Mathematics

For
Rwandan
Primary Schools

Teacher's Guide

5

REB
Rwanda Education Board

Contents

Introduction

Background

Rwanda education board's curriculum has changed from an objective and knowledge based curriculum to a competence based curriculum. This change will ensure that the syllabus responds to the learner's needs. This change emphasises building skills and competences of learners. It is also geared towards ensuring the coherence of the existing content.

This new syllabus guides the interaction between the teacher and the learner through the learning process and highlights the essential practical skills and competences a learner is expected to acquire during and at the end of each unit.

Try to use practical and simplified methods during the actual teaching and learning so that the competences are achieved.

You are also required to ensure that the instructional materials used can help a learner look at the subject in real life situations.

The methods of teaching and instructional materials a teacher uses should be those that focus on how best the learner grasps the competences. Hence, you are expected to apply methods and materials that give learners an opportunity to explore their surroundings. By guiding learners to solve problems using a practical approach and involving all learners the education is inclusive.

Learners with special needs such as the visually impaired, those with hearing impairments and other special needs require special attention. You should ensure the materials they require such as braille, visual aids, learning aids and concrete materials are available in advance of the actual lesson.

Fast learners and slow learners should also be given special attention during the delivery of the lesson.

In the course of teaching and learning sessions, highlight or bring to the attention of learners the relevant cross-cutting issues you intend to develop.

The Teacher's Guide must be used hand in hand with the Pupil's Book.

Purpose of the Teacher's Guide

The Primary Five (P5) Teacher's Guide has been written to guide teachers in their assessment of the development of competences, knowledge and understanding, skills, attitudes and values.

The Teacher's Guide will give you guidance on how to develop the knowledge and understanding, skills, attitudes and values of learners. It is important to note that skills, attitudes and values are developed over a period of time. You should therefore use methods and activities that help learners to develop the knowledge and understanding, skills, attitudes and values over the teaching/learning process.

The Teacher's Guide is meant to guide the teacher. This does not mean that you must limit yourself to the Teacher's Guide.

You are at liberty to devise any other relevant methods which may not be in the Teacher's Guide. Ensure that what you devise effectively assists the learners to achieve the competences, understanding and knowledge, skills, attitudes and values required.

How to use the Teacher's Guide effectively

The Primary Five (P5) Teacher's Guide is specifically addressed to the teacher and it is cross-referenced with the Pupil's Book. This means the two books have to be used hand in hand. It is the responsibility of the teacher to compare the Pupil's Book and the Teacher's Guide before planning or teaching. The Pupil's Book has clear illustrations to show the mathematical concepts in a simplified way, whereas they are stated in the Teacher's Guide. The Teacher's Guide lists the content, learning competence, knowledge and understanding, skills, values and attitudes, suggested teaching methods, suggested instructional materials and the steps involved during the actual teaching and learning process.

At the end of the lesson, there are additional notes to the teacher. Additional activities for each unit have been provided to address multi-ability learning needs.

There are also the expected answers for the Practice Activities outlined. This is intended to give you guidance and ease your work as you conduct the lessons.

Suggested teaching methods

At this level, teaching ought to be learner centred. You are thus required to take the role of facilitator, organiser, advisor and conflict resolver.

To achieve the subject competence, skills, values and attitudes, you are advised to use methods such as demonstration, group discussion, discovery methods where learners explore their surroundings and discover on their own with little or minimum guidance.

Encourage field work/project work to allow learners to relate content to real life experiences. Thus, develop competences through practical work/activities. Practical work/activities are likely to arouse the interest of learners.

Learners tend to remember more of what they do than what they see or hear. They tend to forget mostly what they hear or see. As such, have learners learn by doing. Lecture methods and teacher demonstrations are therefore discouraged. While planning the methods to be used in teaching, consider the interests of learners with special needs. Role play, use of concrete objects, braille and sign language may be appropriate for learners with special needs. Dramatisation can be especially helpful for mentally challenged learners.

You may use different methods in different themes for other learners without special needs.

Guide different learners to learn how to interact well with each other. This will ensure that learners with special needs feel accepted and appreciated in society.

Developing instructional materials

Try as much as possible to use concrete instructional materials that are readily found within the learner's environment. If resources are scarce, you can use semi-concrete instructional materials. This will help cut down the cost of obtaining the materials.

Involve learners in preparing instructional materials by using locally available materials such as wood, clay, bottle tops, stones, sticks.

Developing materials involves collecting and making materials for use during the teaching learning process. Materials for instruction can be classified into:

(a) Low cost materials

These are materials that can be collected locally. They include: empty match boxes, cartons, wooden cases, jars, jerricans, bottles, strings, ropes, wires, thread, tape, ribbon, beads, fruits, seeds, sand, clay, old calendars, cardboard, sticks and counters.

(b) Materials which can be made

- With your learners, you can make the following: abacus, prisms, pyramids, see-saw, beam balance, number cards, sand bags and measuring sticks.
- Materials that may have to be bought are 1 metre ruler, tape measure, spring balance, coloured pencils, geometric instruments and standard weights for instance kilogram, measuring cylinders.

(c) No cost materials

In an environment where the teacher and learner are not able to acquire the materials from the immediate environment, use no cost materials such as making drawings of the item on the chalkboard so that learners may see the picture. Try to use materials that make learning more concrete and effective, more realistic and dynamic.

Importance of instructional materials

- Instructional materials enhance your skills, making the teaching and learning process more effective.
- Instructional materials arouse the attention of learners, thus making them very active during the lesson.
- Instructional materials help you to communicate to learners according to their abilities.
- Instructional materials motivate learners to learn.
- Instructional materials make learning more interesting and interactive thereby getting more ideas from learners.
- Instructional materials help to relate distant ideas to the classroom environment.
- Real objects and models help coordinate visual representation with touch when presenting information.

- Instructional materials create interest in different groups of learners and created for more knowledge.

Rationale

Learning mathematics develops numeracy, logical reasoning skills, critical thinking skills and problem solving skills. As a result, mathematics will be used in various activities of daily life thus serving as an essential tool to society.

In society, mathematics plays a very essential role through abstraction and logic, counting, calculation, measurement, systematic study of shapes and motion.

Mathematics is also very useful in natural sciences, engineering, medicine, finance and social sciences.

Statistics and probability are essential in game theory, in the national census process, in scientific research.

Some cross-cutting issues like financial awareness are used in some mathematics units to improve social and economic welfare.

Learners require basic mathematics competences which include the ability to count, estimate, measure, calculate, interpret statistics, among others.

Mathematics equips learners with knowledge, skills and attitudes necessary for them to thrive in an age of technological growth and socio-economic development. Learners will be able to be confident in problem-solving in real life situations.

Teachers have been given the task to make mathematics a reality in learners' lives.

Broad subject competences

Competence is the ability to carry out a task successfully. This comes as a result of gaining appropriate skills, knowledge and attitudes. Learners have an opportunity to acquire various competences within the mathematic syllabus. Therefore instructors should ensure that the learners are exposed to tasks that will cultivate the desired skills.

During and at the end of the learning process the learner will have acquired these competences.
- Literacy and digital competence
- ICT and digital competence
- Entrepreneurship and business development
- Citizenship and national identity
- Environment
- Life long learning skills
- Critical thinking and problem solving
- Creativity and innovation
- Research
- Communication skills

- Cooperation and teamwork

Pedagogical approach

Competence based curriculum ensures that learning is enjoyable, deep and forms a positive habit.

The teaching strategies incorporate direct instruction, discovery, learning, investigation, guided discovery. Approaches used to deliver include learner-centred learning, different learning abilities and individualisation, use of relevant, suitable and effective teaching materials and formative evaluation to determine effectiveness of teaching and learning processes.

Suitable approaches include: co-operative learning, contextual learning, mastery learning and constructivism.

The learner is encouraged to do research and present findings in group activities. The learner is also cooperative. The learner is the principal person responsible for his or her education.

The teacher on the other hand is a facilitator, organiser, advisor, conflict resolver and is ethical in the impartation of knowledge, skills and attitudes.

Cross-cutting issues

A competence based curriculum aims at imparting knowledge and understanding, skills and attitudes to learners. It also enhances the development of critical thinking and positive choices and actions in learners.

Cross-cutting issues were developed so as to enhance the growth of certain values.

There are eight cross-cutting issues namely:

- Peace and values education
- Genocide studies
- Gender education
- Comprehensive sexuality education
- Inclusive education
- Financial education
- Environment and sustainability
- Standardisation culture

The cross-cutting issues in mathematics are:

- Peace and values education
- Gender education
- Inclusive education
- Financial education
- Environment and sustainability
- Standardisation culture

Guidance on activities and developing generic competences

- Class activities performed outside class are important. Conduct activities detailed in the Pupil's Book for learners and be a facilitator.

- Depending on instructional materials available, organise groups to be small or big. Working in groups will assist in developing various cross-cutting issues and generic competences. The cross-cutting issues like peace and values, gender education, inclusive education, etc can be developed in groups. Use of problem solving methods and measurement in groups develops accuracy and problem solving skills.
- You can have some activities performed individually or in pairs for easy assessment of each learner's performance. Use different learners' abilities to build the group. For example, a learner who is physically handicapped can be the secretary for groups when the activity involves moving steps forward or backwards.

Assessment approach

Assessment is a process of finding out what has been achieved during and after the process of teaching and learning.

The process entails collecting and interpreting evidence of individual learner's learning progress and making judgments about the achievement measured against certain defined standards.

Assessment will be organised at four levels namely school-based assessment. District examinations, National assessment (LARS) and National examinations. Assessment must be competence-based.

The two main types of assessments are formative and summative.

Formative Assessment

Formative assessment occurs when the teaching/learning process is ongoing and continuous assessment is done formally or informally. The teacher can assign classwork, homework, group work and end of week examinations all based on subject competences and generic competences.

You can ask oral questions, observe or use paper and pen or a combination.

Summative Assessment

Summative assessment is done at the end of the term, course, program or year. The results are used to rank/grade learners, decide on progression, selection into the next level of education and for certification.

Ways of assessing

You can use the following ways to assess learners:
- Giving oral and written questions.
- Ask learners to draw then display work for assessment.
- Listening to learners' responses during cooperative group discussion.
- Marking learners' exercise books – homework and classwork.
- Giving and marking topical tests.
- Giving and marking end of term examinations.

- Giving and marking end of year examinations.
- Giving practical work, for example, geometric constructions.
- Assigning learners project work and asking them to present their findings.

Multi-ability learning activities

Different learners have different learning abilities.

This requires you to devise various activities to cater for different learning abilities.

You should identify learning difficulties and give assistance to individual learners.

You should use special remedial strategies for pupils with difficulties. These include peer teaching, mnemonics, grouping and setting different tasks. Fast learners need to be assigned more activities. You should take time to assist both slow learners and average learners during delivery of instructions, and develop a culture of tolerance in the class.

We have provided sample Additional Activities for each unit. Use them to cater for slow, average and fast learners.

Record keeping

Facts and evidence from assessment instruments need to be gathered and kept in an organised manner. These facts are used to judge learners' performance against set standards.

Once learners are assessed, scores achieved will be properly recorded and stored in a portfolio.

Achieved scores will gear the instructor towards remedial actions and alternative instructional strategies. These scores also give feedback to a learner and parents to check learning progress and give advice.

Scores are also used in the final assessment of learners.

The portfolio therefore has the learner's work and the evaluation of strengths and weaknesses of instructions given.

There is a record of activities done over time by the learner in the portfolio.

This record will serve as a verification parameter for every learner to ensure that each learner attended the whole learning process before undergoing the summative assessment of a particular subject.

Special needs learning

Learners with special needs are part and parcel of Rwandan society. It is crucial that they are also given an opportunity to acquire education like other learners. You have the responsibility of identifying such learners. After that, you can use the guidelines

below when dealing with learners with special needs.

Modification for learners with low vision or blindness. Visually impaired learners should be given materials such as braille, white canes, talking computers, calculators and watches.

These learners will be allowed to observe art sample projects with hands for a longer period of time. The learner will also be provided with safe tools and individual guidance when a project is being demonstrated.

The teacher is required to adjust a project slightly to accommodate learners with vision limitations or safety reasons. Learners must be given enough time to exit class before large groups gather outside the class. These learners require concrete materials for learning.

Learners with hearing impairments can use pictures, real objects and other materials in class. After consulting with an expert, the learner can use special devices for hearing known as hearing aids.

Let the learner sit close to the instructor so that they are better equipped to hear instructions or read lips. Let the learner be provided with written instructions so that they can read about the discussion and demonstrations.

Learners with mild brain injury or mental impairments, the teacher is advised to use real objects and pictures made in different shapes and decorated with attractive colours pitched to their mental abilities. The teacher is expected to provide communication of progress to the parent. Provide the learner with school instructions and home instructions for review. Allow them ample time to exit class before the official end of class. Assign them special seats to facilitate appropriate class participation. Identify peers who can articulate projects to the learners.

Physically handicapped or motor impaired learners can use materials that are used by the rest of the class. During projects they can be assigned the role of a secretary so that they can participate in the presentation actively. However, the other learners could assist the physically handicapped learner with mobility.

Safety precautions during field work/project work/class activities

Learners are to fully participate in learning through learner centred approaches. However, it is paramount that learners take precautions in whatever they do.

- During field work or project and class activities the teacher should be gender sensitive while assigning roles to learners. At some ages, girls and boys might not find it easy to freely mingle with each other.

- Learners should also be cautioned on the use of sharp objects for example, a pair of compasses, a pair of scissors, knives and razor blades when carrying out geometric construction.

- The teacher should give clear guidelines and instructions before learners begin

any practical work in class or outside the class.

- The teacher is expected to clearly articulate road safety rules before project work involving roads and vehicles for example collecting data on types of cars.
- Learners should also be advised to take good care of the instructional materials because the same materials may be used at a later time in a different unit.
- The teacher should caution learners against consuming the liquids or food substances that have been used in practical activities. They could have been contaminated in the course of the activities.

Use of exercises and their answers

Even though answers for exercises and question were provided in this book, the teacher is requested to do every activity before marking learner's work.

Sample Competence-based Lesson Plan

School Name: _____ Teacher's Name: _____

Term	Date	Subject	Class	Unit No.	Lesson No.	Duration	Class size
3	25/03/2016	Mathematics	P5	15	2 of 4	40 min	40 pupils

Type of Special Educational Needs to be catered for in this lesson and number of learners in each category	• Learners with difficulty using their hands: 2. Have them observe and report the outcomes of experiment. • Partially deaf learners: 3. Have them closer to the front to hear instructions easily. Allow them to record results. • Learners with poor eyesight: 2. Allow them sit nearer to the front so as to see the board easily.

Unit title	Probability
Key Unit Competence	To be able to conduct experiments to decide how likely something is to happen.
Title of the lesson	Conducting experiments and chances – Tossing a coin several times
Instructional objective	Using a coin, the learner should be able to toss a coin 20 times, record outcomes systematically using a table and draw conclusions about all possibilities/outcomes.
Plan for this class (Location: in or outside)	Open space inside the classroom. Open space can be on a table, desk or floor.
Learning materials (for ALL learners)	Coins, charts for recording data, chart on chalkboard.
References	Pupil's Book page 254, Teacher's Guide page 315.

Timing for each step	Description of teaching and learning activity		Generic competences and cross cutting issues to be addressed + a short explanation

Description of teaching and learning activity
Have learners in groups of five do Activity 15.3 from the Pupil's Book page 255. Let them discuss questions from the Activity using their outcomes from the experiment. Then make a class presentation of their findings.

Timing for each step	Teacher activities	Learner activities	Generic competences and cross cutting issues
Introduction: 5 minutes	• Asking a simple question: When you toss a coin twice, what are your possible outcomes? • Introducing the content.	• Attempting the question asked by the teacher in pairs. • Carrying out simple experiment on tossing coin twice in pairs. • Recording their outcomes. Then draw conclusion on expected outcome from tossing a coin twice. **Expected outcomes** are {HT, TH, TT, HH} where T is tail and H is head.	• **Gender education** – Have a boy and a girl carry out the simple experiment. Ensure each perform the activity and discuss together.
Development of the lesson: 20 minutes	• Demonstrating steps to do Activity 15.3 in the Pupil's Book page 255. Putting learners in small groups of five. • Guiding learners in doing Activity 15.3 in the Pupil's book page 255, in their groups. Assessing their progress.	• In groups of five learners, toss a coin 20 times and record all the possible outcomes using a table – ticking correctly in table for observed outcome (Activity 15.3 from Pupil's Book page 255). • Counting the total number of heads and tails then draw conclusion on chances of getting head or tail from the experiment. **Expected outcomes:** Number of heads and tails vary from one group to the other. But number of heads and tails adds up to 20 (total outcome).	• **Co-operation** – Have learners work together in group work activity. • **Inclusive education** – Have learners of different learning abilities and special needs work in the same groups in the classwork activity.

	• Discussing questions 1 – 4 from Activity 15.3 in their groups as classwork. Expected answers: 1 – 3 will have different responses depending on observations of each group. Question 4: Outcome of tossing a coin is not tied to previous outcome.	• **Peace and value education** – In each group, have learners work together harmoniously and respect each other's ideas during discussion in their groups.
Conclusion: – Assessment – Summary 15 minutes	• Giving classwork on vocabulary of chance from Activity 15.3 and homework. • Teacher checks classwork responses of learners. • Guiding learners to draw conclusions about all outcomes.	• Five learners form a groups. Then discuss questions provided from Activity 15.3 in the Pupil's Book relating vocabulary of chance and tossing a coin. They should discuss and tick correctly on their response in a table. Then make a class presentation on their findings/conclusions drawn from the activity. • Noting homework assigned by the teacher. **Expected answers:** - Different groups might present different answers. They should justify their answers from their outcomes recorded in the table – getting a head or getting a tail. - Response for getting a tail and a head at once or getting no tail and no head in a toss leads to conclusion of impossible event (use vocabulary of chance–impossible).	• **Communication** – through group activity, discussion and presentation of their findings, learners develop effective communication skills.
Teacher self-evaluation	The lesson objectives are achieved. Further, Remedial and Extension Activities are needed.	

Content Map

	Unit 1: Reading, writing, comparing and calculating whole numbers up to 1 000 000	**Unit 2: Addition and subtraction of integers**	**Unit 3: Prime factorisation and divisibility tests**
Number of periods	12	11	16
Introduction	Reading, writing, comparing and calculating whole numbers up to 100 000.	Adding and subtracting integers.	Prime factorise, show the rule of divisibility test less than 13. Find Lowest Common Multiple and Greatest Common Factor of whole numbers.
Classroom organisation	• Whole class orientation. • Group work then individual work.	• Whole class orientation. • Group work then individual work.	• Whole class orientation. • Group work then individual work.
Learning and teaching materials	• Manila cards or slips of papers, scissors, makers	• Masking tape, manila cards and string marked off evenly with knots.	• Manila cards, scissors, markers and masking tape.
Activities	• Matching game • Writing words from teacher's dictation. • Use of flash cards or cut outs. • Carrying out operations using abacus.	• Role-playing using number cards placing them backwards and forward. • Game guided by teacher to show positive/negative integers. • Mental activities: Learner pictures number line and states distance between numbers.	• Using flash cards factorise numbers, showing prime factors using indices. • Finding the Least Common Multiple. • Finding the Greatest Common Factor. • In group activities learners discover how to determine divisibility tests.

Competences practiced	• Team work • Effective communication • Problem solving	• Team work • Effective communication • Problem solving	• Team work • Effective communication • Problem solving
Vocabulary acquisition	• Writing numbers in words up to 1 000 000. • Place values in written numerals.	• Names of different integers. Terminology associated with integers.	Explaining prime numbers, rule of divisibility tests of numbers and the concept of indices (powers).
Study skills	• Group activities/ discussion • Demonstration • Problem solving • Supervised practice	• Group activities/ discussion • Problem solving • Supervised practice	• Group activities/ discussion • Class demonstration • Problem solving
Revision	**Unit Revision Activity**	**Unit Revision Activity**	**Unit Revision Activity**
Assessment	• Ability to read and write whole numbers up to 1 000 000. • Ability to accurately compare whole numbers in terms of size. • Ability to carry out the operations and solve problems involving them. • Continuous practice activities to test what learners have acquired.	• Ability to accurately locate integer on a number line. • Ability to accurately compare and order integers on a number line. • Ability to accurately add and subtract integers. • Direct observation of learners computing distances between integers.	• Ability to prime factorise numbers correctly. • Ability to show the rule of divisibility tests for numbers less than 13. • Ability to find the Lowest Common Multiple (LCM). • Ability to find the Greatest Common Factors of whole numbers. • Continuous practice activities to test what learners have acquired.

Learning outcomes	• Ability to read and write whole numbers up to 1 000 000. • Compare and calculate whole numbers up to 1 000 000. • Ability to carry out operations using correct process and solve daily life problems.	• Know how to locate positive and negative numbers on a number line. • Compare integers physically and mentally. • Ability to calculate the distance between 2 integers. • Ability to solve mathematical problems involving addition and subtraction of integers.	• Knowing how to factorise numbers using prime factors. • Knowing how to calculate and show the rule of divisibility tests. • Knowing how to calculate the Least Common Multiple (LCM) and the Greatest Common Factor (GCF) of numbers.
	Unit 4: Equivalent fractions and operations	**Unit 5: Multiplication and division of decimals**	**Unit 6: Application of direct proportions**
Number of periods	33	21	13
Introduction	Adding, subtracting and finding equivalent fractions.	Multiply, divide and compare decimal numbers up to 3 decimal places.	Apply direct proportions in practical context.
Classroom organisation	• Whole class orientation. • Group work then individual work.	• Whole class orientation • Group work then individual work	• Whole class orientation • Group work then individual work
Learning and teaching materials	• Manila cards, scissors, markers and masking tape.	• Manila cards, scissors, markers and masking tape	• Real clock face, manila cards, masking tape, markers and scissors

Activities	• Use of flash cards in groups and individually carrying out operations using the Least Common Multiple.	• Comparing decimals using >, < or = signs. • Matching fractions to decimals. • Carrying out operations using place values. • Converting fractions to decimals and vice versa.	• Solving problems involving direct proportions. • Stating rule involved in direct proportion. • Carrying out practicals involving direct proportions.
Competences practiced	• Team work • Effective communication • Problem solving • Co-operation	• Co-operation • Effective communication • Creative thinking • Critical thinking	• Co-operation • Effective communication • Creative thinking • Critical thinking
Vocabulary acquisition	Basic terminology used in fractions.	• Read and write decimal numbers in figures and in words. • Practical activities • Group activities • Demonstrator • Manipulation • Supervised activities	Read and write numbers involving direct proportions.
Study skills	• Group activities/ discussion • Class demonstration • Manipulation	• Practical activities • Group activities • Demonstrator • Manipulation • Supervised activities	• Group activities • Demonstration • Multiplication • Practical activities • Experiment • Supervised activities • Question and answers

Revision	Unit Revision Activity	Unit Revision Activity	Unit Revision Activity
Assessment	• Assessment on the ability to add, subtract and find equivalent fractions.	• Ability to explain the concept of decimal numbers using place value up to 3 decimal places. • Ability to identify the place values in written decimals. • Ability to multiply and divide decimal numbers. • Ability to match fractions to decimals. • Ability to apply decimal concepts to solving daily life mathematical problems. • Ability to compare 2 or more decimal numbers in figures and in words.	• Ability to explain the concept of direct proportion. • Ability to explain how to work out problems involving direct proportions. • Ability to calculate numbers involving direct proportions. • Ability to solve mathematical problems involving direct proportions.

Learning outcomes	• Ability to explain the concept of equivalent fractions and how to find equivalent fractions. • Ability to explain how to add or subtract fractions with different denominators using equivalent fractions and the Lowest Common Multiple (LCM).	• Ability to understand concept of decimal fraction through examples. • Ability to compare decimal numbers. • Ability to multiply, divide decimal numbers. • Ability to convert fractions to decimals and vice versa. • Ability to match fractions to decimals. • Ability to identify place value of decimals up to 3 decimal places.	Ability to apply direct proportion in content for example scale drawing three times size of 1 kg.
	Unit 7: Solving problems involving measurements of length, capacity and mass	**Unit 8: Solving problems involving time intervals**	**Unit 9:Money and its financial operations**
Number of periods	**8**	**21**	**21**
Introduction	Solve problems involving measurements of length, capacity, mass and calculating number of intervals.	Solve real life problems that involve finding time intervals and conversion of units.	• Explain money and its financial applications.
Classroom organisation	• Whole class orientation • Group work then individual work	• Whole class orientation • Group work then individual work	• Whole class orientation • Group work • Individual work

Learning and teaching materials	• Charts, tape measure, manila cards and glue	• Tape measures, rulers, digital technology e.g (calculator, spread sheets and data from other subjects.	• Mobile phone • Sheet of paper • ATM cards • Cheque • Coins • Notes (paper money)
Activities	• Measuring fixed distance. • Counting number of intervals on fixed distance. • Use flash cards to revise units of length, mass and capacity.	• Finding time intervals for an event. • Solve real life problems involving time. • Converting units of time from one unit to another.	• Discuss uses of money. • Perform role played on money. • Discuss importance of budgeting at home. • Perform tasks on setting priorities. • Discuss ways of saving money. • Discuss the importance of borrowing money.
Competences practiced	• Co-operation • Effective communication • Critical thinking • Creative thinking	• Creative thinking • Critical thinking • Effective communication • Co-operation	• Effective communication • Accuracy • Problem solving
Vocabulary acquisition	• Read and write units involved in measurement of length, capacity and mass. • Describe how to solve mathematical problems involving time. • Explain the meaning of time intervals.	Read and write time intervals.	Sources Uses Budget Priority Needs Wants Saving Borrowing

Study skills	• Practical work • Group activities • Discussion • Demonstration • Supervised activities	• Group activities • Discussion • Supervised activities	• Group activities • Discussion • Demonstration by the teacher
Revision	**Unit Revision Activity**	**Unit Revision Activity**	**Unit Revision Activity**
Assessment	• Ability to distinguish between the types of intervals. • Ability to explain the use of units of length, capacity and mass in real life situation. • Ability to calculate the number of intervals.	• Ability to explain various units of time. • Ability to describe how to solve mathematical problems involving time. • Ability to explain the meaning of time intervals. • Ability to add and subtract time.	• Ability set priorities while using money. • Ability to describe sources of money. • Ability to explain importance of saving. • Ability to convert currencies. • Ability to explain the importance of borrowing money.

Learning outcomes	• Ability to calculate the number of intervals between objects (on open line or on a closed line). • Ability to solve problems involving intervals. • Ability to select appropriate measurement units when solving problems. • Interpreting decimal representations up to 3 decimal places.	• Ability to solve real life problems that involve finding time intervals. • Ability to convert units of time (converting hours into minutes and seconds and converting hours into days and vice versa).	• Be able to state the role of money in our lives. • Be able to explain budgeting. • Be able to state ways of transferring money. • Be able to explain the importance of saving and borrowing money. • Be able to convert currencies.
	Unit 10: Time	**Unit 11: Money and its financial application**	**Unit 12: Interpreting and constructing scale drawings**
Number of periods	10	8	9
Introduction			Interpret and construct scale drawings.
Classroom organisation	• Whole class orientation • Group work then individual work	• Whole class orientation • Group work then individual work	• Whole class orientation • Group work • Individual work

Learning and teaching materials	• Real clock, clock faces and calendars • Wall charts showing clock faces	• Real money, pictures and drawings of Rwandan currency • Empty tins, boxes, soap and pens to build a classroom shop.	Charts Tape measure Maps Ruler
Activities	• Discussing units of time. • Drawing clock faces. • Telling time drawn and show time given. • Discuss different activities at specific time. • Convert units of time. • Solve problems involving time	• Talk about notes and coins used in Rwanda and how to change from higher to smaller units. • Role-play buying and selling. • Discuss ways of gaining money and how it is used. • Make simple plans according to priorities and financial means	• Discuss scale on a map. • Discuss distance represented on a map. • Discuss conversion of units of length.
Competences practiced	• Communication • Team work • Problem solving • Manipulation skills	• Sharing with others • Team work • Effective communication • Creative thinking • Problem solving	• Effective communication • Accuracy • Problem solving

Vocabulary acquisition	• Identify different units of time • Meaning of a.m. and p.m.	• Identify the various denominations of the Rwandan currency. • Basic terms associated with money and its financial application.	• Scale drawing • Actual • Ratio
Study skills	• Group discussion • Practical work to put learnt concepts into practice • Class demonstrations	• Class demonstrations • Role play and dramatisation • Group discussion	• Discussion • Group work activity • Demonstration
Revision	**Unit Revision Activity**	**Unit Revision Activity**	**Unit Revision Activity**
Assessment	• Assessment on the ability of learners to read and tell time accurately. • Formative assessment on the learner's ability to solve mathematical problems involving time. • Continuous practice activities that test what learners have learnt in the unit.	• Assessment on the ability to identify various denominations of the Rwandan currency. • Formative assessment on the ability to carry out calculations in simple business transactions. • Formative assessment on the ability to solve problems involving buying and selling.	• Ability to calculate the scale on map. • Ability to calculate the actual distance. • Ability to find the drawing length. • Ability to convert between measurements.

Learning outcomes	• Ability to read and tell time accurately. • Ability to convert between units of time and correctly write units of time in a.m. and p.m.	• Ability to identify the various denominations of the Rwandan currency. • Ability to state different ways of using money to meet family needs. • Ability to explain the process of simple budgeting based on priorities.	• Be able to explain the concept of scale drawing. • Use scale drawing in solving problems. • Explain how to find actual distance. • Explain how to find the scale on maps.
	Unit 13: Calculating the circumference of a circle and volume of cuboids and cubes	**Unit 14: Types of lines and angles**	**Unit 15: Probability**
Number of periods	16	8	4
Introduction			Conduct experiment to decide how likely something is to happen.
Classroom organisation	• Whole class orientation • Group work • Individual work	• Whole class orientation • Group work then individual work	• Whole class orientation • Group work then individual work
Learning and teaching materials	• Metre ruler • Rope • Sticks • Paper square • Manila cards • Charts	• Protractor • Manila cards • Markers	• Bottle tops, coins, dice (improvise by using wooden cubes and label the sides as required).

Activities	• Measure distance round. • Discuss volume of cube and cuboids. • Opening boxes • Folding the net to make cubes and cuboids.	• Through observation, learners classify different types of lines. • Draw 2 intersecting lines and tell the number of angles made. • Compare the angles by showing which is greater, smaller or equal. • Give one complementary or supplementary angle.	• Tossing a coin • Tossing a dice • Tossing a bottle top • Have a debate activity
Competences practiced	• Problem solving • Creative thinking • Effective communication	• Communication • Manipulation skills • Team work • Sharing with others	• Effective communication • Critical thinking • Creative thinking • Co-operation
Vocabulary acquisition	Circumference Pi Diameter Volume Nets	• State different types of series. • Recognise types of angles and establish their difference based on their properties.	• Read and write vocabulary of chance.
Study skills	• Group work activities. • Demonstration on round shapes. • Discussion	• Observation • Group discussion • Problem solving	• Practical work • Group activities • Discussion • Demonstration • Supervised activities

Revision	Unit Revision Activity	Unit Revision Activity	Unit Revision Activity
Assessment	• Ability to calculate circumference • Ability to explain Pi. • Ability to calculate volume.	• Direct observation of learners to find out if they can classify lines. • Formative assessment involving giving learners exercise that test their ability to identify types of lines and angles and use a protractor to measure angles.	• Ability to explain that random events have different likelihoods of occurring and recognise associated vocabulary. • Ability to conduct experiments and records outcomes systematically. • Ability to use the vocabulary of likelihood to compare events.
Learning outcomes	• Be able to explain the concept of circumference. • Describe the process of finding circumference. • Be able to establish relationship between cubes and cuboids. • Be able to solve mathematical problems on volume of cubes and cuboids.	• Ability to state different types of lines. • Ability to identify and choose appropriate geometrical instruments. • Ability to recognise types of angles. • Ability to establish the difference between different angles based on their properties.	• Ability to use vocabulary of chance (impossible , certain, equally, likely, even chance, unlikely etc).

	Unit 16: Area of 2D shapes	Unit 17: Elementary statistics	Unit 18: Introduction to probability
Number of periods	16	12	4
Classroom organisation	• Whole class orientation • Group work then individual work	• Whole class orientation • Group work then individual work	• Whole class orientation • Group work then individual work
Learning and teaching materials	Rulers, paper, shapes, squared papers, scissors and glue	Manila paper, scissors, tape measures, rulers, glue, masking tapes and weighing machines	Various games, coins, dice and cards
Activities	• Folding a rectangle along its diagonal to make a triangle. • Drawing triangles on squared papers. • In pairs, find triangles and quadrilaterals with a perimeter of 24 cm. • Find triangles and quadrilaterals in pairs with an area of 36 cm^2.	• Through observation and demonstration. • Learners discuss ways of collecting data, interpreting data using tables and representing data using bar graphs. • Discuss in groups the meaning of qualitative and quantitative data.	• In pairs/small groups, play various games: snakes and ladders, ludo, bingo. • Throwing a dice and tallying the scores. • Playing snap with sets of cards. • Playing various games with playing cards. • Tossing three coins.
Competences practiced	• Manipulation skills • Team work • Creativity • Problem solving • Sharing with others	• Data collection methods • Team work • Manipulation skills • Presentation of findings • Communication	• Team work • Effective communication • Sharing with others • Manipulation skills

Vocabulary acquisition	• Selecting units to use • Differentiate area and perimeter • Basic terms used in area of triangle and quadrilaterals	• Names methods of data collection. • Basic terminology used in statistics.	Terminology associated with games of chance.
Study skills	• Practical work • Investigate • Group discussion • Problem solving	• Observation • Demonstration • Group discussion • Data collection and presentation	• Demonstration • Practical work • Game playing
Revision	**Unit revision activity**	**Unit revision activity**	**Unit revision activity**
Assessment	• Assessment on the ability to distinguish the area and perimeter. • Assessment on the ability to select the correct units to use. • Continuous practice activity to test learners.	• Direct observation of learners as they collect data. • Formative assessment on the ability of learners to collect, represent and interpret data. • Continuous practice activity to test learners.	• Ability to decide whether or not games of chance are fair. • Continuous practice activity to test learners.

Learning outcomes	• Ability to explain area as the space enclosed by a perimeter. • Determine the area of triangles and quadrilaterals by relating them to the area of rectangles.	• Ability to explain how data is collected using tables. • Ability to differentiate between quantitative and qualitative data. • Ability to explain the process of interpreting and extracting information from tables. • Ability to describe how to represent information using tables and bar graphs.	• Ability to know and explain that games have rules and may or may not be fair. • Ability to decide whether or not a game is fair.

Topic Area: Numbers and Operations

Unit 1
Reading, writing, comparing and calculating whole numbers up to 1 000 000

Background

This topic was introduced to learners in the previous years. Thus learners will get an opportunity to use various operations. This will help them get a clear representation of number concepts. Learners will also get an opportunity to relate the concepts to daily life experiences.

Content summary

1.1   Reading and writing numbers in words up to 1 000 000.

1.2   Place value and comparing numbers.

1.3   Addition of 3 or more whole numbers of 7 digits with and without carrying.

1.4   Subtraction of 2 whole numbers of 7 digits with or without borrowing.

1.5   Quick multiplication of a 3 digit number by 5, 9, 11, 25, 49 and 99.

1.6   Multiplication of whole numbers by a 3 digit number.

1.7   Division without a remainder of a 3 digit number a 2 digit numbers.

Key Unit Competence

Ability to read, write, compare and calculate whole numbers up to 1 000 000.

Attitudes and Values

• Appreciate the importance of reading and writing numbers.

• Developing personal confidence in the use of numbers.

• Appreciate the importance of addition, subtraction, multiplication and division in daily life.

• Calculate quickly and accurately.

Assessment of attitudes and values

Observe learners' behaviour to see if they develop a positive attitude towards this topic of numbers and operations.

Relevant cross cutting issues

Peace and values education: In a society, its essential to have peace. When peace prevails there is growth in all sectors of the economy. People work without fear and suspicion. Peace in a society is the most important aspect. Page 8 question 11 talks about a peace rally attended by all members of a society.

Financial education: It is demonstrated by question 10 on page 7. It talks about investment and the culture of saving, investing for the future. Page 5 question 10 deals with a similar aspect of financial education.

Gender education: Sub-topic of comparing. Learners may be different in many aspects but all are equal in humanity. When learners work in groups, balance the number of boys and girls in each group. Have boys and girls perform similar duties in class activities.

Relevant generic competences

- **Communication:** As learners work in pairs or groups emphasise that there should be effective communication. Effective communication is essential so that they can understand each other.

- **Research and problem solving:** Allow the learners to do the activities and solve problems given in practice activities. This will enable development of problem solving skills that can be useful in applying to solve daily life problems related to numeracy from whole numbers.

- **Cooperation:** While carrying out group work activities, learners will develop a sense of cooperation. Working together in cooperation leads to the desired results.

Assessment criteria

Learners should read, write, compare and solve mathematical problems that involve the calculations up to 1 000 000.

Notes to the teacher

(a) Place value

When teaching the place value of numbers, use the method below to help learners identify the place value of each number below.

$$4\ 5\ 6\ 7\ 8$$

Ones
Tens
Hundreds
Thousands
Ten of thousands
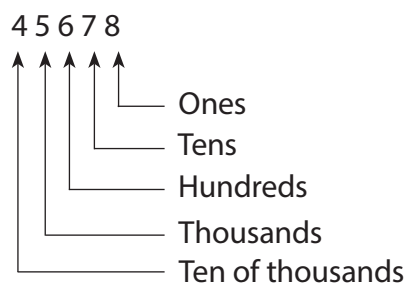
Moreover, across the whole unit emphasise the alignment of digits

$$\begin{array}{r} 54\ 462 \\ +\quad 476 \\ \hline \end{array}$$

. This is especially important before performing any operations.

(b) Quick multiply numbers by 9, 5and 49

1. How to quick multiply a number by 9.

488 × 9

Steps:

(a) Add a zero (0) to the right end of the number.

4 880

(b) Subtract original number from it.

4 880 – 488 = 4 392

Thus, 488 × 9 = 4 392

2. How to quick multiply a number by 5.

864 × 5

Steps:

(a) Divide the number by 2

864 ÷ 2 = 432

(b) Add a zero (0) to the right of the number.

4 320

Thus, 864 × 5 = 4 320

3. How to quick multiply a number by 49.

3 646 × 49

Steps:

(a) Divide the number by 2.

3 646 ÷ 2 = 1 823

(b) Put two zeros to the right or multiply by 100.

1 823 × 100 = 182 300

(c) Subtract the original number from your result.

182 300 – 3 446 = 178 654

Thus, 3646 × 49 = 178 654

Word List

Reference: Pupil's Book page 16

Use the word list to develop reading, listening and writing skills. Build on learner's vocabulary using the word list. Have learners work in pairs to carry out the task using suitable vocabulary.

Content

1.1 Reading and Writing Numbers in Words up to 1 000 000

Number of periods: 1

Reference: Pupil's Book page 1

Knowledge and Understanding

Read written numerals correctly in English.

Skills

Correctly translate between written numerals and spoken English.

Teaching/Learning materials

Slips of papers with a 6-digit number.

Teaching/Learning methods

- Group work activities –Discuss Activity 1.1 in groups on writing numbers in words.
- Explanation – Guide learners how to read and write numbers in words.
- Problem solving – Each group makes a presentation to the class after solving problems in Practice Activity 1.1.

Lesson preparation

Lesson will take place in class. Prepare slips of papers with 6 digit numbers before the lesson. Organise learners to work in small groups for Activity 1.1.

Teaching/Learning steps

1. Ask each learner to pick a slip of paper with a number.
2. Learners arrange themselves in order according to their numbers.
3. Ask each learner to read their number aloud.
4. Let learners discuss how to write numbers in words using Example 1.1. Give learners the dictation activity.
5. Assign learners Practice Activity 1.1 questions 1 and 2 for classwork. Assess learners' progress. Allow learners to discuss problems that are difficult.
6. Have learners give important points they have learnt.
7. Assign learners questions 3 and 4 Practice Activity 1.1 for more practice as homework.

Assessment of skills, knowledge and understanding

Observe learners as they translate between written numerals and spoken English.

Guidance to the teacher

Administer dictation activity to learners.

Dictation activity

Use these problems to give learners a dictation. Write these numbers in words

(a)   134 659   (b)   370 236   (c)   450 050   (d)   300 990

Expected Answers for Dictation Activity

1.   One hundred thirty four thousand six hundred fifty nine.
2.   Three hundred and seventy thousand two hundred thirty six.
3.   Four hundred fifty thousand and fifty.
4.   Three hundred thousand nine hundred and ninety.

Expected Answers to Practice Activity 1.1

1.   (a)   Six hundred seventy one thousand three hundred seventy nine.
     (b)   Two hundred eighty six thousand seven hundred forty eight.
     (c)   Nine hundred and ten thousand eight hundred forty two.
     (d)   Two hundred sixty three thousand four hundred and fifty.
2.   (a)   Seven hundred sixteen thousand eight hundred and nine.
     (b)   Six hundred and four thousand three hundred eighty two.
     (c)   Eight hundred sixty two thousand and fifty nine.
     (d)   Three hundred forty five thousand six hundred seventy one.
3.   Four hundred forty seven thousand, three hundred thirteen.
4.   Five hundred twenty seven thousand one hundred seventy four.

1.2   Reading and Writing Numbers in Figures

Number of periods: 1

Reference: Pupil's Book page 2

Knowledge and understanding

Read written numerals correctly in English.

Skills

Correctly translate between written and spoken numerals.

Teaching/Learning materials

A chart showing solution to Activity 1.2.

Teaching and learning methods

•   Group work activities – Group discussion on Activity 1.2 to match numbers in figures and words.

- Demonstration – Guide learners to write numbers in figures using Example 1.2.
- Problem solving – Organise learners in groups. Then have learners make a presentation on matching numbers in figures and words.

Lesson preparation

Lesson will take place in class.

Prepare the chart showing solutions to problems in Activity 1.2.

Organise learners in discussion groups and have them carry out Activity 1.2.

Teaching/Learning steps

1. Ask learners to read out problems in Activity 1.2 (a).
2. Let learners discuss how to write numbers in figures.
3. Let learners write the numbers in Activity 1.2 (a) in figures.
4. Display the chart with solutions to the activity and match.
5. Demonstrate how to write numbers in figures using Example 1.1.
6. Let learners have a dictation from teacher and they write down numbers in figures.
7. Assign learners Practice Activity 1.2 questions 1 and 2 as classwork. Assess learners' progress. Have fast learners guide slow learners in discussing difficult items if necessary.
8. Let learners give important points they have learnt.
9. Assign learners question 3 and 4 for practice Activity 1.2 for more practice as homework.

Assessment of skills, knowledge and understanding

Observe learners as they translate between written numerals and figures.

Guidance to the teacher

Dictation Activity

Use these questions to take learners through the dictation activity.

Write the following numbers in figures:

(a)   Four hundred twenty five thousand seven hundred.
(b)   One hundred seventy six thousands five hundred and twenty.
(c)   Five hundred thirty one thousand nine hundred eighty nine.
(d)   Eight hundred thousands and thirty-four.

Expected answers for Dictation Activity

(a)   425 700   (b)   176 520   (c)   531 989   (d)   800 034

Expected answers to Practice Activity 1.2

1.   (a)   706 518   (b)   103 604   (c)   900 909   (d)   500 005

2. (a) 650 000   (b)   808 808   (c)   234 111   (d) 471 235
3. 398 766   4. 547 750

1.3 Place Value of Numbers up to 7 Digits

Number of periods: 1

Reference: Pupil's Book page 3

Knowledge and understanding

Name all place value up to 1 000 000 in spoken and written form.

Identify the place values in written numerals. General understanding of place values.

Teaching/Learning materials

- A chart showing solutions to Activity 1.3.
- Paper cutouts with numbers on Activity 1.3.

Teaching/learning methods

- Group work activities – Learners discuss Activity 1.3 on the place value of digits.
- Demonstration – To show the place value of digits on paper cut outs.
- Problem solving – Learners solve problems in Practice Activity 1.3 through group discussion.

Lesson preparation

Lesson will take place in class.

Organise learners to work in small groups for Activity 1.3.

Prepare the chart showing solution to Activity 1.3.

Prepare paper cut-outs with numbers in Activity 1.3

Teaching/Learning steps

1. Let learners have the paper cutouts with numbers.
2. Ask learners to name the place value of each digit.
3. Let learners write the place value of each digit.
4. Learners read the place value of each digit aloud.
5. Display the chart with solutions to Activity 1.3.
6. Demonstrate how to identity place value of digits using Example 1.3.
7. Assign learners Practice Activity 1.3 question 1 as classwork. Let them work in groups. Move round. Assess learners' progress and guide then where necessary.
8. Let learners give important points they have learnt.
9. Give further practice questions 2 – 3 Practice Activity 1.3 as homework.

Assessment of skills, knowledge and understanding

Observe learners as they write down place value of digits correctly.

Guidance to the teacher

• Let learners identify place value of numbers.
• Emphasise that place value of digits in a whole number starts from the digit on the right sides (ones) and progresses to the left (millions).

Expected Answers to Practice Activity 1.3

1. (a) 5 – Hundred thousands   (b) 1 – Hundred thousands
        6 – Ten thousands   8 – Ten thousands
        0 – Thousands   9 – Thousands
        4 – Hundreds   2 – Hundreds
        3 – Tens   7 – Tens
        8 – Ones   4 – Ones

   (c) 9 – Hundred thousands
        0 – Ten thousands
        8 – Thousands
        3 – Hundreds
        4 – Tens
        6 – Ones

2. (a) 9   (b) 3   (c) 8
3. (a) Thousands   (b) Hundred thousands
   (c) Hundred thousands   (d) Hundreds

1.4 Comparing Numbers using <, > or =

Number of periods: 1
Reference: Pupil's Book page 5
Skills
• Compare numbers of any size using place values.
• Apply comparison of numbers in daily life.

Teaching/Learning materials

Paper cutouts of numbers in Activity 1.4

Teaching/Learning methods

• Group work activities – Learners in groups, discuss Activity 1.4 comparing numbers from the largest to the smallest.

- Demonstration – Learners demonstrate the comparison of numbers.
- Problem solving technique – In their discussion groups, learners solve problems assigned from Practice Activity 1.4.

Lesson preparation

The lesson will take place in class.

Organise learners to work in small groups for Activity 1.4 and prepare paper cutouts.

Teaching/Learning steps

1. Let learners write the numbers on paper cutouts.
2. Ask learners to arrange the numbers to form the largest number possible and then the smallest number possible.
3. Let learners use > or < to compare the numbers they formed. Repeat activity with other numbers.
4. Use Example 1.4 to illustrate comparison of numbers. Learners can discuss it as a class.
5. Assign learners Practice Activity 1.4 questions 1 and 2 as classwork. Go round assessing learners' progress and guide where necessary.
6. Let learners give important points they have learnt.
7. Assign learners questions 3 and 4 of practice Activity 1.4 for more practice as homework.

Assessment of skills knowledge and understanding

- Observe learners as they compare numbers using <, = or >.
- Assess learners' ability to justify their answers in question 2 through discussion.

Guidance to the teacher

Emphasise that to compare whole numbers, one must line up the place values and start comparing from the left the digits in the greatest place value position.

Expected answers for Practice Activity 1.4

1. (a) 440 040 = 440 040   (b) 657 000 < 675 000
   (c) 649 362 > 639 462   (d) 831 647 < 861 347
2. (a) 531 926 > 513 926   (b) 100 000 < 1 000 000
   (c) 210 034 > 201 034   (d) 245 689 = 245 689
3. (a) Children   (b) Adults 136 895 < 136989. So there were fewer adults.
4. Musabe made more money. Musabe made 630 000 Frw.
   Now, 630 000 Frw > 550 000 Frw

1.5 Addition of 3 or more whole numbers of 7 digits with or without carrying

Number of periods: 1

Reference: Pupil's Book page 6

Knowledge and understanding

Explain the concept and process of addition of 3 numbers of 6 digits with or without carrying.

Skills

Carry out addition of 3 or more whole numbers.

Apply the knowledge of addition in solving mathematical problems in daily situations.

Teaching/Learning materials

Abacus, objects of different colours

Teaching/Learning methods

- Group work activities – Discuss learning Activity 1.5.
- Demonstration – To show how to add 3 or more numbers.
- Supervised practice – Learners add numbers while the teacher checks their progress.
- Problem solving techniques – Learners in pairs, discuss Practice Activity 1.5. They solve and give accurate answers while explaining their steps.

Lesson preparation

Lesson will take place in class.

Organise learners to work in small groups for Activity 1.5.

Prepare abacus and objects of different colours.

Teaching/Learning steps

1. Have groups of learners add numbers given in Activity 1.5. Have learners do a quick presentation.
2. Use Example 1.5 to demonstrate how to add 3 or more whole numbers.
3. Assign learners to solve problems in Practice Activity 1.5 questions 1 and 2 as classwork. Go round assessing learners' progress. Give hints to learners finding the problems difficult to solve.
4. Have learners give important points they have learnt.
5. Assign learners Practice Activity 1.5 questions 3 – 5 for more practice as homework.

Assessment of skills, knowledge and understanding

Observe learners as they carry out the process of addition.

Guidance to the teacher

You can use an abacus to illustrate addition. For example

Add: 342 054 + 223 110

You can use an abacus as below.
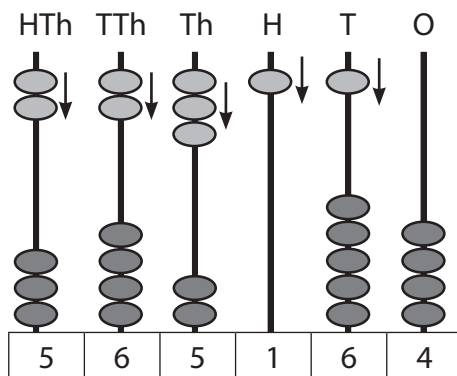
| 5 | 6 | 5 | 1 | 6 | 4 |

The number to obtain is counted from the different place values shown above.

So, 342 054 + 223 110 = 565 164.

Expected answers to Practice Activity 1.5

1. (a) 875 878   (b) 88 777   (c) 701 677   (d) 646 989
2. (a) 496 582   (b) 843 849   (c) 766 945   (d) 1 000 000
3. 837 738
4. (442 300 + 442 100 + 115 600)Frw = 1 000 000 Frw
5. People present were: (8 430 + 5 660 + 7 200)people = 21 290 people

1.6 Subtraction of 2 whole numbers of 7 digits with or without borrowing

Number of periods: 1

Reference: Pupil's Book page 8

Knowledge and understanding

Explain the concept and process of subtraction of 2 numbers of 6 digits or more with or without borrowing.

Skills

Apply the knowledge of subtraction in solving mathematical problems in daily situations.

Carry out subtraction of 2 whole numbers.

Teaching/Learning materials

Abacus, objects of different colours.

Teaching/Learning methods

- Group work activities – Discuss learning activities in groups.
- Supervised practice – Learners subtract numbers while the teacher checks the progress during classwork.
- Problem solving technique – Discuss and solve problems in Practice Activity 1.6.

Lesson preparation

Lesson will take place in class.

Organise learners to work in small groups for Activity 1.6.

Prepare an abacus and objects of different colours.

Teaching/Learning steps

1. Have learners discuss and carry out subtraction of numbers given in Activity 1.6.
2. Use Example 1.6 to demonstrate subtraction.
3. Assign learners Practice Activity 1.6 questions 1 – 5 as classwork. Go round assessing learners' progress. Have fast learners work with slow learners in discussing difficult questions.
4. Have learners give important points they have learnt.
5. Assign learners Practice Activity 1.6 questions 6 – 10 for more practice as homework.

Assessment of skills, knowledge and understanding

Observe learners as they carry out the process of subtraction correctly.

Guidance to the teacher

Use an abacus to demonstrate subtraction. For example:

893 787 – 452 524 is done as follows:
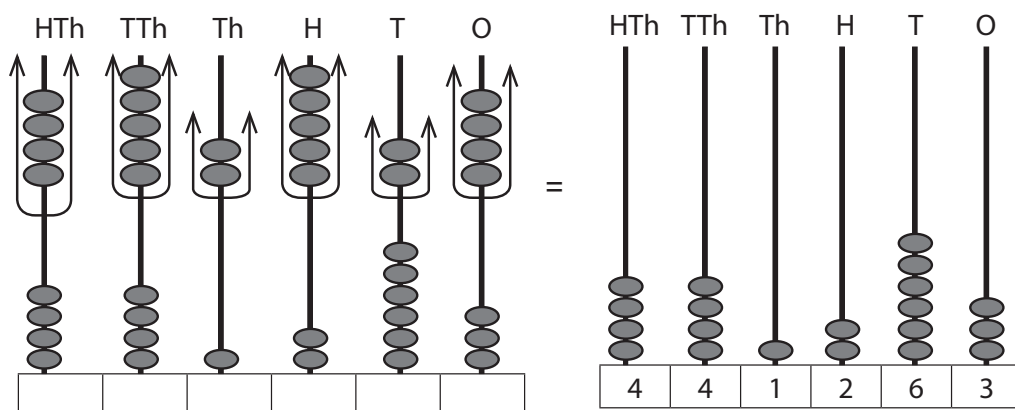
Thus, 893 787 – 452 524 = 441 263

Expected answers to Practice Activity 1.6

1. (a) 603 000   (b) 202 310   (c) 832 620   (d) 21 113
2. (a) 456 677   (b) 317 871   (c) 11 362   (d) 272 667
3. (404 040 – 345 678)kg = 58 362 kg
4. (840 020 – 710 229)*l* = 129 791 *l*

1.7 Quick multiplication of a 3 digit number by 5, 9, 11, 19, 25, 49 and 99

Number of periods: 1

Reference: Pupil's Book page 10

Knowledge and understanding

Explain the concept and process of multiplication of a 3 digit number by 5, 9, 11, 19, 25, 49 and 99.

Skills

Apply the knowledge of multiplication in solving mathematical problems in daily situations.

Teaching/Learning materials

A chart showing worked out examples.

Teaching/Learning methods

*   Group work activities – Discussing the concept given in Activity 1.7.
*   Supervised practice – Learners multiply 3 digit numbers. Check the progress.
*   Discussion – Learners discuss how to quick multiply through examples given.

Lesson preparation

Lesson will take place in class.

Organise learners to work in small groups for Activity 1.7.

Prepare the chart of worked out examples.

Teaching/Learning steps

1. Have learners discuss how to carry out quick multiplication.
2. Use the guidance on Activity 1.7 to guide learners on carrying out Example 1.7.
3. Use Example 1.7 to demonstrate quick multiplication. Then have learners creatively devise steps to complete the assigned task.
4. Assign learners Practice Activity 1.7 questions 1 – 4 as classwork. Go round assessing learners' progress. Generate discussion on quick multiplication concept.
5. Let learners give important points they have learnt.

6. Assign learners Practice Activity 1.7 questions 5 – 8 for more practice as homework.

Assessment of skills, knowledge and understanding

Observe learners as they carry out the process of multiplication.

Guidance to the teacher

Guide learners to think critically and creatively devise steps for quick multiplication through examples.

Guidance on Activity 1.7

Have learners quick multiply to justify the following:

(a) 817 × 5 = 4 085   536 × 49 = 26 264

(b) 764 × 9 = 6 876   228 × 25 = 5 700

(c) 312 × 11 = 3 432   457 × 99 = 45 243

(d) 635 × 19 = 12 065   520 × 5 = 2 600

Suggested problems related to real life:

1. There are 150 bags of sugar each weighing 99 kg. Quick multiply to find their total weight.

2. A container weighs 500 grams. What is the weight of 19 such containers?

3. There are 135 learners, each weighing 49 kg in a class. Quick multiply to find their total mass.

4. There are 11 schools, each has 455 pupils. Quick multiply to find the total number of pupils in the schools.

Expected answers

1. 14 850 kg   2. 9 500 g

3. 6 615 kg   4. 5 005 pupils

Expected answers to Practice Activity 1.7

1. (a) 4 415   (b) 7 443   (c) 6 798   (d) 13 376

2. (a) $(567 ÷ 4) × 100 = 141.75 × 100 = 14\ 175$

   (b) $(430 × 50) – 430 = 21\ 500 – 430 = 21\ 070$

   (c) $(525 × 100) – 525 = 52\ 500 – 525 = 51\ 975$

   (d) $(629 ÷ 2) × 10 = 314.5 × 10 = 3\ 145$

   (e) $(449 × 10) – 449 = 4\ 490 – 449 = 4\ 041$

3. $113 × 99 = (113 × 100) – 99 = 11\ 300 – 99 = 11\ 187$

4. $215 × 25 = (215 ÷ 4) × 100 = 5\ 375$

5. $144 × 19 = (144 × 20) – 144 = 2\ 736$

6. $110 × 99\ Frw = (11\ 000 – 110)\ Frw = 8\ 400\ Frw$

7. $125 \times 49 = (125 \times 50) - 125 = 6\ 125$

8.   For every week, (25×5) packets $= (25 \times 10) \div 2 = 250 \div 2 = 125$ packets.

   For 7 weeks, 125×7 packets $= 875$ packets of milk. Hereby, milk is given in 5 days every week.

Note: ask learners to discuss why it is important to drink milk.

1.8   Multiplication of whole numbers by a 3 digit number

Number of periods: 2

Reference: Pupil's Book page 12

Knowledge and understanding

Explain the concept and process of multiplication of a 3 digit number by a 3 digit number.

Skills

Apply the knowledge of multiplication in solving mathematical problems in daily situations.

Teaching/Learning materials

A chart showing worked out examples.

Teaching/Learning methods

*   Group work activities – Learners discuss and carry out learning activities.
*   Demonstration – To show how to multiply with 3 digits.
*   Supervised practice – Learners multiply 3 digit numbers during classwork.
*   Discussion – In groups, discuss Practice Activity 1.8.

Lesson preparation

Lesson will take place in class.

Organise learners to work in small groups for Activity 1.8.

Prepare the chart of worked out examples.

Teaching/Learning steps

1.   Have learners discuss how to carry out multiplication in Activity 1.8.
2.   Have learners discuss Example 1.8 in class.
3.   Assign learners Practice Activity 1.8 questions 1 – 4 as classwork. Go round the class assessing

progress.

4.   Ask learners to give important points they have learnt.
5.   Assign learners questions 5 – 7 Practice Activity 1.8 for more practice as homework.

Assessment of skills, knowledge and understanding

Observe learners as they carry out the process of multiplication.

Guidance to the teacher

Emphasise multiplication according to place values.

Guidance on Activity 1.8

Finding solution to the problem: 350 × 112

```
      350
×     112
      700    (2 × 350)
     3500    (10 × 350)
    35000    (100 × 350)
    39200
```

Suggested real life problems

- A book has 265 pages. Each page has 150 words. How many words are in the book. (39 750)
- A lorry is loaded with 726 cartons. Each carton has 220 pieces of biscuits. The total number of biscuits is 159 720.
- A school has 352 pupils. Each child was given 250 millilitres of milk. How much milk in millilitres was given in total? (88 000 ml)
- On market day 102 bunches of bananas were brought. Each bunch had 150 bananas. The total number of bananas was 15 300.

Expected answers to Practice Activity 1.8

1. (a)   341 530   (b)   354 991   (c)   137 376   (d)   143 114
    (e)   333 324   (f)   173 445
2. (a)   86 203   (b)   314 019   (c)   47 233   (d)   162 603
3. (a) 258 × 415 = 107 070   (b)   135 × 221 = 29 835
    (c) 375 × 180 = 67 500   (d)   247 × 950 = 234 650 Frw
    (e) 790 × 183 = 144 570

1.9   Division of a 3 digit number by a 2 digit number without a remainder

Number of periods: 1

Reference: Pupil's Book page 13

Knowledge and understanding

Explain the concept and process of division of numbers.

Skills

Apply the knowledge of division in solving mathematical problems in daily situations.

Teaching/Learning materials

- Counting objects.
- A chart showing worked out examples.

Teaching/Learning methods

- Group work activities – Discuss learning activities in groups.
- Supervised practice – Learners divide 3 digit numbers by 2 digit numbers without a remainder. Check the progress of the learners and pr
- Class discussion – Discuss practice activities and present their answers.

Lesson preparation

Lesson will take place in class. Organise learners to work in small groups for Activity 1.9.

Prepare a chart of worked out examples.

Teaching/Learning steps

1. Ask learners to share the 120 objects among 12, then 15, then finally 24 pupils.
2. Let learners discuss Example 1.9 as a class.
3. Display the chart showing worked out examples.
4. Ask learners to work out Practice Activity 1.9 questions 1 – 3 as classwork. Go round assessing their progress.
5. Have learners give important points they have learnt.
6. Assign learners Practice Activity 1.9 questions 4 and 5 for more practice as homework.
7. Identify different learning abilities - slow, average and fast. For slow learners, administer the Remedial Activity. For average learners, administer the Consolidation Activity and for fast learners, the Extension Activity. Give the activities as assignment. Allow the different groups of learners to make a class presentation.

Assessment of skills, knowledge and understanding

Observe learners as they carry out division of numbers.

Guidance to the teacher

- To enhance communication, allow learners to make a class presentation.
- Emphasise that division starts from thousands, hundreds then ones. Align properly as division is done.
- Help learners understand division as repeated subtraction.
- Assign fast learners to assist slow learners.

Expected answers to Practice Activity 1.9

1. (a) 44   (b) 24   (c) 17   (d) 39
    (e) 27   (f) 13
2. (a) 16   (b) 42   (c) 33   (d) 41
3. (180 ÷ 30)trays = 6 trays   4.   (468 ÷ 18)seedlings = 26 seedlings
5. (516 ÷ 43)books = 12 books

Additional Activity 1

Remedial Activity

1. Write the following numbers in words. To write in words start from hundred thousands.
    (a) 239 400   (b) 421 350
2. Write the number below in figures:
    (a) Three hundred forty two thousand five hundred and thirty nine.
    (b) Two hundred thirty one thousand four hundred and eleven.
3. Write the place value of underlined digits e.g. ones, tens, etc.
    (a) 404 040   (b) 192 997
4. Use <, = or > to compare.
    (a) 136 779 ____ 139 776
    (b) 256 411 ____ 256 411
    (c) 688 861 ____ 186 888
5. Work out:
    (a) 26 450 + 335 918 + 47 618 =
    (b) 190 014 + 302 440 + 206 245 =
    (c) 992 642 – 680 546 =
    (d) 496 421 – 258 654 =

Divide.

6. (a) 792 ÷ 24 =
    (b) 738 ÷ 18 =
7. Quick multiply.
    (a) 426 × 5 =   (b) 311 × 9 =   (c) 226 × 11 =
    (d) 300 × 19 =   (e) 234 × 135 =   (f) 368 × 126 =
8. A teacher bought 140 cartons of biscuits. Each carton has 200 biscuits. How many biscuits did he have? Explain your answer.

Expected answers to Remedial Activity

1. (a) Two hundred thirty nine thousand four hundred.

(b)   Four hundred twenty one thousand three hundred and fifty.

2. (a)   342 539   (b)   231 411
3. (a)   4 – hundred thousand   (b)   9 – ten thousands
            4 – tens   9 – hundreds
4. (a)   136 779 < 139 776   (b)   256 411 = 256 411   (c)   688 861 > 186 888
5. (a)   409 986   (b)   698 699
    (c)   312 096   (d)   237 767
6. (a)   33   (b)   41
7. (a)   2 130   (b)   2 799   (c)   2 926
    (d)   5 700   (e)   31 590   (f)   46 368
8. (140 × 200)biscuits = 28 000 biscuits

Consolidation Activity

1. Write the following numbers in words.
    (a)   999 099   (b)   864 627 dl
2. Write the numbers below in figures.
    (a)   Five hundred and sixty five thousand, eight hundred and thirty six.
    (b)   Seven hundred and seven thousand, four hundred and seven.
3. Write the place value of the underlined digits.
    (a)   8̲97 6̲42   (b)   54 9̲23
4. Use <, = or > to compare. Explain your answer.
    (a)   182 743 ____ 187 243   (b)   364 744 ____ 364 474
    (c)   123 143 ____ 123 143   (d)   429 615 ____ 419 625
5. Work out. Justify your answer.
    (a)   32 420 + 26 430 + 3 246 =
    (b)   24 976 + 38 422 + 84 623 =
    (c)   826 430 – 430 264 =
    (d)   384 280 – 236 444 =
6. Divide. Explain steps followed.
    (a)   3 936 ÷ 12 =   (b)   826 ÷ 14 =

Expected answers to Consolidation Activity

1. (a)   Nine hundred and ninety nine thousand and ninety nine.
    (b)   Eight hundred and sixty four thousand, six hundred and twenty seven decilitres.
2. (a)   565 000   (b)   707 000
          +   836   +   407
             565 836   707 407

3. (a) 8 9 7 6 4 2

                  — Ones

                  — Tens

                  — Hundreds

                  — Thousands

                  — Ten thousands

                  — Hundred thousands

(b) 5 4 9 2 3

                  — Ones

                  — Tens

                  — Hundreds
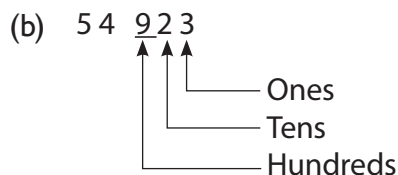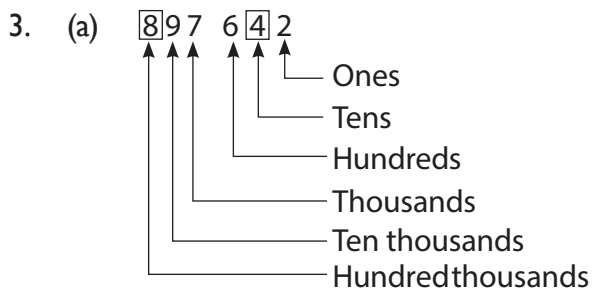
4. (a) 182 743 < 187 243   (b) 364 744 > 364 474

    (c) 123 143 = 123 143   (d) 429 615 > 419 625

5. (a) 62 096   (b) 148 021

    (c) 396 166   (d) 147 836

6. (a) 328   (b) 59

Extension Activity

1. (a) Write 187 187 Frw in words.

    (b) In an animal park, the total mass of some elephants was recorded as 568 249 kg. Write the mass that was recorded in words.

2. Write one hundred eighty six thousand eight hundred and eighty eight litres of oil in figures.

3. The capacity of a tank is two hundred fifty six thousand four hundred and eleven decilitres.

    (a) Write the capacity of the tank in figures.

    (b) What is the place value of digit 2 from your answer in (a)?

4. Use <, = or > to compare. Explain your answer.

    (a) 843 642 ____ 428 647   (b) 192 843 m ____ 192 841 hm

    (c) 12 300 ml ____ 123 d*l*   (d) 482 324 kg ____ 842 324 g

5. During a national census, the population of certain towns were recorded as follows:

Town A	Town B	Town C
97 432	46 230	34 620

    (a) What was the population of the three towns?

    (b) Find the difference in population between the highest and least populated town. Justify your answer.

6. Divide. Explain the steps you followed.

    (a) 1 968 ÷ 12 =   (b) 999 ÷ 9 =

7. Multiply. Explain your steps.

    (a) 894 × 7 =   (b) 123 × 6 =   (c) 582 × 147 =

(d) 777 × 666 =   (e) 120 × 15 =   (f) 531 × 34 =

8. Quick multiply. Explain your steps to the answer.

   (a) 324 × 49 =   (b) 286 × 19 =   (c) 114 × 5 =

   (d) 498 × 11 =   (e) 235 × 99 =   (f) 832 × 9 =

9. A class of twenty five pupils were going on a field trip. The school gave every pupil three hundred and twenty Francs for lunch. How much money did the school spend for the twenty five pupils? You can use quick multiplication.

10. Six hundred and forty two rally cars were to go into competition. The occupants of each rally car were a driver and its co-driver. How many people in total were in the rally cars?

Expected answers to Extension Activity

1. (a) One hundred and eighty seven thousand, one hundred and eighty seven Francs.

    (b) Five hundred and sixty eight thousand, two hundred and forty five kilograms.

2. 186 888 l

3. (a) 256 411 dl   (b) Hundred thousands

4. (a) 843 642 > 428 647   (b) 192 843 m < 192 841 hm

    (c) 12 300 ml = 123 dl   (d) 482 324 kg > 842 324 g

5. (a) 178 282   (b) 51 730

    (c) 2 312   (d) 170 020

6. (a) 164   (b) 111

7. (a) 6 258   (b) 738   (c) 85 554

    (d) 517 482   (e) 1 800   (f) 18 054

8. (a) 15 876   (b) 5 434   (c) 570

    (d) 5 478   (e) 23 265   (f) 7 488

9. 320 Frw × 25 = (320 ÷ 4)Frw × 100 = 80 Frw × 100 = 8 000 Frw

10. (642 × 2)occupants = 1 284 occupants

Formative Assessment Support

Set a competence-based task for this unit using the tips below:

•   Ensure all syllabus unit objectives and key unit competences are covered.

•   Check the assessment criteria from the syllabus.

•   Use the content summary as a quick check for the scope and sequence of items. Learning objectives assist in identifying the difficulty of the items.

Administer the competence-based task to learners as follows. One part can be done in one period and the remaining part in the next period. Assess ability and confidence of the learner through observation.

Learners with special needs should be assisted to develop and nurture competence.

Include them and facilitate their ability to give the expected responses in spite of varied learning ability. Prepare all learners before formative assessment. Give enough time to slow or weak learners to do the task and develop expected competence. Motivate all learners with different abilities to have a positive attitude and achieve the expected results. Fast learners may assist slow learners by discussing in the same groups.

The competence-based task provided in the Pupil's Book page 15 should be used as a guidance tool for formative assessment on the unit. Set aside at least one period to discuss the activity as a class. You can improve the task to cater for all levels of learners and different levels of thinking.

Expected answers have been provided to ease your work.

Expected answers for Revision Activity 1

1. (a) Three hundred eighty two thousand six hundred and forty.

    (b) Nine hundred forty two thousand one hundred and eight.

2. (a) 977 631   (b)   482 765

3. (a) 9 hundred thousands

        1 thousands

    (b) 3 – Tens of thousands

        9 – hundreds

4. (a) 677 931 < 977 631   (b)   848 756 > 848 657

5. (a) (187 255 + 320 316 + 439 230)trees = 946 801 trees

    (b) Highest number of trees planted were 439 230.
        Lowest number of trees planted were 187 255.
        Difference = (439 230 – 187 255) trees
                  = 251 975 trees

6. 840 kg ÷ 35 = 24 kg

7. (a) (265 × 99)cartons = (26 500 – 265)cartons = 26 235 cartons of books

    (b) 1 carton has 25 books.
        Thus, (228 × 25)books = (228 ÷ 4) × 100 books
                            = (57 × 100)books = 5 700 books

Topic Area: Numbers and Operations

Unit 2 — Addition and subtraction of integers

Background

This topic deals with the addition and subtraction of numbers less or greater than zero. Whole numbers that are greater than zero are called positive integers and are to the right side of zero on a number line. Whole numbers that are less than zero are known as negative integers. These numbers are found to the left side of zero on a number line. The integer zero is neutral. This means that it is neither negative nor positive. An integer has a sign before the number. Positive integer (+) and negative integer (–) but zero has no sign. Therefore integers are sets of whole numbers and their opposites.

Content summary

2.1 Location of positive and negative numbers on a number line.

2.2 Comparison and ordering of integers.

    (a) Using a number line.

    (b) Ordering integers and comparing integers using <, > or =.

2.3 Addition of integers

    (a) Addition of integers on a number line.

    (b) Addition without using a number line (calculations).

2.4 Subtraction of integers

    (a) Subtraction of integers using a number line.

    (b) Subtraction without using a number line (calculations).

2.5 Additive inverses of numbers.

2.6 Solving problems involving addition and subtraction of integers.

Key unit competence

Learners will be able to add and subtract integers.

Attitude and values

Appreciate the application of negative numbers in practical contexts. Appreciate the relationship between positive and negatives integers in terms of debits.

Assessment of attitudes and values

Observe the behaviour of learners as they develop a positive attitude towards the topic of addition and subtraction of integers.

Relevant cross cutting issues

Inclusive education: learners of different abilities handle materials in the same environment. In group work activities learners of different abilities work in the same group. All learners deserve education.

Financial education: Integers can be used to explain to learners the aspects of profits and losses. Profit is positive while loss is negative. Also the acts of spending and earning money can be related to both positive (+) and negative (–) integers. Earning is positive while spending is negative. Thus knowledge of integers is useful in analysis of financial Mathematics.

Relevant generic competences

Research and problem solving: As learners work out answers to problems they develop problem solving competence. Provision of real life problems offers opportunity to learners to apply learned concepts on such problems. Consistent problem solving ability is useful in learner's life.

Critical thinking: Learners are given questions that require specific responses, for example, Practice Activity 2.1. This makes them think critically and reason well before giving answers.

Communication skills: During group discussion and activities, learners have to express themselves and share their ideas. This helps them develop good communication skills.

Assessment criteria

Learners should be able to accurately add and subtract integers.

Notes to the teacher

In teaching integers help learners understand the use of integers in real life situations. They are used to indicate rising and falling of temperature. They are also used in stock market profits and losses. Integers are also used in spending and earning money. Guide learners to understand that positive integers are on the right side of zero and negative integers are on the left side of zero on a number line.

Word list

Reference: Pupil's Book page 29

Use the word list to develop reading, listening and writing skills. Have learners work in pairs to carry out stated tasks with suitable vocabulary words.

Content

2.1   Location of positive and negative numbers on a number line

Number of periods: 1

Reference: Pupil's Book page 17

Knowledge and understanding

Explain and demonstrate how to locate positive and negative numbers on the number line.

Teaching/learning materials

A set of numbers on paper cutouts.

Manila paper with the number line for Activity 2.1.

Teaching/learning methods

- Group work activities – Discussion on provided learning activities.
- Demonstration – How to locate integers using Example 2.1.
- Practical approach – Drawing and marking integers.
- Supervised practice – Learners locate integers. Check responses and give feedback.

Lesson preparation

Lesson will take place in class.

Organise learners in groups of five for Activity 2.1. Prepare a set of numbers on paper cutouts. Draw the number line on manila paper for Activity 2.1.

Teaching and learning steps

1. Ask learners to fix paper cutouts with numbers on the manila paper for Activity 2.1 and Activity 2.2.
2. Let learners repeat the activity on the board. Let the class assess correctness as individuals locate numbers on the number line.
3. Let learners discuss steps to follow in locating integers using Example 2.1.
4. Assign learners Practice Activity 2.1 question 2 as classwork to discuss and present their answers.
5. Have learners explain the important steps to follow in locating integers.
6. Assign learners Practice Activity 2.1 questions 1 for more practice as homework.

Assessment of skills, knowledge and understanding

Observe learners as they locate positive and negative numbers on the number line.

Guidance to the teacher

Emphasise the placement of integers in relation to zero. Positive integers are placed on the right side of zero, negative integers are placed on the left side of zero. Encourage learners with learning disabilities to observe other learners as they fix number cards and work together in groups.

Expected answers to Practice Activity 2.1

1.

2. (a)

(b)

(c)

(d)

(e)
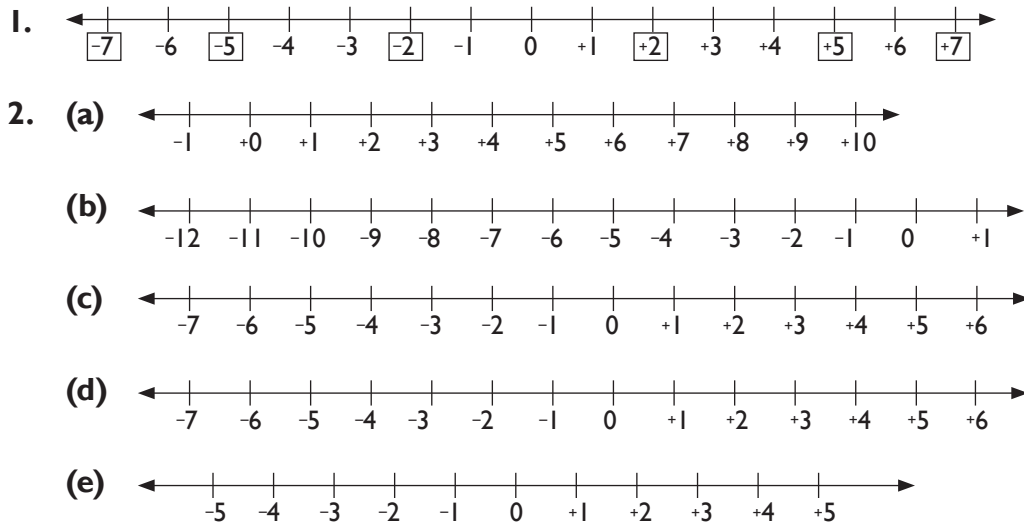
2.2 Comparison and ordering of integers using a number line

Number of periods: 1

Reference: Pupil's Book page 19

Knowledge and understanding

Explain that when two numbers have opposite signs they are located on opposite sides of the number line.

Skills

Compare integers physically and mentally using a number line.

Teaching/learning methods

- Group work activities – Work in groups to carry out learning activities.
- Demonstration – Guide learners to compare integers using Example 2.2.
- Supervised practice – Learners compare integers. Teacher checks responses and gives feedback.

Lesson preparation

Lesson will take place in the class. Organise learners to work in small groups for Activity 2.2. Prepare carton cutouts of integers from -20 to $+20$ (number cards).

Teaching/learning steps

1. Ask learners to draw a number line on the chalkboard.
2. Have learners in turns place number cards at the correct points on the board.
3. Use Example 2.2 to illustrate comparison. Let learners discuss it in class.
4. Assign learners Practice Activity 2.2 question 1 as classwork. Go round assessing their progress and give feedback.
5. Have learners state the main points for comparing integers.
6. Assign learners Practice Activity 2.2 question 2 for more practice as homework.

Assessment of skills, knowledge and understanding

Observe learners as they place number cards of integers at the correct points on the board.

Guidance to the teacher

Emphasise that integers on the right side of 0 are greater than those on the left. Positive numbers are greater than negative numbers. Include physically challenged learners in carrying out activities. Let them direct others to move and place number cards. Learners of different ability should be given remedial activities, consolidation activities and extension activities.

Expected answers for Practice Activity 2.2

1. **(a)** $^+3$ **(b)** 0   **(c)** $^+7$ **(d)** $^-3$
2. **(a)** $^+2$ **(b)** $^+4$ **(c)** $^+5$ **(d)** $^+5$ **(e)** 0   **(f)** $^+9$

Guidance on Activity 2.2

Draw the number line shown in Pupil's Book on the chalkboard. Prepare number cards for the activity. Demonstrate how to answer on the number line. For example, put the +5 card in the correct position.

Then have learners do the activity and have the whole class check the answers.

If number cards are not available you can write the number at the correct place on the board.

2.3 Ordering of integers and comparing integers using <, > or =

Number of periods: 1

Reference: Pupil's Book page 20

Knowledge and understanding

Explain that when two numbers have opposite signs they are located on opposite sides of 0.

Skills

Compare integers physically and mentally.

Teaching/learning materials

Number cards from $+10$ to -10.

Teaching/learning methods

- Group work activities – Group discussion on learning activities.
- Discussion – Learners discuss in pairs Practice Activity.
- Explanation –Guide learners to explain how to order and compare integers using Example 2.3.
- Supervised practice – Learners order integers. Teacher checks response and gives feedback.

Lesson preparation

Lesson takes place in class. Assign learners to make number cards from $+10$ to -10. Organise learners to work in small groups for Activity 2.3.

Teaching learning steps

1. Ask learners to draw a number line and arrange the numbers. Refer to Activity 2.3.
2. Have learners discuss steps to follow in arranging integers from largest to smallest or smallest to largest.
3. Demonstrate ordering and comparison of integers using Example 2.3. Allow learners to discuss it as a class.
4. Assign learners Practice Activity 2.3 questions 1 – 3 in class. Assess their progress.
5. Have learners give important points used when comparing integers.
6. Assign learners question 4 for more practice as homework.

Assessment of skills, knowledge and understanding

Observe learners as they compare integers.

Guidance to the teacher

Guide learners to understand that ordering means arranging numbers from smallest to largest (ascending order). It also means arranging numbers from largest to smallest (descending order). The symbol = means both numbers are equal, the symbol > means the number on the left is greater than the number on the right, symbol < means the number on the left is less than the one on the right.

Expected answers Practice Activity 2.3

1. **(a)** $-10 < +3$ **(b)** $-15 < 0$ **(c)** $+3 = +3$
     (d) $-6 < +4$ **(e)** $+6 > 0$ **(f)** $+4 > -2$

2. **(a)** $-5 < +1$, -5 is less than $+1$.   **(b)** $+7 < +9$, $+7$ is less than $+9$.
     (c) $0 < +8$, 0 is less than $+8$.   **(d)** $+10 > -6$, $+10$ is greater than -6.
     (e) $-11 < +6$, -11 is less than $+6$.   **(f)** $+11 = +11$, $+11$ is equal to $+11$.

Pay attention to learners' discussions. For example, $-5 < +1$ is -5 is less than $+1$. Other learners may argue it as $+1$ is greater than -5 (which is true but not required). Assess learners' understanding on sign $<$, $>$ or $=$ they used. Another account is positive number is greater than negative number and vice versa.

3. **(a)** $-5, -3, +1, +4$ **(b)** $-15, -11, +4, +20$ **(c)** $-22, -11, +11, +22$
4. **(a)** $+9, +1, -2, -8$ **(b)** $+24, +10, -5, -10$ **(c)** $-1, -3, -5, -8$

2.4 Addition of integers using a number line

Number of periods: 1
Reference: Pupil's Book page 21

Knowledge and understanding

Describe the concept of addition of integers.

Skills

Calculate the distance between 2 integers using the position of numbers on the number line.

Teaching/Learning materials

*   White powder or dry loose soil.
*   Lesson will take place out of class in an open space.

Teaching/Learning methods

*   Group work activities – Carry out activities in groups following the steps to add integers.
*   Practical approach – Learners carry out addition of integers using a number line marked in the field.
*   Discussion – Learners discuss activities involving addition of integers.

Lesson preparation

*   Lesson takes place outside the class and then in class.
*   Organise learners in small groups for Activity 2.5.
*   Prepare materials for the practical activity.

Teaching/Learning steps

1. Ask learners to use white powder or loose soil to mark a number line on the field.
2. Let a learner stand at -3 then move to the right 4 steps to demonstrate addition. Repeat with another integer.
3. Assign learners to draw the number line on manila paper to show steps followed in addition.

4. Learners discuss addition of integers in Example 2.4 and Practice Activity 2.4, questions 1 – 6.

5. Let learners give important steps to follow in addition.

6. Assign learners Practice Activity 2.4 questions 7 – 12 for more practice as homework.

Assessment of skills, knowledge and understanding
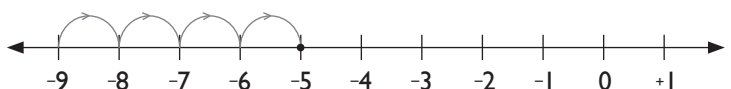
Observe learners as they carry out the addition of integers on the number line.

Guidance to the teacher

Emphasise that when integers with similar signs are added the answer takes that sign. When adding integers with different signs the answer takes the sign of the larger number.
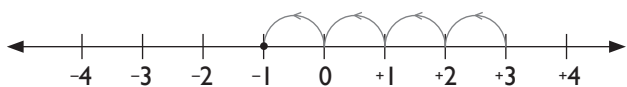
Expected answers to Practice Activity 2.4
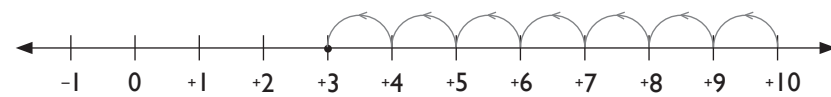
1. $(-1) + (+3) = +2$
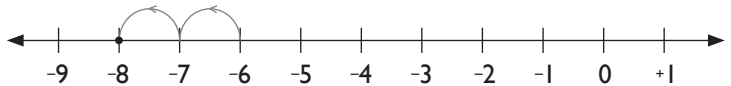
2. $(-9) + (+4) = -5$
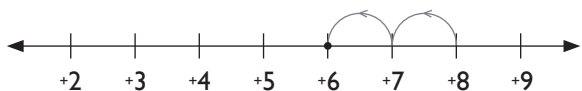
3.

$(-10) + (+5) = -5$
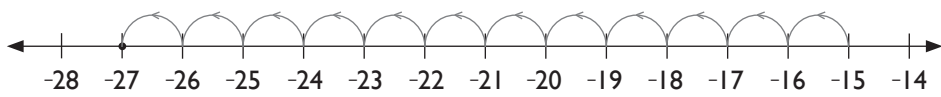
4. $(-2) + (-3) = -5$

5. $(+3) + (-4) = -1$

6.

$(+10) + (-7) = +3$

7. $(-6) + (-2) = -8$

8. $(+8) + (-2) = +6$

9.

$(-15) + (-12) = -27$

10.
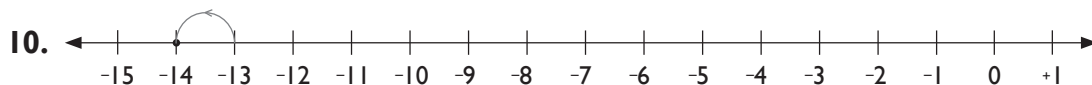
(⁻13) + (⁻1) = ⁻14

For questions 7 – 10, assess learners' ability to explain starting point, steps moved and direction and stopping point.

Guidance on Activity 2.4

Use available materials to prepare a number line in the field or an area near the classroom. Ensure steps made are the length of learners' strides.

Have pupils take turns recording findings of the activity and moving. Encourage learners with disability of movement to record.

2.5 Addition of integers without using a number line

Number of periods: 1

Reference: Pupil's Book page 23

Knowledge and understanding

Describe the concept of addition of integers.

Skills

Calculate the distance between 2 integers using the position of numbers on a number line.

Teaching/Learning materials

*   A chart showing the solution to Activity 2.5.
*   Flash cards on addition of integers.

Teaching/Learning methods

*   Group work activities – Group work carrying out learning activities.
*   Demonstration – Guide learners to call out addition using Example 2.5.
*   Supervised practice – Learners add integers without a number line. Check on the learners and give feedback.

Lesson preparation

The lesson will take place in class.

Prepare a chart showing the solution to Activity 2.5.

Prepare flashcards on addition of integers.

Teaching/Learning steps

1.   Ask learners to add integers without a number line (refer to Activity 2.6).
2.   Have learners discuss steps to follow in addition of integers.
3.   Use Example 2.5 to demonstrate addition of integers.

4. Display the chart with worked out examples.

5. Assign learners Practice Activity 2.5 questions 1 – 5 as classwork. Go round assessing their progress.

6. Have learners give important points they have learnt in addition of integers.

7. Assign learners Practice Activity 2.5 questions 6 – 10 for more practice as homework.

Assessment of skills, knowledge and understanding

Observe learners as they carry out addition of integers.

Guidance to the teacher

Emphasise that when adding integers with similar signs, the answer takes the sign of the greatest number.

When adding numbers with different signs the answer takes the sign of the larger number.

Encourage learners with movement problems to carefully observe what others are doing.

Expected answers to Practice Activity 2.5

1. $^-3$ 2. $^-4$ 3. $^-4$

4. $^+8$ 5. $^-6$ 6. $^-6$

7. $^-(11 - 10) = ^-1$ 8. $^+(4 + 4) = ^+8$

9. $^-(12 - 1) = ^-11$ 10. $^-(9 - 4) = ^-5$

2.6 Subtraction of integers using a number line

Number of periods: 1

Reference: Pupil's Book page 24

Knowledge and understanding

Describe the concept of subtraction of integers.

Skills

Solve mathematical problems involving subtraction of integers.

Teaching/Learning materials

White powder or dry loose soil, tape measure, manila paper

Teaching/Learning methods

• Practical approach – Learners subtract integers using a number line marked in the field.

• Group work activities – Group discussion on learning activities.

• Supervised practice – Learners subtract integers using a number line. Teacher checks learners progress and gives feedback.

Lesson preparation

Lesson takes place in the field and then in the class. Organise learners in groups for Activity 2.7. Prepare the materials for the field activity.

Teaching/Learning steps

1. Ask learners to use white powder or dry loose soil to mark a number line on the field.
2. Let a learner stand at $^-1$ then move three steps backward (to $^-4$ to the left) to demonstrate subtraction.
3. Let a learner again stand at $^-1$ then move 3 steps backward of backward (Forward) to the right to ($^+2$).
4. Once in class demonstrate subtraction using Example 2.6.
5. Assign learners Practice Activity 2.6 questions 1 – 5 as classwork. Assess their progress and give feedback.
6. Let learners state the steps to follow when subtracting integers.
7. Assign learners questions 6 – 10 for more practice as homework.

Assessment of skills, knowledge and understanding

Observe learners as they carry out subtraction of integers on the number line.
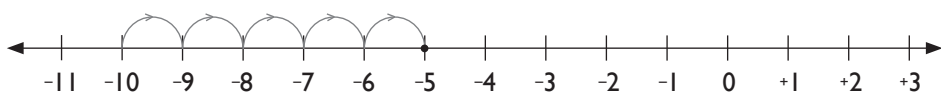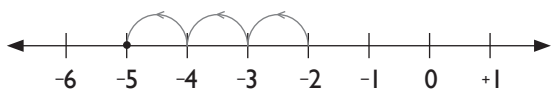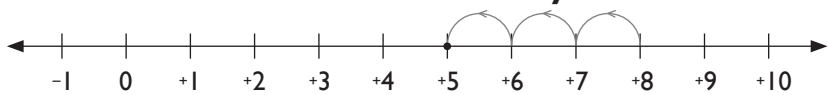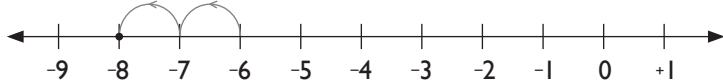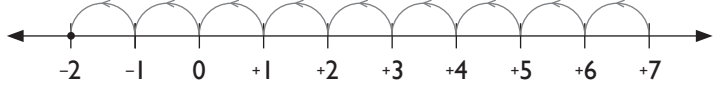
Guidance to the teacher

For example ($^-1$) – ($^-3$) on the number line stand at $^-1$. Move backward of backwards 3 steps (move 3 steps forward).

($^-1$) – ($^-3$) $\equiv$ ($^-1$) + ($^+3$) = $^+2$

Encourage learners with movement problems to observe the steps of other learners while working together in groups.

Expected answers to Practice Activity 2.6

1.

($^+8$) – ($^+3$) = $^+5$

2.
     ($^-6$) – ($^+2$) = $^-8$

3.
     ($^-8$) – ($^+3$) = $^-11$

4.
     ($^+7$) – ($^+9$) = $^-2$

5.
     ($^+7$) – ($^+3$) = $^+4$

6.

$(^+9) - (^+9) = 0$

7.

$(^-4) - (^+1) = {}^-5$

8.

$(^+2) - (^+8) = {}^-6$

9.

$(^+4) - (^+4) = 0$

10.

$(^+13) - (^+10) = {}^+3$
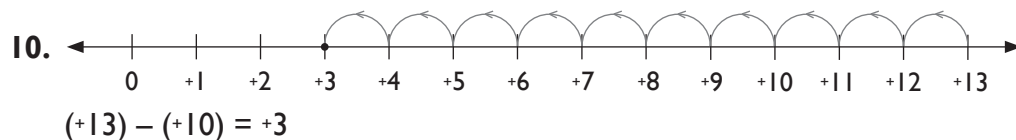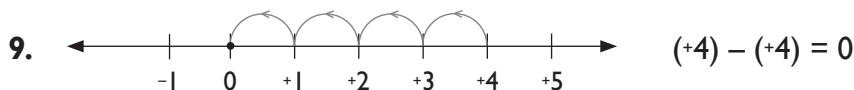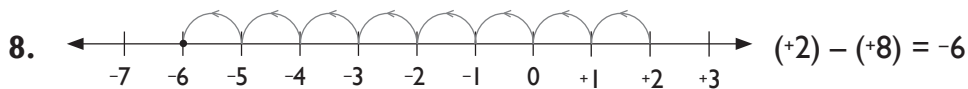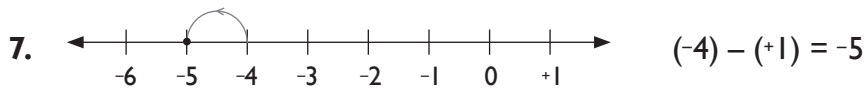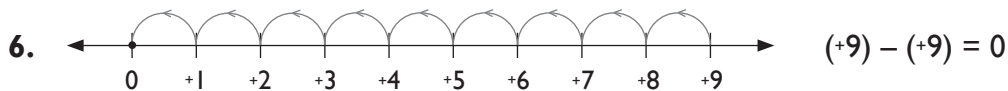
For questions 7 - 10, assess learners' ability to explain starting point, number of steps and direction, then stopping point.

2.7 Subtraction of integers without using a number line

Number of periods: 1

Reference: Pupil's Book page 25

Knowledge and understanding

Describe the concept of subtraction of integers.

Skills

Solve mathematical problems involving subtraction of integers.

Teaching/Learning materials

- A chart showing the solution to Activity 2.8.
- Flash cards on subtraction of integers.

Teaching/Learning methods

- Demonstration – guide learners to subtract integers without a number line using Example 2.7 in Pupil's Book.
- Explanation – Explain how to work out subtraction of integers without a number line.
- Class discussion – The class discuss the Practice Activity 2.7.
- Supervised practice – Learners subtract integers without a number line. Teacher checks responses and gives feedback.

Lesson preparation

Lesson will take place in class. Organise learners to work in small groups for Activity

2.8. Prepare a chart showing solutions to problems in Activity 2.8.

Prepare flash cards on subtraction of integers.

Teaching/Learning steps

1. Ask learners to subtract integers without using a number line.
2. Refer to Activity 2.8.
3. Have learners discuss steps to follow to subtract integers.
4. Use Example 2.7 to demonstrate how to subtract integers without a number line. Learners can discuss it as a class.
5. Assign learners Practice Activity 2.7 questions 1 – 5 as classwork. Go round assessing their progress.
6. Have learners state important points they have learnt.
7. Assign learners questions 6 – 12 for more practice as homework.

Assessment of skills, knowledge and understanding

Observe learners as they carry out subtraction of integers without a number line.

Guidance to the teacher

Allow learners to use a number line first and then solve problems without a number line. When using the number line, emphasise the following:

(i) $(^-5) - (^-4)$: start at $^-5$, move backwards of backwards 4 steps. (Move 4 steps forward).

This without the number line is $(^-5) - (^-4) \equiv (^-5) + (^+4) = ^-1$

(ii) Encourage learners with movement problems to observe other learners' steps while working together in groups.

Expected answers to Practice Activity 2.7

1. $^+2$ **2.** $^-20$ **3.** $^-4$ **4.** $^-10$ **5.** $^+19$ **6.** $^-17$

7. $^-(13 - 7) = ^-6$ **8.** $^-(10 - 8) = ^-2$

9. $(^+9) + (^+4) = ^+13$ **10.** $(^-6) + (^+13) = 13 - 6 = ^+7$

11. $(^-4) + (^+12) = 12 - 4 = ^+8$ **12.** $(^-2) + (^+3) = 3 - 2 = ^+1$

Assess learner's ability to discuss steps leading to correct answers.

2.8 Additive inverses of numbers

Number of periods: 1

Reference: Pupil's Book page 26

Skills

Calculate the distance between 2 integers using the position of numbers on the number line.

Teaching/Learning materials

Chart with worked out examples, flash cards

Teaching/Learning methods

- Group work activities – Group discussion on the learning activities.
- Supervised practice – Learners get additive inverse of numbers. Teacher checks progress and gives feedback.
- Class discussion – Discuss practice activities in pairs.

Lesson preparation

The lesson will take place in class.

Organise learners in small working groups for Activity 2.9.

Prepare flashcards.

Teaching/Learning steps

1. Ask learners to add integers given in Activity 2.9.
2. Let learners state five other negative integers whose sum is 0. Write the integers on flash cards.
3. Let learners discuss additive inverses using Example 2.8.
4. Assign learners Practice Activity 2.8 questions 1 – 7 as classwork. Go round assessing their progress. Have learners discuss the questions that are challenging.
5. Ask learners to give important points they have learnt during the lesson.
6. Assign learners Practice Activity 2 questions 5 – 8 for more practice as homework.

Assessment of skills, Knowledge and understanding

Observe learners as they give additive inverse of numbers.

Guidance to the teacher

Emphasise that an additive inverse is an integer whose sum with another integer will be 0.

Expected answers for Practice Activity 2.8

1. $^+3$ **2.** $^+10$ **3.** $^+11$ **4.** $^+14$ **5.** $^+15$

6. $^-4$ **7.** $^-6; (^-6) + (^+6) = 0$ **8.** $^-8; (^-8) + (^+8) = 0$

9. $^-10; (^-10) + (^+10) = 0$ **10.** $^-12; (^-12) + (^+12) = 0$

11. $^+7; (^+7) + (^-7) = 0$ **12.** $^+8; (^+8) + (^-8) = 0$

13. $^-9; (^-9) + (^+9) = 0$ **14.** $^-8; (^-8) + (^+8) = 0$

15. $^-15; (^-15) + (^+15) = 0$

For questions 7 – 15, assess learner's ability to explain that additive inverse have their sum as zero.

2.9 Solving problems involving addition and subtraction of integers

Number of periods: 1

Reference: Pupil's Book page 27

Knowledge and understanding

Describe the concept of addition and subtraction of integers.

Skills

Solve mathematical problems involving addition and subtraction of integers.

Teaching/Learning materials

Chart with worked out examples on a number line.

Teaching/Learning methods

- Group work activities – Group work discussion on learning activities.
- Demonstration – Show how to solve problems using Example 2.9.
- Supervised activity – Learners solve problems involving addition and subtraction. Teacher checks responses and gives feedback.
- Class discussion – Discuss practice activities in pairs.

Lesson preparation

Lesson takes place in class. Prepare the chart.

Teaching/Learning steps

1. Ask learners to read the instructions and solve the puzzle in Activity 2.9, using distance between integers.
2. Let learners discuss how to solve puzzle using Example 2.9.
3. Assign learners Practice Activity 2.9 questions 1 – 3 as classwork. Go round assessing their progress.
4. Ask learners to state important points they have learnt.
5. Assign learners Practice Activity 2.9 questions 4 – 6 for more practice as homework.
6. Identify different learning abilities to administer Additional Activity 2. For slow learners, give the Remedial Activity. For average learners, give the Consolidation Activity and for fast learners, the Extension Activity. Learners should be in groups according to their levels of ability. Each group discusses their activity. This will be an assignment. Later, let each group make a class presentation.

Assessment of skills knowledge and understanding

Observe learners solve mathematical problems involving addition and subtraction of integers.

Guidance to the teacher

Encourage learners to read the question and grasp the requirement. Later do the operation.

Expected answers for Practice Activity 2.9

1. 11 steps from 0 is either $^-11$ or $^+11$. Since the number is positive, then it is $^+11$.
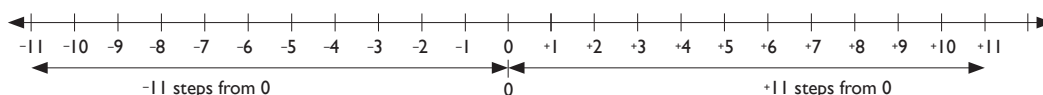
2. 17 steps from $^+7$ is either $^+24$ or $^-10$. But Mary is next to $^-9$. Therefore, Mary is at $^-10$.

3. Difference = 15°C – 6°C = $^+9$°C

4. Exactly 9 steps from $^-1$ is either $(^-1) – (^+9) = ^-10$ or $(^-1) + (^+9) = ^+8$. Since the number is negative, then the answer is $^-10$.

5. 8 steps away from $^-3$ is either $(^-3) – (^+8) = ^-11$ or $(^-3) + (^+8) = ^+5$. Since the number is positive and greater than 4, then the answer is $^+5$.

6. 15 steps from $^+10$ is either $(^+10) – (^+15) = ^-5$ or $(^+10) + (^+15) = ^+25$. Since the number is less than $^-4$, then the number is $^-5$.

Additional Activity 2

Remedial Activity

1. Write missing numbers.
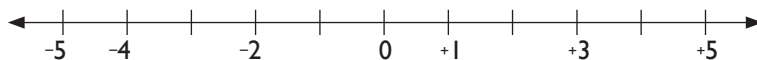
2. In each pair of integers which is greater?

    (a) $^+3$ and $^-1$ **(b)** $^-4$ and 1

3. Use <, > or = to complete. Explain your answer.

    (a) $^+6$ —— $^-2$ **(b)** $^+10$ —— $^+10$ **(c)** $^-4$ —— $^-1$

4. Use a number line to complete.

    (a) $(^+4) + (^+2)$ **(b)** $(^-5) + (^+4)$

5. Add or subtract.

    (a) $(^-8) + (^+3)$ **(b)** $(^+9) – (^+4)$

6. Write the additive inverse of:

    (a) $^+4$ **(b)** $^-6$ **(c)** $^-3$ **(d)** $^+7$

7. Habimana is 4 steps away from 0. This is a negative number less than $^-3$. He is standing at ____.

Consolidation Activity

1. Fill in the missing integers.

2. Which is greater?

   (a) $^+2$ or $^-4$ **(b)** $^-8$ or $^+2$ **(c)** $^-5$ or $^-1$

3. Use <, > or = to complete. Justify your answer.

   (a) $^+6$ —— $^+11$ **(b)** $^-7$ —— $^-10$

   (c) $^+6$ —— $^+6$ **(d)** $^+8$ —— $^-10$

4. Use a number line to add or subtract. Explain your answer.

   (a) $^+3 - 4$ **(b)** $^+3 + 1$

   (c) $^-4 + 2$ **(d)** $^-5 - 3$

5. Write the additive inverse of:

   (a) $^+11$ **(b)** $^-10$ **(c)** $^-8$

6. Add or subtract. Discuss your steps.

   (a) $(^-9) - (^+3)$ **(b)** $(^+11) - (^+5)$

   (c) $(^-11) + (^+6)$ **(d)** $(^+12) - (^+4)$

Extension Activity

1. Fill in the missing integers. Explain your answers.
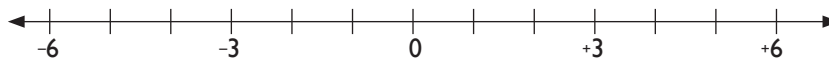
2. Which is greater? Justify your answer.

   (a) $^-6$ or $^-9$ **(b)** $^+16$ or $^+11$

   (c) $^-5$ or $^+5$ **(d)** $^+7$ or $^-10$

3. Use <, > or = to complete. Explain.

   (a) $^-11$ —— $^+6$ **(b)** $^+7$ —— $^-10$

   (c) $^-7$ —— $^-5$ **(d)** $^-11$ —— $^+3$

4. Write the additive inverse of the following. Then discuss your answers.

   (a) $^-14$ **(b)** $^+16$

5. **(a)** The temperature of a certain town was $^-6°C$ in the morning. After 2 hours, the temperature rose by $^+10°C$. Find the temperature of the town after 2 hours.

   (b) Juice in a fridge was $^+5°C$ cold at 8 a.m. At 9 a.m., the juice was $^+3°C$. Calculate the drop in temperature of the juice from 8 a.m. to 9 a.m.

   (c) The temperature of an ice was $^-7°C$ in the evening. The following morning, the ice temperature had reduced by $^-3°C$. What was the final temperature of ice that morning?

6. I am 6 steps away from ⁻5. I am more than 0. Who am I? Explain your answer.

7. I am standing 10 steps away from ⁺4. I am less than ⁻4. Where am I standing? Justify your answer.

Answers

Remedial Activity

1.

$$\xleftarrow{\quad} \; -5 \quad -4 \quad \boxed{-3} \quad -2 \quad \boxed{-1} \quad 0 \quad +1 \quad \boxed{+2} \quad +3 \quad \boxed{+4} \quad +5 \; \xrightarrow{\quad}$$

2. **(a)** ⁺3 greater than ⁻1.
(b) ⁺1 greater than ⁻4.

3. **(a)** ⁺6 > ⁻2   **(b)** ⁺10 = ⁺10   **(c)** ⁻4 < ⁻1

4. **(a)**

$$\xleftarrow{\quad} \; -1 \quad 0 \quad +1 \quad +2 \quad +3 \quad +4 \quad +5 \quad +6 \; \xrightarrow{\quad} \; = \; +6$$

   (b)

$$\xleftarrow{\quad} \; -6 \quad -5 \quad -4 \quad -3 \quad -2 \quad -1 \quad 0 \quad +1 \; \xrightarrow{\quad} \; = \; -1$$
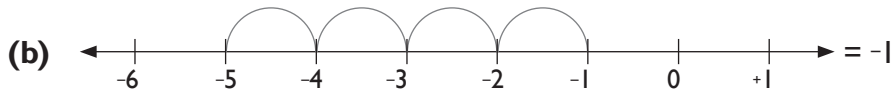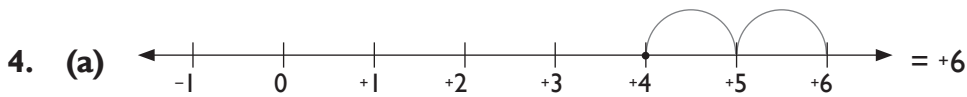
5. **(a)** ⁻5   **(b)** ⁺5

6. **(a)** ⁻4   **(b)** ⁺6   **(c)** ⁺3   **(d)** ⁻7

7. ⁻4

Consolidation Activity

1.

$$\xleftarrow{\quad} \; -6 \; -5 \; -4 \; -3 \; -2 \; -1 \; 0 \; +1 \; +2 \; +3 \; +4 \; +5 \; +5 \; +6 \; +7 \; \xrightarrow{\quad}$$
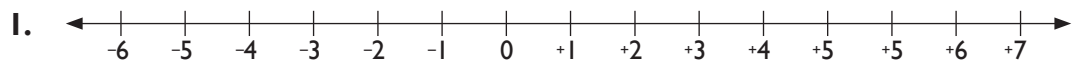
2. **(a)** ⁺2 greater than ⁻4   **(b)** ⁺2 greater than ⁻8
   (c) ⁻1 greater than ⁻5

3. **(a)** ⁺6 < ⁺11   **(b)** ⁻7 > ⁻10   **(c)** ⁺6 = ⁺6   **(d)** ⁺8 > ⁻10

4. **(a)**

$$\xleftarrow{\quad} \; -5 \quad -4 \quad -3 \quad -2 \quad \boxed{-1} \quad 0 \quad +1 \quad +2 \quad +3 \; \xrightarrow{\quad} \; = \; -1$$

   (b)

$$\xleftarrow{\quad} \; -1 \; 0 \; +1 \; +2 \; +3 \; +4 \; +5 \; +6 \; +7 \; +8 \; \boxed{+9} \; \xrightarrow{\quad} \; = \; +9$$

   (c)

$$\xleftarrow{\quad} \; -5 \quad -4 \quad -3 \quad \boxed{-2} \quad -1 \quad 0 \quad +1 \quad +2 \quad +3 \; \xrightarrow{\quad} \; = \; -2$$

   (d)

$$\xleftarrow{\quad} \; -10 \; -9 \; \boxed{-8} \; -7 \; -6 \; -5 \; -4 \; -3 \; -2 \; -1 \; 0 \; +1 \; +2 \; \xrightarrow{\quad} \; = \; -8$$

Extension Activity

1.
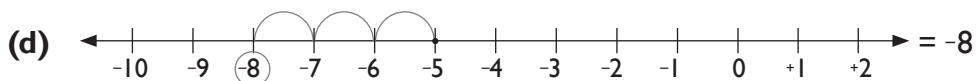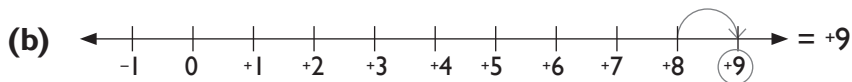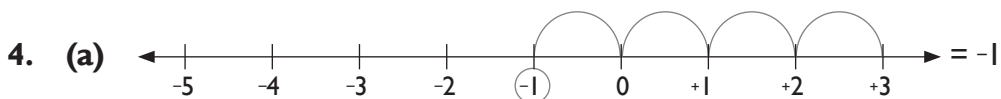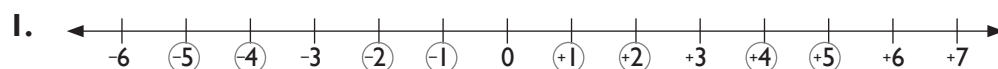
2. (a) $^-6$ greater than $^-9$

(b) $^+16$ greater than $^+11$

(c) $^+5$ greater than $^-5$

(d) $^+7$ greater than $^-10$

3. (a) $^-11 < {}^+6$ **(b)** $^+7 > {}^-10$

(c) $^-7 < {}^-5$ **(d)** $^-11 < {}^+3$

4. (a) $^+14$ **(b)** $^-16$

5. (a) $(^-6°C) + (^+10°C) = {}^+4°C$ **(b)** $(^+5°C) - (^+3°C) = {}^+2°C$

(c) $(^-7°C) + (^+3°C) = {}^-10°C$

6. 6 steps away from $^-5$ is either $(^-5) + (^+6) = {}^+1$ or $(^-5) - (^+6) = {}^-11$. The number is more than 0, so the answer is $^+1$.

7. 10 steps away from $^+4$ is either $(^+4) - (^+10) = {}^-6$ or $(^+4) + (^+10) = {}^+14$. The number is less than $^-4$. So the answer is $^-6$. In fact, $^-6 < {}^-4$ but $^+14 > {}^-4$ or $^-4 < {}^+14$.

Formative Assessment Support

It is important to set competence-based task for the unit. This is done by:

* Ensuring all unit objectives and key unit competence in the syllabus are covered.
* Check the provided assessment criteria from the syllabus.
* List the requirements using the content summary for this unit.
* Check scope and item sequence.
* Learners' objectives assist to know the difficulty of items.

After setting competence-based activity, administer to learners. Guidelines are as follows:

The assessment can be done in a double lesson where all learners give their responses. It can also be done in one period and the remaining part done in another lesson. Assess the abilities and confidence of learners through observation.

Special needs learners can be assisted to develop and nurture competence. Let them be included with others to facilitate their ability to give the expected response in spite of varied ability in learning.

Prepare all learners before the formative assessment. Assess both generic and subject based competence in unit. Allow enough time for slow or weak learners to develop the expected competence. This can be done by grouping them together for assistance. Ensure all subtopics are revised before conducting the revision activity. Allocate at least two lessons to revise the activity adequately after marking.

We have provided a sample of a competence-based task in Pupil's Book page 29. Use

it as a guidance tool for formative assessment in this unit.

You may improve the material and use it to assess different levels of thinking. That is to cater to the needs of different learning abilities. You can also use locally available materials that suit the learner's environment and to assist slow learners.

Expected answer for Revision Activity 2

1.
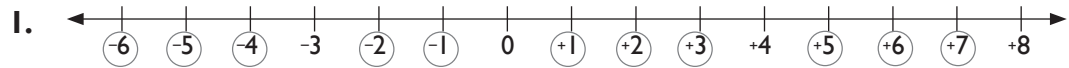
2. **(a)** $^+4$ is greater than $^-4$ **(b)** $^-3$ is greater than $^-9$

     (c) $^+10$ is greater than $^+6$ **(d)** $^+7$ is greater than $^-5$

3. **(a)** $^+5 < {}^+11$ **(b)** $^-8 < {}^-2$ **(c)** $^+11 > {}^-11$ **(d)** $^-9 < {}^+4$

4. **(a)**

$(^+6) + (^+2) = {}^+8$

(b)

$(^-7) - (^+3) = {}^-10$

(c)

$(^+9) - (^+4) = {}^+5$

(d)
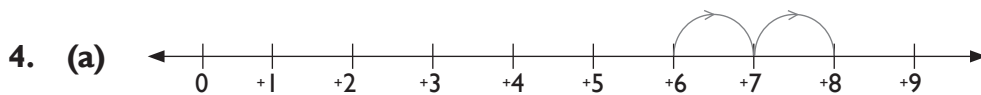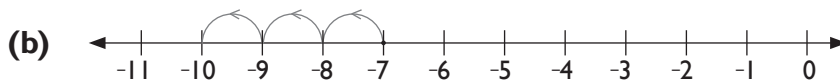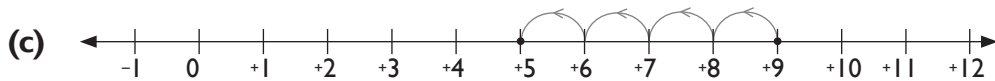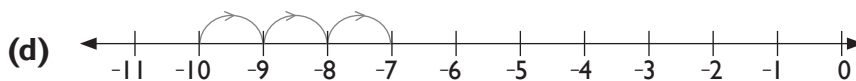
$(^-10) + (^+3) = {}^-7$

5. **(a)** $^+5$ **(b)** $^+9$ **(c)** $^-6$ **(d)** $^-9$

6. **(a)** $^+2$ **(b)** $^+6$ **(c)** $^-7$ **(d)** $^-5$

7. 10 steps away from $^+3$ is either $(^+3) - (^+10) = {}^-7$ or $(^+3) + (^+10) = {}^+13$. Since the number is negative and less than $^-6$, then the answer is $^-7$. It cannot be $^+13$ because $^+13 > {}^-6$ and is not negative.

Topic Area: Numbers and operations

Unit 3 — Prime factorisation and divisibility tests

Background

The topic deals with prime factorisation of numbers and its uniqueness. Using indices as short hand for repeated factors. Calculation of the Least Common Multiple and the Greatest Common Factors. Also divisibility test of whole numbers less than 13. Learners will be able to use the operations of these numbers and have a clear understanding of number concepts. They will also have an opportunity to relate these mathematical concepts to real life experiences.

Content summary

3.1   Prime factorisation of numbers and its uniqueness.

3.2   Using indices as shorthand for repeated factors.

3.3   Calculation of the Least Common Multiple (LCM).

3.4   Calculation of the Greatest Common Factors (GCF).

3.5   Divisibility test for 2.

3.6   Divisibility test for 3.

3.7   Divisibility test for 4.

3.8   Divisibility test for 5.

3.9   Divisibility test for 6.

3.10   Divisibility test for 8.

3.11   Divisibility test for 9.

3.12   Divisibility test for 10.

3.13   Divisibility test for 11.

3.14   Divisibility test for 12.

Key unit competence

Ability to prime factorise, show the rules of divisibility tests for numbers less than 13, find the Lowest Common Multiple (LCM) and the Greatest Common Factor (GCF) of whole numbers.

Attitudes and values

Appreciate the importance of the LCM in daily life situations. Show respect to one another. Be confident and accurate when carrying out different calculations.

Assessment of attitudes and values

Observe learners' behaviour as they develop a positive attitude towards this topic of prime factorisation and divisibility tests.

Relevant cross cutting issues

Inclusive education: Have learners with different abilities work together without any discrimination. Learners interact with the same learning materials and face the same challenges as a team.

Gender education: As learners interact in group work and discussion, ensure mix of boys and girls. As they receive and explore to get information, create gender sensitivity.

Relevant generic competencies

Research and problem solving: acquired by learners as they solve mathematical problems. It will help them solve daily problems in real life situations.

Critical thinking: let learners give accurate answers to each problem so that they are able to get required responses. For example, $8 = 2 \times 2 \times 2$ or 2^3 and not 2×4 in prime factorisation. Why? 4 is not a prime factor.

Communication skills: As learners work in groups and discuss problems, they are able to achieve effective communication skills.

Assessment criteria

Learners should be able to accurately prime factorise numbers, get rules for divisibility tests, find the LCM and the GCF of whole numbers.

Notes to the teacher

- In teaching prime factorisation guide learners to get the main idea of division of the numbers by prime numbers. This cuts across to calculation of the Least Common Multiple and the Greatest Common Factors.

- Divisibility test mainly deals with division as an operation with uniqueness of numbers below 13. It is essential to point out application of divisibility test of 4 in cases like birthday of children born on 29th February – they only celebrate their birthdays in years divisible by 4 e.g. 2012, 2016, etc.

Word list

Reference: Pupil's Book page 47

Use the word list to develop reading, listening and writing skills. Have learners work in pairs to build on their vocabulary using the word list. Let learners carry out the stated tasks with suitable vocabulary words.

Content

3.1   Prime factorisation of numbers and its uniqueness

Number of periods: 1

Reference: Pupil's Book page 30

Knowledge and understanding

Explain prime numbers.

Skills

Factorise numbers using prime factors.

Teaching/Learning materials

Flash cards

Teaching/Learning methods

- Group work activities – Discuss learning activities in groups.
- Demonstration – using Example 3.1 show the learners how to factorise.
- Class discussion – Discuss practice activities in pairs.

Lesson preparation

The lesson takes place in class. Prepare flash cards. Organise learners in small groups of mixed ability and gender.

Teaching/Learning steps

1. Ask learners to work out Activity 3.1.
2. Let learners discuss Example 3.1 as you guide them.
3. Assign learners Practice Activity 3.1 questions 1 – 7 as classwork. Go round checking progress.
4. Ask learners to identify main points they have learnt.
6. Assign learners Practice Activity 3.1 questions 8 – 15 for more practice and homework.

Assessment of skills, knowledge and understanding

Observe learners as they prime factorise numbers.

Guidance to the teacher

Emphasise that when carrying out prime factorisation you start by dividing by the smallest prime factor until there is not any other prime factor that can divide the number.

Expected answers to Practice Activity 3.1

1. $40 = 2 \times 2 \times 2 \times 5$
2. $120 = 2 \times 2 \times 2 \times 3 \times 5$
3. $170 = 2 \times 5 \times 17$
4. $80 = 2 \times 2 \times 2 \times 2 \times 5$

5. $200 = 2 \times 2 \times 2 \times 5 \times 5$

6. $320 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 5$

7. $540 = 2 \times 2 \times 3 \times 3 \times 3 \times 5$

8. $670 = 2 \times 5 \times 67$

9. $560 = 2 \times 2 \times 2 \times 2 \times 5 \times 7$

10. $132 = 2 \times 2 \times 3 \times 11$

11. $366 = 2 \times 3 \times 61$

12. $144 = 2 \times 2 \times 2 \times 2 \times 3 \times 3$

13. $266 = 2 \times 7 \times 19$

14. $470 = 2 \times 5 \times 47$

15. $920 = 2 \times 2 \times 2 \times 5 \times 23$

3.2 Using indices as shorthand for repeated factors

Number of periods: 1

Reference: Pupil's Book page 31

Knowledge and understanding

Explain the concept of indices (powers) as short hand for repeated factors.

Teaching/Learning materials

Chart showing worked out examples of Activity 3.2.

Teaching/Learning methods

- Demonstration – how to write indices using Example 3.2.
- Group work activities – Discuss learning activities in groups.
- Class discussion – Discuss practice activities.

Lesson preparation

Prepare chart to illustrate. Organise learners in groups of mixed abilities and gender. Lesson will take place in class.

Teaching/Learning steps

1. Ask learners to work out Activity 3.2.
2. Display chart with illustrated work.
3. Let learners discuss Example 3.2.
4. Assign learners Practice Activity 3.2 questions 1 – 6 as classwork. Go round assessing their progress.
5. Ask learners to name important points they have learnt.
6. Assign learners Practice Activity 3.6 questions 7 – 12 as more practice and homework.

Assessment of skills, knowledge and understanding

Observe learners as they write down prime factors using indices.

Guidance to the teacher

Let learners grasp that indices or powers are used where prime factors have been repeated. Indices are a short form for repeated factors.

Expected answers for Practice Activity 3.2

1. $27 = 3^3$
2. $75 = 3 \times 5^2$
3. $36 = 2^2 \times 3^2$
4. $76 = 2^2 \times 19$
5. $98 = 2 \times 7^2$
6. $48 = 2^4 \times 3$
7. $25 = 5^2$
8. $64 = 2^6$
9. $45 = 3^2 \times 5$
10. $106 = 2 \times 53$
11. $54 = 2 \times 3^3$
12. $74 = 2 \times 37$

3.3   Calculation of the Least Common Multiple the LCM

Number of periods: 1

Reference: Pupil's Book page 32

Knowledge and understanding

Explain the LCM. Establish the relationship between the LCM and the GCF.

Skills

Explain the importance of the LCM in daily life situations. Calculate the LCM of numbers.

Teaching/Learning materials

Flash cards

Teaching/Learning methods

• Demonstration – Use Example 3.3 to demonstrate the LCM using indices.
• Group work activities – Discuss learning activities in groups..
• Supervised practice – Learners solve problems. Check progress of learners.

Teaching/Learning steps

1. Ask learners to work out Activity 3.3.
2. Distribute flash cards.
3. Let learners discuss Example 3.3.
4. Assign learners Practice Activity 3.3 questions 1 and 2. Go round assessing their progress and give feedback.
5. Ask learners to give important points they have learnt.
6. Assign learners problems in Practice Activity 3.3 question 3 as homework and more practice.

Assessment of skills, knowledge and understanding

Observe learners as they calculate the Least Common Multiple.

Guidance to the teacher

Guide learners to calculate the Least Common Multiple. Let them divide the numbers until only 1 remains then multiply divisors to get the LCM.

Expected answers for Practice Activity 3.3

1. (a) 10   (b) 90   (c) 24
2. (a) 60   (b) 20   (c) 60
3. (a) $4 = 2^2, 5 = 5 \times 1, 12 = 3 \times 4 = 3 \times 2^2$; LCM is $2^2 \times 3 \times 5 = 60$
   (b) $4 = 2^2, 6 = 2 \times 3, 9 = 3^2$; LCM is $2^2 \times 3^2 = 36$
   (c) $6 = 2 \times 3, 10 = 2 \times 5, 15 = 3 \times 5$; LCM is $2 \times 3 \times 5 = 30$
   (d) $12 = 3 \times 4 = 2^2 \times 3, 18 = 2 \times 9 = 2 \times 3^2$; LCM is $2^2 \times 3^2 = 36$
   (e) $10 = 2 \times 5, 15 = 3 \times 5, 9 = 3^2$; LCM is $2 \times 3^2 \times 5 = 90$

3.4   Calculation of the Greatest Common Factors (GCF)

Number of periods: 1

Reference: Pupil's Book page 33

Knowledge and understanding

Establish the relationship between the LCM and the GCF. Explain the Greatest Common Factor.

Skills

Calculate the GCF of numbers.

Teaching/Learning materials

Flash cards

Teaching/Learning methods

- Group work activities – Discuss learning activities in groups.
- Demonstration – use Example 3.4 to demonstrate how to find the GCF.
- Supervised practice – learners solve problems. Teacher assess progress and give feedback.

Teaching/Learning steps

1. Ask learners to work out Activity 3.4.
   Distribute flash cards.
2. Learners discuss Example 3.4.
3. Ask learners to solve problems in Practice Activity 3.4 questions 1 – 5. Go round assessing the progress and give feedback.
4. Ask learners to state important points they have learnt.
5. Assign learners problems in Practice Activity 3 questions 6 – 10 for more practice and homework.

Assessment of skills, knowledge and understanding

Observe learners as they calculate the GCF.

Guidance to the teacher

Establish that with the Greatest Common Factor only the prime factors that divide all the numbers are required.

Expected answers for Practice Activity 3.4

1.   2   2.   4   3.   12   4.   28   5.   14   6.   20

7. $54 = 2 \times 27 = 2 \times 3^3$, $90 = 2 \times 45 = 2 \times 3^2 \times 5$; GCF is $2 \times 3^2 = 18$

8. $45 = 3^2 \times 5$, $60 = 2^2 \times 3 \times 5$, $750 = 10 \times 75 = 2 \times 3 \times 5^3$; GCF is $3 \times 5 = 15$

9. $250 = 10 \times 25 = 2 \times 5^3$, $450 = 10 \times 45 = 2 \times 5 \times 5 \times 9 = 2 \times 5^2 \times 3^2$,
      $750 = 2 \times 3 \times 5^3$; GCF is $2 \times 5^2 = 50$

10. $180 = 10 \times 18 = 2 \times 5 \times 6 \times 3 = 2^2 \times 3^2 \times 5$, $360 = 180 \times 2 = 2^3 \times 3^2 \times 5$,
      $630 = 10 \times 63 = 2 \times 5 \times 7 \times 9 = 2 \times 3^2 \times 5 \times 7$; GCF is $2 \times 3^2 \times 5 = 90$

3.5   Divisibility test for 2

Number of periods: 1

Reference: Pupil's Book page 35

Knowledge and understanding

Explain and memorise the rule of divisibility test for 2.

Skills

Calculate and show the rule of divisibility test for 2.

Teaching/Learning materials

Number cards

Teaching/Learning methods

• Group work activities – Discuss divisibility test for 2.
• Demonstration – learners discuss Example 3.5.
• Class discussion – Discuss practice activities in groups.

Lesson preparation

Organise learners in groups of mixed ability and gender. Let learners make number cards. Lesson will take place in class.

Teaching/Learning steps

1.   Ask learners to work out Activity 3.5.
2.   Let learners discuss Example 3.5.
3.   Let learners work out division using number cards.
4.   Assign learners Practice Activity 3.5 questions 1 – 10 as classwork. Go round assessing the progress.
5.   Let learners state important points they have learnt.

6. Assign learners Practice Activity 3.5 questions 11 – 18 for more practice and homework.

Assessment of skills, knowledge and understanding

Observe learners as they carry out divisibility test for 2.

Guidance to the teacher

Rule on divisibility of 2. A number is divisible by 2 if the last digit ends with 0, 2, 4, 6, 8. These are called even numbers.

Expected answers of Practice Activity 3.5

1. Divisible
2. Not divisible
3. Divisible
4. Divisible
5. Divisible
6. Divisible
7. Not divisible
8. Not divisible
9. Not divisible
10. Divisible (since last digit is 0)
11. Divisible (since last digit is 6)
12. Divisible (since last digit is 6)
13. Divisible (since last digit is 2)
14. Not divisible (since last digit is 3)
15. Divisible (since last digit is 8)
16. Divisible (since last digit is 2)
17. Divisible (since last digit is 2)
18. Divisible (since last digit is 2)

3.6   Divisibility test for 3

Number of periods: 1

Reference: Pupil's Book page 36

Knowledge and understanding

Explain and memorise the rule of divisibility test for 3.

Skills

Calculate and show the rule of divisibility test for 3.

Teaching/Learning materials

Number cards

Teaching/Learning methods

•   Group work activities – Discuss Activity 3.6 in Pupil's Book.
•   Demonstration – Use Example 3.6 to demonstrate divisibility test for 3.
•   Discussion – Class discussion on Practice Activity 3.6.

Lesson preparation

Lesson takes place in class. Organise learners into groups of mixed ability and gender.

Teaching/Learning steps

1. Let learners display numbers with number cards and divide them by 3. Let learners carry out Activity 3.6.

2. Let learners discuss Example 3.6.

3. Assign learners Practice Activity 3.6 questions 1 – 8. Go round assessing responses.

4. Let learners state important points they have learnt.

5. Assign learners problems in Practice Activity 3.6 questions 9 – 15 for more practice and homework.

Assessment of skills, knowledge and understanding

Observe learners as they divide numbers by 3.

Guidance to the teacher

Emphasise that a number is divisible by 3 if the sum of its digit is a multiple of 3.

Expected answers for Practice Activity 3.6

1. Divisible (1 + 8 + 3 + 6 = 18. Now, 18 is a multiple of 3)
2. Divisible (5 + 6 + 1 + 3 = 15. Now, 15 is a multiple of 3)
3. Divisible (9 + 7 + 8 + 6 = 30. Now, 30 is a multiple of 3)
4. Divisible (6 + 1 + 2 + 3 = 12. Now, 12 is a multiple of 3)
5. Divisible (5 + 6 + 0 + 0 + 4 = 15. Now, 15 is a multiple of 3)
6. Divisible (2 + 3 + 1 + 1 +2 = 9. Now, 9 is a multiple of 3)
7. Divisible (6 + 2 + 1 + 7 + 2 = 18. Now, 18 is a multiple of 3)
8. Divisible (4 + 5 + 6 + 3 + 1 + 2 = 21. Now, 21 is a multiple of 3)
9. Divisible (2 + 1 + 4 + 7 + 0 + 1 = 15. Now, 15 is a multiple of 3)
10. Divisible (Sum of its digits is divisible by 3)
11. Divisible (Sum of its digits is divisible by 3)
12. Divisible (Sum of its digits is divisible by 3)
13. Not divisible (Sum of its digits is 1 + 0 + 0 + 4 + 5 + 6 = 16. Now, 16 is not divisible by 3)
14. Divisible (Sum of its digits is divisible by 3)
15. Divisible (Sum of its digits is divisible by 3)

3.7   Divisibility test for 4

Number of periods: 1

Reference: Pupil's Book page 37

Knowledge and understanding

Explain and memorise the rule of divisibility test for 4.

Skills

Calculate and show the rule of divisibility test for 4.

Teaching/Learning materials

Number cards

Teaching/Learning methods

- Group work activities – Discuss Activity 3.7 in the Pupil's Book.
- Demonstration – Discussing examples to demonstrate the concept.
- Class discussion – Identify numbers divisible by 4 by discussing in groups.

Lesson preparation

Lesson takes place in class. Organise learners in groups of mixed abilities and gender. Prepare number cards.

Teaching/Learning steps

1. Ask learners to carry out Activity 3.7.
2. Let learners discuss Example 3.7. Display number cards and divide the numbers by 4.
3. Assign learners Practice Activity 3.7 questions 1 – 8 as classwork. Go round assessing learners' progress.
4. Let learners state important points they have learnt.
5. Assign learners Practice Activity 3.7 questions 9 – 15 as homework and more practice.

Assessment of skills, knowledge and understanding

Observe learners as they carry out divisibility test for 4.

Guidance to the teacher

Emphasise that the rule is that a number is divisible by 4 if the last 2 digits form a number divisible by 4. A number divisible by 4 is a multiple of 4. Hence check only the last 2 digits.

Expected answers for Practice Activity 3.7

1. Divisible
2. Divisible
3. Divisible
4. Divisible
5. Divisible
6. Not divisible
7. Not divisible
8. Divisible
9. Divisible
10. Divisible (48 is a multiple of 4)
11. Not divisible (41 is not a multiple of 4)
12. Not divisible (10 is not a multiple of 4)
13. Divisible (40 is a multiple of 4)
14. Divisible (84 is a multiple of 4)
15. Divisible (12 is a multiple of 4)

3.8　Divisibility test for 5

Number of periods: 1

Reference: Pupil's Book page 38

Knowledge and understanding

Explain and memorise the rule of divisibility test for 5.

Skills

Calculate and show the rule of divisibility test for 5.

Teaching/Learning materials

Number cards

Teaching/Learning methods

- Group work activities – discuss Activity 3.8 in small groups.
- Demonstration – use Example 3.8 to demonstrate divisibility of 5.
- Discussion – class discussion and presentation on Practice Activity 3.8.

Teaching/Learning steps

1. Ask learners to carry out Activity 3.8.
2. Let them discuss Example 3.8.
3. Assign learners Practice Activity 3.8 questions 1 – 8 as classwork. Go round assessing their responses.
4. Ask learners to state important points they have learnt.
5. Assign learners Practice Activity 3.8 questions 9 – 15 as homework and more practice.

Assessment of skills, knowledge and understanding

Observe learners as they carry out the divisibility test for 5.

Guidance to the teacher

Emphasise the rule is that a number is divisible by 5 if its last digit is 0 or 5. Thus we only check the last digit.

Expected answers for Practice Activity 3.8

1. Divisible
2. Divisible
3. Divisible
4. Divisible
5. Not divisible
6. Not divisible
7. Divisible (last digit is 0)
8. Divisible (last digit is 5)
9. Divisible (last digit is 5)
10. Divisible (last digit is 5)
11. Divisible (last digit is 0)
12. Divisible (last digit is 0)
13. Not divisible (last digit is 9)
14. Not divisible (last digit is 8)
15. Divisible (last digit is 0)

3.9   Divisibility test for 6

Number of periods: 1

Reference: Pupil's Book page 39

Knowledge and understanding

Explain and memorise the rule of divisibility test for 6.

Skills

Calculate and show the rule of divisibility test for 6.

Teaching/Learning materials

Number cards

Teaching/Learning methods

- Group work activities – discuss the activity in small groups.
- Demonstration – use Example 3.9 to demonstrate divisibility test for 6.
- Discussion – class discussion on Practice Activity.

Lesson preparation

Organise learners in groups of mixed abilities, Lesson will take place in class. Prepare number cards.

Teaching/Learning steps

1. Ask learners to carry out Activity 3.9.
2. Let them discuss Example 3.8.
3. Assign learners Practice Activity 3.9 questions 1 – 8 as classwork. Go round assessing their response.
4. Ask learners to state important points they have learnt.
5. Assign learners Practice Activity 3.9 questions 9 – 15 as homework and more practice.

Assessment of skills, knowledge and understanding

Observe learners as they carry out the test for 6.

Guidance to the teacher

Rule: A number is divisible by 6 if it is also divisible by 2 and 3. Thus conduct the test for 2 and 3 to conclude whether divisible or not.

Expected answers for Practice Activity 3.9

1. Divisible   2. Not divisible   3. Divisible
4. Divisible   5. Divisible   6. Divisible
7. Divisible (458 710 is divisible by both 2 and 3)
8. Not divisible (51 200 is only divisible by 2 but not 3)

9. Divisible (216 is divisible by both 2 and 3)

10. Divisible (144 is divisible by both 2 and 3)

11. Not divisible (928 is only divisible by 2 but not 3)

12. Not divisible (93 621 is only divisible 3 but not 2)

13. Not divisible (3 759 is only divisible by 3 but not 2)

14. Divisible (48 780 is divisible by both 2 and 3)

15. Not divisible (56 800 is only divisible by 2 but not 3)

3.10   Divisibility test for 8

Number of periods: 1

Reference: Pupil's Book page 40

Knowledge and understanding

Explain and memorise the rule of divisibility test for 8.

Skills

Calculate and show the rule of divisibility test for 8.

Teaching/Learning materials

Number cards

Teaching/Learning methods

- Discussion – carry out Activity 3.10.
- Problem solving – solve problems in Practice Activity 3.10.
- Supervised practice – learners solve problems. Teacher checks.

Lesson preparation

Organise learners in groups of mixed ability and gender. Prepare number cards. Lesson will take place in class.

Teaching/Learning steps

1. Ask learners to carry out Activity 3.10.

2. Let learners discuss Example 3.10.

3. Learners use the number cards to divide by 8.

4. Assign learners Practice Activity 3.10 questions 1 – 8 as classwork. Go round assessing the response.

5. Let learners give important points they have learnt.

6. Assign learners more practice in Practice Activity 3.10 questions 9 – 15 as homework.

Assessment of skills, knowledge and understanding

Observe learners as they carry out test for 8.

Guidance to the teacher

Rule of 8. A number is divisible by 8 if the last three digits forms a number which is divisible by 8. Thus testing requires the last three digits only.

Expected answers for Practice Activity 3.10

1. Divisible   2. Divisible   3. Not divisible
4. Divisible   5. Not divisible   6. Divisible
7. Not divisible   8. Not divisible   9. Divisible
10. Divisible (3 last digits form 168. Now, 168 is divisible by 8)
11. Divisible (3 last digits form 800. Now, 800 is divisible by 8)
12. Not divisible (3 last digits form 756. Now, 756 is divisible by 8)
13. Divisible (3 last digits form 912. Now, 912 is divisible by 8)
14. Divisible (3 last digits form 480. Now, 480 is divisible by 8)
15. Not divisible (3 last digits form 263. Now, 263 is not divisible by 8)

3.11   Divisibility test for 9

Number of periods: 1

Reference: Pupil's Book page 41

Knowledge and understanding

Explain and memorise the rule of divisibility test for 9.

Skills

Calculate and show the rule of divisibility test for 9.

Teaching/Learning materials

Number cards

Teaching/Learning methods

- Group work activities – group discussion on learning activities.
- Discussion – learners in pairs discuss Example 3.11.
- Supervised practice – learners solve problems. Assess the learners response.

Lesson preparation

Lesson will take place in class. Let learners prepare number cards. Organise learners in groups of mixed ability and gender.

Teaching/Learning steps

1. Ask learners to carry out Activity 3.11.
2. Let learners display cards while others determine whether numbers in cards are divisible by 9.
3. Learners discuss Example 3.11 to show how to test for 9.

4. Assign learners Practice Activity 3.11 question 1 as classwork. Go round assessing their responses.

5. Ask learners to state important points they have learnt.

6. Assign learners more practice in Practice Activity 3.11 question 2 as homework.

Assessment of skills, knowledge and understanding

Observe learners as they test for 9.

Guidance to the teacher

Rule for divisibility of 9. A number is divisible by 9 if the sum of its digits is a number divisible by 9. Hence to test for 9 add the digits in a number then check if the number formed is a multiple of nine.

Expected answers for Practice Activity 3.11

1. (a) Divisible   (b) Divisible   (c) Divisible

     (d) Divisible   (e) Divisible   (f) Not divisible

     (g) Not divisible   (h) Divisible   (i) Divisible

2. (a) Divisible $(7 + 1 + 3 + 6 + 1 + 0 = 18$ is a multiple of 9)

     (b) Divisible $(8 + 1 + 9 + 2 + 3 + 4 = 27$ is a multiple of 9)

     (c) Divisible $(9 + 9 + 9 + 0 + 4 + 5 = 36$ is a multiple of 9)

     (d) Not divisible $(5 + 1 + 5 + 2 + 3 + 0 = 16$ is not a multiple of 9)

     (e) Not divisible $(3 + 0 + 4 + 1 + 3 + 3 = 14$ is not a multiple of 9)

3.12 Divisibility test for 10

Number of periods: 1

Reference: Pupil's Book page 42

Knowledge and understanding

Explain and memorise the rule of divisibility test for 10.

Skills

Calculate and show the rule of divisibility test for 10.

Learning/Teaching materials

Number cards

Teaching/Learning methods

• Group work activities – group discussion on learning activities.

• Discussion – learners to discuss Example 3.12.

• Supervised practice – learners work out questions in Practice Activity.

Lesson preparation

Organise learners in groups of mixed ability and gender. Lesson will be in class.

Prepare number cards.

Teaching/Learning steps

1. Let learners display cards and divide numbers by 10.
2. Ask learners to carry out Activity 3.12.
3. Let learners discuss Example 3.12.
4. Assign learners Practice Activity 3.12 questions 1. (a) – (e) and 2. (a) – (e) as classwork. Go round assessing progress. Assist learners with difficulties.
5. Let learners state important points they have learnt.
6. Assign learners more practice with Practice Activity 3.12 questions 3 and 4 as homework.

Assessment of knowledge skills and understanding

Observe learners as they test for 10.

Guidance to the teacher

A number is divisible by 10 if the last digit is zero. Thus only check the last digit then conclude.

Expected answers for Practice Activity 3.12

Number that ends with 0 are divisible by 10. Numbers not ending with 0 are not divisible by 10.

1. (a) Divisible   (b) Divisible   (c) Not divisible
   (d) Divisible   (e) Divisible
2. (a) Divisible   (b) Divisible   (c) Divisible
   (d) Divisible   (e) Not divisible
3. Check numbers that ends with 0 only.   4. 500

3.13   Divisibility test for 11

Number of periods: 1

Reference: Pupil's Book page 44

Knowledge and understanding

Explain and memorise the rule of divisibility test for 11.

Skills

Calculate and show the rule of divisibility test of 11.

Teaching/Learning materials

Number cards

Teaching/Learning methods

• Group work activities – group discussion on Activity 3.13.

- Discussion – learners discuss in pairs Practice Activity 3.13.

Lesson preparation

Ask learners to prepare number cards. Lesson is in class. Organise learners in groups of mixed ability.

Teaching/Learning steps

1. Ask learners to display the number cards. Divide the numbers by 11. Work out Activity 3.13.
2. Learners discuss Example 3.13 on test of 11.
3. Assign learners Practice Activity 3.13 questions 1 and 2 as classwork. Go round assessing progress.
4. Ask learners to state the important points they have learnt.
5. Assign learners Practice Activity 3.13 question 3 as homework and more practice.

Assessment of skills, knowledge and understanding

Observe learners as they test for 11.

Guidance to the teacher

Rule: A number is divisible by 11 if the difference between the sums of the alternate digits is 0 or 11 or a multiple of 11.

Guidance to Activity 3.13

Get the sum of alternate digits. Then find the difference of sum of alternate digits as shown below.

(a)
$$1 + 0 = 1$$
3 1 9 0
$$(3 + 9) = 12$$
Difference: $12 - 1 = 11$

(b)
$$4 + 5 = 9$$
3 4 6 5
$$(3 + 6) = 9$$
Difference: $9 - 9 = 0$

(c)
⑨
2 3 7 6
$$2 + 7 = 9$$
Difference: $9 - 9 = 0$

(d)
$$8 + 3 = 11$$
1 8 9 3 1
$$1 + 9 + 1 = 11$$
Difference: $11 - 11 = 0$

Difference in (a) is 11, (b) is 0, (c) is 0 and in (d) is 0.

A number is divisible by 11 if the difference between sum of alternate digits is 0, 11 or a multiple of 11.

Thus a, b, c, d are all divisible by 11.

Expected answers for Practice Activity 3.13

1. (a) Not divisible   (b) Not divisible   (c) Divisible   (d) Divisible
2. (a) Divisible; difference of sum of alternate digits is

$(1 + 2 + 6) - (0 + 7 + 2) = 9 - 9 = 0$

(b) Divisible; difference of sum of alternate digits is

$(1 + 5 + 2) - (0 + 8 + 0) = 8 - 8 = 0$

(c) Not divisible; difference of sum of alternate digits is

$(8 + 2 + 1) - (6 + 2 + 1) = 11 - 9 = 2$. Now, 2 is not a multiple of 11.

(d) Divisible; difference of sum of alternate digits is

$(2 + 9 + 9) - (4 + 2 + 3) = 20 - 9 = 11$. Now, 11 is a multiple of 11.

3. (a) Not divisible; difference of sum of alternate digits is

$(3 + 2 + 7) - (5 + 2 + 4) = 12 - 11 = 1$. Now, 1 is not a multiple of 11.

(b) Divisible; difference of sum of alternate digits is

$(3 + 9 + 3) - (2 + 8 + 5) = 15 - 15 = 0$.

(c) Not divisible; difference of sum of alternate digits is

$(2 + 9 + 0) - (4 + 2 + 4) = 11 - 10 = 1$. Now, 1 is not a multiple of 11.

(d) Divisible; difference of sum of alternate digits is

$(9 + 2) - (6 + 5) = 11 - 11 = 0$.

3.14   Divisibility test for 12

Number of periods: 1

Reference: Pupil's Book page 45

Knowledge and understanding

Explain and memorise the rule of divisibility test for 12.

Skills

Calculate and show the rule of divisibility test for 12.

Teaching/Learning materials

Number cards

Teaching/Learning methods

•   Group work activities – discuss Activity 3.14 in groups.
•   Demonstration – use Example 3.14 to demonstrate divisibility test for 12.
•   Discussion – class discussion on Practice Activity.

Teaching/Learning steps

1. Ask learners to carry out Activity 3.14.
2. Let learners discuss Example 3.14. Display number cards and determine if numbers are divisible by 12.
3. Assign learners Practice Activity 3.14 questions 1 – 7 as classwork. Go round assessing learners' progress.
4. Ask learners to state important points they have learnt.
5. Assign learners more practice in Practice Activity 3.14 questions 8 – 14 as homework.
6. Identify different learning abilities. Give Additional Activity 3 as an assignment. For slow learners, give the Remedial Activity. For average learners, give the Consolidation Activity and for fast learners, give the Extension Activity. Let each group discuss their assignment. Afterwards, let each group make a class presentation.

Guidance to the teacher

Emphasise that a number is divisible by 12 if it is both divisible by 3 and 4. Thus test for divisibility of 3 and 4 then conclude.

Expected answers for Practice Activity 3.14

1. Divisible
2. Divisible
3. Divisible
4. Divisible
5. Divisible
6. Divisible
7. Divisible
8. Not divisible
9. Divisible

10. Test for 3: (9 + 3 + 3 + 2 + 1 + 6) = 24. Now, 24 is a multiple of 3.

    Test for 4: Last two digits form 16. Now, 16 is a multiple of 4. Thus the number is divisible by 4. Hence, 933 216 is divisible by 12 (divisible by both 3 and 4).

11. Test for 3: (7 + 5 + 3 + 0 + 7 + 2) = 24. Now, 24 is a multiple of 3.

    Test for 4: Last two digits form 72. Now, 72 is a multiple of 4. Thus, 753 072 is divisible by 12 (since it is divisible by both 3 and 4).

12. Test for 3: (6 + 6 + 5 + 5 + 8 + 0) = 30. Now, 30 is a multiple of 3.

    Test for 4: Last two digits form 80. Now, 80 is a multiple of 4. Thus, 665 580 is divisible by 12 (since it is divisible by both 3 and 4).

13. Test for 3: (5 + 8 + 2 + 1 + 0 + 0) = 16. Now, 16 is not a multiple of 3.

    Test for 4: Last two digits form 00. So the number is divisible by 4. Thus, 582 100 is not divisible by 12. (Since it is only divisible by 4 but not 3).

14. Test for 3: (4 + 0 + 3 + 5 + 6 + 0) = 18. Now, 18 is a multiple of 3.

    Test for 4: Last two digits form 60. Now 60 is a multiple of 4. Thus, 403 560 is divisible by 12 (It is divisible by both 3 and 4).

Additional Activity 3

Remedial Activity

1. Write the following as a product of its prime factors in indices form.
    (a) 36   (b) 24
2. Find the Least Common Multiple (LCM) of:
    (a) 3, 4 and 5   (b) 4, 8 and 12
3. Calculate the Greatest Common Multiple (GCD) of the following. Discuss your steps.
    (a) 12, 24, 36   (b) 180, 360 and 630
4. Which of the following numbers are divisible by 2?
    (a) 3 841   (b) 4 026   (c) 3 284
    (d) 4 039   (e) 5 265   (f) 3 946
5. Which of the following numbers are divisible by 3?
    (a) 8 036   (b) 4 754
    (c) 1 230   (d) 18 360
6. Which of the following numbers are divisible by 4?
    (a) 48 962   (b) 41 828
    (c) 54 610   (d) 890 004
7. Which of the following numbers are divisible by 5?
    (a) 984 065   (b) 846 263
    (c) 49 600   (e) 37 478
8. Which of the following numbers are divisible by 6 and 12? Explain your answer.
    (a) 54 691   (b) 2 160
    (c) 40 320   (d) 10 860
9. Test and write the numbers divisible by 11 from:
    (a) 103 686   (b) 99 328   (c) 81 620

Expected answers to Remedial Activity

1. (a) $36 = 2 \times 2 \times 3 \times 3 = 2^2 \times 3^2$ (b) $24 = 2 \times 2 \times 2 \times 3 = 2^3 \times 3$
2. (a) 60   (b) 24
3. (a) 12   (b) 90
4. (b) 4 026   (c) 3 284   (f) 3 946
5. (c) 54 610   (d) 18 360
6. (b) 41 828   (d) 890 004
7. (a) 984 065   (c) 49 600
8. (b) 2 160   (c) 40 320   (d) 10 860
9. Testing for divisibility using divisibility test for 11.

(a) 103 686
  – Sum digits in alternate positions
    $1 + 3 + 8 = 12$
    $0 + 6 + 6 = 12$
  – Difference
    $12 - 12 = 0$
    Thus, 103 686 is divisible by 11

(b) 99 328
  – Sum digits in alternate positions
    $9 + 3 + 8 = 20$
    $9 + 2 = 11$
  – Difference
    $20 - 11 = 9$
    Thus, 99 328 is not divisible by 11

(c) 81 620
  Sum digits in alternate positions
  $8 + 6 + 0 = 14$
  $1 + 2 = 3$
  Difference
  $14 - 3 = 11$
  Thus, 81 620 is divisible by 11

Consolidation Activity

1. Show the prime factorisation of the following in indices form.
   (a) 216   (b) 243

2. Find the Least Common Multiples (LCM) of the groups of numbers. Justify your answer.
   (a) 12, 24 and 36   (b) 10, 15 and 25
   (c) 6, 8 and 10   (d) 9, 10 and 15

3. Calculate the Greatest Common Factor (GCF) of the groups of numbers. Explain your steps.
   (a) 24, 36 and 60   (b) 210 and 350
   (c) 48, 96, 120   (d) 16, 36, 52

4. Which of the following numbers are divisible by 6?
   (a) 42 694   (b) 24 360
   (c) 93 621   (d) 86 006

5. Which of the following numbers are divisible by 8?
   (a) 5 328   (b) 32 700
   (c) 3 040   (d) 21 800

6. Which of the following numbers are divisible by 9?
   (a) 713 610   (b) 304 136

7. Which of the following numbers are divisible by 10?
   (a) 47 800   (b) 36 495
   (c) 50 640   (d) 49 768

8. Write the numbers divisible by 12, 4 and 8. Justify your answer.

    (a)   432 153   (b)   40 080   (c)   562 008

9. Which of the following numbers are divisible by 11? Discuss your answers.

    (a)   993 280   (b)   893 200   (c)   103 686

Expected Answers for Consolidation Activity

1.   (a) $216 = 2 \times 2 \times 2 \times 3 \times 3 \times 3 = 2^3 \times 3^3$

    (b) $243 = 3 \times 3 \times 3 \times 3 \times 3 = 3^5$

2.   (a)   72   (b)   150   (c)   120   (d)   90

3.   (a)   12   (b)   70   (c)   24   (d)   4

4.   (b)   24 360

5.   (a)   5 328   (c)   3 040   (d)   2 800

6.   (a)   713 610

7.   (a)   47 800   (b)   50 640

8.   (b)   40 080   (c)   562 008

9.   (b)   893 200   (c)   103 686

Extension Activity

1. Which of the following numbers are divisible by 9, 3 and 6? Justify your answer.

    (a)   68 942   (b)   304 165   (c)   2 916

    (d)   17 668   (e)   96 253   (f)   14 256

2. Which of the following numbers are divisible by 11? Explain the steps to your answer.

    (a)   47 896   (b)   657 580

    (c)   9 686   (d)   403 560

3. Which of the following numbers is divisible by 4, 8 and 12? Discuss your steps.

    (a)   432 153   (b)   102 960

    (c)   562 008   (d)   40 080

4. Which of the following numbers is divisible by 12, 3 and 4? Justify your answer.

    (a)   1 224   (b)   93 300

    (c)   3 390   (d)   30 888

5. Learners were picking paper slips. Two learners picked 144 and 540 respectively

    (a)   Prime factorise the two numbers in indice form.

    (b)   Hence, find the LCM and the GCF of the numbers using indice forms. Discuss your steps.

6. Find the product of the GCF and the LCM of 12, 18 and 24. Explain your steps.

7. Alice was born on 29th February 2000. How many birthdays will she have

celebrated when she is 22 years old? Justify your answer.

Expected answers to Extension Activity

1. (c) 2 916   (d) 17 668   (f) 14 256
2. (a) 47 896   (b) 657 580
3. (b) 102 960   (c) 562 008
4. (b) 93 300   (c) 30 888
5. (a) $144 = 12 \times 12 = 2 \times 2 \times 3 \times 2 \times 2 \times 3 = 2^4 \times 3^2$
      and $540 = 9 \times 6 \times 10 = 2 \times 2 \times 3 \times 3 \times 5 = 2^2 \times 3^3 \times 5$
   (b) $LCM = 2^4 \times 3^2 \times 5 = 2\ 160$
      $GCF = 2^2 \times 3^2 = 36$
6. $GCF = 6, LCM = 72$
   $Product = 6 \times 72 = 432$
7. Her birthday celebration years are: 2004, 2008, 2012, 2016, 2020 while at 22 years. They are years divisible by 4. Thus, she would have celebrated 5 birthdays.

Formative Assessment Support

Tips to set a competence-based task for the units are as follows:

• Ensure that all unit objectives and key unit competences in the syllabus are covered, check assessment criteria from the syllabus. Then list the requirements to develop a competence-based task. A quick check is the content summary. To know the difficulty of items, learning objectives are of great importance.

• Administer the set task to learners as follows:

   Use a double lesson where all learners give their responses. Alternatively the first part be done in one lesson and the remaining part in another lesson. Assess the ability and confidence of learners through observation.

• Learners with special needs can be assisted to nurture and develop competence. Learners with mental challenges eyesight problems and hearing challenges should always be included. However, facilitate their ability to give the expected response in spite of varying learning abilities. Prepare all learners before the formative assessment. Assess both generic and subject based competences in the unit. Provide weak learners more time to complete the task. Motivate all learners with different abilities to have a positive attitude and achieve expected competence.

• The sample of a competence-based task provided in the Pupil's Book page 46 should be used as a guidance tool for formative assessment of this unit. You can improve the material to cater for all the levels of the learners and use it to assess the learners. Set aside at least one lesson to discuss the activity after assessing the responses.

Expected answers for Revision Activity 3

1. (a) $240 = 2^4 \times 3 \times 5$ (b) $300 = 2^2 \times 3 \times 5^2$

    (c) $1\,000 = 2^3 \times 5^3$

2. (a) 36   (b) 40   (c) 40   (d) 60

3. (a) 8   (b) 10

4. (a) 649 425 and 792 400

5. 300 012, 400 560

6. 480 120, 820 440

7. 400 255, 728 400

8. 403 560, 67 260

9. 480 240

10. 810 720, 820 503

11. 716 300, 633 420

12. 467 181, 891 484

13. 891 480, 556 680

Unit 4   Equivalent fractions and operations

Background

This topic was introduced in the previous years. Learners are building on existing concepts. Learners will get an opportunity to add and subtract fractions using equivalent fractions and lowest common multiples. They will also get the concept of equivalent fractions using models and later through calculation. Learners will have an opportunity to relate these mathematical concepts to real life situations.

Content summary

4.1   Concept of equivalence of fractions (using models).

4.2   Calculation of equivalent fractions.

4.3   Addition of fractions with different denominators using equivalent fractions.

4.4   Addition of fractions using the Lowest Common Multiple.

4.5   Addition of mixed fractions with different denominators.

4.6   Word problems for addition of fractions.

4.7   Subtraction of fractions with different denominators using equivalent fractions.

4.8   Subtraction of fractions using the Lowest Common Multiple.

4.8   Subtraction of whole numbers and fractions.

4.10   Subtraction of mixed numbers with different denominators.

4.11   Word problems on subtraction of fractions.

Key unit competence

Ability to add, subtract and find equivalent fractions.

Attitudes and values

Show respect to one another when working in groups. Be confident and accurate when finding equivalent fractions. Develop personal confidence in the use of fractions. Appreciate the importance of accuracy when working out equivalent fractions and adding and subtracting fractions.

Assessment of attitudes and values

Observe the behaviour of learners response as they develop a positive attitude towards this topic of equivalent fractions and operations.

Relevant cross cutting issues

Inclusive education: Learners of different abilities work together to acquire values. Learners with physical, mental and other challenges should learn together with other learners. They interact within the same environment and with similar materials as they acquire the desired values and skills.

Gender education: In group work activities and discussion learners are organised in groups of different genders. Both males and females work together as a team. As they discover and explore to get information, they are part of a team irrespective of gender. Use question 5(c) of Practice Activity 4.27 to bring out different roles played by boys and girls. Similarly, discuss similar roles played by both genders.

Peace and values education: Learners work together in group work as a team. They explore areas of education harmoniously. This is vital to acquisition of education. This way learners value each other as a team.

Relevant generic competences

Research and problem solving: As learners find responses to the problems set in practice activities they develop the problem solving ability. This can be used to solve problems in real life situations.

Critical thinking: Learners are given problems that require specific responses for instance Activity 4.6 where learners compare fractions to determine whether they are equivalent or not.

Communication skills: As learners discuss activities and the examples given they require effective communication. They are expected to speak and communicate their ideas articulately. As they express themselves they develop effective communication.

Assessment criteria

Learners should add, subtract and find equivalent fractions.

Notes to the teacher

In teaching equivalent fractions and operations learners should be able to apply the knowledge they acquire of equivalent fractions in daily life situations. As they work together they should be able to respect one another irrespective of differences in order to achieve a common goal.

Word list

Reference: Pupil's Book page 84

Use the word list to develop reading, listening and writing skills. Let learners work in pairs to carry out the stated tasks with suitable vocabulary words.

Content

4.1   Concept of equivalent fractions using models

Number of periods: 1

Reference: Pupil's Book page 48

Knowledge and understanding

Explain the concept of equivalent fractions.

Skills

Apply the knowledge of equivalent fractions to daily life situations.

Teaching/Learning materials

Strips of paper cutouts.

Teaching/Learning methods

Group work activities – working in small groups discuss Activity 4.1.

Demonstration – comparing sizes of shaded fractions in example 4.1.

Practical approach – folding and paper cutouts of $\frac{1}{2}$, $\frac{2}{4}$ and $\frac{4}{8}$.

Supervised practice – learners shade equivalent fractions. Teacher checks responses and gives feedback.

Lesson preparation

Lesson will take place in class. Organise learners in small working groups. Prepare strips of papers.

Teaching/Learning steps

1.   Ask learners to get 3 equal strips of papers and work out Activity 4.1.
2.   Let learners discuss Example 4.1.
3.   Assign learners Practice Activity 4.1 questions 1 – 4 as classwork. Go round assessing progress.
4.   Have learners state important points they have learnt.
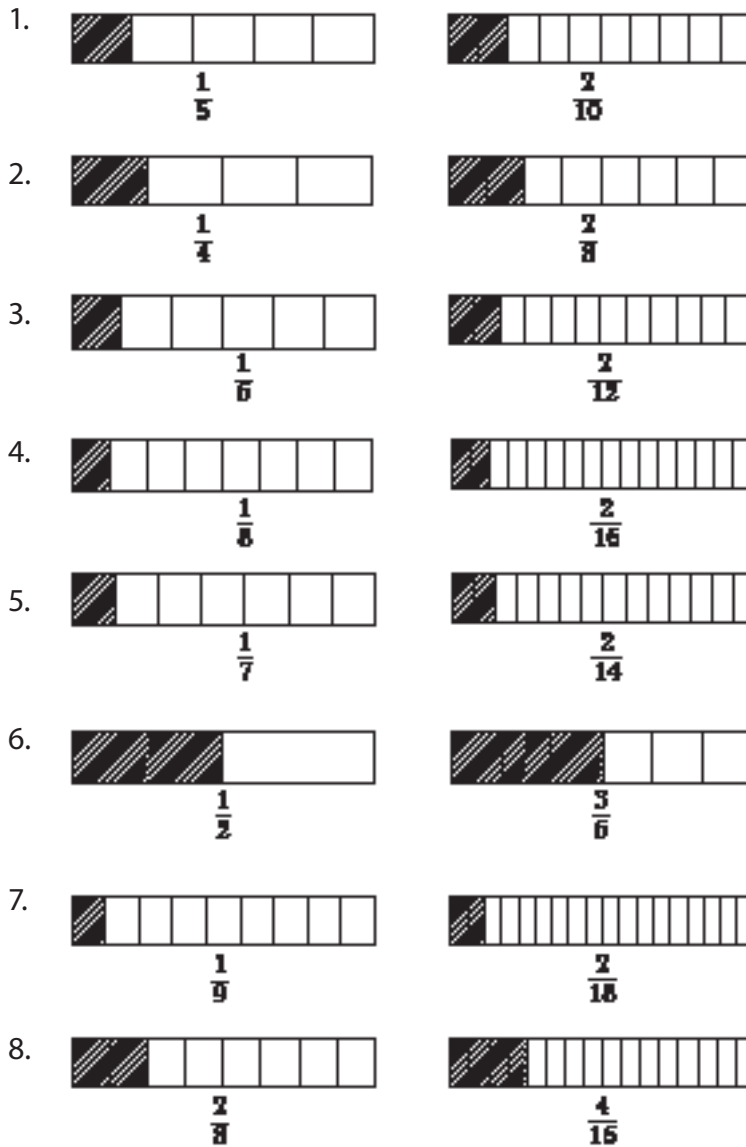5.   Assign learners Practice Activity 4.1 questions 5 – 8 for more practice as homework.

Assessment of knowledge and understanding

Observe learners as they shade equivalent fractions.

Guidance to the teacher

Emphasise that the shaded strips are equal. There are more parts, but the shaded part is equal. Equivalent fractions are equal.

Expected answer for Practice Activity 4.1

1.

$$\frac{1}{5}$$

$$\frac{2}{10}$$

2.

$$\frac{1}{4}$$

$$\frac{2}{8}$$

3.

$$\frac{1}{6}$$

$$\frac{2}{12}$$

4.

$$\frac{1}{8}$$

$$\frac{2}{16}$$

5.

$$\frac{1}{7}$$

$$\frac{2}{14}$$

6.

$$\frac{1}{2}$$

$$\frac{3}{6}$$

7.

$$\frac{1}{9}$$

$$\frac{2}{18}$$

8.

$$\frac{2}{8}$$

$$\frac{4}{16}$$

4.2   Concept of equivalent fractions using models

Number of periods: 1

Reference: Pupil's Book page 49

Knowledge and understanding

Explain the concept of equivalent fractions.

Skills

Apply the knowledge of equivalent fractions in daily life situations.

Teaching/Learning materials

Equal strips of paper cutouts.

Teaching/ Learning methods

Group work activities – group discussion on learning activity.

Practical approach – Activity 4.2 folding paper cutouts.

Demonstration – comparing shaded parts in Example 4.2.

Supervised practice – learners shade 2 more equivalent fractions. Teacher checks and gives feedback.

Teaching/Learning steps

1. Ask learners to get 3 equal strips of paper and work out Activity 4.2.

2. Let learners discuss Example 4.2.

3. Assign learners Practice Activity 4.2 questions 1 – 4 as classwork. Go round assessing learners' progress.

4. Have learners state important points they have learnt.

5. Assign learners Practice Activity 4.2 questions 5 – 8 for more practice as homework.

Assessment of knowledge and understanding

Observe learners as they shade equivalent fractions.

Guidance to the teacher

Emphasise that the shaded strips are equal. There are more parts but the shaded part is equal. Equivalent fractions are equal.

Expected answer for Practice Activity 4.2

1.

$\frac{2}{5}$ $\frac{4}{10}$ $\frac{6}{15}$

2.

$\frac{3}{7}$ $\frac{6}{14}$ $\frac{9}{21}$

3.

$\frac{2}{9}$ $\frac{4}{18}$ $\frac{6}{27}$

4.

$\frac{5}{6}$ $\frac{10}{12}$ $\frac{15}{18}$

5.

$\frac{3}{8}$ $\frac{6}{16}$ $\frac{9}{24}$
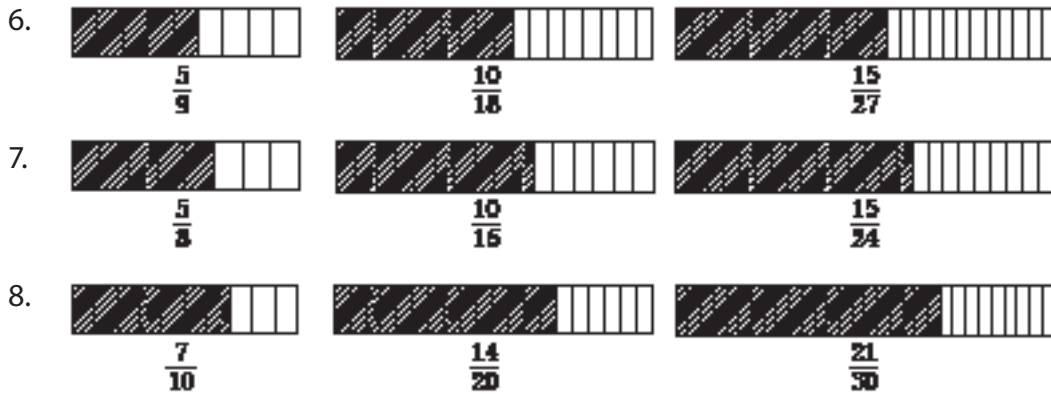
6.

$$\frac{5}{9} \qquad \frac{10}{18} \qquad \frac{15}{27}$$

7.

$$\frac{5}{8} \qquad \frac{10}{16} \qquad \frac{15}{24}$$

8.

$$\frac{7}{10} \qquad \frac{14}{20} \qquad \frac{21}{30}$$

Concept of equivalent fractions using models

Number of periods: 1

Reference: Pupil's Book page 51

Knowledge and understanding

Explain the concept of equivalent fractions.

Skills

Apply the knowledge of equivalent fractions in daily life situations.

Teaching learning materials

Paper cutouts

Teaching/Learning methods

• Group work activities – group discussion on learning activities.
• Practical approach – Activity 4.3 use paper cutouts.
• Demonstration – comparing shaded parts in Example 4.3.
• Supervised practice – learners shade equivalent fractions.

Teaching/Learning steps

1. Ask learners to draw and shade $\frac{2}{3}$. Let them make paper cutouts and compare the sizes. See Activity 4.3.
2. Let learners discuss Example 4.3.
3. Assign learners Practice Activity 4.3 questions 1 – 4 as classwork. Go round assessing their progress.
4. Let learners state important points they have learnt.
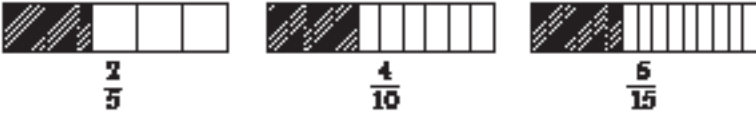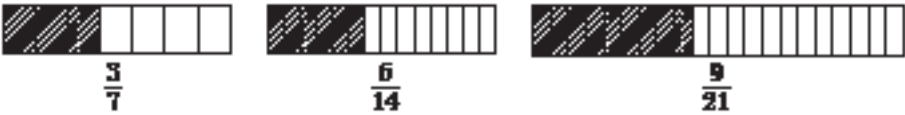5. Assign learners Practice Activity 4.3 questions 5 – 8 for more practice as homework.

Assessment of knowledge and understanding

Observe learners as they shade equivalent fractions.

Guidance to the teacher

Emphasise that learners shade the equivalent fractions after carefully checking.

Expected answers for Practice Activity 4.3

1.

$\frac{3}{5}$ $\frac{6}{10}$

2.

$\frac{7}{8}$ $\frac{14}{16}$

3.

$\frac{9}{4}$ $\frac{6}{8}$

4.

$\frac{3}{8}$ $\frac{6}{16}$

5.

$\frac{2}{3}$ $\frac{4}{6}$

6.

$\frac{4}{5}$ $\frac{8}{10}$

7.

$\frac{9}{7}$ $\frac{6}{14}$

8.

$\frac{5}{8}$ $\frac{10}{16}$

Concept of equivalent fractions using models

Number of periods: 1

Reference: Pupil's Book page 52

Knowledge and understanding

Explain the concept of equivalent fractions.

Skills

Apply the knowledge of equivalent fractions in daily life situations.

Teaching/Learning materials

Chart with shaded equivalent fractions.

Teaching/Learning methods
- Group work activities – carry out activities in groups.
- Demonstration – writing shaded fractions in Example 4.4.
- Supervised practice – learners shade equivalent fractions. Teacher checks and gives feedback.

Teaching/Learning steps
1. Ask learners to write the shaded fraction in Activity 4.4.
2. Let learners discuss Example 4.4.
3. Assign learners Practice Activity 4.4 questions 1 – 6 of A as classwork. Go round assessing the progress.
4. Let learners state important points they have learnt.
5. Assign learners Practice Activity 4.4 questions 1 – 4 of B for more practice as homework.
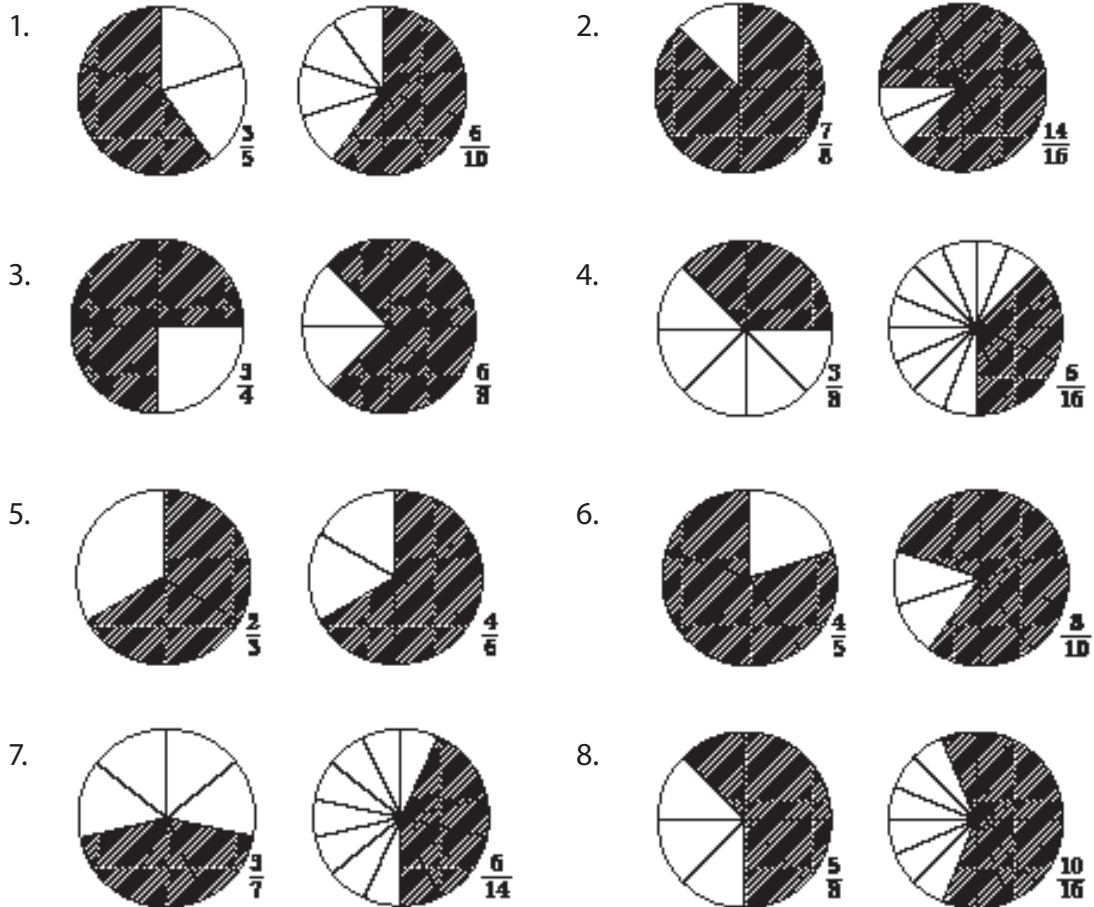
Assessment of knowledge, skills and understanding
Observe learners as they write the equivalent fractions for models in each case.

Guidance to the teacher
Emphasise that for equivalent fractions both the numerator and the denominator are multiplied by the same number.

Expected answers for Practice Activity 4.4

A. 1. $\frac{1}{2}, \frac{3}{6}$ 2. $\frac{2}{3}, \frac{6}{9}$ 3. $\frac{3}{5}, \frac{6}{10}$

   4. $\frac{3}{7}, \frac{6}{14}$ 5. $\frac{5}{8}, \frac{15}{24}$ 6. $\frac{3}{6}, \frac{6}{12}$

B. 1. $\frac{5}{12}, \frac{10}{24}$ 2. $\frac{4}{5}, \frac{8}{10}$ 3. $\frac{7}{10}, \frac{14}{20}$ 4. $\frac{5}{16}, \frac{10}{32}$

Concept of equivalent fractions using models
Number of periods: 1
Reference: Pupil's Book page 54

Knowledge and understanding
Explain the concept of equivalent fractions.

Skills
Apply the knowledge of equivalent fractions in daily life situations.

Teaching/Learning materials
Chart with worked out example.

Lesson preparation

Lesson will take place.

Teaching/Learning methods

- Group work activities – learners discuss learning activities in groups.
- Demonstration – writing equivalent fractions from shaded parts.
- Supervised practice – learners write down equivalent fractions. Teacher checks and gives feedback.

Teaching/Learning steps

1. Ask learners to identify the shaded part showing equivalent fractions in Activity 4.5.
2. Let learners discuss Example 4.5.
3. Assign learners Practice Activity 4.5 questions 1 – 5 as classwork. Go round assessing learners' progress.
4. Let learners state important points they have learnt.
5. Assign learners practice Activity 4.5 questions 6 – 10 for more practice as homework.

Assessment of knowledge and understanding

Observe learners as they write equivalent fractions.

Addition notes to the teacher

Emphasise that equivalent fractions are found by multiplying both numerator and denominator with the same whole number.

Expected answers for Practice Activity 4.5

1. (i)   a and b
    (ii) $\frac{1}{4}, \frac{2}{8}$

2. (i)   a and c
    (ii) $\frac{1}{3}, \frac{3}{9}$

3. (i)   a and c
    (ii) $\frac{1}{3}, \frac{2}{6}$

4. (i)   a and b
    (ii) $\frac{2}{6}, \frac{4}{12}$

5. (i)   a and b
    (ii) $\frac{3}{6}, \frac{1}{2}$

6. (i)   a and c
    (ii) $\frac{2}{7}, \frac{4}{14}$

7. (i)   a and b
    (ii) $\frac{5}{12}, \frac{10}{24}$

8. (i)   a and b
    (ii) $\frac{3}{9}, \frac{6}{18}$

9. (i)   a and b
    (ii) $\frac{3}{5}, \frac{9}{15}$

10. (i)   a and c
    (ii) $\frac{3}{4}, \frac{9}{12}$

4.3   Calculation of equivalent fractions

Number of periods: 2

Reference: Pupil's Book page 56

Knowledge and understanding

Explain how to find equivalent fractions. Give examples of equivalent fractions.

Skills

Apply the knowledge of equivalent fractions in daily life situations.

Teaching/Learning materials

- Flash cards, paper cutout.
- Chart with worked out examples.

Teaching/Learning methods

- Group work activities – learners discuss in groups.
- Demonstration – finding equivalent fractions using Example 4.6.
- Supervised practice – learners work out equivalent fractions. Teacher checks and gives feedback.

Lesson preparation

- Lesson takes place in class. Organise learners in small groups of mixed ability and gender.
- Prepare a chart showing solutions to problems in Activity 4.6.
- Prepare flash cards on finding equivalent fractions.

Teaching/Learning steps

1. Ask learners to work out Activity 4.6. Display the chart of worked out examples in Activity 4.6.
2. Let learners discuss Example 4.6.
3. Assign learners Practice Activity 4.6 questions 1 – 7 as classwork. Go round assessing their progress.
4. Let learners state important points they have learnt.
5. Assign learners Practice Activity 4.6 questions 8 – 15 for more practice as homework.

Assessment of knowledge, skills and understanding

Observe learners as they find equivalent fractions of given fractions.

Guidance to the teacher

Explain that to find equivalent fractions, one must multiply the denominator and numerator by a whole number.

Expected answers to Practice Activity 4.6

1. $\frac{1}{4} \times \frac{13}{13} = \frac{13}{52}$

2. $\frac{2}{3} \times \frac{8}{8} = \frac{16}{24}$

3. $\frac{3}{10} \times \frac{5}{5} = \frac{15}{50}$

4. $\frac{5}{6} \times \frac{9}{9} = \frac{45}{54}$

5. $\frac{16 \div 4}{28 \div 4} = \frac{4}{7}$

6. $\frac{27 \div 9}{27 \div 9} = \frac{3}{9}$

7. $\frac{34 \div 2}{50 \div 2} = \frac{17}{50}$

8. $\frac{1}{11} \times \frac{3}{3} = \frac{3}{33}$

9. $\frac{3}{9} \times \frac{3}{3} = \frac{9}{27}$ 　　10. $\frac{7}{10} \times \frac{3}{3} = \frac{21}{30}$ 　　11. $\frac{4}{9} \times \frac{4}{4} = \frac{16}{36}$ 　　12. $\frac{2}{3} \times \frac{4}{4} = \frac{8}{12}$

13. $\frac{4 \div 2}{6 \div 2} = \frac{2}{3}$ 　　14. $\frac{7}{8} \times \frac{4}{4} = \frac{28}{32}$ 　　15. $\frac{3}{4} \times \frac{3}{3} = \frac{9}{12}$

Calculation of equivalent fractions

Number of periods: 1

Reference: Pupil's Book page 57

Knowledge and understanding

- Explain how to find equivalent fractions.
- Give examples of equivalent fractions.

Skills

Apply the knowledge of equivalent fractions in daily life situations.

Teaching/Learning materials

- Flash cards, paper cutouts.
- Chart with worked out examples.

Teaching/Learning methods

- Group work activities – group discussion on learning activity.
- Demonstration – how to find equivalent fractions using Example 4.6.
- Supervised practice – learners find equivalent fractions. Teacher checks and gives feedback.

Lesson preparation

- Lesson takes place in class. Organise learners in small groups of mixed ability and gender.
- Prepare the chart showing solutions to problems in Activity 4.7.
- Prepare flash cards on finding equivalent fractions.

Teaching/Learning steps

1. Ask learners to work out Activity 4.7. Display the chart of worked out examples for Activity 4.7.
2. Let learners discuss Example 4.7.
3. Assign learners Practice Activity 4.7 questions 1 – 5 of A as classwork. Go round assessing progress. Assist learners with difficulties. Pair fast learners with slow learners to discuss.
4. Let learners state important point of what they have learnt.

5. Assign learners Practice Activity 4.7 questions 1 – 7 of B for more practice as homework.

Assessment of skills, knowledge and understanding

Observe learners as they find 2 equivalent fractions.

Guidance to the teacher

Emphasise that to get two equivalent fractions one should multiply by a whole number for example $\frac{2}{2}$. Then multiply by another number again for instance $\frac{3}{3}$.

Expected answers to Practice Activity 4.7

A. 1. $\frac{5}{8} \times \frac{2}{2} = \frac{5 \times 2}{8 \times 2} = \frac{10}{16}, \frac{5}{8} \times \frac{3}{3} = \frac{5 \times 3}{8 \times 3} = \frac{15}{24}$
  2. $\frac{3}{7} \times \frac{2}{2} = \frac{6}{14}, \frac{3}{7} \times \frac{3}{3} = \frac{9}{21}$

  3. $\frac{2}{3} \times \frac{2}{2} = \frac{4}{6}, \frac{2}{3} \times \frac{3}{3} = \frac{6}{9}$
  4. $\frac{6}{11} \times \frac{2}{2} = \frac{12}{22}, \frac{6}{11} \times \frac{3}{3} = \frac{18}{33}$

  5. $\frac{3}{10} \times \frac{2}{2} = \frac{6}{20}, \frac{3}{10} \times \frac{3}{3} = \frac{9}{30}$

B. 1. $\frac{7}{9} \times \frac{2}{2} = \frac{14}{18}, \frac{7}{9} \times \frac{3}{3} = \frac{21}{27}$
  2. $\frac{8}{12} \times \frac{2}{2} = \frac{16}{24}, \frac{8}{12} \times \frac{3}{3} = \frac{24}{36}$

  3. $\frac{3}{5} \times \frac{2}{2} = \frac{6}{10}, \frac{3}{5} \times \frac{3}{3} = \frac{9}{15}$
  4. $\frac{6}{7} \times \frac{2}{2} = \frac{12}{14}, \frac{6}{7} \times \frac{3}{3} = \frac{18}{21}$

  5. $\frac{9}{13} \times \frac{2}{2} = \frac{18}{26}, \frac{9}{13} \times \frac{3}{3} = \frac{27}{39}$
  6. $\frac{6}{9} \times \frac{2}{2} = \frac{12}{18}, \frac{6}{9} \times \frac{3}{3} = \frac{18}{27}$

  7. $\frac{4}{6} \times \frac{2}{2} = \frac{8}{12}, \frac{4}{6} \times \frac{3}{3} = \frac{12}{18}$

Calculation of equivalent fractions

Number of periods: 1
Reference: Pupil's Book page 58

Knowledge and understanding

- Explain how to find equivalent fractions.
- Give examples of equivalent fractions.

Skills

Apply the knowledge of equivalent fractions in daily life situations.

Teaching/Learning materials

Chart with worked out examples.

Teaching/Learning methods

- Group work activities – learners discuss learning activities.
- Demonstration – finding equivalent fractions using Example 4.8.
- Supervised practice – learners find equivalent fractions. Teacher checks and gives feedback.
- Class discussion – discuss Example 4.8.

Lesson preparation

- Lesson takes place in class. Organise learners in small groups of mixed ability and gender.
- Prepare chart showing solutions to Activity 4.8.

Teaching/Learning steps

1. Ask learners to work out Activity 4.8. Display the chart of worked out examples.
2. Let learners discuss Example 4.8.
3. Assign learners Practice Activity 4 – 8 questions in A and B as classwork. Go round assessing learners' progress.
4. Let learners state important points they have learnt.
5. Assign learners Practice Activity 4.8 questions in C for more practice as homework.

Assessment of skills, knowledge and understanding

Observe learners while they find 3 equivalent fractions.

Guidance to the teacher

To get three equivalent fractions multiply the given fraction with three different whole numbers.

For example: $\frac{2}{3} \times \frac{2}{2} = \frac{4}{6}$ $\frac{2}{3} \times \frac{4}{4} = \frac{8}{12}$ $\frac{2}{3} \times \frac{3}{3} = \frac{6}{9}$

This equivalent fraction of $\frac{2}{3} = \frac{4}{6} = \frac{6}{9} = \frac{8}{12}$

Expected answers to Practice Activity 4.8

A. 1. $\frac{1}{5} \times \frac{2}{2} = \frac{2}{10}, \frac{1}{5} \times \frac{3}{3} = \frac{3}{15}, \frac{1}{5} \times \frac{4}{4} = \frac{4}{20}$

2. $\frac{8}{15} \times \frac{2}{2} = \frac{16}{30}, \frac{8}{15} \times \frac{3}{3} = \frac{24}{45}, \frac{8}{15} \times \frac{4}{4} = \frac{32}{60}$

3. $\frac{5}{9} \times \frac{2}{2} = \frac{10}{18}, \frac{5}{9} \times \frac{3}{3} = \frac{15}{27}, \frac{5}{9} \times \frac{4}{4} = \frac{20}{36}$

4. $\frac{5}{12} \times \frac{2}{2} = \frac{10}{24}, \frac{5}{12} \times \frac{3}{3} = \frac{15}{36}, \frac{5}{12} \times \frac{4}{4} = \frac{20}{48}$

5. $\dfrac{5}{6} \times \dfrac{2}{2} = \dfrac{10}{12}, \dfrac{5}{6} \times \dfrac{3}{3} = \dfrac{15}{18}, \dfrac{5}{6} \times \dfrac{4}{4} = \dfrac{20}{24}$

B. 1. $\dfrac{3}{8} \times \dfrac{2}{2} = \dfrac{6}{16}, \dfrac{3}{8} \times \dfrac{3}{3} = \dfrac{9}{24}, \dfrac{3}{8} \times \dfrac{4}{4} = \dfrac{12}{32}$

2. $\dfrac{4}{5} \times \dfrac{2}{2} = \dfrac{8}{10}, \dfrac{4}{5} \times \dfrac{3}{3} = \dfrac{12}{15}, \dfrac{4}{5} \times \dfrac{4}{4} = \dfrac{16}{20}$

3. $\dfrac{3}{4} \times \dfrac{2}{2} = \dfrac{6}{8}, \dfrac{3}{4} \times \dfrac{3}{3} = \dfrac{9}{12}, \dfrac{3}{4} \times \dfrac{4}{4} = \dfrac{12}{16}$

C. 1. $\dfrac{7}{16} \times \dfrac{2}{2} = \dfrac{14}{32}, \dfrac{7}{16} \times \dfrac{3}{3} = \dfrac{21}{48}, \dfrac{7}{16} \times \dfrac{4}{4} = \dfrac{28}{64}$

2. $\dfrac{1}{2} \times \dfrac{2}{2} = \dfrac{2}{4}, \dfrac{1}{2} \times \dfrac{3}{3} = \dfrac{3}{6}, \dfrac{1}{2} \times \dfrac{4}{4} = \dfrac{4}{8}$

3. $\dfrac{5}{8} \times \dfrac{2}{2} = \dfrac{10}{16}, \dfrac{5}{8} \times \dfrac{3}{3} = \dfrac{15}{24}, \dfrac{5}{8} \times \dfrac{4}{4} = \dfrac{20}{32}$

4. $\dfrac{7}{8} \times \dfrac{2}{2} = \dfrac{14}{16}, \dfrac{7}{8} \times \dfrac{3}{3} = \dfrac{21}{24}, \dfrac{7}{8} \times \dfrac{4}{4} = \dfrac{28}{32}$

Calculation of equivalent fractions

Number of periods: 1

Reference: Pupil's Book page 59

Knowledge and understanding

- Explain how to find equivalent fractions.
- Give examples of equivalent fractions.

Skills

Apply the knowledge of equivalent fractions in daily life situations.

Teaching/Learning materials

Chart with worked out examples.

Teaching/Learning methods

- Group work activities – learners discuss in groups learning activities.
- Demonstration – finding equivalent fractions using Example 4.9.
- Supervised practice – learners find equivalent fractions. Teacher checks and gives feedback.

Lesson preparation

- Lesson takes place in class. Organise learners in small groups of mixed ability and gender.
- Prepare chart showing solutions to problems in Activity 4.9.

Teaching steps

1. Ask learners to work out Activity 4.9. Display chart with worked out problems in Activity 4.9.
2. Ask learners to discuss Example 4.9.
3. Assign learners Practice Activity 4.9 questions 1 – 2 as classwork. Go round assessing learners' progress.
4. Ask learners to give important points they have learnt.
5. Assign learners Practice Activity 4.9 number 3 for more practice as homework.

Assessment of skills, knowledge and understanding

Observe learners finding equivalent fractions with denominator 30, 48 and 60.

Guidance to the teacher

Emphasise that finding equivalent fractions with a particular denominator e.g. 48, divide 48 by the fraction denominator. Then multiply the numerator and denominator by the answer to get the equivalent fraction.

For example finding the equivalent fraction for $\frac{1}{6}$ with the denominator 30.

Step 1: Divide 30 by 6. That is $30 \div 6 = 5$

Step 2: Multiply as below:

$\frac{1}{6} \times \frac{5}{5} = \frac{5}{30}$. Therefore, $\frac{1}{6} = \frac{5}{30}$

Expected answer to Practice Activity 4.9

1. (a) $\frac{1}{3} = \frac{1}{3} \times \frac{10}{10} = \frac{10}{30}$ (b) $\frac{1}{5} = \frac{1}{5} \times \frac{6}{6} = \frac{6}{30}$

    (c) $\frac{1}{10} = \frac{1}{10} \times \frac{3}{3} = \frac{3}{30}$ (d) $\frac{1}{15} = \frac{1}{15} \times \frac{2}{2} = \frac{2}{30}$

2. (a) $\frac{1}{2} = \frac{1}{2} \times \frac{24}{24} = \frac{24}{48}$ (b) $\frac{1}{3} = \frac{1}{3} \times \frac{16}{16} = \frac{16}{48}$

    (c) $\frac{1}{4} = \frac{1}{4} \times \frac{12}{12} = \frac{12}{48}$ (d) $\frac{2}{96} = \frac{2 \div 2}{96 \div 2} = \frac{1}{48}$

    (e) $\frac{1}{8} = \frac{1}{8} \times \frac{6}{6} = \frac{6}{48}$

3. (a) $\frac{2}{3} = \frac{2 \times 20}{3 \times 20} = \frac{40}{60}$ (b) $\frac{3}{4} = \frac{3 \times 15}{4 \times 15} = \frac{45}{60}$

    (c) $\frac{4}{5} = \frac{4 \times 12}{5 \times 12} = \frac{48}{60}$ (d) $\frac{20}{600} = \frac{10 \div 20}{600 \div 10} = \frac{2}{60}$

    (e) $\frac{10}{120} = \frac{10 \div 2}{120 \div 2} = \frac{5}{60}$ (f) $\frac{7}{15} = \frac{7 \times 4}{15 \times 4} = \frac{28}{60}$

4.4 Addition of fractions with different denominators using equivalent fractions

Number of periods: 2

Reference: Pupil's Book page 60

Knowledge and understanding

Explain how to add fractions with different denominators using equivalent fractions.

Skills

Describe the method for addition of fractions.

Teaching/Learning materials

Flash cards

Teaching/Learning methods

- Group work activities – learners discuss learning activities in groups.
- Demonstration – addition of fractions using equivalent fraction using Example 4.10.
- Supervised practice – learners work out addition of fractions. Teacher checks and give feedback.

Lesson preparation

- Lesson takes place in class. Organise learners in groups of five of mixed ability and gender.
- Prepare flash cards.

Teaching/Learning steps

1. Ask learners to work out Activity 4.10.
2. Let learners discuss Example 4.10.
3. Assign learners Practice Activity 4.10 questions 1 – 5 to solve as classwork. Go round assessing their progress.
4. Ask learners to state important points they have learnt.
5. Assign learners Practice Activity 4.10 questions 6 – 10 for more practice as homework.

Assessment of skills, Knowledge and understanding

Observe learners adding fractions using equivalent fractions.

Guidance to the teacher

Emphasise that addition of fractions with different denominators requires one fraction to be changed into an equivalent fraction before addition is done.

Expected answers to Practice Activity 4.10

1. $\dfrac{1}{10} + \dfrac{3}{5} = \dfrac{1}{10} + \dfrac{6}{10} = \dfrac{1+6}{10} = \dfrac{7}{10}$ 2. $\dfrac{3}{8} + \dfrac{1}{2} = \dfrac{3}{8} + \dfrac{4}{8} = \dfrac{3+4}{8} = \dfrac{7}{8}$

3. $\dfrac{2}{3} + \dfrac{1}{9} = \dfrac{6}{9} + \dfrac{1}{9} = \dfrac{6+1}{9} = \dfrac{7}{9}$ 4. $\dfrac{1}{5} + \dfrac{3}{10} = \dfrac{2}{10} + \dfrac{3}{10} = \dfrac{2+3}{10} = \dfrac{5}{10}$

5. $\dfrac{3}{7} + \dfrac{1}{14} = \dfrac{6}{14} + \dfrac{1}{14} = \dfrac{6+1}{14} = \dfrac{7}{14}$ 6. $\dfrac{1}{2} + \dfrac{2}{8} = \dfrac{4}{8} + \dfrac{2}{8} = \dfrac{4+2}{8} = \dfrac{6}{8}$

7. $\dfrac{3}{4} + \dfrac{1}{8} = \dfrac{6}{8} + \dfrac{1}{8} = \dfrac{6+1}{8} = \dfrac{7}{8}$ 8. $\dfrac{1}{3} + \dfrac{1}{6} = \dfrac{2}{6} + \dfrac{1}{6} = \dfrac{2+1}{6} = \dfrac{3}{6}$

9. $\dfrac{2}{3} + \dfrac{3}{9} = \dfrac{6}{9} + \dfrac{3}{9} = \dfrac{6+3}{9} = \dfrac{9}{9} = 1$ 10. $\dfrac{3}{10} + \dfrac{1}{5} = \dfrac{3}{10} + \dfrac{2}{10} = \dfrac{3+2}{10} = \dfrac{5}{10}$

Addition of fractions with different denominators using equivalent fractions

Number of periods: 1

Reference: Pupil's Book page 61

Knowledge and understanding

Explain how to add fractions with different denominators using equivalent fractions.

Skills

Describe the method of addition.

Teaching/Learning materials

Flash cards

Teaching/Learning methods

- Group work activities – learners work in groups on learning activities.
- Demonstration – addition of fractions using equivalent fractions using Example 4.11.
- Supervised – learners work out addition of fractions using equivalent fractions. Teacher checks and gives feedback.

Lesson preparation

- Lesson takes place in class. Organise learners in groups of five with mixed abilities and gender.
- Prepare flash cards.

Teaching/Learning steps

1. Ask learners to work out Activity 4.11.

2. Let learners discuss Example 4.11

3. Assign learners Practice Activity 4.11 questions 1 – 6 as classwork. Go round assessing their progress.

4. Ask learners to state important points they have learnt.

5. Assign learners Practice Activity 4.11 questions 7 – 12 for more practice and homework.

Assessment of skills, knowledge and understanding

Observe learners adding fractions using equivalent fractions.

Guidance to the teacher

Emphasise that learners find the equivalent fraction of a fraction with the same denominator before adding.

Expected answers for Practice Activity 4.11

1. Equivalent fraction of $\frac{1}{2}$ with 4 as denominator is $\frac{1 \times 2}{2 \times 2} = \frac{2}{4}$.
   Thus, $\frac{1}{2} + \frac{1}{4} = \frac{2}{4} + \frac{1}{4} = \frac{3}{4}$

2. $\frac{1 \times 2}{4 \times 2} = \frac{2}{8}, \frac{1}{4} + \frac{1}{8} = \frac{2}{8} + \frac{1}{8} = \frac{3}{8}$ 3. $\frac{1}{4} = \frac{1}{4} \times \frac{3}{3} = \frac{3}{12}, \frac{1}{4} + \frac{1}{12} = \frac{3}{12} + \frac{1}{12} = \frac{4}{12}$

4. $\frac{1}{2} = \frac{1}{2} \times \frac{4}{4} = \frac{4}{8}, \frac{1}{2} + \frac{1}{8} = \frac{4}{8} + \frac{1}{8} = \frac{5}{8}$ 5. $\frac{1}{5} = \frac{1}{5} \times \frac{2}{2} = \frac{2}{10}, \frac{1}{5} + \frac{1}{10} = \frac{2}{10} + \frac{1}{10} = \frac{3}{10}$

6. $\frac{1}{3} = \frac{1}{3} \times \frac{3}{3} = \frac{3}{9}, \frac{1}{3} + \frac{1}{9} = \frac{3}{9} + \frac{1}{9} = \frac{4}{9}$ 7. $\frac{1}{2} = \frac{1}{2} \times \frac{5}{5} = \frac{5}{10}, \frac{1}{2} + \frac{1}{10} = \frac{5}{10} + \frac{1}{10} = \frac{6}{10}$

8. $\frac{1}{2} = \frac{1}{2} \times \frac{6}{6} = \frac{6}{12}, \frac{1}{2} + \frac{1}{12} = \frac{6}{12} + \frac{1}{12} = \frac{7}{12}$

9. $\frac{1}{7} = \frac{1}{7} \times \frac{2}{2} = \frac{2}{14}, \frac{1}{7} + \frac{1}{14} = \frac{2}{14} + \frac{1}{14} = \frac{3}{14}$ 10. $\frac{1}{3} = \frac{1}{3} \times \frac{2}{2} = \frac{2}{6}, \frac{1}{6} + \frac{1}{3} = \frac{1}{6} + \frac{2}{6} = \frac{3}{6}$

11. $\frac{1}{6} = \frac{1}{6} \times \frac{2}{2} = \frac{2}{12}, \frac{1}{12} + \frac{1}{6} = \frac{1}{12} + \frac{2}{12} = \frac{3}{12}$ 12. $\frac{1}{6} = \frac{1}{6} \times \frac{3}{3} = \frac{3}{18}, \frac{1}{6} + \frac{1}{18} = \frac{3}{18} + \frac{1}{18} = \frac{4}{18}$

Addition of fractions with different denominators using equivalent fractions

Number of periods: 1

Reference: Pupil's Book page 62

Knowledge and understanding

Explain how to add fractions with different denominators using equivalent fractions.

Skills

Describe the method of addition of fractions.

Teaching/Learning materials

Flash cards

Teaching/Learning methods

- Group work activities – group discussion on learning activities.
- Demonstration – demonstration of worked out activities.
- Supervised practice – learners solve problems, teacher checks and provides feedback.

Lesson preparation

- Lesson takes place in class. Organise learner's in groups of five with mixed abilities and gender.
- Prepare flash cards.

Teaching/Learning steps

1. Ask learners to work out Activity 4.12.
2. Let learners discuss Example 4.12.
3. Ask learners Practice Activity 4.12 questions 1 – 6 as classwork. Go round assessing progress.
4. Ask learners to give important points they have learnt.
5. Assign learners to do Practice Activity 4.12 questions 7 – 12 as more practice and homework.

Assessment of skills knowledge and understanding

Observe learners as they carry out addition.

Guidance to the teacher

Emphasise that learners calculate the equivalent fractions of before carrying out addition.

Expected answers to Practice Activity 4.12

1. $\frac{2}{5} = \frac{2}{5} \times \frac{2}{2} = \frac{4}{10}$. Thus, $\frac{2}{5} + \frac{3}{10} = \frac{4}{10} + \frac{3}{10} = \frac{7}{10}$

2. $\frac{3}{4} = \frac{3}{4} \times \frac{3}{3} = \frac{9}{12}$. Thus, $\frac{1}{12} + \frac{3}{4} = \frac{1}{12} + \frac{9}{12} = \frac{10}{12}$

3. $\frac{2}{5} = \frac{2}{5} \times \frac{2}{2} = \frac{4}{10}$. Thus, $\frac{2}{5} + \frac{3}{10} = \frac{4}{10} + \frac{3}{10} = \frac{7}{8}$

4. $\frac{2}{3} = \frac{2}{3} \times \frac{3}{3} = \frac{6}{9}$. Thus, $\frac{2}{3} + \frac{1}{9} = \frac{6}{9} + \frac{1}{9} = \frac{7}{9}$

5. $\frac{1}{4} = \frac{1}{4} \times \frac{2}{2} = \frac{2}{8}$. Thus, $\frac{1}{4} + \frac{3}{8} = \frac{2}{8} + \frac{3}{8} = \frac{5}{8}$

6. $\frac{3}{7} = \frac{3}{7} \times \frac{2}{2} = \frac{6}{14}$. Thus, $\frac{3}{7} + \frac{1}{14} = \frac{6}{14} + \frac{1}{14} = \frac{7}{14}$

7. $\frac{1}{2} = \frac{1}{2} \times \frac{6}{6} = \frac{6}{12}$. Thus, $\frac{1}{2} + \frac{5}{12} = \frac{6}{12} + \frac{5}{12} = \frac{11}{12}$

8. $\frac{2}{3} = \frac{2}{3} \times \frac{2}{2} = \frac{4}{6}$. Thus, $\frac{2}{3} + \frac{1}{6} = \frac{4}{6} + \frac{1}{6} = \frac{5}{6}$

9. $\frac{3}{5} = \frac{3}{5} \times \frac{2}{2} = \frac{6}{10}$. Thus, $\frac{3}{5} + \frac{1}{10} = \frac{6}{10} + \frac{1}{10} = \frac{7}{10}$

10. $\frac{2}{3} = \frac{2}{3} \times \frac{3}{3} = \frac{6}{9}$. Thus, $\frac{2}{9} + \frac{2}{3} = \frac{2}{9} + \frac{6}{9} = \frac{8}{9}$

11. $\frac{2}{7} = \frac{2}{7} \times \frac{2}{2} = \frac{4}{14}$. Thus, $\frac{2}{7} + \frac{3}{14} = \frac{4}{14} + \frac{3}{14} = \frac{7}{14}$

12. $\frac{3}{6} = \frac{3}{6} \times \frac{2}{2} = \frac{6}{12}$. Thus, $\frac{5}{12} + \frac{3}{6} = \frac{5}{12} + \frac{6}{12} = \frac{11}{12}$

Addition of fractions with different denominators using equivalent fractions

Number of periods: 1

Reference: Pupil's Book page 63

Knowledge and understanding

Explain how to add fractions with different denominators using equivalent fractions.

Skills

Describe the method of addition of fractions.

Teaching/Learning materials

Flash cards

Teaching/Learning methods

• Group work activities – discuss learning activities in groups.
• Demonstration – add fractions using equivalent fractions Example 4.13.
• Class discussion – discuss steps to find equivalent fractions.

Lesson preparation

Lesson takes place in class. Organise learners in groups of five with different mixed abilities and gender. Prepare flash cards.

Teaching/Learning steps

1. Ask learners to carry out Activity 4.13 through group discussion.
2. Let learners discuss Example 4.13.
3. Assign learners Practice Activity 4.13 questions 1 – 6 as classwork. Go round checking progress.
4. Ask learners to state important points they have learnt.
5. Assign learners to do Practice Activity 4.12 questions 7 – 12 as more practice and homework.

Assessment of skills, knowledge and understanding

Observe learners as they carry out addition.

Guidance to the teacher

Emphasise that when adding fractions with different denominators. One must first identify the denominators, check if the denominators are multiples of each other. Then use the largest denominator as a common denominator. In case the denominators are not multiples of each other find a common multiple. Then add fractions with a common denominator.

Expected answers for Practice Activity 4.13

1. $\frac{1}{2}+\frac{3}{5}$ LCM of 2, 5 is $2\times5=10$
   Equivalent fractions

   $\frac{1}{2}=\frac{1}{2}\times\frac{5}{5}=\frac{5}{10},\ \frac{3}{5}=\frac{3}{5}\times\frac{2}{2}=\frac{6}{10}$

   Thus, $\frac{1}{2}+\frac{3}{5}=\frac{5}{10}+\frac{6}{10}=\frac{11}{10}=1\frac{1}{10}$

2. $\frac{6}{7}+\frac{2}{3}$
   LCM of 7, 3 is $7\times3=21$

   $\frac{6}{7}=\frac{6}{7}\times\frac{3}{3}=\frac{18}{21},\ \frac{2}{3}=\frac{2}{3}\times\frac{7}{7}=\frac{14}{21}$

   Thus, $\frac{6}{7}+\frac{2}{3}=\frac{18}{21}+\frac{14}{21}=\frac{32}{21}=1\frac{11}{21}$

3. $\frac{1}{3}+\frac{6}{7}$ LCM of 3, 7 is $3\times7=21$

   $\frac{1}{3}=\frac{1}{3}\times\frac{7}{7}=\frac{7}{21},\ \frac{6}{7}=\frac{6}{7}\times\frac{3}{3}=\frac{18}{21}$

   Thus, $\frac{1}{3}+\frac{6}{7}=\frac{7}{21}+\frac{18}{21}=\frac{25}{21}=1\frac{4}{21}$

4. $\frac{1}{2}+\frac{1}{3}$ LCM of 2, 3 is $2\times3=6$

   $\frac{1}{2}=\frac{1}{2}\times\frac{3}{3}=\frac{3}{6},\ \frac{1}{3}=\frac{1}{3}\times\frac{2}{2}=\frac{2}{6}$

   Thus, $\frac{1}{2}+\frac{1}{3}=\frac{3}{6}+\frac{2}{6}=\frac{5}{6}$

5. $\frac{1}{2}+\frac{1}{5}$ LCM of 2, 5 is $2\times5=10$

   $\frac{1}{2}=\frac{1}{2}\times\frac{5}{5}=\frac{5}{10},\ \frac{1}{5}=\frac{1}{5}\times\frac{2}{2}=\frac{2}{10}$

   Thus, $\frac{1}{2}+\frac{1}{5}=\frac{5}{10}+\frac{2}{10}=\frac{7}{10}$

6. $\frac{3}{4}+\frac{2}{5}$ LCM of 4, 5 is $4\times5=20$

   $\frac{3}{4}=\frac{3}{4}\times\frac{5}{5}=\frac{15}{20},\ \frac{2}{5}=\frac{2}{5}\times\frac{4}{4}=\frac{8}{20}$

   Thus, $\frac{3}{4}+\frac{2}{5}=\frac{15}{20}+\frac{8}{20}=\frac{23}{20}=1\frac{3}{20}$

7. $\frac{4}{5}+\frac{2}{6}$ LCM of 5, 6 is $5\times6=30$

   $\frac{4}{5}=\frac{4}{5}\times\frac{6}{6}=\frac{24}{30},\ \frac{2}{6}=\frac{2}{6}\times\frac{5}{5}=\frac{10}{30}$

   Thus, $\frac{4}{5}+\frac{2}{6}=\frac{24}{30}+\frac{10}{30}=\frac{34}{30}=1\frac{4}{30}$

8. $\frac{1}{3}+\frac{1}{4}$ LCM of 3, 4 is $3\times4=12$

   $\frac{1}{3}=\frac{1}{3}\times\frac{4}{4}=\frac{4}{12},\ \frac{1}{4}=\frac{1}{4}\times\frac{3}{3}=\frac{3}{12}$

   Thus, $\frac{1}{3}+\frac{1}{4}=\frac{4}{12}+\frac{3}{12}=\frac{7}{12}$

9. $\frac{2}{3}+\frac{3}{4}$ LCM of 3, 4 is $3\times4=12$

   $\frac{2}{3}=\frac{2}{3}\times\frac{4}{4}=\frac{8}{12},\ \frac{3}{4}=\frac{3}{4}\times\frac{3}{3}=\frac{9}{12}$

   Thus, $\frac{2}{3}+\frac{3}{4}=\frac{8}{12}+\frac{9}{12}=\frac{17}{12}=1\frac{5}{12}$

10. $\frac{3}{5}+\frac{2}{7}$ LCM of 5, 7 is $5\times7=35$

    $\frac{3}{5}=\frac{3}{5}\times\frac{7}{7}=\frac{21}{35},\ \frac{2}{7}=\frac{2}{7}\times\frac{5}{5}=\frac{10}{35}$

    Thus, $\frac{3}{5}+\frac{2}{7}=\frac{21}{35}+\frac{10}{35}=\frac{31}{35}$

11. $\frac{1}{7} + \frac{1}{6}$ LCM of 6, 7 is $6 \times 7 = 42$

$\frac{1}{7} = \frac{1}{7} \times \frac{6}{6} = \frac{6}{42}, \quad \frac{1}{6} = \frac{1}{6} \times \frac{7}{7} = \frac{7}{42}$

Thus, $\frac{1}{7} + \frac{1}{6} = \frac{6}{42} + \frac{7}{42} = \frac{13}{42}$

12. $\frac{3}{5} + \frac{1}{4}$ LCM of 5, 4 is $5 \times 4 = 20$

$\frac{3}{5} = \frac{3}{5} \times \frac{4}{4} = \frac{12}{20}, \quad \frac{1}{4} = \frac{1}{4} \times \frac{5}{5} = \frac{5}{20}$

Thus, $\frac{3}{5} + \frac{1}{4} = \frac{12}{20} + \frac{5}{20} = \frac{17}{20}$

4.5 Addition of fractions with different denominators using the LCM

Number of periods: 2

Reference: Pupil's Book page 64

Knowledge and understanding

Explain how to add fractions with different denominators using the Lowest Common Multiple (LCM). Describe the method of addition of fractions.

Teaching/Learning materials

Flash cards

Teaching/Learning methods

- Group work activities – in groups, learners discuss Activity 4.14.
- Demonstration – use Example 4.14 to demonstrate the concept.
- Discussion – discussing and solving questions in Practice Activity 4.14

Lesson preparation

Lesson takes place in class. Organise learners in groups of five with mixed gender and ability. Prepare flashcards.

Teaching/Learning steps

1. Ask learners to do the revision on finding the LCM.
2. Let learners work out Activity 4.14. Distribute the flash cards to groups.
3. Guide learners' discussion about Example 4.14.
4. Assign learners Practice Activity 4.14 questions 1 – 6 as classwork. Go round checking progress. Assist learners with difficulties by pairing them with other learners and giving more hints.
5. Ask learners to state important points they have learnt.
6. Assign learners to do Practice Activity 4.14 questions 7 – 12 as more practice and homework.

Assessment of skill, knowledge and understanding

Observe learners as they carry out addition using the Least Common Multiple.

Guidance to the teacher

Emphasise that when calculating the LCM of different denominators, first one divides the largest with the smallest denominator then multiplies by the numerator.

Expected answers for Practice Activity 4.14

1. $\frac{1}{8} + \frac{1}{2}$ LCM of 8 and 2 is 8

$$\frac{1}{2} = \frac{1}{2} \times \frac{4}{4} = \frac{4}{8}$$

Thus, $\frac{1}{8} + \frac{1}{2} = \frac{1}{8} + \frac{4}{8} = \frac{5}{8}$

2. $\frac{1}{6} + \frac{1}{12}$ LCM of 6, 12 is 12

$$\frac{1}{6} = \frac{1}{6} \times \frac{2}{2} = \frac{2}{12}$$

Thus, $\frac{1}{6} + \frac{1}{12} = \frac{2}{12} + \frac{1}{12} = \frac{3}{12}$

3. $\frac{1}{4} + \frac{1}{8}$ LCM of 4, 8 is 8

$$\frac{1}{4} = \frac{1}{4} \times \frac{2}{2} = \frac{2}{8}$$

Thus, $\frac{1}{4} + \frac{1}{8} = \frac{2}{8} + \frac{1}{8} = \frac{3}{8}$

4. $\frac{1}{4} + \frac{1}{12}$ LCM of 4, 12 is 12

$$\frac{1}{4} = \frac{1}{4} \times \frac{3}{3} = \frac{3}{12}$$

Thus, $\frac{1}{4} + \frac{1}{12} = \frac{3}{12} + \frac{1}{12} = \frac{4}{12}$

5. $\frac{1}{7} + \frac{1}{14}$ LCM of 7 and 14 is 14

$$\frac{1}{7} = \frac{1}{7} \times \frac{2}{2} = \frac{2}{14}$$

Thus, $\frac{1}{7} + \frac{1}{14} = \frac{2}{14} + \frac{1}{14} = \frac{3}{14}$

6. $\frac{1}{2} + \frac{1}{4}$ LCM of 2 and 4 is 4

$$\frac{1}{2} = \frac{1}{2} \times \frac{2}{2} = \frac{2}{4}$$

Thus, $\frac{1}{2} + \frac{1}{4} = \frac{2}{4} + \frac{1}{4} = \frac{3}{4}$

7. $\frac{1}{7} + \frac{1}{21}$ LCM of 7 and 21 is 21

$$\frac{1}{7} = \frac{1}{7} \times \frac{3}{3} = \frac{3}{21}$$

Thus, $\frac{1}{7} + \frac{1}{21} = \frac{3}{21} + \frac{1}{21} = \frac{4}{21}$

8. $\frac{1}{5} + \frac{1}{10}$ LCM of 5 and 10 is 10

$$\frac{1}{5} = \frac{1}{5} \times \frac{2}{2} = \frac{2}{10}$$

Thus, $\frac{1}{5} + \frac{1}{10} = \frac{2}{10} + \frac{1}{10} = \frac{3}{10}$

9. $\frac{1}{12} + \frac{1}{24}$ LCM of 12 and 24 is 24

$$\frac{1}{12} = \frac{1}{12} \times \frac{2}{2} = \frac{2}{24}$$

Thus, $\frac{1}{12} + \frac{1}{24} = \frac{2}{24} + \frac{1}{24} = \frac{3}{24}$

10. $\frac{1}{12} + \frac{1}{4}$ LCM of 12 and 4 is 12

$$\frac{1}{4} = \frac{1}{4} \times \frac{3}{3} = \frac{3}{12}$$

Thus, $\frac{1}{12} + \frac{1}{4} = \frac{1}{12} + \frac{3}{12} = \frac{4}{12}$

11. $\frac{1}{15} + \frac{1}{3}$ LCM of 15 and 3 is 15

$$\frac{1}{3} = \frac{1}{3} \times \frac{5}{5} = \frac{5}{15}$$

Thus, $\frac{1}{15} + \frac{1}{3} = \frac{1}{15} + \frac{5}{15} = \frac{6}{15}$

12. $\frac{1}{6} + \frac{1}{18}$ LCM of 6 and 18 is 18

$$\frac{1}{6} = \frac{1}{6} \times \frac{3}{3} = \frac{3}{18}$$

Thus, $\frac{1}{6} + \frac{1}{18} = \frac{3}{18} + \frac{1}{18} = \frac{4}{18}$

Addition of fractions with different denominators using the LCM

Number of periods: 1

Reference: Pupil's Book page 66

Knowledge and understanding

Explain how to add fractions with different denominators using the LCM.

Skills

Describe the use of the LCM in the addition of fractions and calculate and use the LCM in the addition of fractions.

Teaching/Learning materials

Flash cards

Teaching/Learning methods

- Group work activities – discuss learning activities in groups.
- Supervised activity – learners carry out addition, teacher checks and gives feedback.
- Discussion – class discusses steps to get the answers to Practice Activity.

Lesson preparation

- Lesson takes place in class. Organise learners in groups of five with mixed ability and gender.
- Prepare flash cards.

Teaching/Learning steps

1. Ask learners to work out Activity 4.15.
2. Let learners discuss Example 4.15.
3. Ask learners to do Practice Activity 4.15 questions 1 – 6 as classwork. Go round assessing progress.
4. Ask learners to state important points they have learnt.
5. Assign learners to do Practice Activity 4.15 questions 7 – 12 as more practice and homework.

Assessment of skills, knowledge and understanding

Observe learners as they carry out addition correctly.

Guidance to the teacher

Emphasise that when calculating the LCM divide the denominators by prime numbers until both are reduced to 1. Now multiply numbers you divided with to get the LCM.

Expected answers to Practice Activity 4.15

1. $\frac{1}{6} + \frac{2}{7}$ LCM of 6 and 7 is 42

   Thus, $\frac{1}{6} + \frac{2}{7} = \frac{1(42 \div 6) + 2(42 \div 7)}{42}$

   $= \frac{7 + 12}{42} = \frac{19}{42}$

2. $\frac{1}{3} + \frac{5}{12}$ LCM of 3 and 12 is 12

   Thus, $\frac{1}{3} + \frac{5}{12} = \frac{1(12 \div 3) + 3(30 \div 10)}{12}$

   $= \frac{4 + 5}{12} = \frac{9}{12}$

3. $\frac{2}{3} + \frac{3}{10}$ LCM of 3 and 10 is 30

   Thus, $\frac{2}{3} + \frac{3}{10} = \frac{2(30 \div 3) + 3(30 \div 10)}{30}$

   $= \frac{20 + 9}{30} = \frac{29}{30}$

4. $\frac{3}{5} + \frac{2}{7}$ LCM of 5 and 7 is 35

   Thus, $\frac{3}{5} + \frac{2}{7} = \frac{3(35 \div 5) + 2(35 \div 7)}{35}$

   $= \frac{21 + 10}{35} = \frac{31}{35}$

5. $\frac{1}{6} + \frac{2}{3}$ LCM of 6 and 3 is 6

   Thus, $\frac{1}{6} + \frac{2}{3} = \frac{1(6 \div 6) + 2(6 \div 3)}{6}$

   $= \frac{1 + 4}{6} = \frac{5}{6}$

6. $\frac{2}{5} + \frac{1}{2}$ LCM of 5 and 2 is 10

   Thus, $\frac{2}{5} + \frac{1}{2} = \frac{2(10 \div 5) + 1(10 \div 2)}{10}$

   $= \frac{4 + 5}{10} = \frac{9}{10}$

7. $\frac{4}{9} + \frac{3}{7}$ LCM of 9 and 7 is 63

   Thus, $\frac{4}{9} + \frac{3}{7} = \frac{4(63 \div 9) + 3(63 \div 7)}{63}$

   $= \frac{28 + 27}{63} = \frac{55}{63}$

8. $\frac{4}{12} + \frac{1}{9}$ LCM of 12 and 9 is 36

   Thus, $\frac{4}{12} + \frac{1}{9} = \frac{4(36 \div 12) + 1(36 \div 9)}{36}$

   $= \frac{12 + 4}{36} = \frac{16}{36}$

9. $\frac{2}{6} + \frac{2}{9}$ LCM of 6 and 9 is 18

   Thus, $\frac{2}{6} + \frac{2}{9} = \frac{2(18 \div 6) + 2(18 \div 9)}{18}$

   $= \frac{6 + 4}{18} = \frac{10}{18}$

10. $\frac{2}{8} + \frac{3}{6}$ LCM of 8 and 6 is 24

    Thus, $\frac{2}{8} + \frac{3}{6} = \frac{2(24 \div 8) + 3(24 \div 6)}{24}$

    $= \frac{6 + 12}{24} = \frac{18}{24}$

11. $\frac{3}{7} + \frac{1}{4}$ LCM of 7 and 7 is 28

    Thus, $\frac{3}{7} + \frac{1}{4} = \frac{3(28 \div 7) + 1(28 \div 4)}{88}$

    $= \frac{12 + 7}{28} = \frac{19}{28}$

12. $\frac{2}{7} + \frac{1}{6}$ LCM of 7 and 6 is 42

    Thus, $\frac{2}{7} + \frac{1}{6} = \frac{2(42 \div 7) + 1(42 \div)}{42}$

    $= \frac{12 + 7}{42} = \frac{19}{42}$

Addition of fractions with different denominators using the LCM

Number of periods: 1

Reference: Pupil's Book page 67

Knowledge and understanding

Explain how to add fractions with different denominators using the LCM.

Skills

Describe the use of the LCM in addition of fractions and calculate and use the LCM to add fractions.

Teaching/Learning materials

Flash cards

Lesson preparation

Lesson takes place in class. Organise learners in groups of five with mixed ability and gender. Prepare flash cards.

Teaching/Learning methods

- Group work activities – in groups, discuss learning activities.
- Demonstration – learners show how to carry out addition.
- Supervised activity – learners calculate, teacher checks progress.

Teaching/Learning steps

1. Ask learners to work out Activity 4.16 in groups.
2. Let learners discuss Example 4.16
3. Ask learners to complete Practice Activity 4.16 questions 1 – 6 as classwork. Go round assessing progress.
4. Ask learners to give important points they have learnt.
5. Assign learners Practice Activity 4.16 questions 7 – 12 as more practice and homework.

Assessment of knowledge, skills and understanding

Observe learners as they carry out addition.

Guidance to the teacher

Emphasise that when calculating the LCM one divides the denominators by prime numbers until both are reduced to 1. Then one multiplies the numbers they divided with to get the LCM. Refer to Example 4.16.

Expected answers to Practice Activity 4.16

1. $\frac{8}{12} + \frac{1}{4}$ LCM of 12 and 4 is 12

    Thus, $\frac{8}{12} + \frac{1}{4} = \frac{8(12 \div 12) + 1(12 \div 4)}{12}$

    $= \frac{8 + 3}{12} = \frac{11}{12}$

2. $\frac{4}{6} + \frac{8}{24}$ LCM of 6 and 24 is 24

    Thus, $\frac{4}{6} + \frac{8}{24} = \frac{4(24 \div 6) + 8(24 \div 24)}{24}$

    $= \frac{16 + 8}{24} = \frac{24}{24} = 1$

3. $\frac{4}{8} + \frac{3}{6}$ LCM of 8 and 6 is 24

    Thus, $\frac{4}{8} + \frac{3}{6} = \frac{4(24 \div 8) + 4(24 \div 6)}{24}$

    $= \frac{12 + 12}{24} = \frac{24}{24} = 1$

4. $\frac{5}{7} + \frac{6}{21}$ LCM of 7 and 21 is 21

    Thus, $\frac{5}{7} + \frac{6}{21} = \frac{5(21 \div 7) + 6(21 \div 21)}{21}$

    $= \frac{15 + 6}{21} = \frac{21}{21} = 1$

5. $\frac{12}{36} + \frac{5}{9}$ LCM of 36 and 9 is 36

    Thus, $\frac{12}{36} + \frac{5}{9} = \frac{12(36 \div 36) + 5(36 \div 9)}{36}$

    $= \frac{12 + 20}{36} = \frac{32}{36}$

6. $\frac{18}{30} + \frac{2}{5}$ LCM of 30 and 5 is 30

    Thus, $\frac{18}{30} + \frac{2}{5} = \frac{18(30 \div 30) + 2(30 \div 5)}{30}$

    $= \frac{18 + 12}{30} = \frac{30}{30} = 1$

7. $\frac{9}{15} + \frac{4}{10}$ LCM of 15 and 10 is 30

    Thus, $\frac{9}{15} + \frac{4}{10} = \frac{9(30 \div 15) + 4(30 \div 10)}{30}$

    $= \frac{18 + 12}{30} = \frac{30}{30} = 1$

8. $\frac{16}{28} + \frac{3}{7}$ LCM of 28 and 7 is 28

    Thus, $\frac{16}{28} + \frac{3}{7} = \frac{16(28 \div 28) + 3(28 \div 7)}{28}$

    $= \frac{16 + 12}{28} = \frac{28}{28} = 1$

9. $\frac{12}{18} + \frac{2}{6}$ LCM of 18 and 6 is 18

    Thus, $\frac{12}{18} + \frac{2}{6} = \frac{12(18 \div 18) + 2(18 \div 6)}{18}$

    $= \frac{12 + 6}{18} = \frac{18}{18} = 1$

10. $\frac{7}{8} + \frac{4}{32}$ LCM of 8 and 32 is 32

    Thus, $\frac{7}{8} + \frac{4}{32} = \frac{7(32 \div 8) + 5(32 \div 32)}{32}$

    $= \frac{28 + 4}{32} = \frac{32}{32} = 1$

11. $\frac{10}{12} + \frac{1}{6}$ LCM of 12 and 6 is 12

    Thus, $\frac{10}{12} + \frac{1}{6} = \frac{10(12 \div 12) + 1(12 \div 6)}{12}$

    $= \frac{10 + 2}{12} = \frac{12}{12} = 1$

12. $\frac{9}{24} + \frac{5}{8}$ LCM of 24 and 8 is 24

    Thus, $\frac{9}{24} + \frac{5}{8} = \frac{9(24 \div 24) + 5(24 \div 8)}{24}$

    $= \frac{9 + 15}{24} = \frac{24}{24} = 1$

4.6   Addition of more fractions with different denominators

Number of periods: 1

Reference: Pupil's Book page 68

Knowledge and understanding

Explain how to add fractions with different denominators using the LCM.

Skills

Describe the use of the LCM in addition of fractions and calculate and use the LCM to add fractions.

Teaching/Learning materials

Flash cards

Lesson preparation

Lesson takes place in class. Organise learners in groups of five with mixed ability and gender. Prepare flash cards.

Teaching/Learning methods

- Group work activities – group discussion on learning activities.
- Demonstration – demonstrate how to carry out addition in fractions using examples.
- Supervised activity – learners carry out addition while teacher checks progress.

Teaching/Learning steps

1. Ask learners to work out Activity 4.17 in groups.
2. Let learners discuss Example 4.17.
3. Assign learners Practice Activity 4.17 questions 1 – 5 as classwork. Go round checking progress.
4. Ask learners to state important points they have learnt.
5. Assign learners Practice Activity 4.18 questions 6 – 9 as more practice and homework.

Assessment of skills, knowledge and understanding

Observe learners carrying out addition of fractions.

Guidance to the teacher

Guide learners to calculate the LCM through prime factorisation.

Expected answers to Practice Activity 4.17

1. $\frac{4}{5}+\frac{4}{7}$ LCM of 5 and 7 is 35

   Add $\frac{4}{5}+\frac{4}{7}=\frac{28+20}{35}=\frac{48}{35}$

   $\frac{48}{35}=48\div 35=35\overline{\smash{)}48}^{1}$
   $\phantom{\frac{48}{35}=48\div 35=35}\underline{-35}$
   $\phantom{\frac{48}{35}=48\div 35=35}13$

   Therefore, $\frac{48}{35}=1\frac{13}{35}$

2. $\frac{7}{8}+\frac{3}{4}$ LCM of 8 and 4 is 8

   Add $\frac{7}{8}+\frac{3}{4}=\frac{7+6}{8}=\frac{13}{8}$

   $\frac{13}{8}=13\div 8=8\overline{\smash{)}13}^{1}$
   $\phantom{\frac{13}{8}=13\div 8=8}\underline{-8}$
   $\phantom{\frac{13}{8}=13\div 8=8}5$

   Therefore, $\frac{13}{8}=1\frac{5}{8}$

3. $\frac{4}{9}+\frac{9}{10}$ LCM of 9 and 10 is 90

   Add $\frac{4}{9}+\frac{9}{10}=\frac{40+81}{90}=\frac{121}{90}$

   $\frac{121}{90}=121\div 90=90\overline{\smash{)}121}^{1}$
   $\phantom{\frac{121}{90}=121\div 90=90}\underline{-90}$
   $\phantom{\frac{121}{90}=121\div 90=90}31$

   Therefore, $\frac{121}{90}=1\frac{31}{90}$

4. $\frac{5}{6}+\frac{3}{7}$ LCM of 6 and 7 is 42

   Add $\frac{5}{6}+\frac{3}{7}=\frac{35+18}{42}=\frac{53}{42}$

   $\frac{53}{42}=53\div 42=42\overline{\smash{)}53}^{1}$
   $\phantom{\frac{53}{42}=53\div 42=42}\underline{-42}$
   $\phantom{\frac{53}{42}=53\div 42=42}11$

   Therefore, $\frac{53}{42}=1\frac{11}{42}$

5. $\frac{4}{5}+\frac{2}{3}$ LCM of 5 and 3 is 15

   Add $\frac{4}{5}+\frac{2}{3}=\frac{12+10}{15}=\frac{22}{15}$

   $\frac{22}{15}=22\div 15=15\overline{\smash{)}22}^{1}$
   $\phantom{\frac{22}{15}=22\div 15=15}\underline{-15}$
   $\phantom{\frac{22}{15}=22\div 15=15}7$

   Therefore, $\frac{22}{15}=1\frac{7}{15}$

6. $\frac{2}{3}+\frac{1}{2}$ LCM of 3 and 2 is 6

   Add $\frac{2}{3}+\frac{1}{2}=\frac{4+3}{6}=\frac{7}{6}$

   $\frac{7}{6}=7\div 6=6\overline{\smash{)}7}^{1}$
   $\phantom{\frac{7}{6}=7\div 6=6}\underline{-6}$
   $\phantom{\frac{7}{6}=7\div 6=6}1$

   Therefore, $\frac{7}{6}=1\frac{1}{6}$

7. $\frac{5}{4}+\frac{4}{3}$ LCM of 4 and 3 is 12

   Add $\frac{5}{4}+\frac{4}{3}=\frac{15+16}{12}=\frac{31}{12}$

   $\frac{31}{12}=31\div 12=12\overline{\smash{)}31}^{2}$
   $\phantom{\frac{31}{12}=31\div 12=12}\underline{-24}$
   $\phantom{\frac{31}{12}=31\div 12=12}7$

   Therefore, $\frac{31}{12}=2\frac{7}{12}$

8. $\frac{8}{7}+\frac{9}{8}$ LCM of 7 and 8 is 56

   Add $\frac{8}{7}+\frac{9}{8}=\frac{64+63}{56}=\frac{127}{56}$

   $\frac{127}{56}=127\div 56=56\overline{\smash{)}127}^{2}$
   $\phantom{\frac{127}{56}=127\div 56=56}\underline{-112}$
   $\phantom{\frac{127}{56}=127\div 56=56}15$

   Therefore, $\frac{127}{56}=2\frac{15}{56}$

9. $\frac{3}{2} + \frac{4}{3}$ LCM of 2 and 3 is 6

Add $\frac{3}{2} + \frac{4}{3} = \frac{9+8}{6} = \frac{17}{6}$

$$\frac{17}{6} = 17 \div 6 = \quad 6\overline{\smash{\big)}17} \atop \begin{array}{r} 2 \\ \underline{-12} \\ 5 \end{array}$$

Therefore, $\frac{17}{6} = 2\frac{5}{6}$

4.7 Addition of mixed number with different denominators

Number of periods: 2

Reference: Pupil's Book page 70

Knowledge and understanding

Explain how to add fractions with different denominators using the LCM.

Skills

Describe the use of the LCM in addition of fractions and calculate and use the LCM in adding fractions.

Teaching/Learning materials

Flash cards

Lesson preparation

Lesson takes place in class. Organise learners in groups of five with mixed ability and gender. Prepare flash cards.

Teaching/Learning methods

- Group work activities – group discussion on learning activities.
- Demonstration – show how to add using Example 4.18.
- Supervised practice – learners solve problems, teacher checks progress.

Teaching/Learning steps

1. Ask learners to work out Activity 4.18 in groups.
2. Let learners discuss Example 4.18. Distribute flash cards in groups.
3. Assign learners Practice Activity 4.18 questions 1 – 5 as classwork. Check progress as they solve the questions.
4. Ask learners to give important points they have learnt.
5. Assign learners Practice Activity 4.18 questions 6 – 9 as more practice and homework.

Assessment of skills, knowledge and understanding

Observe learners carry out addition of fractions.

Guidance to the teacher

Emphasise that in adding mixed numbers whole numbers are added first. Then add the fractions using the LCM.

Guidance on Activity 4.18

Writing fractions as improper fractions.

$$2\frac{1}{5} = \frac{(2 \times 5)}{5} + \frac{1}{5} = \frac{10+1}{5} = \frac{11}{5}$$

$$3\frac{3}{8} = \frac{(3 \times 8)}{8} + \frac{3}{8} = \frac{24+3}{8} = \frac{27}{8}$$

$$3\frac{1}{6} = \frac{(3 \times 6)}{6} + \frac{1}{6} = \frac{18+1}{6} = \frac{19}{6}$$

$$4\frac{1}{9} = \frac{(4 \times 9)}{9} + \frac{1}{9} = \frac{36+1}{9} = \frac{37}{9}$$

Addition: (a) $2\frac{1}{5} + 3\frac{1}{4} = (2+3) + (\frac{1}{5} + \frac{1}{4})$ (b) $7 + \frac{27+8}{72} = 7\frac{35}{72}$

$$= 5 + \frac{4+5}{20} = 5\frac{9}{20}$$

Expected answers for Practice Activity 4.18

1. $3\frac{3}{8} + 1\frac{1}{4} = (3+1) + (\frac{3}{8} + \frac{1}{4})$

     $4 + \frac{3+2}{8} = 4\frac{5}{8}$

2. $4\frac{1}{5} + 3\frac{1}{2} = (4+3) + (\frac{1}{5} + \frac{1}{2})$

     $7 + \frac{2+5}{10} = 7\frac{7}{10}$

3. $2\frac{2}{9} + 1\frac{3}{4} = (2+1) + (\frac{2}{9} + \frac{3}{4})$

     $3 + \frac{8+27}{36} = 2\frac{35}{36}$

4. $1\frac{3}{5} + 2\frac{1}{2} = (1+2) + (\frac{3}{5} + \frac{1}{2})$

     $3\frac{6+5}{10} = 3 + \frac{11}{10}$ (but $\frac{11}{10} = 1\frac{1}{10}$)

            $= 3 + 1\frac{1}{10} = 4\frac{1}{10}$

5. $2\frac{1}{6} + 5\frac{1}{3} = (2+5) + (\frac{1}{6} + \frac{1}{3})$

     $7 + \frac{1+2}{6} = 7\frac{3}{6}$

6. $1\frac{3}{8} + 3\frac{3}{4} = (1+3) + (\frac{3}{8} + \frac{3}{4})$

     $4 + \frac{3+6}{8} = 4 + \frac{9}{8}$ (but $\frac{9}{8} = 1\frac{1}{8}$)

            $= 4 + 1\frac{1}{8} = 5\frac{1}{8}$

7. $3\frac{5}{7} + 4\frac{1}{3} = (3+4) + (\frac{5}{7} + \frac{1}{3})$

     $7 + \frac{15+7}{21} = 7 + \frac{22}{21}$ (but $\frac{22}{21} = 1\frac{1}{21}$)

            $= 7 + 1\frac{1}{21} = 8\frac{1}{21}$

8. $3\frac{9}{10} + 4\frac{4}{5} = (3+4) + (\frac{9}{10} + \frac{4}{5})$

     $7 + \frac{45+40}{50} = 7 + \frac{95}{50}$ (but $\frac{95}{50} = 1\frac{45}{50}$)

            $= 7 + 1\frac{45}{50} = 8\frac{45}{50} = 8\frac{9}{10}$

9. $4\frac{3}{7} + 3\frac{3}{4} = (4 + 2) + (\frac{3}{7} + \frac{3}{4})$

$6 + \frac{12 + 21}{28} = 6\frac{33}{28}$ (but $\frac{33}{28} = 1\frac{5}{28}$)

$= 6 + 1\frac{5}{28} = 7\frac{5}{28}$

4.8 Word problems for addition of fractions

Number of periods: 2

Reference: Pupil's Book page 71

Knowledge and understanding

Explain how to add fractions with different denominators using the LCM.

Skills

Describe the use of the LCM in addition of fractions and calculate and use the LCM in adding fractions.

Teaching/Learning materials

Flash cards

Lesson preparation

Lesson takes place in class. Organise learners in groups of five with mixed ability and gender. Prepare flash cards.

Teaching/Learning methods

- Group work activities – group discussion on learning activities.
- Demonstration – demonstrate how to add using Example 4.19.
- Supervised practice – learners solve problems, teacher checks progress.
- Class discussion – discuss steps to the answers in Example 4.20 and Practice Activity 4.19.

Teaching/Learning steps

1. Ask learners to discuss Activity 4.19 in groups of five.
2. Let learners discuss Example 4.19 and 4.20. Distribute flash cards to write fraction parts to add.
3. Assign learners Practice Activity 4.19 questions 1 – 3 as classwork. Go round checking progress and give feedback.
4. Ask learners to name important points they have learnt.
5. Assign learners Practice Activity 4.19 questions 4 and 5 for more practice homework. Learners can do this as individual work or group work.
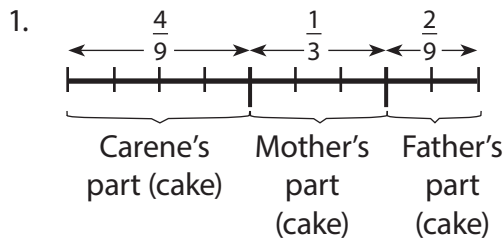
Assessment of skills, knowledge and understanding

Observe learners carry out addition of fractions.
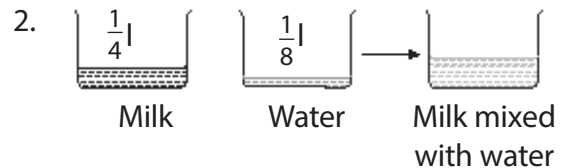
Guidance to the teacher

Emphasise to learners the importance of reading and understanding the question first. Then carry out the addition as required.

Expected answers to Practice Activity 4.19

1.

Carene's part (cake)   Mother's part (cake)   Father's part (cake)

$\frac{4}{9} + \frac{1}{3}$ LCM of 9 and 3 is 9.

Thus, $\frac{4}{9} + \frac{1}{3} = \frac{1 \times 4 + 3 \times 1}{9} = \frac{4 + 3}{9} = \frac{7}{9}$

2.

Milk   Water   Milk mixed with water

$\frac{1}{4} + \frac{1}{8}$ LCM of 4 and 8 is 8.

Thus, $\left(\frac{1}{4} + \frac{1}{8}\right)l = \left(\frac{2 \times 1 + 1 \times 1}{8}\right)l = \frac{2 + 1}{8} l$

$= \frac{3}{8} l$

3. $\frac{1}{3} + \frac{1}{2}$ LCM of 3 and 2 is 6

Thus, $\left(\frac{1}{3} + \frac{1}{2}\right)l = \frac{1 \times 2 + 1 \times 3}{6} l = \frac{3 + 2}{6} l$

$= \frac{5}{6} l$

4. $\frac{4}{7} + \frac{7}{10}$ LCM of 7 and 10 is 70

Thus, $\left(\frac{4}{7} + \frac{7}{10}\right)$ acres

$= \left(\frac{10 \times 4 + 7 \times 7}{70}\right)$ acres

$= \left(\frac{40 + 49}{70}\right)$ acres

$= 1\frac{19}{70}$ acres

5. $\frac{1}{3} + \frac{1}{4}$ LCM of 3 and 4 is 12

Thus, $\frac{1}{3} + \frac{1}{4} = \frac{1 \times 4 + 1 \times 3}{12} = \frac{4 + 3}{12}$

$= \frac{7}{12}$

4.9 Subtraction of fractions with different denominators using equivalent fractions

Number of periods: 1

Reference: Pupil's Book page 73

Knowledge and understanding

Explain how to subtract fractions with different denominators using equivalent fractions.

Teaching/Learning materials

Flash cards

Lesson preparation

Lesson takes place in class. Organise learners in groups of five with mixed ability and gender. Prepare flash cards.

Teaching/Learning methods

- Group work activities – discuss learning activities in groups.
- Demonstration – demonstrate how to subtract using Example 4.21.
- Supervised practice – learners solve problems, teacher checks progress.
- Discussion – discuss steps in addition of fractions

Teaching/Learning steps

1. Ask learners to work out Activity 4.20.
2. Let learners discuss Example 4.21. Distribute flash cards so that learners solve problems written.
3. Assign learners Practice Activity 4.20 questions A and B as classwork. Go round checking progress.
4. Ask learners to identify important points they have learnt.
5. Assign learners Practice Activity 4.20 questions in C for more practice and homework.

Assessment of skills knowledge and understanding

Observe learners carry out subtraction of fraction.

Guidance to the teacher

Emphasise that learners find the equivalent fraction of one fraction before carrying out the operation.

Expected answers for Practice Activity 4.20

A. 1. $\frac{1}{4} - \frac{1}{8} = \frac{2}{8} - \frac{1}{8} = \frac{2-1}{8} = \frac{1}{8}$ 2. $\frac{5}{8} - \frac{1}{4} = \frac{5}{8} - \frac{2}{8} = \frac{5-2}{8} = \frac{3}{8}$

3. $\frac{5}{6} - \frac{1}{3} = \frac{5}{6} - \frac{2}{6} = \frac{5-2}{6} = \frac{3}{6}$ 4. $\frac{3}{4} - \frac{1}{2} = \frac{3}{4} - \frac{2}{4} = \frac{3-2}{8} = \frac{1}{4}$

B. 1. $\frac{7}{8} - \frac{1}{2} = \frac{7}{8} - \frac{4}{8} = \frac{7-4}{8} = \frac{3}{8}$ 2. $\frac{4}{5} - \frac{1}{10} = \frac{8}{10} - \frac{1}{10} = \frac{8-1}{10} = \frac{7}{10}$

3. $\frac{5}{9} - \frac{1}{3} = \frac{5}{9} - \frac{3}{9} = \frac{5-3}{9} = \frac{2}{9}$ 4. $\frac{1}{3} - \frac{1}{6} = \frac{2}{6} - \frac{1}{6} = \frac{1}{6}$

C. 1. $\frac{7}{10} - \frac{1}{5} = \frac{7}{10} - \frac{2}{10} = \frac{5}{10}$ 2. $\frac{2}{3} - \frac{2}{9} = \frac{6}{9} - \frac{2}{9} = \frac{4}{9}$

3. $\dfrac{3}{10} - \dfrac{1}{5} = \dfrac{3}{10} - \dfrac{2}{10} = \dfrac{1}{10}$ 4. $\dfrac{4}{7} - \dfrac{2}{14} = \dfrac{8}{14} - \dfrac{2}{14} = \dfrac{6}{14}$

Subtraction of fractions with different denominators using equivalent fractions

Number of periods: 1

Reference: Pupil's Book page 74

Knowledge and understanding

Explain how to subtract fractions with different denominators using equivalent fractions.

Skills

Describe the method for subtraction of fractions.

Teaching/Learning materials

Flash cards

Lesson preparation

Lesson takes place in class. Organise learners in groups of five with mixed ability and gender. Prepare flash cards.

Teaching/Learning methods

- Group work activities – discuss learning activities in groups.
- Demonstration – demonstrate how to subtract using Example 4.22.
- Supervised practice – learners solve problems, teacher checks progress.

Teaching/Learning steps

1. Ask learners to work out Activity 4.21.
2. Let learners discuss Example 4.22. Distribute flashcards for learners to solve problems written.
3. Assign learners Practice Activity 4.21 questions in A and B as classwork. Go round assessing progress.
4. Ask learners to name important points they have learnt.
5. Assign learners Practice Activity 4.21 questions in C for more practice and homework.

Assessment of skills, knowledge and understanding

Observe learners carry out addition of fractions.

Guidance to the teacher

Emphasise that learners find the equivalent fraction of the number with the lesser denominator before doing the subtraction.

Expected answers for Practice Activity 4.21

A. 1. $\frac{1}{2} = \frac{1}{2} \times \frac{5}{5} = \frac{5}{10}$. Therefore, $\frac{1}{2} - \frac{1}{10} = \frac{5}{10} - \frac{1}{10} = \frac{4}{10}$

   2. $\frac{1}{2} = \frac{1}{2} \times \frac{4}{4} = \frac{4}{8}$. Therefore, $\frac{1}{2} - \frac{1}{8} = \frac{4}{8} - \frac{1}{8} = \frac{3}{8}$

   3. $\frac{1}{3} = \frac{1}{3} \times \frac{4}{4} = \frac{4}{12}$. Therefore, $\frac{1}{3} - \frac{1}{12} = \frac{4}{12} - \frac{1}{12} = \frac{3}{12}$

B. 1. $\frac{1}{3} = \frac{1}{3} \times \frac{2}{2} = \frac{2}{6}$. Therefore, $\frac{1}{3} - \frac{1}{6} = \frac{2}{6} - \frac{1}{6} = \frac{1}{6}$

   2. $\frac{1}{7} = \frac{1}{7} \times \frac{2}{2} = \frac{2}{14}$. Therefore, $\frac{1}{7} - \frac{1}{14} = \frac{2}{14} - \frac{1}{14} = \frac{1}{14}$

   3. $\frac{1}{9} = \frac{1}{9} \times \frac{2}{2} = \frac{2}{18}$. Therefore, $\frac{1}{9} - \frac{1}{18} = \frac{2}{18} - \frac{1}{18} = \frac{1}{18}$

   4. $\frac{1}{2} = \frac{1}{2} \times \frac{6}{6} = \frac{6}{12}$. Therefore, $\frac{1}{2} - \frac{1}{12} = \frac{6}{12} - \frac{1}{12} = \frac{5}{12}$

   5. $\frac{1}{6} = \frac{1}{6} \times \frac{3}{3} = \frac{3}{18}$. Therefore, $\frac{1}{6} - \frac{1}{18} = \frac{3}{18} - \frac{1}{18} = \frac{2}{18}$

C. 1. $\frac{1}{10} = \frac{1}{10} \times \frac{2}{2} = \frac{2}{20}$. Therefore, $\frac{1}{10} - \frac{1}{20} = \frac{2}{20} - \frac{1}{20} = \frac{1}{20}$

   2. $\frac{1}{4} = \frac{1}{4} \times \frac{3}{3} = \frac{3}{12}$. Therefore, $\frac{1}{4} - \frac{1}{12} = \frac{3}{12} - \frac{1}{12} = \frac{2}{12}$

   3. $\frac{1}{4} = \frac{1}{4} \times \frac{4}{4} = \frac{4}{16}$. Therefore, $\frac{1}{4} - \frac{1}{16} = \frac{4}{16} - \frac{1}{16} = \frac{3}{16}$

   4. $\frac{1}{5} = \frac{1}{5} \times \frac{3}{3} = \frac{3}{15}$. Therefore, $\frac{1}{5} - \frac{1}{15} = \frac{3}{15} - \frac{1}{15} = \frac{2}{15}$

Subtraction of fractions with different denominators using equivalent fractions

Number of periods: 1

Reference: Pupil's Book page 75

Knowledge and understanding

Explain how to subtract fractions with different denominators using equivalent fractions.

Skills

Describe the method for subtraction of fractions.

Teaching/Learning materials

Flash cards

Lesson preparation

Lesson takes place in class. Organise learners in groups of five with mixed abilities and gender. Prepare flashcards.

Teaching/Learning methods

- Group work activities – working in small groups, discuss Activity 4.22.
- Demonstration – demonstrate subtraction using Example 4.23.
- Supervised practice – learners solve problems, teacher checks progress.
- Discussion – discuss steps to find answers.

Teaching/Learning steps

1. Ask learners to work out Activity 4.22.
2. Let learners discuss Example 4.23. Distribute flash cards for learners to solve written problems.
3. Assign learners Practice Activity 4.22 questions 1 – 6 as classwork. Go round assessing progress.
4. Ask learners to state important points they have learnt.
5. Assign learners Practice Activity 4.22 questions 7 – 12 for more practice and homework.

Assessment of skills, knowledge and understanding

Observe learners carry out subtraction of fractions.

Guidance to the teacher

Emphasise that learners find the common multiple of the denominators. Then rewrite the fractions with the denominator. Then carry out the subtraction.

Expected answers for Practice Activity 4.22

1. $\dfrac{9}{10} - \dfrac{3}{6}$

   LCM of 10 and 6 is 30.

   $\dfrac{9}{10} = \dfrac{9}{10} \times \dfrac{3}{3} = \dfrac{27}{30}$

   $\dfrac{3}{6} = \dfrac{3}{6} \times \dfrac{5}{5} = \dfrac{15}{30}$

   Thus, $\dfrac{9}{10} - \dfrac{3}{6} = \dfrac{27}{30} - \dfrac{15}{30} = \dfrac{27-15}{30} = \dfrac{12}{30}$

2. $\dfrac{5}{6} - \dfrac{7}{9}$

   LCM of 6 and 9 is 36.

   $\dfrac{5}{6} = \dfrac{5}{6} \times \dfrac{6}{6} = \dfrac{30}{36}$

   $\dfrac{7}{9} = \dfrac{7}{9} \times \dfrac{4}{4} = \dfrac{28}{36}$

   Thus, $\dfrac{5}{6} - \dfrac{7}{9} = \dfrac{30}{36} - \dfrac{28}{36} = \dfrac{30-28}{36} = \dfrac{2}{36}$

3. $\dfrac{7}{8} - \dfrac{1}{3}$

LCM of 8 and 3 is 24.

$\dfrac{7}{8} = \dfrac{7}{8} \times \dfrac{3}{3} = \dfrac{21}{24}$

$\dfrac{1}{3} = \dfrac{1}{3} \times \dfrac{8}{8} = \dfrac{8}{24}$

Thus, $\dfrac{7}{8} - \dfrac{1}{3} = \dfrac{21}{24} - \dfrac{8}{24} = \dfrac{21-8}{24} = \dfrac{13}{24}$

4. $\dfrac{8}{9} - \dfrac{1}{5}$

LCM of 9 and 5 is 45.

$\dfrac{8}{9} = \dfrac{8}{9} \times \dfrac{5}{5} = \dfrac{40}{45}$

$\dfrac{1}{5} = \dfrac{1}{5} \times \dfrac{9}{9} = \dfrac{9}{45}$

Thus, $\dfrac{8}{9} - \dfrac{1}{5} = \dfrac{40}{45} - \dfrac{9}{45} = \dfrac{40-9}{45} = \dfrac{31}{45}$

5. $\dfrac{2}{3} - \dfrac{2}{4}$

LCM of 3 and 4 is 12.

$\dfrac{2}{3} = \dfrac{2}{3} \times \dfrac{4}{4} = \dfrac{8}{12}$

$\dfrac{2}{4} = \dfrac{2}{3} \times \dfrac{3}{3} = \dfrac{6}{12}$

Thus, $\dfrac{2}{3} - \dfrac{2}{4} = \dfrac{8}{12} - \dfrac{6}{12} = \dfrac{8-6}{12} = \dfrac{2}{12}$

6. $\dfrac{6}{7} - \dfrac{2}{5}$

LCM of 7 and 5 is 35.

$\dfrac{6}{7} = \dfrac{6}{7} \times \dfrac{5}{5} = \dfrac{30}{35}$

$\dfrac{2}{5} = \dfrac{2}{5} \times \dfrac{7}{7} = \dfrac{14}{35}$

Thus, $\dfrac{6}{7} - \dfrac{2}{5} = \dfrac{30}{35} - \dfrac{14}{35} = \dfrac{30-14}{35} = \dfrac{16}{35}$

7. $\dfrac{7}{8} - \dfrac{2}{3}$

LCM of 8 and 3 is 24.

$\dfrac{7}{8} = \dfrac{7}{8} \times \dfrac{3}{3} = \dfrac{21}{24}$

$\dfrac{2}{3} = \dfrac{2}{3} \times \dfrac{8}{8} = \dfrac{16}{24}$

Thus, $\dfrac{7}{8} - \dfrac{2}{3} = \dfrac{21}{24} - \dfrac{16}{24} = \dfrac{21-16}{24} = \dfrac{5}{24}$

8. $\dfrac{2}{3} - \dfrac{4}{7}$

LCM of 3 and 7 is 21.

$\dfrac{2}{3} = \dfrac{2}{3} \times \dfrac{7}{7} = \dfrac{14}{21}$

$\dfrac{4}{7} = \dfrac{4}{7} \times \dfrac{3}{3} = \dfrac{12}{21}$

Thus, $\dfrac{2}{3} - \dfrac{4}{7} = \dfrac{14}{21} - \dfrac{12}{21} = \dfrac{14-12}{21} = \dfrac{2}{21}$

9. $\dfrac{2}{3} - \dfrac{3}{5}$

LCM of 3 and 5 is 15.

$\dfrac{2}{3} = \dfrac{2}{3} \times \dfrac{5}{5} = \dfrac{10}{15}$

$\dfrac{3}{5} = \dfrac{3}{5} \times \dfrac{3}{3} = \dfrac{9}{15}$

Thus, $\dfrac{2}{3} - \dfrac{3}{5} = \dfrac{10}{15} - \dfrac{9}{15} = \dfrac{10-9}{15} = \dfrac{1}{15}$

10. $\dfrac{7}{9} - \dfrac{1}{4}$

LCM of 9 and 4 is 36.

$\dfrac{7}{9} = \dfrac{7}{9} \times \dfrac{4}{4} = \dfrac{28}{36}$

$\dfrac{1}{4} = \dfrac{1}{4} \times \dfrac{9}{9} = \dfrac{9}{36}$

Thus, $\dfrac{7}{9} - \dfrac{1}{4} = \dfrac{28}{36} - \dfrac{9}{36} = \dfrac{28-9}{36} = \dfrac{19}{36}$

11. $\frac{5}{7} - \frac{2}{5}$

LCM of 7 and 5 is 35.

$\frac{5}{7} = \frac{5}{7} \times \frac{5}{5} = \frac{25}{35}$

$\frac{2}{5} = \frac{2}{5} \times \frac{7}{7} = \frac{14}{35}$

Thus, $\frac{5}{7} - \frac{2}{5} = \frac{25}{35} - \frac{14}{35} = \frac{25 - 14}{35} = \frac{11}{35}$

12. $\frac{3}{10} - \frac{2}{9}$

LCM of 10 and 9 is 90.

$\frac{3}{10} = \frac{3}{10} \times \frac{9}{9} = \frac{27}{90}$

$\frac{2}{9} = \frac{2}{9} \times \frac{10}{10} = \frac{20}{90}$

Thus, $\frac{3}{10} - \frac{2}{9} = \frac{27}{90} - \frac{20}{90} = \frac{27 - 20}{90} = \frac{7}{90}$

4.10 Subtraction of fractions with different denominators using the LCM

Number of periods: 1

Reference: Pupil's Book page 76

Knowledge and understanding

Explain how to subtract fractions with different denominators using the Lowest Common Multiple.

Skills

Describe the method of subtraction of fractions.

Teaching/Learning materials

Flash cards

Lesson preparation

Lesson takes place in class. Organise learners in groups of five with mixed gender and ability. Prepare flash cards.

Teaching/Learning methods

- Group work activities – in small groups, discuss steps to subtract fractions.
- Demonstration – demonstrate subtraction using Example 4.24.
- Supervised practice – learners solve problems, teacher checks progress.
- Class discussion – discuss steps to follow in subtraction using the LCM.

Teaching/Learning steps

1. Ask learners to work out Activity 4.23.
2. Let learners discuss Example 4.24. Distribute flash cards for learners to solve written problems.
3. Assign learners Practice Activity 4.23 questions in A as classwork. Go round assessing progress. Have learners discuss questions that are difficult.
4. Ask learners to identify important points they have learnt.
5. Assign learners Practice Activity 4.23 questions in B for more practice and homework.

Assessment of skills, knowledge and understanding

Observe learners carry out subtraction of fractions.

Guidance to the teacher

Emphasise that learners find the Least Common Multiple by calculation. Rewrite the fractions with the same denominator using LCM. Then carry out subtraction.

Expected answers for Practice Activity 4.23

A. 1. $\dfrac{1}{3} - \dfrac{1}{7} = \dfrac{(21 \div 3) \times 1 - (21 \div 7) \times 1}{21}$

$= \dfrac{7 - 3}{21} = \dfrac{4}{21}$

2. $\dfrac{1}{3} - \dfrac{1}{9} = \dfrac{(27 \div 3) \times 1 - (27 \div 9) \times 1}{27}$

$= \dfrac{9 - 3}{27} = \dfrac{6}{27}$

3. $\dfrac{1}{5} - \dfrac{1}{10} = \dfrac{(10 \div 5) \times 1 - (10 \div 10) \times 1}{10}$

$= \dfrac{2 - 1}{10} = \dfrac{1}{10}$

4. $\dfrac{1}{2} - \dfrac{1}{9} = \dfrac{(18 \div 2) \times 1 - (18 \div 9) \times 1}{18}$

$= \dfrac{9 - 2}{18} = \dfrac{7}{18}$

5. $\dfrac{1}{4} - \dfrac{1}{12} = \dfrac{(12 \div 4) \times 1 - (12 \div 12) \times 1}{12}$

$= \dfrac{3 - 1}{12} = \dfrac{2}{12}$

6. $\dfrac{1}{5} - \dfrac{1}{6} = \dfrac{(30 \div 5) \times 1 - (30 \div 6) \times 1}{30}$

$= \dfrac{6 - 5}{30} = \dfrac{1}{30}$

B. 1. $\dfrac{1}{6} - \dfrac{1}{7} = \dfrac{(42 \div 6) \times 1 - (42 \div 7) \times 1}{42}$

$= \dfrac{7 - 6}{42} = \dfrac{1}{42}$

2. $\dfrac{1}{8} - \dfrac{1}{9} = \dfrac{(72 \div 8) \times 1 - (72 \div 9) \times 1}{27}$

$= \dfrac{9 - 8}{72} = \dfrac{1}{72}$

3. $\dfrac{1}{9} - \dfrac{1}{10} = \dfrac{(90 \div 9) \times 1 - (90 \div 10) \times 1}{90}$

$= \dfrac{10 - 9}{90} = \dfrac{1}{90}$

4. $\dfrac{1}{10} - \dfrac{1}{12} = \dfrac{(60 \div 10) \times 1 - (60 \div 12) \times 1}{60}$

$= \dfrac{6 - 5}{60} = \dfrac{1}{60}$

5. $\dfrac{1}{7} - \dfrac{1}{9} = \dfrac{(63 \div 7) \times 1 - (63 \div 9) \times 1}{63}$

$= \dfrac{9 - 7}{63} = \dfrac{2}{63}$

6. $\dfrac{1}{10} - \dfrac{1}{14} = \dfrac{(70 \div 10) \times 1 - (70 \div 14) \times 1}{70}$

$= \dfrac{7 - 5}{70} = \dfrac{2}{70}$

Subtraction of fractions with different denominators using the LCM

Number of periods: 1

Reference: Pupil's Book page 77

Knowledge and understanding

Explain how to subtract factors with different denominators using the Least Common Multiple.

Skills

Describe the method for subtraction of fractions.

Teaching/Learning materials

Flash cards

Lesson preparation

Lesson takes place in class. Organise learners in groups of five with mixed ability and gender. Prepare flash cards.

Teaching/Learning methods

- Group work activities – group discussion on learning activities.
- Demonstration – show how to subtract using Example 4.25.
- Supervised practice – learners solve questions, teacher checks progress.
- Class discussion – discuss steps to subtract using the LCM.

Teaching/Learning steps

1. Ask learners to work out Activity 4.24.
2. Let learners discuss Example 4.25. Distribute flash cards for learners to solve written problems.
3. Assign learners Practice Activity 4.24 questions 1 – 6 as classwork. Go round assessing progress.
4. Assign learners Practice Activity 4.24 questions 7 – 12 for more practice as homework.

Assessment of skills knowledge and understanding

Observe learners carry out subtraction of fractions.

Guidance to the teacher

Emphasise to learners the importance of finding the Least Common Multiple by calculation. Rewrite the fractions with same denominator. Then carry out subtraction.

Expected answer for practice Activity 4.24

1. $\frac{6}{7} - \frac{3}{4}$ Common denominator is 28.

$$\frac{6}{7} = \frac{6}{7} \times \frac{4}{4} = \frac{24}{28}$$

$$\frac{3}{4} = \frac{3}{4} \times \frac{7}{7} = \frac{21}{28}$$

Thus, $\frac{6}{7} - \frac{3}{4} = \frac{24}{28} - \frac{21}{28} = \frac{24-21}{28} = \frac{3}{28}$

2. $\frac{8}{9} - \frac{8}{12}$ Common denominator is 36.

$$\frac{8}{9} = \frac{8}{9} \times \frac{4}{4} = \frac{32}{36}$$

$$\frac{8}{12} = \frac{8}{12} \times \frac{3}{3} = \frac{24}{36}$$

Thus, $\frac{8}{9} - \frac{8}{12} = \frac{32}{36} - \frac{24}{36} = \frac{32-24}{36} = \frac{8}{36}$

3. $\frac{2}{3} - \frac{2}{7}$ Common denominator is 21.

$\frac{2}{3} = \frac{2}{3} \times \frac{7}{7} = \frac{14}{21}$

$\frac{2}{7} = \frac{2}{7} \times \frac{3}{3} = \frac{6}{21}$

Thus, $\frac{2}{3} - \frac{2}{7} = \frac{14}{21} - \frac{6}{21} = \frac{14-6}{21} = \frac{8}{21}$

4. $\frac{5}{6} - \frac{5}{8}$ Common denominator is 24.

$\frac{5}{6} = \frac{5}{6} \times \frac{4}{4} = \frac{20}{24}$

$\frac{5}{8} = \frac{5}{8} \times \frac{3}{3} = \frac{15}{24}$

Thus, $\frac{5}{6} - \frac{5}{8} = \frac{20}{24} - \frac{15}{24} = \frac{20-15}{24} = \frac{5}{24}$

5. $\frac{5}{6} - \frac{1}{2}$ Common denominator is 6.

$\frac{5}{6} = \frac{5}{6} \times \frac{1}{1} = \frac{5}{6}$

$\frac{1}{2} = \frac{1}{2} \times \frac{3}{3} = \frac{3}{6}$

Thus, $\frac{5}{6} - \frac{1}{2} = \frac{5}{6} - \frac{3}{6} = \frac{5-3}{6} = \frac{2}{6}$

6. $\frac{8}{9} - \frac{2}{3}$ Common denominator is 27

$\frac{8}{9} = \frac{8}{9} \times \frac{3}{3} = \frac{24}{27}$

$\frac{2}{3} = \frac{2}{3} \times \frac{9}{9} = \frac{18}{27}$

Thus, $\frac{8}{9} - \frac{2}{3} = \frac{24}{27} - \frac{18}{27} = \frac{6}{27}$

7. $\frac{1}{2} - \frac{1}{12}$ Common denominator is 12.

$\frac{1}{2} = \frac{1}{2} \times \frac{6}{6} = \frac{6}{12}$

Thus, $\frac{1}{2} - \frac{1}{12} = \frac{6}{12} - \frac{1}{12} = \frac{6-1}{12} = \frac{5}{12}$

8. $\frac{6}{8} - \frac{1}{3}$ Common denominator is 24.

$\frac{6}{8} = \frac{6}{8} \times \frac{3}{3} = \frac{18}{24}$

$\frac{1}{3} = \frac{1}{3} \times \frac{8}{8} = \frac{8}{24}$

Thus, $\frac{6}{8} - \frac{1}{3} = \frac{18}{24} - \frac{8}{24} = \frac{10}{24}$

9. $\frac{2}{6} - \frac{2}{9}$ Common denominator is 18.

$\frac{2}{6} = \frac{2}{6} \times \frac{3}{3} = \frac{6}{18}$

$\frac{2}{9} = \frac{2}{9} \times \frac{2}{2} = \frac{4}{18}$

Thus, $\frac{2}{6} - \frac{2}{9} = \frac{6}{18} - \frac{4}{18} = \frac{6-4}{18} = \frac{2}{18}$

10. $\frac{7}{9} - \frac{7}{12}$ Common denominator is 36.

$\frac{7}{9} = \frac{7}{9} \times \frac{4}{4} = \frac{28}{36}$

$\frac{7}{12} = \frac{7}{12} \times \frac{3}{3} = \frac{21}{36}$

Thus, $\frac{7}{9} - \frac{7}{12} = \frac{28}{36} - \frac{21}{36} = \frac{28-21}{36} = \frac{7}{36}$

11. $\frac{2}{3} - \frac{2}{10}$ Common denominator is 30

$\frac{2}{3} = \frac{2}{3} \times \frac{10}{10} = \frac{20}{30}$

$\frac{2}{10} = \frac{2}{10} \times \frac{3}{3} = \frac{6}{30}$

Thus, $\frac{2}{3} - \frac{2}{10} = \frac{20}{30} - \frac{6}{30} = \frac{20-6}{30} = \frac{14}{30}$

12. $\frac{4}{5} - \frac{3}{4}$ Common denominator is 20

$\frac{4}{5} = \frac{4}{5} \times \frac{4}{4} = \frac{16}{20}$

$\frac{3}{4} = \frac{3}{4} \times \frac{5}{5} = \frac{15}{20}$

Thus, $\frac{4}{5} - \frac{3}{4} = \frac{16}{20} - \frac{15}{20} = \frac{16-15}{20} = \frac{1}{20}$

4.11 Subtraction of whole numbers and fractions

Number of periods: 1

Reference: Pupil's Book page 78

Knowledge and understanding

Explain how to subtract fractions with different denominators using the Least Common Multiple.

Skills

Describe the method for subtraction of fractions.

Teaching/Learning materials

Flash cards

Lesson preparation

Lesson takes place in class. Organise learners in groups of five with mixed abilities and gender. Prepare flash cards.

Teaching/Learning methods

- Group work activities – discuss learning activities in small groups.
- Demonstration – demonstrate how to subtract using Example 4.26.
- Supervised practice – learners solve problems, teacher checks progress.
- Discussion – discuss steps to subtract mixed fractions using the LCM.

Teaching/Learning steps

1. Ask learners to work out Activity 4.25.
2. Let learners discuss Example 4.26. Distribute flash cards for learners to solve written problems.
3. Assign learners Practice Activity 4.25 questions 1 – 5 as classwork. Go round assessing progress.
4. Ask learners to name important points they have learnt.
5. Assign learners Practice Activity 4.25 questions 6 – 10 for more practice and homework.

Assessment of skills knowledge and understanding

Observe learners carry out subtraction of fractions.

Guidance to the teacher

Emphasise that whole numbers are subtracted first followed by fractions.

Expected answers for Practice Activity 4.25

1. $8\frac{5}{6} - 3\frac{2}{6} = (8 - 3) + (\frac{5}{6} - \frac{2}{6}) = 5\frac{3}{6}$ 2. $6\frac{3}{5} - 3\frac{1}{5} = (6 - 3) + (\frac{3}{5} - \frac{1}{5}) = 3\frac{2}{5}$

3. $4\frac{7}{8} - 1\frac{3}{8} = (4 - 1) + (\frac{7}{8} - \frac{3}{8}) = 3\frac{4}{8}$ 4.$5\frac{5}{9} - 2\frac{2}{9} = (5 - 2) + (\frac{5}{9} - \frac{2}{9}) = 3\frac{3}{9}$

5. $4\frac{1}{4} - 1\frac{1}{4} = (4 - 1) + (\frac{1}{4} - \frac{1}{4}) = 3$

6. $4\frac{7}{10} - 1\frac{2}{5} = (4 - 1) + (\frac{7}{10} - \frac{2}{5}) = 3 + \left(\frac{7}{10} - \frac{4}{10}\right) = 3\frac{3}{10}$

7. $5 - \frac{7}{10} = 4 + (\frac{10}{10} - \frac{7}{10}) = 4\frac{3}{10}$ 8.$6 - \frac{1}{2} = 5 + (\frac{2}{2} - \frac{1}{2}) = 5\frac{1}{2}$

9. $7 - \frac{4}{7} = 6 + (\frac{7}{7} - \frac{4}{7}) = 6\frac{3}{7}$

10. $9 - 3\frac{3}{4} = (9 - 3) - \frac{3}{4} = 6 - \frac{3}{4} = 5 + (\frac{4}{4} - \frac{3}{4}) = 5\frac{1}{4}$

4.12   Subtraction of mixed numbers with different denominators

Number of periods: 1

Reference: Pupil's Book page 79

Knowledge and understanding

Explain how to subtract fractions with different denominators using the Least Common Multiple.

Skills

Describe the method for subtraction of fractions.

Teaching/Learning materials

Flash cards

Lesson preparation

Lesson takes place in class. Organise learners in groups of 5 with mixed abilities and gender. Prepare flash cards.

Teaching/Learning methods

- Group work – group discussion on learning activities.
- Demonstration – demonstrate how to subtract using Example 4.27.
- Supervised activity – learners solve problems, teacher check progress.

Teaching/Learning steps

1. Ask learners to work out Activity 4.26.
2. Let learners discuss Example 4.27. Distribute flash cards for learners to solve written problems.
3. Assign learners Practice Activity 4.26 questions in B as classwork. Go round assessing progress.
4. Have learners state important points they have learnt.

5. Assign learners Practice Activity 4.26 questions in A for more practice and homework.
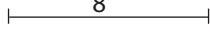
Assessment of skill, knowledge and understanding

Observe learners carry out subtraction of fractions.

Guidance to the teacher

Emphasise that learners subtract whole numbers first then the fractions.

Guidance on Activity 4.26

Carrying out subtraction of mixed numbers.

1. $1\frac{1}{4} - \frac{1}{4} =$ • Subtract the fractions $= 1\frac{1}{4} - \frac{1}{4} = 1$

2. $3 - \frac{1}{2} =$ • Borrow 1 from 3 and change it to 2 halves then subtract

   $2\frac{2}{2} - \frac{1}{2} = 2\frac{1}{2}$

3. $4\frac{1}{4} - \frac{1}{8} =$ • Subtract fractions with the LCM $= 4\frac{2}{8} - \frac{1}{8} = 4\frac{1}{8}$

4. $5 - \frac{3}{4} =$ • Borrow 1 from 5 and change it to 4 quarters then subtract.

   $4 - \frac{3}{4} = 4\frac{1}{4}$

Expected answers for Practice Activity 4.26

A. 1. $4\frac{1}{2} - 1\frac{4}{5} = (4 - 1) + (\frac{1}{2} - \frac{4}{5}) = 3 + \frac{5 - 8}{10} = 2 + \frac{10 + 5 - 8}{10} = 2 + \frac{15 - 8}{10} = 2\frac{7}{10}$

   2. $6\frac{1}{2} - 2\frac{5}{6} = (6 - 2) + (\frac{1}{2} - \frac{5}{6}) = 4 + \frac{3 - 5}{6} = 3 + \frac{6 + 3 - 5}{6} = 3 + \frac{9 - 5}{6} = 3\frac{4}{6}$

   3. $2\frac{1}{4} - \frac{2}{3} = 2 + (\frac{1}{4} - \frac{2}{3}) = 2 + \frac{3 - 8}{12} = 1 + \frac{12 + 3 - 8}{12} = 1\frac{7}{12}$

B. 1. $5\frac{1}{4} - \frac{3}{4} = 5 + (\frac{1}{4} - \frac{3}{4}) = 4 + \frac{4 + 1 - 3}{4} = 4\frac{2}{4}$

   2. $4\frac{1}{5} - 1\frac{7}{8} = (4 - 1) + (\frac{1}{5} - \frac{7}{8}) = 3 + \frac{8 - 35}{40} = 2 + \frac{40 + 8 - 35}{40} = 3\frac{13}{40}$

   3. $2\frac{1}{2} - \frac{3}{4} = 2 + (\frac{1}{2} - \frac{3}{4}) = 1 + \frac{4 + 2 - 3}{4} = 1\frac{3}{4}$

   4. $6\frac{2}{3} - 3\frac{5}{6} = (6 - 3) + (\frac{2}{3} - \frac{5}{6}) = 2 + \frac{6 + 4 - 5}{6} = 2\frac{5}{6}$

   5. $7\frac{3}{4} - 3\frac{2}{3} = (7 - 3) + (\frac{3}{4} - \frac{2}{3}) = 4 + \frac{9 - 8}{12} = 4\frac{1}{12}$

   6. $2\frac{1}{4} - 1\frac{1}{4} = (2 - 1) + (\frac{1}{4} - \frac{1}{4}) = 1$

7. $4\frac{7}{9} - 3\frac{2}{3} = (4-3) + (\frac{7}{9} - \frac{2}{3}) = 1 + \frac{7-6}{9} = 1\frac{1}{9}$

8. $3\frac{7}{11} - 1\frac{1}{2} = (3-1) + (\frac{7}{11} - \frac{1}{2}) = 2 + \frac{14-11}{22} = 2\frac{3}{22}$

9. $4\frac{1}{6} - 1\frac{6}{9} = (4-1) + (\frac{1}{6} - \frac{6}{9}) = 3 + \frac{3-12}{18} = 2 + \frac{18+3-12}{18} = 2\frac{9}{18}$

4.13 Word problems on subtraction of fractions

Number of periods: 1

Reference: Pupil's Book page 80

Knowledge and understanding

Explain how to subtract fractions with different denominators using the Least Common Multiple.

Skills

Describe the method of subtraction of fractions.

Teaching/Learning materials

Flash cards

Lesson preparation

Lesson takes place in class. Organise learners in groups of 5 with mixed abilities and gender. Prepare flash cards.

Teaching/Learning methods

- Group work activities – in small groups, discuss learning activities.
- Demonstration – demonstrate how to subtract using Examples 4.28 and 4.29.
- Supervised activities – learners solve problems. Teacher checks progress.
- Discussion – class discussion on Practice Activity 4.27.

Teaching/Learning steps

1. Ask learners to work out Activity 4.27.
2. Let learners discuss Example 4.28 and 4.29. Distribute flash cards.
3. Assign learners Practice Activity 4.27 questions 1 – 4 as classwork. Go round assessing progress.
4. Have learners state important points they have learnt.
5. Assign learners Practice Activity 4.27 questions 5 – 6 for more practice and homework.
6. Identify different learning abilities. Assign learners Additional Activity 4 as a group work assignment. Let learners discuss in various groups. For slow learners, give the Remedial Activity. For average learners, give the Consolidation Activity

and for fast learners give the Extension Activity. Thereafter, have each group make a class presentation.

Assessment of skills knowledge and understanding

Observe learners carry out subtraction of fractions.

Guidance to the teacher

Emphasise that learners read the problem, understand it then then carry out the operation.

Expected answers to Practice Activity 4.27

1. $\frac{7}{8}$ m

   ├─────────────┤ Jane's stick

   ├────────┤ Michael's stick
   $\frac{5}{6}$ m

   $\frac{7}{8}$ m $- \frac{5}{6}$ m Common denominator = 24

   $\frac{7}{8} = \frac{7}{8} \times \frac{3}{3} = \frac{21}{24}$

   $\frac{5}{6} = \frac{5}{6} \times \frac{4}{4} = \frac{20}{24}$

   $\left(\frac{7}{8} - \frac{5}{6}\right)m = \left(\frac{21}{24} - \frac{20}{24}\right)m = \left(\frac{21-20}{24}\right)m = \frac{1}{24}$ m

2. $\frac{3}{4}$ m thread

   $\underbrace{\frac{1}{2} \text{ m for}}_{\text{mending}}$ $\underbrace{\text{Remaining}}_{\text{thread}}$
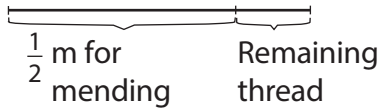
   $\frac{3}{4} - \frac{1}{2}$ Common denominator is 4

   Thus, $\left(\frac{3}{4} - \frac{1}{2}\right)$ m $= \left(\frac{3-2}{4}\right)$m $= \frac{1}{4}$ metres

3. $\left(\frac{9}{12} - \frac{1}{2}\right)$ tonnes Common denominator is 12

   Thus, $\left(\frac{9}{12} - \frac{1}{2}\right)$ tonnes $= \left(\frac{9-6}{4}\right)$ tonnes $= \frac{3}{12}$ tonnes

4. $\left(\frac{1}{2} - \frac{2}{8}\right)$ kg $= \left(\frac{4-2}{8}\right)$kg $= \frac{2}{8}$ kg; Both ate equal mass of cake.

5.   (a) Boys and girls form a whole (1).

      $\frac{7}{7} - \frac{3}{7} = \frac{4}{7}$. Girls were $\frac{4}{7}$ of the whole class.

      (b) $\frac{4}{7} - \frac{3}{7} = \frac{1}{7}$

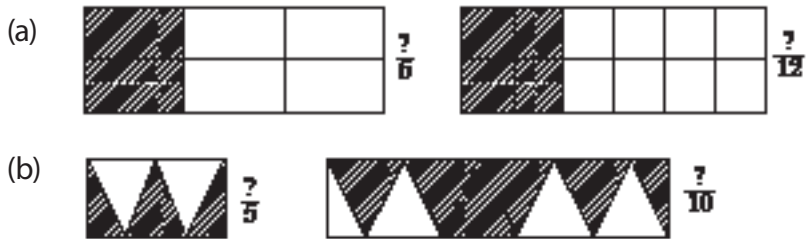3. $\left(\frac{3}{4} - \frac{3}{8}\right) l = \left(\frac{6-3}{8}\right) l = \frac{3}{8} l$

Additional Activity 4

Remedial Activity

1. Shade an equivalent fraction below.

    (a)   (b)
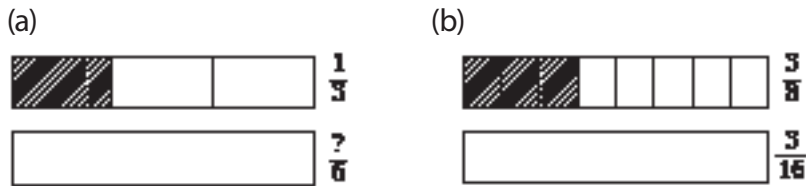
2. Write the following equivalent fractions shaded below.

    (a)

    (b)

3. Find the equivalent fraction of the given fraction.

    (a) $\frac{3}{13} = \frac{\square}{26}$ (b) $\frac{5}{8} = \frac{\square}{16}$

4. Write 2 equivalent fractions of each fraction.

    (a) $\frac{4}{7}$ (b) $\frac{7}{10}$

5. Find equivalent fractions with the denominator 36.

    (a) $\frac{2}{9}$ (b) $\frac{5}{6}$

6. Fill in the missing number.

    $\frac{2}{3} + \frac{1}{6} = \frac{\square}{6} + \frac{1}{6} = \frac{\square + 1}{8} = \frac{\square}{6}$

7. Use equivalent fractions to add. Explain your answer.

    (a) $\frac{1}{2} + \frac{1}{6} =$ (b) $\frac{4}{9} + \frac{1}{3} =$

8. Calculate using the Least Common Multiple.

    (a) $\frac{1}{4} + \frac{1}{8}$ (b) $\frac{2}{7} + \frac{2}{6}$

9. Add and write answers as mixed numbers.

    (a) $\frac{4}{5} + \frac{3}{4}$ (b) $3\frac{1}{5} + 1\frac{1}{2}$

10. Work out using equivalent fractions.

    (a) $\frac{7}{10} - \frac{5}{12}$ (b) $\frac{2}{3} - \frac{2}{9}$

11. Use the LCM to subtract. Explain your answer.

  (a) $\dfrac{2}{3} - \dfrac{1}{5}$
  (b) $\dfrac{3}{4} - \dfrac{5}{8}$

  (c) $7\dfrac{1}{6} - 2\dfrac{5}{9}$
  (d) $4\dfrac{1}{3} - 2\dfrac{2}{5}$

Consolidation Activity

1. Write 3 equivalent fractions of:

  (a) $\dfrac{4}{7}$
  (b) $\dfrac{4}{11}$

2. Write equivalent fractions with 48 as the denominator.

  (a) $\dfrac{4}{12}$
  (b) $\dfrac{7}{16}$
  (c) $\dfrac{5}{6}$

3. Use equivalent fractions to work out:

  (a) $\dfrac{1}{3} + \dfrac{4}{9}$
  (b) $\dfrac{2}{5} + \dfrac{1}{10}$

4. Use equivalent fractions to work out. Discuss your steps to calculate the answers.

  (a) $\dfrac{3}{4} - \dfrac{1}{8}$
  (b) $\dfrac{2}{3} - \dfrac{2}{7}$

5. Solve using the LCM. Explain the steps you followed.

  (a) $\dfrac{5}{8} - \dfrac{5}{10}$
  (b) $\dfrac{2}{3} - \dfrac{2}{9}$

6. Use the LCM to add. Explain your answer.

  (a) $\dfrac{3}{7} + \dfrac{3}{5}$
  (b) $\dfrac{2}{3} + \dfrac{1}{4}$

7. Find the sum of the following. Justify your answer.

  (a) $5\dfrac{4}{5} + 3\dfrac{1}{4}$
  (b) $1\dfrac{1}{9} + 2\dfrac{3}{4}$

8. Solve.

  (a) $10 - 4\dfrac{3}{4}$
  (b) $9 - 1\dfrac{6}{7}$

  (c) $4\dfrac{1}{3} - 2\dfrac{5}{6}$
  (d) $5\dfrac{1}{2} - \dfrac{3}{4}$

9. What is seven ninths minus one half?

10. What is the sum of $2\dfrac{1}{4}$ and $3\dfrac{1}{6}$? Explain the steps to the answer.

Extension Activity

1. Write 3 equivalent fractions of the following. Justify your answers:

  (a) $\dfrac{3}{8}$
  (b) $\dfrac{4}{9}$
  (c) $\dfrac{6}{11}$

2. Write equivalent fractions with the denominator 54.

  (a) $\dfrac{2}{3}$
  (b) $\dfrac{5}{6}$
  (c) $\dfrac{2}{9}$

3. Use equivalent fractions to work out. Explain your steps.

   (a) $\frac{2}{7} + \frac{1}{14}$ (b) $\frac{1}{6} + \frac{5}{12}$ (c) $\frac{3}{4} + \frac{1}{8}$

4. Use equivalent fractions to work out. Explain your steps.

   (a) $\frac{1}{3} - \frac{1}{6}$ (b) $\frac{3}{7} - \frac{1}{14}$ (c) $\frac{2}{5} - \frac{2}{7}$

5. Work out using the Least Common Multiple. Explain your work.

   (a) $\frac{2}{3} - \frac{1}{9}$ (b) $\frac{4}{10} - \frac{4}{12}$ (c) $\frac{5}{8} - \frac{5}{9}$

6. Use the LCM to add. Explain your work.

   (a) $\frac{1}{4} + \frac{2}{12}$ (b) $\frac{1}{7} + \frac{1}{8}$ (c) $\frac{7}{15} + \frac{3}{10}$

7. Work out. Justify your answer.

   (a) $4\frac{3}{8} + 1\frac{1}{9}$ (b) $4\frac{4}{7} + 3\frac{1}{3}$ (c) $5\frac{3}{5} + 2\frac{2}{9}$

8. Work out. Justify your answer.

   (a) $7 - 2\frac{4}{9}$ (b) $6\frac{4}{5} - 2\frac{4}{6}$ (c) $3\frac{3}{4} - 1\frac{2}{3}$

9. During a class activity, Stella got $\frac{4}{5}$ of the questions correctly. In the next activity, she got $\frac{4}{7}$ of the questions correctly.

   (a) Find the total fractions of questions she got correctly.

   (b) Find the total fraction of questions she did not get correctly.

   (c) Find the difference of her fractions she got correctly.

Expected Answers

Remedial Activity

1. (a) $\frac{2}{6}$ (b) $\frac{6}{15}$

2. (a) $\frac{2}{6}, \frac{4}{12}$ (b) $\frac{3}{5}, \frac{6}{10}$

3. (a) $\frac{3}{13} = \frac{9}{26}$ (c) $\frac{5}{8} = \frac{10}{16}$

4. (a) $\frac{4}{7} \times \frac{2}{2} = \frac{8}{14}, \frac{4}{7} \times \frac{3}{3} = \frac{12}{21}$ (b) $\frac{7}{10} \times \frac{2}{2} = \frac{14}{20}, \frac{7}{10} \times \frac{3}{3} = \frac{21}{30}$

5. (a) $\frac{2}{9} = \frac{2}{9} \times \frac{4}{4} = \frac{8}{36}$ (b) $\frac{5}{6} = \frac{5}{6} \times \frac{6}{6} = \frac{30}{36}$

6. $\frac{4}{6} + \frac{1}{6} = \frac{4+1}{6} = \frac{5}{6}$

7. (a) $\frac{1}{2} = \frac{1}{2} \times \frac{3}{3} = \frac{3}{6}$. Thus, $\frac{1}{2} + \frac{1}{6} = \frac{3}{6} + \frac{1}{6} = \frac{4}{6}$.

   (b) $\frac{4}{9} + \frac{1}{3} = \frac{(9 \div 9) \times 4 + (9 \div 3) \times 1}{9} = \frac{4 + 3}{9} = \frac{7}{9}$

8. (a) $\frac{1}{4}+\frac{1}{8}=\frac{2}{8}+\frac{1}{8}=\frac{3}{8}$

   (b) $\frac{2}{7}+\frac{2}{6}=\frac{(42\div7)\times2+(42\div6)\times2}{42}=\frac{12+14}{42}=\frac{26}{42}$

9. (a) $\frac{4}{5}+\frac{3}{4}=\frac{(20\div5)\times4+(20\div4)\times3}{20}=\frac{16+15}{20}=\frac{31}{20}=1\frac{11}{20}$

   (b) $3\frac{1}{5}+1\frac{1}{2}=(3+1)+(\frac{1}{5}+\frac{1}{2})=4+\frac{2+5}{10}=4\frac{7}{10}$

10. (a) $\frac{7}{10}-\frac{5}{12}$. Rename: $\frac{7}{10}\times\frac{6}{6}=\frac{42}{60}$ and $\frac{5}{12}\times\frac{5}{5}=\frac{25}{60}$

   Thus, $\frac{7}{10}-\frac{5}{12}=\frac{42}{60}-\frac{25}{60}=\frac{42-25}{60}=\frac{17}{60}$

   (b) $\frac{2}{3}-\frac{2}{9}$. Rename $\frac{2}{3}=\frac{2}{3}\times\frac{3}{3}=\frac{6}{9}$

   Thus, $\frac{2}{3}-\frac{2}{9}=\frac{6}{9}-\frac{2}{9}=\frac{4}{9}$

11. (a) $\frac{2}{3}-\frac{1}{5}=\frac{10-3}{15}=\frac{7}{15}$ (b) $\frac{3}{4}-\frac{5}{8}=\frac{6-5}{8}=\frac{1}{8}$

   (c) $7\frac{1}{6}-2\frac{5}{9}=(7-2)+(\frac{1}{6}-\frac{5}{9})=5+\frac{3-10}{18}=4+\frac{18}{18}+\frac{3-10}{18}=4\frac{11}{18}$

   (d) $4\frac{1}{3}-2\frac{2}{5}=(4-2)+(\frac{1}{3}-\frac{2}{5})=2+\frac{5-6}{15}=1+\frac{15}{15}+\frac{5-6}{15}=1\frac{14}{15}$

Consolidation Activity

1. (a) $\frac{4}{7}\times\frac{2}{2}=\frac{8}{14}$, $\frac{4}{7}\times\frac{3}{3}=\frac{12}{21}$, $\frac{4}{7}\times\frac{4}{4}=\frac{16}{28}$

   (b) $\frac{4}{11}\times\frac{2}{2}=\frac{8}{22}$, $\frac{4}{11}\times\frac{3}{3}=\frac{12}{33}$, $\frac{4}{11}\times\frac{4}{4}=\frac{16}{44}$

2. (a) $\frac{4}{12}=\frac{4}{12}\times\frac{4}{4}=\frac{16}{48}$ (b) $\frac{7}{16}=\frac{7}{16}\times\frac{3}{3}=\frac{21}{48}$ (c) $\frac{5}{6}=\frac{5}{6}\times\frac{8}{8}=\frac{40}{48}$

3. (a) $\frac{1}{3}=\frac{1}{3}\times\frac{3}{3}=\frac{3}{9}$. So $\frac{1}{3}+\frac{4}{9}=\frac{3}{9}+\frac{4}{9}=\frac{7}{9}$

   (b) $\frac{2}{5}=\frac{2}{5}\times\frac{2}{2}=\frac{4}{10}$. So $\frac{2}{5}+\frac{1}{10}=\frac{4}{10}+\frac{1}{10}=\frac{5}{10}$

4. (a) $\frac{3}{4}-\frac{1}{8}$; $\frac{3}{4}=\frac{3}{4}\times\frac{2}{2}=\frac{6}{8}$. Thus, $\frac{3}{4}-\frac{1}{8}=\frac{6}{8}-\frac{1}{8}=\frac{5}{8}$

   (b) $\frac{2}{3}-\frac{2}{7}$; $\frac{2}{3}=\frac{2}{3}\times\frac{7}{7}=\frac{14}{21}$ and $\frac{2}{7}=\frac{2}{7}\times\frac{3}{3}=\frac{6}{21}$

   Thus, $\frac{2}{3}-\frac{2}{7}=\frac{14}{21}-\frac{6}{21}=\frac{14-7}{21}=\frac{8}{21}$

5. (a) $\frac{5}{8}=\frac{5}{8}\times\frac{5}{5}=\frac{25}{40}$ and $\frac{5}{10}=\frac{5}{10}\times\frac{4}{4}=\frac{20}{40}$

   Thus, $\frac{5}{8}-\frac{5}{10}=\frac{25}{40}-\frac{20}{40}=\frac{25-20}{40}=\frac{5}{40}$

(b) $\frac{2}{3} = \frac{2}{3} \times \frac{3}{3} = \frac{6}{9}$.

So $\frac{2}{3} - \frac{2}{9} = \frac{6}{9} - \frac{2}{9} = \frac{6-2}{9} = \frac{4}{9}$

6. (a) $\frac{3}{7} + \frac{3}{5} = \frac{15+21}{35} = \frac{36}{35} = 1\frac{1}{36}$ (b) $\frac{2}{3} + \frac{1}{4} = \frac{8+3}{12} = \frac{11}{12}$

7. (a) $5\frac{4}{5} + 3\frac{1}{4} = (5 + 3) + \frac{16+5}{20} = 8 + \frac{21}{20} = 8 + 1\frac{1}{20} = 9\frac{1}{20}$

    (b) $1\frac{1}{9} + 2\frac{3}{4} = (1 + 2) + \frac{4+27}{36} = 3\frac{31}{36}$

8. (a) $10 - 4\frac{3}{4} = (10 - 4) = 6 - \frac{3}{4} = 5 + \frac{4}{4} - \frac{3}{4} = 5\frac{1}{4}$

    (b) $9 - 1\frac{6}{7} = (9 - 1) - \frac{6}{7} = 8 - \frac{6}{7} = 7 + \frac{7}{7} - \frac{6}{7} = 7\frac{1}{7}$

    (c) $4\frac{1}{3} - 2\frac{5}{6} = (4 - 2) + (\frac{2}{6} - \frac{5}{6}) = 2 + (\frac{2-5}{6}) = 1 + \frac{6+2-5}{6} = 1\frac{3}{6}$

    (d) $5\frac{1}{2} - \frac{3}{4} = 5 + \frac{2-3}{4} = 4 + \frac{4+2-3}{4} = 4\frac{3}{4}$

9. $\frac{7}{9} - \frac{1}{2} = \frac{14-9}{18} = \frac{5}{18}$ 10. $2\frac{1}{4} + 3\frac{1}{6} = (2 + 3) + \frac{3+2}{12} = 5\frac{5}{12}$

Extension Activity

1. (a) $\frac{3}{8} \times \frac{2}{2} = \frac{6}{16}, \frac{3}{8} \times \frac{3}{3} = \frac{9}{24}, \frac{3}{8} \times \frac{4}{4} = \frac{12}{32}$

    (b) $\frac{4}{9} \times \frac{2}{2} = \frac{8}{18}, \frac{4}{9} \times \frac{3}{3} = \frac{12}{27}, \frac{4}{9} \times \frac{4}{4} = \frac{16}{36}$

    (c) $\frac{6}{11} \times \frac{2}{2} = \frac{12}{22}, \frac{6}{11} \times \frac{3}{3} = \frac{18}{33}, \frac{6}{11} \times \frac{4}{4} = \frac{24}{44}$

2. (a) $\frac{2}{3} \times \frac{18}{18} = \frac{36}{54}$ (b) $\frac{5}{6} \times \frac{9}{9} = \frac{45}{54}$ (c) $\frac{2}{9} \times \frac{6}{6} = \frac{12}{54}$

3. (a) $\frac{2}{7} = \frac{2}{7} \times \frac{2}{2} = \frac{4}{14}$. So, $\frac{2}{7} + \frac{1}{14} = \frac{4}{14} + \frac{1}{14} = \frac{5}{14}$

    (b) $\frac{1}{6} = \frac{1}{6} \times \frac{2}{2} = \frac{2}{12}$. So, $\frac{1}{6} + \frac{5}{12} = \frac{2}{12} + \frac{5}{12} = \frac{7}{12}$

    (c) $\frac{3}{4} = \frac{3}{4} \times \frac{2}{2} = \frac{6}{8}$. So, $\frac{3}{4} + \frac{1}{8} = \frac{6}{8} + \frac{1}{8} = \frac{7}{8}$

4. (a) $\frac{1}{3} - \frac{1}{6} = \frac{2}{6} - \frac{1}{6} = \frac{1}{6}$ (b) $\frac{3}{7} - \frac{1}{14} = \frac{6}{14} - \frac{1}{14} = \frac{5}{14}$

    (c) $\frac{2}{5} = \frac{2}{5} \times \frac{7}{7} = \frac{14}{35}, \frac{2}{7} = \frac{2}{7} \times \frac{5}{5} = \frac{10}{35}$. So, $\frac{2}{5} - \frac{2}{7} = \frac{14}{35} - \frac{10}{35} = \frac{4}{35}$

5. (a) $\frac{2}{3} - \frac{1}{9} = \frac{6-1}{9} = \frac{5}{9}$ (b) $\frac{4}{10} - \frac{4}{12} = \frac{24-20}{60} = \frac{4}{60}$

    (c) $\frac{5}{8} - \frac{5}{9} = \frac{45-40}{72} = \frac{5}{72}$

6. (a) $\dfrac{1}{4} + \dfrac{2}{12} = \dfrac{3+2}{12} = \dfrac{5}{12}$ (b) $\dfrac{1}{7} + \dfrac{1}{8} = \dfrac{8+7}{56} = \dfrac{15}{56}$

  (c) $\dfrac{7}{15} + \dfrac{3}{10} = \dfrac{14+9}{30} = \dfrac{23}{30}$

7. (a) $4\dfrac{3}{8} + 1\dfrac{1}{9} = (4+1) + (\dfrac{27+8}{72}) = 5\dfrac{35}{72}$

  (b) $4\dfrac{4}{7} + 3\dfrac{1}{3} = (4+3) + (\dfrac{12+7}{21}) = 7\dfrac{19}{21}$

  (c) $5\dfrac{3}{5} + 2\dfrac{2}{9} = (5+2) + \left(\dfrac{3}{5} + \dfrac{2}{9}\right) = 7 + (\dfrac{27+10}{45}) = 7\dfrac{37}{45}$

8. (a) $7 - 2\dfrac{4}{9} = 7 - 2 = 5 - \dfrac{4}{9} = 4\dfrac{9}{9} - \dfrac{4}{5} = 4\dfrac{5}{9}$

  (b) $6\dfrac{4}{5} - 2\dfrac{4}{6} = (6-2) + \left(\dfrac{4}{5} + \dfrac{4}{6}\right) = 4 + (\dfrac{24-20}{30}) = 4 + \dfrac{4}{30} = 4\dfrac{4}{30}$

  (c) $3\dfrac{3}{4} - 1\dfrac{2}{3} = (3-1) + \left(\dfrac{3}{4} - \dfrac{2}{3}\right) = 2 + \dfrac{9-8}{12} = 2\dfrac{1}{12}$

9. (a) $\dfrac{4}{5} + \dfrac{4}{7} = \dfrac{28+20}{35} = \dfrac{48}{35} = 1\dfrac{13}{35}$

  (b) $\dfrac{1}{5} + \dfrac{3}{7} = \dfrac{7+15}{35} = \dfrac{22}{35}$

  (c) $\dfrac{4}{5} - \dfrac{4}{7} = \dfrac{28-20}{35} = \dfrac{8}{35}$

Formative Assessment Support

It's of essence to set competence-based task for the unit. This is done by:

1. Ensuring all unit objectives and key unit competences in the syllabus are covered.

2. Check the provided assessment criteria from syllabus.

3. List the requirements using the content summary to check scope and item sequence.

Learning objectives assist with knowing the difficulty of items.

After setting a competence-based activity administer it to learners. Guidelines are as follows:

- The assessment can be done in a double lesson where all learners give their responses. It can also be done in one period and the remaining part done in another lesson. Assess the abilities and confidence of learners through observation.

- Special needs learners can be assisted to develop competence. Let them be included with others and facilitate their ability to give the expected response in spite of varied abilities.

- Prepare all learners before formative assessment. Assess both generic and subject based competence in the unit. Reserve enough time for slow or weak learners to develop expected competence. Gifted learners may assist slow learners to develop cooperation if need be. We have provided a sample of a

competence-based task in the Pupil's Book page 83. Revision Activity 4. Use it as a guidance tool for formative assessment of this unit. You may improve the material to cater for all learners by varying it to assess all levels of thinking. Expected answers are provided below to ease your work.

Expected answers for Revision Activity 4

1. $\dfrac{7}{10} = \dfrac{7}{10} \times \dfrac{2}{2} = \dfrac{14}{20}$ $\qquad$ $\dfrac{4}{10} = \dfrac{4}{10} \times \dfrac{2}{2} = \dfrac{8}{20}$ $\qquad$ $\dfrac{8}{18} = \dfrac{8}{18} \times \dfrac{2}{2} = \dfrac{16}{36}$

2. (a) $\dfrac{2}{5}$ $\quad$ $\dfrac{4}{10}$ $\quad$ $\dfrac{6}{15}$

   (b) $\dfrac{5}{7}$ $\quad$ $\dfrac{10}{14}$ $\quad$ $\dfrac{15}{21}$

3. (a) $\dfrac{3}{8} = \dfrac{3}{8} \times \dfrac{2}{2} = \dfrac{6}{16}$, $\dfrac{3}{8} = \dfrac{3}{8} \times \dfrac{3}{3} = \dfrac{9}{24}$

   (b) $\dfrac{3}{11} = \dfrac{3}{11} \times \dfrac{2}{2} = \dfrac{6}{22}$, $\dfrac{3}{11} = \dfrac{3}{11} \times \dfrac{3}{3} = \dfrac{9}{33}$

4. (a) $\dfrac{2}{3} = \dfrac{2}{3} \times \dfrac{8}{8} = \dfrac{16}{24}$ $\qquad$ (b) $\qquad$ $\dfrac{1}{6} = \dfrac{1}{6} \times \dfrac{4}{4} = \dfrac{4}{24}$

   (c) $\dfrac{1}{4} = \dfrac{1}{4} \times \dfrac{6}{6} = \dfrac{6}{24}$ $\qquad$ (d) $\qquad$ $\dfrac{3}{8} = \dfrac{3}{8} \times \dfrac{3}{3} = \dfrac{9}{24}$

5. (a) $\dfrac{2}{3} = \dfrac{2}{3} \times \dfrac{3}{3} = \dfrac{6}{9}$. So, $\dfrac{2}{3} + \dfrac{4}{9} = \dfrac{6}{9} + \dfrac{4}{9} = \dfrac{10}{9} = 1\dfrac{1}{9}$

   (b) $\dfrac{5}{6} = \dfrac{5}{6} \times \dfrac{2}{2} = \dfrac{10}{12}$. So, $\dfrac{3}{12} + \dfrac{5}{6} = \dfrac{3}{12} + \dfrac{10}{12} = \dfrac{13}{12} = 1\dfrac{1}{12}$

   (c) $\dfrac{3}{5} = \dfrac{3}{5} \times \dfrac{2}{2} = \dfrac{6}{10}$. Thus, $\dfrac{3}{10} + \dfrac{3}{5} = \dfrac{3}{10} + \dfrac{6}{10} = \dfrac{9}{10}$

6. (a) $\dfrac{1}{2} = \dfrac{1}{2} \times \dfrac{4}{4} = \dfrac{4}{8}$. So, $\dfrac{5}{8} - \dfrac{1}{2} = \dfrac{5}{8} - \dfrac{4}{8} = \dfrac{1}{8}$

   (b) $\dfrac{3}{4} = \dfrac{3}{4} \times \dfrac{3}{3} = \dfrac{9}{12}$. Thus, $\dfrac{3}{4} - \dfrac{1}{12} = \dfrac{9}{12} - \dfrac{1}{12} = \dfrac{8}{12}$

   (c) $\dfrac{2}{3} = \dfrac{2}{3} \times \dfrac{3}{3} = \dfrac{6}{9}$. Thus, $\dfrac{2}{3} - \dfrac{1}{9} = \dfrac{6}{9} - \dfrac{1}{9} = \dfrac{5}{9}$

7. (a) $\dfrac{3}{7} + \dfrac{5}{6}$ Common denominator is 42

   $\dfrac{3}{7} + \dfrac{5}{6} = \dfrac{(42 \div 7) \times 3 + (42 \div 6) \times 5}{42} = \dfrac{18 + 35}{42} = \dfrac{53}{42} = 1\dfrac{11}{42}$

   (b) $\dfrac{2}{9} + \dfrac{2}{12}$ Common denominator is 36

   $\dfrac{2}{9} + \dfrac{2}{12} = \dfrac{(36 \div 9) \times 2 + (36 \div 12) \times 2}{36} = \dfrac{8 + 6}{36} = \dfrac{14}{36}$

(c) $1\frac{1}{6} + 3\frac{1}{4} = (1 + 3) + (\frac{1}{6} + \frac{1}{4}) = 4 + \frac{2+3}{12} = 4\frac{5}{12}$

8. (a) $\frac{1}{5} - \frac{1}{7}$ Common denominator is 35

$$\frac{1}{5} - \frac{1}{7} = \frac{(35 \div 5) \times 1 + (35 \div 7) \times 1}{35} = \frac{7-5}{35} = \frac{2}{35}$$

(b) $\frac{7}{8} - \frac{7}{9}$ Common denominator is 72

$$\frac{7}{8} - \frac{7}{9} = \frac{(72 \div 8) \times 7 + (72 \div 9) \times 7}{72} = \frac{63-56}{72} = \frac{7}{72}$$

(c) $4 - \frac{2}{5} = 3 + \frac{5}{5} - \frac{2}{5} = 3\frac{3}{5}$

(d) $3\frac{1}{2} - 1\frac{1}{2} = (3 - 1) + (\frac{1}{2} - \frac{1}{2}) = 2$

(e) $5\frac{3}{4} - 2\frac{2}{3} = (5 - 2) + (\frac{3}{4} - \frac{2}{3}) = 3 + \frac{9-8}{12} = 3\frac{1}{2}$

(f) $1\frac{1}{4} - \frac{2}{3} = 1 + \left(\frac{1}{4} - \frac{2}{3}\right) = 1 + (\frac{3-8}{12}) = \frac{12+3-8}{12} = \frac{7}{12}$

9. (a) Margarita. Now, $\left(\frac{5}{8} - \frac{1}{4}\right)$km $= \frac{5-2}{8}$ km $= \frac{3}{8}$ km.

Margarita by $\frac{3}{8}$ km.

10. (a) Men and children

$$\frac{1}{3} + \frac{1}{4} = \frac{4+3}{12} = \frac{7}{12}$$

(b) Women: $\frac{12}{12} - \frac{7}{12} = \frac{5}{12}$

All forms a whole, $1 = \frac{12}{12}$

(c) Men and women: $\frac{4}{12} + \frac{5}{12} = \frac{9}{12}$

(d) Women + children: $\frac{5}{12} + \frac{3}{12} = \frac{8}{12}$

Topic Area: Area and operations

Unit 5 — **Multiplication and division of decimals**

Background

In this unit learners are introduced to place values up to thousands. Also learners practice writing and giving decimal numbers in words. It should be noted that sometimes we quickly read decimal numbers such as 0.321 as zero point three, two, one and written as three hundred twenty one thousandths. Conversion of tenths, hundredths and thousandths into decimals, recognition of place value and division are all covered. Fractions that can be written with denominators of 10, 100 or 1000 are also converted into decimals. It follow that decimal fractions up to three decimal places are also converted into fractions in this unit.

Content summary

This unit covers several sub topics. These are:

5.1   Decimal fractions

5.2   Place value of decimals

5.3   Comparing decimal numbers

5.4   Conversion of fractions to decimals

5.5   Conversion of decimals to fractions

5.6   Multiplication of decimal fractions

5.7   Division of decimal fractions

5.8   Mixed operations of multiplication and division.

Key unit competence

To be able to multiply, divide and compare decimal numbers up to three decimal places.

Attitudes and values

- Develop personal confidence in the use of decimal numbers.
- Appreciate the importance of decimal fractions in comparing and sharing.

Assessment of attitudes and values

Observe learners multiplying, dividing and comparing decimals up to 3 decimals places.

Relevant cross-cutting issues

In this unit, the following cross-cutting issues have been developed.
- Peace and values education – Have learners work harmoniously in groups.
- Gender education – Have boys and girls work in small groups to do activities. Use question 3 of Practice Activity 5.4 to discuss importance of educating both boys and girls in our society.
- Inclusive education – Have learners of different abilities work in groups without discrimination.

Relevant generic competence

In this unit develop the following generic competence.
- Critical thinking: Develop this by giving closed questions on decimals. Allow learners to give various answers but help them to find the correct answers.
- Creativity and innovation: Develop this by giving open questions on decimals and letting learners give various response that are relevant.
- Co-operation: Have learners interact and work together in group work activities
- Communication skills: use group work to ensure learners communicate well. Allow learners to discuss various problems in group work activities.

Assessment criteria

Learners should be able to accurately multiply, divide and compare decimal numbers up to 3 decimal places.

Notes to the teacher

Some units of measurement can be whole numbers or decimals. For example,
- 1 g can be written as a decimal (0.001 kg)
- 5 dl = 0.5 l
- 15 cm = 0.15 m

Develop the concept decimals using real life examples.

Word list

Reference: Pupil's Book page 102
- Use the word list to develop reading, listening and writing skills. Have learners work in pairs to build their vocabulary using the word list.
- Do the stated task with suitable vocabulary from the lesson.

Content

5.1 Decimal fractions

Number of periods: 3

Reference: Pupil's Book page 85

Knowledge and understanding

The learner will be able to explain the concept of decimal numbers using place value up to 3 decimal places.

Skills

The learner will explain the concept of decimal fractions through examples and read and write decimal numbers in figures and words.

Teaching/Learning materials

Manila cards, scissors, markers, masking tape, pencil, knife, orange, ruler.

Teaching/Learning methods

- Group activities – In small groups work out Activity 5.1, 5.2 and 5.3.
- Demonstration – Show how to get a tenth, hundredth and a thousandth using given materials.
- Discussion – In small groups of different abilities discuss the findings and tips.
- Problem solving – In pairs of different abilities work out Practice Activity 5.1 questions 1 – 4
- Practical Activities – Learners make a cube using wet clay.
- Supervised Practice – Assess their progress.
- Explanation – to explain their observations.

Teaching/Learning preparations

- Provide enough teaching/learning materials in the classroom.
- Organise pupils in small group of mixed abilities and gender.
- Provide the instructions inside the classroom.

Teaching/Learning steps

1. Introduce decimal fractions using Activity 5.1, 5.2 and 5.3.
2. Let learners discuss their findings.
3. Discuss Example 5.1 from Pupil's Book.
4. Let learners note the meaning of $\frac{1}{10}, \frac{1}{100}, \frac{1}{1000}$.
5. Have learners do questions 1 and 2 of Practice Activity 5.1 and supervise their progress, assisting those with learning difficulties accordingly.
6. Give assignment Practice Activity 5.1 question 3 – 5.

Assessment of skills knowledge and understanding

Observe learners' ability to discuss and work out in groups the concept of decimals.

Guidance to the teacher

- Emphasise on practical work through discussion.
- Emphasise that from the decimal point to the right we name the digits from tenth, hundredth and thousandth.
- Encourage the learners to identify that a tenth, a hundredth and a thousandth are part of a whole.
- Give physically handicapped learners more time to complete the task.
- Give remedial work to slow learners, and extension work to fast learners.
- Have visually impaired learners sit in front or at a distance where they can view the board with ease.

Expected answers to Practice Activity 5.1

1. (b)   Zero point eight or eight tenths
    (c)   Zero point zero one
    (d)   0.08, eight hundredths
    (e)   Zero point seven zero six or seven hundred six thousandths.
    (f)   4.023; four point zero two three

2. (a) $\frac{2}{10} = 0.2 =$ two tenths   (b) $\frac{4}{10} = 0.4 =$ four tenths
    (c) $\frac{5}{10} = 0.5 =$ five tenths   (d) $\frac{8}{10} = 0.8 =$ eight tenths

3. (a) $\frac{13}{100} = 0.13$ (b) $\frac{87}{100}$

4. (a)   0.256 – two and fifty six thousandths.
    (b)   2.513 – two and five hundred thirteen thousandths.
    (c)   436.2 – four hundred thirty six and two tenths.
    (e)   0.75 – seventy five hundredths
    (f)   0.4 – four tenths.

5. (a)   0.235   (b)   0.378   (c)   0.06
    (d)   800.007   (e)   4000.02   (f)   6

5.2   Place value of decimals

Number of periods:
Reference: Pupil's Book page 89

Knowledge and understanding

The learner will be able to identify the place value of decimal numbers in figures and words.

Skills

The learner will correctly read, write and identify place values in written decimals.

Teaching/Learning materials

A chart showing the place value of different decimal fractions up to 3 decimal places.

Teaching/Learning Methods

- Discussion – In pairs discuss place values of decimals using Activity 5.4.
- Explanation – In pairs of different abilities, explain the position of each digit using Activity 5.4.
- Supervised activity – Assess their progress as they do Practice Activity 5.2 questions 1 and 2.

Lesson preparation

- Prepare a chart showing the place value of decimals up to 3 digits.
- Group learners in small groups of different ability and gender. The instruction takes place inside the classroom.

Teaching/Learning steps

1. Introduce the lesson by discussing the prepared chart of the place value of decimals up to 3 digits.
2. Let learners discuss the place value of decimals using Activity 5.4.
3. Let learners do Practice Activity 5.2 questions 1 and 2 in small groups. Assess their progress and assist those with learning difficulties by giving vital hints.
4. Challenge fast learners by giving them more challenging tasks.

Assessment of skills, knowledge and understanding

- Observe learners as they identify the place value in written decimals.
- Listen carefully as they present their work.

Guidance to the teacher

- Encourage learners to identify the place values of decimal fractions.
- Emphasise that on the right side of a decimal point, we name the digits, tenths, hundredths and thousandths.

Expected Answers for Practice Activity 5.2

1.

	Decimal number in figures	Place value							
		Thousands	Hundreds	Tens	Ones	Decimal point	Tenths	Hundredths	Thousandths
(a)	0.25				0	.	2	5	
(b)	0.485				0	.	4	5	8
(c)	5.236				5	.	2	3	6
(d)	84.5			8	4	.	5		
(e)	625.01		6	2	5	.	0	1	
(f)	467.2		4	6	7	.	2		
(g)	4 321.036	4	3	2	1	.	0	3	6
(h)	57.3			5	7	.	3		
(i)	0.934				0	.	9	3	4
(j)	5 000.62	5	0	0	0	.	6	2	
(k)	100.423		1	0	0	.	4	2	3

2. (a) tenths   (b) thousandths
   (c) tenths   (d) thousandths
   (e) hundredths

3. (a) tenths   (b) hundredths
   (c) thousandths (d) thousandths
   (e) tenths

4. (a) hundredths   (b) thousandths
   (c) ones   (d) tens
   (e) tenths

5.3 Comparing decimal numbers

Number of periods: 2

Reference: Pupil's Book page 91

Skills

Learners will be able to compare 2 or more decimal numbers using >, < or =.

Teaching/Learning materials

Manila cards, scissors, markers, pencils and masking tape.

Teaching/Learning methods

- Practical activities – learners to measure cut strips of paper of the same size and use them to compare decimal numbers following instruction in Activity 5.5.
- Question and answer – learners to ask questions and debate their answers.
- Discussion – Learners to discuss the findings in small groups of different abilities.
- Explanation – Learners to explain their findings.
- Supervised Activities – Assess learners' progress.

Lesson preparations

- Provide enough material for the activity
- If manila cards are not available use low cost or no cost materials e.g. empty cartons
- Organise pupils in small groups of different ability and gender.
- Instruction is done in the classroom.

Teaching/Learning steps

1. Introduce the lesson using Activity 5.5.
2. Let learners discuss their findings.
3. Discuss Example 5.2 a, b and c from the Pupil's Book.
4. Let learners explain their findings from the number line to wind up the lesson.
5. Have learners do questions 1 and 2 of Practice Activity 5.3.
6. Assess their progress and assist those with learning difficulties.
7. Give assignment, Practice Activity 5.3 questions 3 and 4.

Assessment of skills, knowledge and understanding

Observe learners as they compare decimal numbers using manila strips and a number line.

Guidance to the teacher

- Encourage learners to participate in activities so as to discover the difference between a tenth, a hundredth and a thousandth.

- Encourage learners to explain their findings.
- Let learners discuss Example 5.2 (a), (b) and (c) from the Pupil's Book in their groups and present their findings.
- Group learners with different abilities together in order to assist one another.
- Assign average learners consolidation activity, give remedial activity to slow learners and give more challenging work (extension activity) to gifted and talented learners.
- Provide visually handicapped learners with large print materials.
- Since the lessons involve a lot of practical work let physically handicapped learners be in charge of giving instructions.
- Provide learners with hearing impairments all the details of the lesson in written form using notes, diagrams, models and visual aids.
- Show learners with communication disorders what to do rather than tell them.

Expected Answers for Practice Activity 5.3

1. (a)
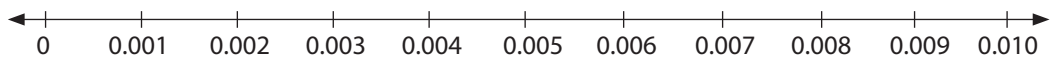
(b)
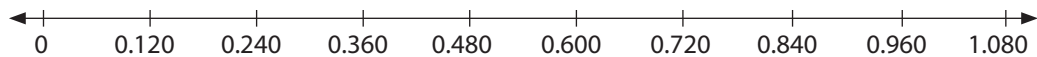
(c)
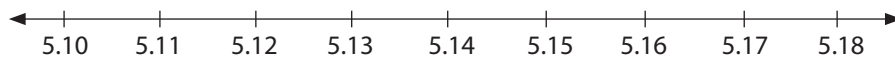
2. (a) $0.005 < 0.007$ (b) $0.003 < 0.008$
   (c) $3.40 > 3.040$ (d) $0.77 = 0.770$
   (e) $0.825 < 0.826$ (f) $0.23 > 0.023$

3. (a) $0.06 < 0.07$ (b) $4.105 > 3.05$
   (c) $0.9 > 0.8$ (d) $0.77 = 0.770$

4. (a) $0.01 < 0.02 < 0.04 < 0.05$
   (b) $0.003 < 0.005 < 0.006 < 0.007$
   (c) $0.252 < 0.436 < 0.452$
   (d) $0.4 < 0.5 < 0.6 < 0.8$

5. (a) $23 \text{ g} = 0.23 \text{ kg}$ (b) $25 \text{ g} = 0.25 \text{ kg}$
   (c) $0.25 \text{ kg} > 0.23 \text{ kg}$; eggs had smaller mass

6. (a) The farmer recorded the highest amount of milk on Wednesday
   (b) 0.23 hl, 0.25 hl, 0.30 hl, 0.34 hl

5.4   Conversion of fractions to decimals

Number of periods: 2 lesson

Reference: Pupil's Book page 93

Knowledge and understanding

Learners will be able to explain how to divide decimal numbers.

Skills

Learner will be able to divide decimal numbers up to 3 decimal places and match fraction to decimals

Teaching/Learning materials

Manila paper, a pair of scissors

Teaching/Learning methods

- Demonstration – Fold papers as instructed in Activity 5.6.
- Discussion – In groups, discuss Examples 5.3 and 5.4.
- Question and answer – In groups of different abilities, work out Practical Activity 5.4 and Examples 5.3 and 5.4.
- Supervised activities – Have learners work out activities as you assess their progress.
- Explanation – Learners explain their findings in Activity 5.6.

Lessons preparations

- Provide all teaching and learning materials for the lesson.
- Organise learners into small group of mixed abilities and gender.
- Let the activity take place inside the classroom.

Teaching/Learning steps

1. Introduce the lesson using Activity 5.6.
2. Let the learners explain their findings in Activity 5.6.
3. Have learners discuss Example 5.3 and 5.4 in their group and give their findings.
4. Give learners some problems to solve from Practice Activity 5.4.
5. Assess their progress and give more hints to learners with learning difficulties.
6. Assign fast learners some more challenging work.

Assessment of skills, knowledge and understanding

Observe learners as they divide decimal numbers up to 3 decimal places to convert fractions to decimals.

Guidance to the teacher

This subtopic involves a lot of division therefore encourage learners to master multiplication skills to assist their division skills.

Expected Answers for Practice Activity 5.4

1. (a) $\frac{5}{10}$ = Five tenths = 0.5
   (b) $\frac{2}{5} = \frac{2}{5} \times \frac{2}{2} = \frac{4}{10}$ = Four tenths = 0.4

   (c) $\frac{6}{25} = \frac{6}{25} \times \frac{4}{4} = \frac{24}{100} = 0.24$
   (d) $\frac{5}{20} = \frac{5}{20} \times \frac{5}{5} = \frac{25}{100} = 0.25$

   (e) $\frac{21}{25} = \frac{21}{25} \times \frac{4}{4} = \frac{84}{100} = 0.84$
   (f) $\frac{8}{1000}$ = eight hundredths = 0.008

2. (a) $\frac{2}{50} = \frac{2}{50} \times \frac{2}{2} = \frac{4}{100} = 0.04$
   (b) $\frac{5}{20} = \frac{5}{20} \times \frac{5}{5} = \frac{25}{100} = 0.25$

   (c) $\frac{3}{4} = \frac{3}{4} \times \frac{25}{25} = \frac{75}{100} = 0.75$
   (d) $\frac{1}{4} = \frac{1}{4} \times \frac{25}{25} = \frac{25}{100} = 0.25$

   (e) $\frac{4}{5} = \frac{4}{5} \times \frac{20}{20} = \frac{80}{100} = 0.8$
   (f) $\frac{25}{10} = 2.5$

   (g) $\frac{3}{8} = 8\overline{)30}^{\,0.375}$ Therefore $\frac{3}{8} = 0.375$

   -24
   60
   -56
   40

3. Match the fractions to decimals.

	Fractions	Decimal
(a)	$\frac{8}{100}$	0.1
(b)	$\frac{8}{1000}$	0.9
(c)	$\frac{1}{10}$	0.008
(d)	$\frac{9}{10}$	0.08
(e)	$\frac{165}{100}$	0.165
(f)	$\frac{165}{1000}$	1.65

4. $1 \div 4 = \frac{1 \times 25}{4 \times 25} = \frac{25}{100} = 0.25$

5.5   Conversion of decimals to fractions

Number of periods: 2 lessons

Reference: Pupil's Book page 96

Knowledge and understanding

Learners will be able to explain how to multiply and divide decimal numbers.

Skills

Learners will be able to carry out multiplication or division of decimal numbers up to 3 decimal places and match fractions to decimals.

Teaching/Learning materials

Manila paper or locally available materials e.g. empty cartons, pair of scissors

Teaching/Learning methods

Discussion – In small groups of different abilities, discuss Activity 5.7.

Question and answer – In small groups of different abilities, solve the problem in Practice Activity 5.5.

Demonstration – Show how to convert decimals to fractions.

Explanation – To explain the tip in their groups.

Supervised Activities – Assess their progress as they convert decimal to fractions. Assist slow learners by pairing them to with quick learners.

Teaching/Learning preparations

- Provide enough teaching learning materials in the classroom.
- Organise pupils in small groups of mixed abilities and gender.
- The activities are done in the classroom.

Teaching/Learning steps

1. Introduce the lesson by allowing pupils to discuss Activity 5.7.
2. Let the learners explain their steps and the tips.
3. Demonstrate how to convert decimals to fractions using Example 5.7 (a).
4. Let the learners discuss Example 5.7 (b) and give their findings.
6. Assign learners Practice Activity 5.5 questions 1 – 3.
7. Assess their progress and assist mentally handicapped learners accordingly.
8. Give question 4 of Practice Activity 5.5, as an assignment.

Assessment of skills, knowledge and understanding

Observe the learners as they convert decimals to fractions.

Guidance to the teacher

- Encourage learners to master multiplication facts to ease division.

- Mentally handicapped learners require a lot of assistance and time. Provide assistance as necessary.
- For question 4 and 5 of Practice Activity 5.5 guide the learners to convert decimals into fractions with common denominators to ease their work.

For example,

Which one is greater?

$\frac{1}{2}$ or 0.06

Steps

Convert 0.006 into a fraction $\frac{6}{100}$.

$\frac{1}{2}$ or $\frac{6}{100}$ (get a common denominator)

Denominator 2 becomes 100 when 2×50.

We express $\frac{1}{2}$ as $\frac{1}{2} = \frac{1}{2} \times \frac{50}{50} = \frac{50}{100}$. Now, $\frac{50}{100} > \frac{6}{100}$

Therefore, $\frac{1}{2}$ is greater than 0.06.

Expected Answers for Practice Activity 5.5

1. (a) $0.75 = \frac{\cancel{75}^{3}}{\cancel{100}_{4}} = \frac{3}{4}$

   (b) $0.455 = \frac{\cancel{455}^{91}}{\cancel{1000}_{200}} = \frac{91}{200}$

   (c) $0.625 = \frac{\cancel{625}^{\cancel{25}^{5}}}{\cancel{1000}_{\cancel{40}_{8}}} = \frac{5}{8}$

   (d) $0.075 = \frac{\cancel{75}^{3}}{\cancel{1000}_{40}} = \frac{3}{40}$

2. (a) $0.41 = \frac{41}{100}$

   (b) $0.009 = \frac{9}{1000}$

   (c) $1.8 = \frac{\cancel{18}^{9}}{\cancel{10}_{5}} = \frac{9}{5} = 1\frac{4}{5}$

   (d) $0.62 = \frac{\cancel{62}^{31}}{\cancel{100}_{50}} = \frac{31}{50}$

   (e) $0.136 = \frac{\cancel{136}^{17}}{\cancel{1000}_{125}} = \frac{17}{125}$

   (f) $0.005 = \frac{\cancel{5}^{1}}{\cancel{1000}_{200}} = \frac{1}{200}$

   (g) $1.45 = 1\frac{45}{100} = 1\frac{\cancel{45}^{9}}{\cancel{100}_{20}} = 1\frac{9}{20}$

   (h) $0.28 = \frac{\cancel{28}^{7}}{\cancel{100}_{25}} = \frac{7}{25}$

3. (a) $0.75 = \frac{75 \div 25}{100 \div 25} = \frac{3}{4}$

   (b) $0.52 = \frac{52 \div 4}{100 \div 4} = \frac{13}{25}$

   (c) $0.5 = \frac{5 \div 5}{10 \div 5} = \frac{1}{2}$

   (d) $0.006 = \frac{6 \div 2}{1000 \div 2} = \frac{3}{500}$

   (e) $0.25 = \frac{\cancel{25}^{1}}{\cancel{100}_{4}} = \frac{1}{4}$

   (f) $2.4 = \frac{24}{10} = 2\frac{\cancel{4}^{2}}{\cancel{10}_{5}} = 2\frac{2}{5}$

   (g) $20.4 = \frac{204}{10} = 20\frac{\cancel{4}^{2}}{\cancel{10}_{5}} = 20\frac{2}{5}$

   (h) $17.125 = 17\frac{\cancel{125}^{\cancel{5}^{1}}}{\cancel{1000}_{\cancel{40}_{8}}} = 17\frac{1}{8}$

4. (a) $\frac{3}{5}$ 0r 0.007, $0.007 = \frac{7}{1000}$, $\frac{3}{5}$ is greater

(b) $\frac{1}{5}$ or 0.75, $0.75 = \frac{75}{100} = \frac{3}{4}$, 0.75 is greater

(c) $\frac{2}{5}$ or 0.25, $0.25 = \frac{25}{100} = \frac{1}{4}$

5. (a) 0.56, $\frac{3}{10} = 0.3$, 0.09. We arrange as: 0.09, $\frac{3}{10}$, 0.56

(b) $\frac{3}{10} = 0.3$, 0.84, 0.25. We arrange as 0.25, $\frac{3}{10}$, 0.84

(c) 0.44, $\frac{1}{4} = 025$, 0.5. We arrange as $\frac{1}{4}$, 0.44, 0.5

6.

Fractions	Decimal
(a) 0.180	$\frac{900}{1000}$
(b) 0.018	$\frac{18}{10}$
(c) 1.8	$\frac{180}{1000}$
(d) 0.900	$\frac{9}{10}$
(e) 0.9	$\frac{9}{100}$
(f) 0.09	$\frac{18}{1000}$

5.6   Multiplication of decimal fractions

Number of periods: 3

Reference: Pupil's Book page 97

Knowledge and understanding

Learners will explain how to multiply decimal numbers up to 3 decimal places.

Skills

Learners will carry out multiplication of decimals numbers up to 3 decimals places correctly.

Teaching/Learning materials

Knife, orange

Teaching/Learning methods

• Discussion – In small groups of different abilities, discuss Activity 5.8.

- Question and answer – solve the problem in Practice Activity 5.6 in pairs of different abilities, in Pupil's Book.
- Supervised Activities – Assess their progress.
- Group work Activities – in groups, work out Example 5.8.
- Demonstration – show the steps followed.

Lesson preparations

- Provide teaching/learning materials.
- Organise pupils in small groups of mixed abilities and gender.
- The activity is done inside the classroom.

Teaching/Learning steps

1. Introduce the lesson using Activity 5.6.
2. Let the learners discuss Example 5.8 in small groups of different abilities.
3. Assign learners questions 1 and 2 to do in small groups of different abilities.
4. Assess their progress. Assign more work for homework.

Assessment of skills, knowledge and understanding

Observe learners as they multiply decimal fractions.

Guidance to the teacher

This lesson requires a lot of practice, therefore give learners enough time to practise.

- Encourage learners in mastery of basic multiplication.
- Encourage slow learners to treat multiplication as repeated addition.

Expected Answers for Practice Activity 5.6

1. (a) $0.06 \times 7 = \frac{6}{100} = \frac{7}{1} = \frac{42}{100} = 0.42$ (b) $2.2 \times 7 = \frac{22}{10} = \frac{7}{1} = \frac{154}{10} = 15.4$

   (c) $3.502 \times 2 = \frac{3502}{1000} = \frac{2}{1} = \frac{7004}{1000} = 7.004$

   (d) $7.04 \times 4 = \frac{704}{100} = \frac{4}{1} = \frac{2816}{100} = 28.16$

   (e) $15.23 \times 8 = \frac{1523}{100} = \frac{8}{1} = \frac{12184}{100} = 121.84$

   (f) $0.105 \times 9 = \frac{105}{1000} = \frac{9}{1} = \frac{945}{1000} = 0.945$

   (g) $2.66 \times 11 = \frac{266}{100} = \frac{11}{1} = \frac{2926}{100} = 29.26$

   (h) $6.35 \times 11 = \frac{635}{100} = \frac{11}{1} = \frac{6985}{100} = 69.85$

   (i) $6.9 \times 33 = \frac{69}{10} = \frac{33}{1} = \frac{2277}{10} = 227.7$

2. (a) $0.2 \times 0.6 = \frac{2}{10} = \frac{6}{10} = \frac{12}{100} = 0.12$

    (b) $0.14 \times 0.2 = \frac{14}{100} = \frac{2}{10} = \frac{28}{1000} = 0.028$

    (c) $1.5 \times 0.02 = \frac{15}{10} = \frac{2}{100} = \frac{30}{1000} = 0.030$

    (d) $0.17 \times 0.3 = \frac{17}{100} = \frac{3}{10} = \frac{51}{1000} = 0.051$

    (e) $0.2 \times 0.04 = \frac{2}{10} = \frac{4}{100} = \frac{8}{1000} = 0.008$

    (f) $1.5 \times 1.2 = \frac{15}{10} = \frac{12}{10} = \frac{180}{100} = 1.80$

    (g) $1.3 \times 3.3 = \frac{13}{10} = \frac{33}{10} = \frac{429}{100} = 4.29$

    (h) $1.3 \times 1.5 = \frac{13}{10} = \frac{15}{10} = \frac{195}{100} = 1.95$

    (i) $0.93 \times 0.7 = \frac{93}{100} = \frac{7}{10} = \frac{651}{1000} = 0.651$

3. (a) $2.25 \times 10 = 22.5$ (b) $0.039 \times 10 = 0.39$ (c) $0.245 \times 10 = 2.45$
    (d) $8.91 \times 10 = 89.1$ (e) $35.4 \times 10 = 354$ (f) $116.7 \times 10 = 1\ 167$
4. (a) $0.089 \times 100 = 8.9$ (b) $2.533 \times 100 = 253.3$ (c) $33.52 \times 100 = 3\ 352$
    (d) $1.485 \times 100 = 148.5$ (e) $4.008 \times 100 = 400.8$ (f) $22.7 \times 100 = 2\ 270$

5. (a) $0.005 \times 1\ 000 = 6$ (b) $4.005 \times 1\ 000 = 4\ 005$
    (c) $21.06 \times 1\ 000 = 21\ 060$ (d) $13.507 \times 1\ 000 = 13\ 507$
    (e) $0.015 \times 1\ 000 = 15$ (f) $0.267 \times 1\ 000 = 267$

6. $5.25 \times 1.5 = \frac{525}{100} \times \frac{15}{10} = \frac{7875}{1000} = 7.875$ km

7. $0.1 \times 9 = \frac{1}{10} \times 9 = \frac{9}{10} = 0.9$ 8. $20 \times 0.5 = \frac{5}{10} = \frac{100}{10} = 10$ loaves

9. $0.3 \times 12 = \frac{3}{10} \times 12 = \frac{36}{10} = 3.6$ litres

5.7   Division of decimal fractions

Number of periods: 3

Reference: Pupil's Book page 99

Knowledge and understanding

Learners will be able to explain division of decimal numbers up to 3 decimal places.

Skills

Learners will be able to carry out division of decimal numbers up to 3 decimal places.

Teaching/Learning materials

- Group activity – Work out Activity 5.9 in discussion groups.
- Discussion – discuss Example 5.7 and 5.8.
- Explanation – explain the tip given after Example 5.7 and 5.8.
- Supervised activities – Assess their progress. Assist the slow learners by giving them more hints.
- Problem solving – in pairs of different abilities, work out the task of Practice Activity 5.7.

Teaching/Learning preparation

- Provide enough teaching/learning material for lesson.
- Organise learners into small groups of different abilities and gender.
- The activity is done inside the classroom.

Teaching/Learning steps

1. Introduce the lesson using Activity 5.9.
2. Let the learners discuss Example 5.7 and 5.8 and share their findings.
3. In their small groups, have learners explain their findings and the tip.
4. Guide learners in doing Practice Activity 5.7 questions 1 – 2.
5. Supervise their progress and assist those with learning difficulties according to their abilities. They can have a discussion with those who have solved the questions.
6. Assign learners Practice Activity 5.7 questions 3 – 5 for homework.

Assessment of skills, knowledge and understanding

Observe learners as they divide decimal fractions up to 3 decimal places.

Additional note to the teacher

- This lesson is a bit challenging to mentally challenged learners, therefore assist them as needed.
- Encourage learners to master basic multiplication facts to ease the division of decimal numbers.
- Encourage learners to change a decimal fraction into a whole number before division.

Expected Answers for Practice Activity 5.7

1. (a) $0.2 \div 5 = \frac{0.2}{5} = 0.04$ (b) $0.44 \div 1.1 = \frac{0.44}{1.1} = \frac{4}{10} = 0.4$

(c) $\dfrac{6.4 \times 10}{1.6 \times 10} = \dfrac{64}{16} = 4$ 　　　(d) $\dfrac{4 \times 100}{0.02 \times 100} = \dfrac{400}{2} = 200$

(e) $\dfrac{1.792 \times 1\,\cancel{000}}{0.07 \times 1\,\cancel{000}} = \dfrac{1792}{70} = 25.6$ 　　　(f) $\dfrac{2.4 \times 1\cancel{00}}{0.08 \times 1\cancel{00}} = \dfrac{240}{8} = 30$

2. (a) $\dfrac{12.22 \times 100}{26 \times 100} = \dfrac{1222}{2600} = 0.47$ 　　　(b) $\dfrac{8.648 \times 1000}{0.23 \times 1000} = \dfrac{8648}{230} = 37.6$

(c) $\dfrac{0.13 \times 100}{0.05 \times 100} = \dfrac{13}{5} = 2.6$

3. $\dfrac{540 \times 10}{3.6 \times 10} = \dfrac{5400}{36} = 150$ dresses 　　　4. $\dfrac{525 \times 100}{0.25 \times 100} = \dfrac{52\,500}{25} = 2\,100$ poles

5. $\dfrac{1}{4} \div 5 = \dfrac{1}{4} \times \dfrac{1}{5} = 0.05$

5.8　Mixed operations of multiplication and division

Number of periods: 2

Reference: Pupil's Book page 101

Knowledge and understanding

Learners will be able to explain how to multiply and divide decimal numbers.

Skills

Learners will be able to carry out multiplication or division of decimal numbers up to 3 decimal place.

Teaching/Learning materials

A chart showing worked examples.

Teaching/Learning methods

- Group activity – In small groups work out Activity 5.10.
- Question and answer – In pairs of different abilities, solve the problem of Practice Activity 5.9.
- Discussion – In small groups of different abilities, discuss Example 5.9.

Teaching/Learning preparations

- Prepare a chart showing steps to follow while carrying out mixed operations.
- Organise learners into small groups of different abilities and gender.
- The activity is done inside the classroom.

Teaching/Learning steps

1. Introduce the lesson by displaying a chart showing steps to follow while carrying out mixed operations.

2. Let learners discuss Activity 5.10 in their groups and explain their findings.

3. Assign learners the problem to solve in pair of Practice Activity 5.8 question 1.

4. Assign learners Practice Activity 5.8 question 2 for homework.

5. Assess different learning abilities in your class. Assign learners accordingly using Additional Activity 5. Let the slow learners do the Remedial Activity, average learners to do the Consolidation Activity and fast learners to do the Extension Activity. Let the Additional Activity be done in small groups then groups will make a class presentation.

Assessment of skills, knowledge and understanding

Observe learners as they carry out multiplication and division of decimal numbers up to 3 decimal places.

Guidance to the teacher

- Encourage the learners in mastering basic multiplication.
- Emphasise that division of decimal fractions comes first before multiplication in a mixed operation activity.

Guidance in Activity 5.10

- Organise learners to discuss the problem.

  Let them make a class presentation from their groups.

  Guidance on the solution is below.

  $0.6 \times (0.2 \div 0.04)$

  $0.2 \div 0.04$ (divide first)

  $\dfrac{0.2 \times 100}{0.04 \times 100} \quad \dfrac{2 \times 10}{4} = \dfrac{\overset{5}{\cancel{20}}}{\underset{1}{\cancel{4}}}$ (simplify)

  $= 0.6 \times 5 = 6 \times 5 = 3.0$ (count the number of decimal places)

  $= 3.0$

Expected Answers of Practice Activity 5.8

1. (a) $\dfrac{0.4 \times 0.2}{0.8} = \dfrac{0.08}{0.8} = \dfrac{\overset{1}{\cancel{0.08}}}{\underset{1}{\cancel{0.8}}} = 0.1$ (b) $\dfrac{0.5 \times 0.2}{0.4} = \dfrac{0.1 \times 10}{0.4 \times 10} = \dfrac{1}{4}$ or 0.25

   (c) $\dfrac{0.04 \times 0.2 \times 10}{0.4 \times 10} = \dfrac{\overset{0.02}{\cancel{0.04}} \times \overset{1}{\cancel{2}}}{\underset{\underset{1}{\cancel{2}}}{\cancel{4}}} = 0.02$ (d) $\dfrac{5 \times 1.6}{0.08 \times 10} = \dfrac{5 \times 16}{0.8} = \dfrac{80}{0.8} = 100$

   (e) $\dfrac{29.14 \times 9.2 \times 10}{0.2 \times 10} = \dfrac{29.14 \times \overset{46}{\cancel{92}}}{\underset{1}{\cancel{2}}} = 1\,340.44$

2. (a) $\dfrac{1.2 \times 1.2 \times 10}{1.2 \times 10} = \dfrac{1.2 \times \cancel{12}^{\,1}}{\cancel{12}_{\,1}} = 1.2$ (b) $\dfrac{4 \times 0.4 \times 10}{0.16 \times 10} = \dfrac{4 \times 4}{1.6} = \dfrac{16}{1.6} = 10$

(c) $\dfrac{0.3 \times 0.03 \times 100}{0.009 \times 100} = \dfrac{0.3 \times 3}{0.9} = \dfrac{0.9}{0.9} = 1$

Additional Activity 5

Remedial Activity

Using the diagram below name the decimal fraction given.

1. $\dfrac{3}{10} = \text{———}$

2. Change 0.01 to a fraction.

3. Write the place value of the following numbers

0 . 2 3 4 → tenths
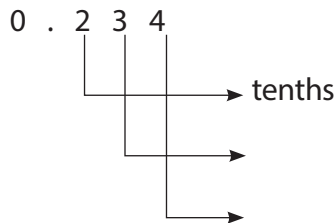
4. Use >,< or = to fill in blank spaces. Discuss your answers.
    (a) 0.002 —— 0.004
    (b) 0.003 —— 0.001

5. Write in figures. Explain your steps.
    Two hundred and sixty seven thousandths.

Consolidation Activity

1. From the diagram below, name the decimal fraction for the shaded part.

    _____
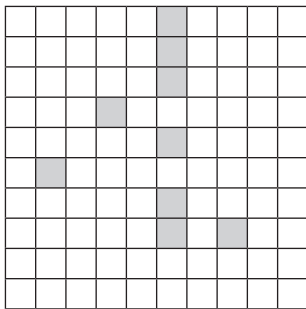
2. Change 0.562 to a fraction.
3. Write the place value of each digit in the following number: 0.325.
4. Use >, < or = fill in blank spaces. Use a number line. Explain your answers.
    (a) 0.523 —— 0.623

(b)   0.62 —— 0.062

5.   Write in words 0.567

Extension Activity

1.   Multiply 0.52 by 0.5. Explain your findings.

2.   Draw a number line and compare the following decimals. Present your findings.

(a)   0.052 —— 0.062   (b)   1.7 —— 0.7

(c)   2.003 —— 5.003

3.   Arrange in order starting from the smallest to the largest: 0.03, 0.95, 0.36

4.   In a competence test, Alice scored $\frac{95}{100}$ in Mathematics and $\frac{87}{100}$ in English.

(a)   Write the marks she scored above as decimal numbers. Then give the place value of digit 5 and 8.

(b)   In the remaining 3 other subjects, Alice got $\frac{90}{100}$ marks in each subject. Find the total score in the 3 subjects as a decimal.

(c)   (i)   What was the total marks for her 5 subjects?

(ii)   Divide your answer by 5 and present your answer as decimal. Interpret your answer.

Expected Answers for Additional Activity 5

Remedial Activity

1.   0.3   2. $0.01 = \frac{1}{100}$

3.   (a)   hundredth   (b)   thousandth

4.   (a)   0.002 < 0.004   (b)   0.003 > 0.001

5.   0.267

Consolidation Activity

1. $\frac{9}{100} = 0.09$ 2. $\frac{\cancel{562}}{\cancel{1000}} = \frac{281}{500}$

3.   3 – tenth; 2 – hundredth; 5 – thousand

4.   (a)   0.523 < 0.623   (b)   0.62 > 0.062

5.   Five hundred and sixty seven thousandths.

Extension Activity

1. $0.52 \times 0.5 = \frac{52}{100} \times \frac{5}{10} = \frac{52 \times 5}{100 \times 10} = \frac{260}{1000} = 0.260$

2.   (a) 0.052 < 0.062   (b) 1.7 > 0.7   (c) 2.003 < 5.003

3.   0.03, 0.36, 0.95

4. (a)
$$100 \overline{\smash)950} \quad 0.95$$
$$\underline{-\ 900}$$
$$500$$
$$\underline{-\ 500}$$
$$...$$
Mathematics – 0.95,

$$100 \overline{\smash)870} \quad 0.87$$
$$\underline{-\ 800}$$
$$700$$
$$\underline{-\ 700}$$
$$...$$
English – 0.87

Place value of 5 is hundredths, 8 is tenths.

(b)
$$100 \overline{\smash)900} \quad 0.9$$
$$\underline{-\ 900}$$
$$...$$
$0.90 \times 3 = 2.70$. This is 270 marks.

(c) (i) $\dfrac{95}{100} + \dfrac{87}{100} + \dfrac{90}{100} \times 3 = \dfrac{452}{100} = 4.52$ or 452 marks

(ii) $\dfrac{452}{100} \div 5 = \dfrac{4.52}{5} = 0.904$. This means 90.4 marks out of 100.

Formative Assessment Support

Set a competence-based task for this unit by following these tips. Ensure that all syllabus unit objectives and key unit competences have been covered. Check the provided assessment criteria from the syllabus. You can then list the requirements to develop the competence-based task for this unit. Use the content summary to check the scope and sequence of items. Learning objectives assist you to know the difficulty of your items

Once you have set a competence-based task activity for this unit administer it to the learners as follows. You can do part of the assessment in one lesson, and the remaining part in another lesson. However you can also do it in a double lesson where all learners will give their responses. It is important to observe learners with physical challenges and assist them to develop and nurture competence. This includes learners with mental challenges, eye sight problems, hearing problems e.t.c. Organise these learners to be included with all learners but facilitate their ability to give expected responses. In spite of their varied learning abilities. It is important that you prepare all learners before formative assessment. This should be gauged towards measuring the level of learners' achievement of competence. Assess both generic and subject based competence per unit. It is important, you assess different abilities of the learners appropriately. As such, give enough time for slow or weak learners to do the task and develop the expected competence. You can modify some items in the task or use real objects to facilitate learners with different abilities to have a positive attitude and achieve the expected competence. Fast learners may assist slow learners if necessary to develop class co-operation.

We have provided a sample of a competence-based task in Pupil's Book page 102 as Revision Activity 5. Use it as a guidance tool for formative assessment of this unit. You are at liberty to improve the material to cater for special needs that are in the classroom and use it to asses your learners. We have provided its expected answers below to ease your work.

Expected Answers for Revision Activity 5

1. $0.23 \times 0.23 = \begin{array}{r} 23 \\ \times\ 23 \\ \hline 169 \\ 46 \\ \hline 0.0529 \end{array} = 0.0529$

2. $\dfrac{3 \times 10}{0.3 \times 10} = \dfrac{\overset{10}{\cancel{30}}}{\underset{1}{\cancel{3}}} = 10$

3. Hundredths

4. $2\overline{\smash{\big)}10}\ \ \begin{array}{c} 0.5 \\ \hline \\ 10 \\ \hline \cdot\,\cdot \end{array} = 0.5$

5. $\dfrac{\cancel{236}}{\cancel{1000}} = \dfrac{\cancel{118}}{\cancel{500}} = \dfrac{59}{250}$

6. 0.85, 0.26, 0.027

7. (a) $0.081 < 0.095$ (b) $0.25 > 0.205$

8. (a) 600.067   (b) 0.72   (c) 1.1

9. $2\overline{\smash{\big)}20}\ \ \begin{array}{c} 0.2 \\ \hline \\ 20 \\ \hline \cdot\,\cdot \end{array} = 0.2$

10. $\dfrac{1.44 \times 10}{1.2 \times 10} = \dfrac{\overset{12}{\cancel{14.4}}}{\underset{1}{\cancel{12}}} = 1.2$

11. $\dfrac{\overset{1}{\cancel{2}}}{\underset{10}{\cancel{20}}} = \dfrac{1}{10}$

12. $\dfrac{0.2 \times 0.5 \times 100}{0.01 \times 100} = \dfrac{2 \times 5}{1} = 10$

13. $\dfrac{5.2 \times 0.2 \times \cancel{100}}{0.05 \times \cancel{100}} = \dfrac{52 \times 2}{5} = \dfrac{104}{5} = 20.8$

14. Thousandths

15. Fifty two and sixty seven thousandths.

Topic Area: Fraction and proportional reasoning

Unit 6 — Application of direct proportions

Background

Scale drawing is formally introduced to learners in this unit. Take learners through this unit carefully as this will form the basis of future work. The first examples, should therefore use things that are very familiar to them or even learners themselves. For example you could use the ratio of boys to girls in a selected group or use various items that learner have to illustrate your point. In the introduction of a new concept it is important that familiar things be used, otherwise the learning will be out of context for the learners and appear irrelevant. The concept of proportion is also developed using examples that are thought to be familiar to the learners. At this introductory stage, clear vivid illustrations and examples are very important.

Content summary

This unit covers several sub-topics. These are:
6.1   Concept of direct proportions
6.2   Ratios and direct proportion
6.3   Problems involving direct proportion

Key unit competences

To be able to apply direct proportions in a practical context.

Attitudes and values

Appreciate the importance of direct proportions in daily life situations.

Assessment of attitudes and values

Learners should be able to apply direct proportions in a practical context and solve problems involving direct proportion.

Relevant cross-cutting issues

In this unit develop the following cross cutting issues:

• Peace and values education – Have learners work and cooperate peacefully in their groups. Illustrate this using Example 6.3 from learners' discussions.

• Gender education – Have boys and girls work in their small groups to do activities. Mix them in various groups so they can interact together. Point out importance of educating both boys and girls from discussion on Practice Activity 6.4 question 1.

- Inclusive education – Have learners of different abilities work in groups without discrimination. Fast learners will work together with slow learners.
- Financial education – Use concept of farming as investment, Practice Activity 6.3 question 9, question 3 for transport business and importance of selling from Practice Activity 6.4 question 3.

Relevant generic competences

This unit develops the following generic competences

- Communication skills: use diagrams or real objects in groups to ensure learners communicate well. Let them discuss activities amongst themselves. This enhances their communication skills.
- Co-operation: have learners interact in group activities freely.
- Creativity and innovation: develop this using open questions about direct proportion. Let learners give various responses that are relevant.
- Critical thinking: develop using closed questions on the application of direct proportion. Allow learners to give various answers but lead them to the correct answers. Use questions that require specific answers.

Notes to the teacher

Definition: Direct proportion and ratio

Two quantities are directly proportional if one quantity decreases, the second quantity decreases in the same way. Similarly, when one quantity increases, the second quantity increases in the same way. In this case, the same way refers to same ratio.

A ratio is a comparison of two quantities. For example, the ratio of boys to girls or the ratio of distance covered on foot to by bus. (Ratios must have the same units. If the quantities are of different kinds, then it is termed as rate e.g. speed). A rate is a type of a ratio.

Word list

Reference: Pupil's Book page 113

Use the word list to develop reading, listening and writing skills. Have learners work in pairs to build their vocabulary using the word list.

Use the stated task with suitable vocabulary words from the lessons throughout the unit.

6.1   Concept of direct proportions

Number of periods: 3

Reference: Pupil's Book page 103

Knowledge and understanding

Learners will be able to explain the concept of direct proportions.

Skills

Learners will be able to apply the knowledge of direct proportions in a practical context.

Teaching/Learning materials

Counters (same size), 1 litre bottle, $\frac{1}{2}$ litre bottle, a cup and a bucket.

Teaching/Learning methods

- Group work activities – work on Activity 6.1 in groups.
- Demonstration – using counters to show the concept of direct proportion.
- Discussion – in groups, discuss the concept of direct proportion.
- Problem solving – in pairs of different learning abilities, work out the given task of Practice Activity 6.1.
- Supervised practical – assess their progress.
- Explanation – learners to explain their observations.

Teaching/Learning preparations

Provide enough counters in the classroom.

Organise pupils in small groups of mixed abilities and gender.

Instruction is done inside the classroom.

Teaching/Learning steps

1. Introduce the concept of direct proportion using Activity 6.1.
2. Have learners carry out the experiment in Activity 6.2.
3. Let learners discuss their findings.
4. Discuss Example 6.1 from the Pupil's Book.
5. Let learners note the rule for direct proportion.
6. Have learners do question 1 of Practice Activity 6.1 and check their progress. Assist slow learners by giving them more hints.
7. Give Practice Activity 6.1 question 2 – 5 as an assignment.

Guidance to the teacher

- Emphasise the increase in quantities in the same way. This forms the basis for the rule of direct proportion. When one quantity increases the other quantity increases in the same way (ratio). It is also true to state that when one quantity decreases the other quantity decreases in the same way.
- Hereby it is important to note that the quantities must relate to each other (Develop this through practical approach).
- Physically handicapped learners can assist in counting.

Assessment of skills, knowledge and understanding

Observe learners as they carry out the experiment to develop the concept of direct proportion.

Expected answers for Practice Activity 6.1

1. $3 \times \frac{1}{2} = 1\frac{1}{2}$ $4 \times \frac{1}{2} = 2$ $5 \times \frac{1}{2} = 2\frac{1}{2}$ $20 \div \frac{1}{2} = 20 \times \frac{2}{1} = 40$

Number of pupils	1	2	3	4	5	40
Quantity of bread eaten	$\frac{1}{2}$	1	$1\frac{1}{2}$	2	$2\frac{1}{2}$	20

2. $8 \div 4 = 2$ $4 \times 4 = 16$ $20 \times 4 = 80$ $100 \div 4 = 25$

$35 \times 4 = 140$

Number of pupils	1	2	4	20	25	34
Exercise books they have	4	8	16	80	100	140

3. $1\,500 l \times 6 = 9\,000\ l$ 4.   2 minutes x 7 = 14 minutes

5. (20 x 10) years = 200 years

6.2   Ratios and direct proportions

Number of periods: 2

Reference: Pupil's Book page 106

Knowledge and understanding

Learners to explain how to work out problems involving direct proportions.

Skills

Learners to calculate numbers involving direct proportions

Teaching/Learning materials

Counters (same size)

Teaching/Learning methods

• Group work activities – working Activity 6.3.

• Discussion – in groups of different abilities, discuss Example 6.2.

• Demonstration – using counters to show the concept of direct proportion.

• Problem solving – in pairs, learners work out the given task of Practice Activity 6.2

• Supervised practical – Assess their progress.

• Explanation – learners to explain their observations.

• Question and answers – answer the questions orally.

Teaching/Learning preparations.

- Provide enough counters in the classroom.
- Organise pupils in small groups of mixed abilities and gender.

Teaching/Learning steps

1. Introduce the ratio and direct proportion using Activity 6.3.
2. Have learners carry out Example 6.2 in pairs of different abilities.
3. Let learners discuss their findings.
4. Discuss Example 6.2 from the Pupil's Book in class.
5. Have learners discuss question 1 and 2 of Practice Activity 6.2 as you assess their progress.
6. Give learners Practice Activity 6.2 questions 3 – 9 as an assignment.

Guidance to the teacher

- Encourage learners to participate in the activities so as to discover the rule of ratio and direct proportion.
- Group learners with different abilities and gender.
- Encourage learners to master multiplication to simplify ratios.
- Assign fast learners more work. Give remedial classes to slow learners and assign more challenging work to fast learners.
- Pair slow learners with fast learners to assist slow learners to do the calculations.

Assessment of skills, knowledge and understanding

Observe learners as they simplify and find the ratio for the given items.

Expected answers for Practice Activity 6.2

1. (a) $8:24 = \dfrac{\overset{1}{\cancel{8}}}{\underset{3}{\cancel{24}}} = 1:3$ (b) $21:24 = \dfrac{\overset{1}{\cancel{21}}}{\underset{2}{\cancel{42}}} = 1:2$

   (c) $9:27 = \dfrac{\overset{1}{\cancel{9}}}{\underset{3}{\cancel{27}}} = 1:3$ (d) $16:12 = \dfrac{\overset{4}{\cancel{16}}}{\underset{3}{\cancel{12}}} = 4:3$

   (e) $18:8 = \dfrac{\overset{9}{\cancel{18}}}{\underset{4}{\cancel{8}}} = 9:4$ (f) $24:16 = \dfrac{\overset{3}{\cancel{24}}}{\underset{2}{\cancel{16}}} = 3:2$

   (g) $8:50 = \dfrac{\overset{4}{\cancel{8}}}{\underset{25}{\cancel{50}}} = 4:25$

2. $28:64 = \dfrac{\overset{7}{\cancel{28}}}{\underset{16}{\cancel{64}}} = 7:16$ 3. $420:560 = \dfrac{\overset{3}{\cancel{420}}}{\underset{4}{\cancel{560}}} = 3:4$

4. $120:360 = \dfrac{\overset{1}{\cancel{120}}}{\underset{3}{\cancel{360}}} = 1:3$ 5. $120:360 = \dfrac{\overset{1}{\cancel{120}}}{\underset{3}{\cancel{360}}} = 1:3$

6. $3:5 = 3 + 5 = 8$ Rice $= \dfrac{5}{\overset{1}{\cancel{8}}} \times \overset{12}{\cancel{96}}$ Rice $= 60$ kg

$$\text{Maize} = \dfrac{3}{\overset{1}{\cancel{8}}} \times \overset{12}{\cancel{96}} \quad \text{Maize} = 36 \text{ kg}$$

7. $56 - 14 = 42$ $14:42 \; \dfrac{\overset{1}{\cancel{14}}}{\underset{3}{\cancel{42}}} = 1:3$ 8. $900:300 \; \dfrac{\overset{3}{\cancel{900}}}{\underset{1}{\cancel{300}}} = 3:1$

9. (a) and (b) – same responses (c)   different responses

6.3   Problems involving direct proportion

Number of periods: 5

Reference: Pupil's Book page 108

Knowledge and understanding

Learners to state where to apply direct proportions in day to day life.

Skills

Learners to be able to solve mathematical problem involving direct proportions

Teaching/Learning materials

A chart

Teaching/Learning methods

- Discussion – In groups of different abilities, discuss Example 6.3.
- Question and answers – in groups of different abilities, learners present their answers to the class for Activities 6.4 and 6.5.
- Problem solving – in pairs of different abilities, work out Example 6.4.
- Supervised practice – in pairs of different abilities, learners work out Practice Activity 6.3 questions 1 – 2, assess their progress.
- Explanation – learners to explain their findings to the class.

Teaching/Learning preparations

- Provide a chart showing the steps to solve problems involving direct proportion.
- Organise pupils in small groups of mixed abilities and gender.
- The activities are done inside the classroom.

Teaching/Learning steps

1. Introduce the lesson by displaying a chart showing the steps in solving problems involving direct proportions
2. Have learners discuss steps to follow in solving problems involving direct proportion.
3. Learners can discuss Example 6.3 and 6.4 in their groups inside the classroom.

4. Learners discuss Practice Activity 6.3 and 6.4 question 1 and 2 in the classroom. Go round assessing their progress. Give slow learners more hints.

5. Let learners state important points they have learnt.

6. Assign the remaining questions as homework to the learners. They should discuss in groups and present their work. Have fast learners discuss questions with slow and average learners.

7. Assess different learning abilities in your class. Assign learners assignment accordingly using Additional Activity 6. Slow learners to do the Remedial Activity, average learners to do the Consolidation Activity and fast learners to do the Extension Activity. Let the Additional Activity be done in small groups, then groups will make a class presentation.

Assessment of skills, knowledge and understanding

Observe learners as they solve problems involving direct proportion.

Assess how well they have understood the concept.

Guidance to the teacher

- It is important to note that, this sub-topic has two activities, two examples and two practice activities. Allocate time as follows:
- Allocate two periods to carry out Activity 6.4, Example 6.3 and Practice Activity 6.3.
- Allocate three periods to carry out Activity 6.5, Example 6.4 and Practice Activity 6.4.
- Introduce this sub-topic with real examples. Let learners vividly understand the concept through real life situations.

Guidance to Activity 6.5

Organise learners to discuss the problems. Let them make a class presentation from their groups. All learners should be able to handle question (a) and its related items.

Guidance on the solution for (b) is below.

Let boys be b, girls be g (in original group)

b:g = 3:5

For new group.

b + 24:g − 24 = 5:3

So $\frac{b}{g} = \frac{3}{5}$ and $\frac{b + 24}{g - 24} = \frac{5}{3}$

We have $b = \frac{3}{5} g$ and $\left(\frac{b + 24}{g - 24} \right) = \frac{5}{3}$

We substitute and solve.

$\frac{\frac{3}{5}g + 24}{g - 24} = \frac{5}{3}$ or $3(\frac{3}{5} g + 24) = 5(g - 24)$

$\frac{9}{5}$g + 72 = 5g – 120

5g – $\frac{9}{5}$g = 72 + 120 or $\frac{25 - 9}{5}$ g = 192

16 g = 5 × 192 or $\frac{5 \times 192}{16}$ = 60

g = 60 girls

b = $\frac{3}{5}$ g = $\frac{3}{5}$ × 60 = 36 boys.

Expected answers for Practice Activity 6.3

1. $\frac{480 \text{ g}}{8}$ = 60 g

2. 12 km x 3 = 36 km

3. $\frac{54}{3}$ x 8 = 144 passengers

4. $\frac{72 \text{ km}}{3 \, l}$ = 24 km per litre. So, $\frac{648 \text{ km}}{24 \text{ km}/l}$ = 27 litres

5. $\frac{64 \text{ litres}}{8 \text{ litres/day}}$ = 8 days

6. $\frac{132}{4}$ = 33 days

7. $\frac{300}{15}$ = 20 kg

8. 100 x 6 = 600 passengers

9. $\frac{\overset{3}{\cancel{30}}}{\underset{1}{\cancel{10}}}$ = 9 tractors

Expected answers for Practice Activity 6.4

1. (a) Total parts in ratio is 3 + 5 = 8

   Number of chickens = $\frac{5}{8}$ x 320 = 200 chickens

   (b) Number of goats = $\frac{3}{8}$ x 320 = 120 goats

   (c) After selling, the farmer had (200 – 80)chickens and (120 – 20)goat. These are 120 chickens and 100 goats. Ratio is 100:120 = $\cancel{100}^{5}:\cancel{120}^{6}$ = 5:6.

2. (a) Initial group had 175 people. Ratio of children to adults was 3:4. So, number of children is $\overset{25}{\cancel{175}}$ x $\frac{3}{\underset{1}{\cancel{7}}}$ (7 is total parts or 3 + 4) = 25 x 3 = 75 children.

   Number of adults is $\overset{25}{\cancel{175}}$ x $\frac{4}{\underset{1}{\cancel{7}}}$ = 100 adults or (175 – 75) = 100 adults.

   (b) In final group, children were 75 – 18 = 57 children.

   (c) In final group, adults were 100 – 5 = 95 adults.

   (d) Initial group had 100 adults. Ratio of men to women was 2:3.

      (i) Number of women is $\frac{3}{(2 + 3)}$ x 100 = $\frac{3}{5}$ x 100 = 60 women.

      (ii) Number of men = (100 – 60)men or $\frac{2}{5}$ x 100 men = 40 men.

3. Let us represent shirts by s and trousers by t. So, s:t = 5:6, or $\frac{s}{t}$: 1 = $\frac{5}{6}$: 1. It follows $\frac{s}{t} = \frac{5}{6}$ or s = $\frac{5}{6}$t.

   Shopkeeper bought 10 more shirts and 10 more trousers.

   It means (s + 10):(t + 10) = 7:8

   $\left(\frac{s + 10}{t + 10}\right)$: 1 = $\frac{7}{8} : \frac{8}{8}$. Follows that $\frac{s + 10}{t + 10} = \frac{7}{8}$.

Cross-multiply to have 8 x (s + 10) = 7 x (t + 10), but we know from initial group that $s = \frac{5}{6}t$.

Hence, $8 \times (\frac{5}{6}t + 10) = 7t + 70$

$\frac{40t}{6} + 80 = 7t + 70$

$40t + 480 = 42t + 420$

$42t - 40t = 480 - 420$

$2t = 60$

$t = 30$.

But $s = \frac{5}{6}t = \frac{5}{6} \times 30 = 25$

(a)   There are 25 shirts   (b)   There were 30 trousers

(c)   3= + 10 = 40 trousers (d)   25 + 10 = 35 shirts

4.   In the morning, (170 + b) boys and (180 + g) girls were b is boys and g is girls.

So $\frac{b}{g} : 1 = \frac{5}{6} : \frac{6}{6}$ or $\frac{b}{g} = \frac{5}{6}$. It means $b = \frac{5}{6}g$.

At midday, (170 + b) boys and (180 + g) girls were there. Their ratio was

(170 + b):(180 + g) = 7:8 or $\left(\frac{170 + b}{180 + g}\right) : 1 = \frac{5}{6} : \frac{8}{8}$

Follows that $\frac{170 + b}{180 + g} = \frac{7}{8}$

Cross-multiply; (170 + b) x 8 = 7 x (180 + g)

1 360 + 8b = 1 260 + 7g (but $b = \frac{5}{6}g$ from above).

1 360 + 8 x $\frac{5}{6}g$ = 1 260 + 7g − $\frac{40}{6}g = \frac{1}{3}g$.

Thus, $\frac{1}{3}g = 100$ or $g = \frac{3}{1} \times 100 = 300$ girls.

Thus, $b = \frac{5}{6}g = \frac{5}{6} \times 300 = 250$ boys initially.

(a)   In the morning, there were 300 girls.

(b)   In the morning, there were 250 boys.

(c)   At midday, there was (250 + 170) boys = 420 boys.

(d)   At midday, there was (300 + 180) girls = 480 girls.

Additional Activity 6

Remedial Activity

1. Complete the table below.

Number of pupils	Counters
👤	⚪ ⚪ 2
👤👤	⚪ ⚪ ⚪ ⚪ 4
👤👤👤	_____

2. Fill in the table below.

Number of pupils	👤	👤👤	👤👤👤
Quantity of cake eaten	◖ $\frac{1}{2}$	◖ + ◖ = 1	◖ ◖ ◖ =

3. Three tractors can dig 5 acres of land in a day. How many tractors are needed to dig 10 acres in a day? Discuss your finding.

Consolidation Activity

1. Complete the table below.

Number of pupils	Counters
👤👤	⚪ ⚪ ⚪ ⚪
👤👤👤	⚪ ⚪ ⚪ ⚪ ⚪ ⚪
👤👤👤👤	_____
👤👤👤👤👤	_____

2. In a scale drawing 1 cm represents 5 km of road. What length is represented by 3 cm? Justify your answer.

3. Express the given ratio in its simplest form 9:27.

4. The weight of 5 boys is 200 kg. What is the weight of one boy? Explain the steps you followed to arrive at your answer.

Extension Activity

1. Fill in the table below. Explain your work.

Number of pupils	1	2	3	4	5	
Quantity of cake eaten	$\frac{1}{4}$	$\frac{1}{2}$	–	–	–	2

2. Dusabimana has 420 oranges and 240 mangoes. Find the ratio of her mangoes to her oranges. Justify your answer.

3. During breakfast 4 loaves of bread are served to 16 children. How many loaves are needed for 64 children? Discuss the steps followed.

4. 120 workers attended community work to clean a river. The ratio of men to women was 3:2.

   (a) How many women were there?

   (b) How many men were there? Discuss your steps.

Expected Answers for Additional Activity 6

Remedial Activity

1. 6   2. $1\frac{1}{2}$ 3. 6 tractors

Consolidation Activity

1. 8, 10   2. 3 x 5 km = 15 km

3. $\overset{1}{\cancel{9}}:\overset{3}{\cancel{27}}$ = 1:3   4. 200 kg ÷ 5 = 40 kg

Extension Activity

1. $\frac{1}{4}$ x 3 = $\frac{3}{4}$, $\frac{1}{4}$ x 4 = 1, $\frac{1}{4}$ x 5 = $1\frac{1}{4}$ and 2 ÷ $\frac{1}{4}$ = 8

Number of pupils	1	2	3	4	5	8
Quantity of cake eaten	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{3}{4}$	1	$1\frac{1}{4}$	2

2. 240 mangoes : 420 oranges = $\overset{4}{\cancel{240}}:\overset{7}{\cancel{420}}$ = 4:7

3. $\dfrac{\overset{4}{\cancel{64}}}{\underset{1}{\cancel{16}}}$ x 4 = 4 x 4 = 16

4. m : w = 3 : 2 (120 workers)

   (a) $\dfrac{\overset{24}{\cancel{120}}}{\underset{1}{\cancel{5}}}$ x 2 = 48   (b) $\dfrac{\overset{24}{\cancel{120}}}{\underset{1}{\cancel{5}}}$ x 3 = 72

Formative Assessment Support

Set a competence-based task for this unit by following these tips. Ensure that all syllabus unit objectives and key unit competences are covered. Check provided assessment criteria from the syllabus to list the requirements to develop the competence-based task for this unit. Content summary is a quick check to scope and sequence of items. Learning objectives assist you to know the difficulty of your items.

Once you have set a competence-based task/activity for this unit, administer it to learners as follows. You can do part of the assessment in one period and the remaining part be done in double lesson, while all learners will give this responses. It is important to assess abilities and confidence of the learners by observation. Learners with physical challenges can be assisted to develop and nurture competence. Such include learners with mental challenges, eyesight problems, hearing etc. Organise them to be included with all learners but facilitate their ability to give expected response. It is important that you prepare all learners before formulative assessment. This should be gauged towards measuring rate of learners achievements of competences. Assess both generic and subject based competences spelt per unit.

It is important, you assess different abilities of the learners appropriately as such give enough time to slow or weak learners to do the task and develop expected competence. You can reset some items in the task or use real objects to facilitate learners with different abilities to proceed well. Motivate all learners with different abilities to have positive attitude and achieve expected competence.
Fast learners may assist slow learners. If necessary to develop a class cooperation.

We have provided a sample of competence-based task in Pupil's Book page 112, Revision Activity 6. Use it as a guidance tool for formative assessment of this unit. You are at liberty to improve the material to cater for all needs levels of thinking so as to assess different learning abilities.

Let it be done after the completion of this unit. Organise learners in small groups of different abilities and gender to discuss the activity. Later, have a class presentation.

We have provided its expected answers below to ease your work.

Expected Answers for Revision Activity 6

1. 60, 90, 120, 6, 210

2. 5 x 30 = 150

3. $\cancel{20}{:}\cancel{100} = 1{:}5$ (where 20 → 1 and 100 → 5)

4. $\cancel{\frac{2}{8}}^{1} \times \cancel{64}^{8} = 16$

5. 10 x 5 = 50 glasses

6. 40 x 2 = 80 x 7 = 560 min ÷ 60 = 9 h 20 min

7. 120 : 240 = 1:2

8. $\frac{\cancel{30}^{10}}{\cancel{90}_{3}} \times \cancel{30}^{1} = 10$ km

9. 4 x 60 = 240 km

10. $\dfrac{160 \text{ min}}{40 \text{ min}} = 4$ compositions

Topic Area: Measurement

Unit 7

Solving problems involving measurements of length, capacity and mass

Background

The standard units for measuring length, capacity and mass were introduced in P4. In this unit learners are introduced to find the concept of number of intervals between objects on open and closed lines. Develop this to allow learners discover why we add 1 to get the number of poles, trees or flowers using examples on an open line in some cases.

Content summary

This unit covers two sub-units. These include:

7.1 Number of intervals between objects on an open line.

7.2 Finding the number of intervals on a closed line.

Key unit competence

To be able to solve problems involving measurement of length, capacity, and mass and calculating the number of intervals.

Attitudes and values

Calculate quickly and accurately problems involving intervals. Appreciate the importance of measurements of length, capacity and mass in daily life situations.

Assessment of attitudes and values

Observe learners solving problems involving measurement of length, capacity and mass and calculating the number of intervals.

Relevant cross-cutting issues

In this unit develop these relevant cross-cutting issues.

- Gender – organise small groups made up of boys and girls let them share responsibilities equally while carrying out the activities

- Peace and values education – encourage learners to work harmoniously in their groups. Provide enough materials to develop this.

- Inclusive education – organise learners to work in small groups. Learners with special needs to be treated with respect and given an equal chance to participate according to their abilities.

- Standardisation culture – When learners are measuring length, capacity and mass, emphasise accuracy and the need for standard units of measurements when handling different substances. Use concept of poles of electricity to reinforce the standardisation culture.

Relevant generic competence

- Cooperation: Have learners interact harmoniously in group work activities.
- Research and problem solving: In small groups let learners take accurate measurements. Also research on different ways to calculate intervals related to real life practices.
- Communication skills: Have learners express themselves through class presentations and discussions.

Assessment criteria

Learners should solve problems involving measurements of length, capacity and mass and calculate number of intervals.

Notes to the teacher

- This unit requires a practical approach rather than a theoretical approach.
- In a straight line (open distance), interval distance can be uniform. Then interval X number of intervals = distance of the straight line.

   Number of trees or posts varies depending on choices applied at ends.
- For a closed distance, number of intervals = number of posts.

Word list

Reference: Pupil's Book page 121

Use the word list to develop reading, listening and writing skills. Have learners work in pairs to build on learners' vocabulary using the word list.

Use the stated task with suitable vocabulary words from the lessons throughout the unit.

Content

7.1 Revision problems on length, capacity and mass

Number of periods: 1

Reference: Pupil's Book page 114

Teaching/Learning methods

- Group work – learners discuss and solve problems.
- Supervised practice – assess learners' progress and correct their responses.

Teaching/Learning steps

1. Have learners work in groups of five. Let them discuss and solve revision problems from Revision work 7.

2. Allow different groups to present their findings as you assess and correct their responses.

Guidance to the teacher

You can organise learners of different abilities to work in the same groups. Different groups can handle different questions on different content.

Expected answers for Revision work 7

1. (a)

km	hm	dam	m	dm	cm	mm
1	0	0	0	0	0	0
	1	0	0	0	0	0
		1	0	0	0	0
			1	0	0	0
				1	0	0
					1	0

1 dm = 100 m

1 km = 1 000 000 mm

1 hm = 100 m

1 dam = 10 m

1 m = 100 cm

1 m = 1 000 mm

(b)

h*l*	da*l*	*l*	d*l*	c*l*	m*l*
1	0	0	0	0	0
	1	0	0	0	0
		1	0	0	0
			1	0	0
				1	0
					1

1 *l* = 1 000 m*l*

1 h*l* = 100 *l*

1 da*l* = 10 *l*

1 *l* = 10 d*l*

1 *l* = 100 c*l*

(c)

kg	hg	dag	g	dg	cg	mg
1	0	0	0	0	0	0
	1	0	0	0	0	0
		1	0	0	0	0
			1	0	0	0
				1	0	0
					1	0

1 g = 10 dg

1 kg = 10 hg

1 dag = 10 g

1 kg = 1 000 000 mg

1 g = 1 000 mg

(d)

t	q		kg
1	0	0	0
	1	0	0
		1	0
			1

1 t = 1 000 kg

2. (a) 10 mm = 1 cm. So, 30 mm = (30 ÷ 10)cm = 3 cm

   (b) 60 ÷ 10 = 6 cm

   (c) 0.7 x 100 000 = 70 000 cm

3. (a) 40 x 10 = 400 mm   (b) 2.4 x 10 = 24 mm

   (c) 0.85 x 1 000 = 850 mm (d) 0.5 x 1 000 000 = 500 000 mm

4. (a) 260 ÷ 100 = 2.6 m   (b) 4 000 ÷ 100 = 40 m

   (c) 6 x 1 000 = 6 000 m   (d) 60 ÷ 100 = 0.6 m

5. (a) 600 ÷ 10 000 = 0.006 km   (b) 360 000 ÷ 1 000 000 = 0.36 km

   (c) 800 ÷ 1 000 = 0.8 km   (d) 14 000 ÷ 100 000 = 0.14 km

6. (a) 10 cm = 1 dm. So, 600 cm = $\frac{600}{10}$ dm = 60 dm

   (b) 100 mm = 1 dm. So, 4 000 mm = $\frac{4\,000}{100}$ dm = 40 dm

   (c) 100 dm = 1 dam. So, 120 dam = 120 x 100 dm = 12 000 dm

   (d) 100 x 6 = 600 dm

   (e) 1 000 dm = 1 dam. So, 2 km = 2 x 10 000 dm = 20 000 dm

7. (a) 100 000 mm = 1 dam. So, 1 000 000 mm = $\frac{1\,000\,000}{100\,000}$ dam = 10 dam

   (b) 10 000 cm = 1 dam.

   (c) 100 m = 1 dam. So, 220 m = $\frac{220}{100}$ = 2 dam

   (d) 100 dam = 1 km. So, 20 km = 20 x 100 = 2 000 dam

8. (a) 10 dam = 1 hm. So, 3 000 dam = $\frac{3\,000}{10}$ hm = 300 hm

   (b) 10 000 cm = 1 hm. So, 12 000 cm = $\frac{12\,000}{10\,000}$ hm = 1.2 hm

   (c) 100 m = 1 hm. So, 1 000 m = $\frac{1\,000}{100}$ hm = 10 hm

   (d) 10 000 dm = 1 hm. So, 10 dm = $\frac{10}{10\,000}$ hm = 0.001 hm

9. (a) 10 d*l* = 1 *l*. So, 30 d*l* = $\frac{30}{10}$ = 3 *l*

   (b) 10 d*l* = 1 *l*. So, 105 d*l* = $\frac{105}{10}$ = 10.5 *l*

   (c) 1 000 m*l* = 1 *l*. So, 1 050 m*l* = $\frac{1\,050}{1\,000}$ = 1.05 *l*

(d) 1 000 ml = 1 l. So, 2 500 ml = $\frac{2\ 500}{1\ 000}$ = 2.5 l

10. (a) $\frac{3\ 450}{1\ 000}$ = 3.45 tonnes   (b) $\frac{2\ 050}{1\ 000}$ = 2.05 tonnes

    (c) $\frac{170\ 000}{1\ 000}$ = 170 tonnes

11. (a) 9 m = 90 dm and 2 m 6 dm 4 cm = (20 + 6 + 0.4)dm = 26.4 dm

    Hence, have 90 dm – 26.4 dm = 63.6 dm

    (b) 1 000 cm = 1 dam. Thus, 27 dam = 27 x 1 000 cm = 27 000 cm

    Number of students $= \dfrac{\overset{300}{\cancel{27\ 000}}}{\underset{1}{\cancel{90}}}$ = 300 strides

12. (a) 100 dag = 1 kg. So, 13.6 dag = $\frac{13.6}{100}$ = 0.136 kg

    $$\begin{array}{r} 0.136 \text{ kg} \\ +\ 4.500 \text{ kg} \\ \hline 4.636 \text{ kg} \end{array}$$ Hence 0.136 kg + 4.5 kg = 4.636 kg

    (b) 10 dal = 1 hl. So, 20 dal = $\frac{20}{10}$ hl = 2 hl.

    4 hl – 2 hl = 2 hl = 2 x 100 l = 200 l

    (c) Converting into hm, we have:

    2 dam 3 m = $\left(\frac{2}{10} + \frac{3}{100}\right)$ hm = (0.2 + 0.03) hm = 0.23 hm.

    Thus, have 0.23 x 5 = 1.15 hm.

7.2   Number of intervals between objects on an open line

Number of periods: 2

Reference: Pupil's Book page 116

Knowledge and understanding

Learners to distinguish between the types of intervals.

Skills

Learners will be able to calculate the number of intervals.

Learners will be able to apply the knowledge of length in solving problems involving intervals.

Teaching/Learning materials

Charts, tape measure, manila cards and glue.

Teaching/Learning methods

- Group work – learners of mixed abilities and gender to measure the length of the major paths in the school compound. Activity 7.1.
- Practical activity – learners to make a 0.9 m stick and use it to mark distances from one point to another. Activity 7.1.
- Problem solving – Count the number of intervals for fixed distances from one point to the other.
- Explanation – In small groups of different abilities, learners explain their findings.
- Supervised practice – assess their accuracy as they measure. Assist slow learners by pairing them to discuss with other learners.

Teaching/Learning preparation

- Provide all required materials for the lesson.
- Organise pupils in small groups of different abilities and gender.
- Mark all the paths to be measured
- This lesson should be done outside the classroom under the supervision of the teacher.

Teaching/Learning steps

1. Introduce the lesson on the number of intervals between objects on an open line using Activity 7.1.
2. Have learners carry out the practical activity in Activity 7.1.
3. Let learners discuss their findings in their small groups outside the classroom.
4. Discuss Example 7.1 from the Pupil's Book.
5. Let learners note the rule for intervals between objects on an open line.
6. Have learners do question 1 – 3 of Practice Activity 7.1 and supervise their progress.
7. Give Practice Activity 7.1 questions 4 – 6 as an assignment.

Assessment of skills, knowledge and understanding

Observe learners as they measure length and count the number of intervals between objects on an open line.

Guidance to the teacher

This sub-unit requires a lot of practical activities and it is important to give learners enough time to measure and count the numbers between intervals of objects on an open line.

Assign physically challenged learners work that is suitable for them for example commanding and recording the number of intervals. Give slow learners more time to complete the task.

Expected answers for Practice Activity 7.1

1. 2 x 1 000 m = 2 000 m. Number of trees $= \dfrac{\text{Distance}}{\text{Interval}} = \dfrac{\overset{1}{\cancel{2}}\,000}{\underset{1}{\cancel{2}}} = 1\,000$ trees

2. 100 dm = 1 dam. So, 5 x 100 = 500 dm. Number of trees $= \dfrac{\text{Distance}}{\text{Interval}} + 1$ =
    $\dfrac{\overset{1}{\cancel{5}}00}{\underset{1}{\cancel{5}}} + 1 = 101$ trees on one side. On both sides, we have 101 x 2 = 202 trees.

3. 16 x 1 000 m = 16 000 m.

    Number of poles $= \dfrac{\text{Distance}}{\text{Interval}} + 1 = \dfrac{16\,00\cancel{0}}{1\cancel{0}} + 1 = 1\,601$ poles

4. (a) $\dfrac{20\text{ m}}{0.5\text{ m}} - 1 = \dfrac{200}{5} - 1 = 39$ plants   (b) 39 x 10 = 390 plants

5. Number of intervals 20 – 1 = 19. Each interval is 2 m. Hence, length of terrace is 19 x 2 m = 38 m

6. Internal length $= \dfrac{\text{Distance}}{\text{Number of intervals}}$. Number of intervals = 21 – 1 = 20 intervals.

    Hence interval length $= \dfrac{30\text{ m}}{20} = 1.5$ m

7. Distance = 3 x 100 000 cm = 300 000 cm.

    Number of flowers $= \left(\dfrac{\text{Distance}}{\text{Interval}} + 1\right) \times 4 = \left(\dfrac{300\,000}{200} + 1\right) \times 4$

    $= (1\,500 + 1) \times 4 = 6\,004$

7.3   Finding the number of intervals on a closed line

Number of periods: 3

Reference: Pupil's Book page 118

Knowledge and understanding

Learners will be able to distinguish between the types of intervals.

Skills

Learners will be able to calculate the number of intervals.

Learners will be able to apply the knowledge of length in solving problems involving intervals.

Teaching/Learning materials

Charts, tape measure, manila cards and glue.

Teaching/Learning methods

•   Group work activities – learners in small groups of mixed abilities and gender to measure a 1 metre long stick.

- Practical activity – in small groups of different abilities, learners make a square and rectangle on the ground. Let the perimeter be 12 m.
- Problem solving – Count the number of intervals on a fixed closed line.
- Explanation – In small groups of different abilities, explain their findings.
- Supervised practice: assess their accuracy as they measure.

Teaching/Learning preparation

- Provide all required materials for the lesson.
- Organise pupils in small groups of different abilities and gender.
- Give clear instructions taking into consideration all the special needs in the classroom.
- This lesson should be done outside the classroom on an open ground under the supervision of the teacher.
- Assign physically handicapped learners with appropriate work for example giving commands and recording findings.

Teaching/Learning steps

1. Introduce the lesson of number of intervals between objects on a closed line using activity 7.2.
2. Let learners carry out the practical activity in Activity 7.2.
3. Let learners discuss their findings in small groups outside the classroom.
4. Discuss Example 7.2 from the Pupil's Book.
5. Let learners discover the rule for intervals between objects on a closed line.
6. Have learners do questions 1 – 3 of Practice Activity 7.2 and supervise their progress.
7. Give Practice Activity 7.2 questions 4 – 6 as an assignment.
8. Assess and identify different learning abilities to administer Additional Activity 7. Assign fast learners the Extension Activity, average learners the Consolidation Activity and the Remedial Activity to slow learners. Let them discuss in their small groups, then present their answers to the class.

Assessment of skills, knowledge and understanding

Observe learners as they measure length and count the number of intervals between objects on a closed line.

Guidance to the teacher

This sub-unit requires a lot of practical activities therefore, be sure to give learners enough time to measure and count the numbers of intervals of objects on a closed line. Assign physically challenged learners suitable activities for example commanding and recording the number of intervals.

Give slow learners more time to complete the task.

Expected answers for Practice Activity 7.2

1. Perimeter = 50 m x 4 = 200 m. Number of poles = $\frac{200}{2}$ = 100 poles

2. $\frac{154}{3.5}$ = 44 poles

3. Perimeter = 2 x (100 m + 125 m) = 450 m.

   Length of interval = $\frac{\text{Distance}}{\text{Number of poles}}$ = $\frac{450}{150}$ = 3 m

4. Length of each interval = $\frac{\text{Distance}}{\text{Number of intervals}}$ = $\frac{\overset{0.2}{\cancel{4.2}} \times 1\,00\cancel{0}\ m}{\underset{1}{\cancel{210}}}$ = 20 m

5. Distance = Number of poles x interval length = 50 x 2.5 m = 125 m

   (125 ÷ 100)dam = 12.5 dam.

6. $\frac{402}{6}$ = 67 trees

Additional Activity 7

Remedial Activity

1. Complete these conversion for length

km	hm	dam	m	dm	cm	mm
1	0	0	0	0	0	0
	1	0	0			

   From table 1 hm = __ m

2. Subtract   5 L 3 dl – 3 L 1 dl = __ L __ dl.

3. A boy's stride is 5 dm long. He walks a distance of 5 dam. Discuss how many strides he takes to cover the distance.

Consolidation Activity

1. Use the table below to convert the following units. Discuss your findings.

km	hm	dam	m	dm	cm	mm
1	0	0	0	0	0	0

   (i)   1 km = __ dm
   (ii)   1 hm = __ cm
   (iii)   1 dam = __ mm

2. How many kg make one tonne?

3. Electric poles are fixed along 10 km of road. The poles are placed 10 m apart from each other. How many poles are fixed on one side of the road. Justify your findings.

4. The diagram below represents a fishing pond. Its circumference is 22 m. Post are fixed at intervals of 2 m apart. How many post are fixed?
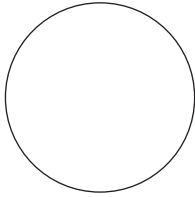
5. 4 hl – 30 dl = ___ l

Extension Activity

1. Work out:

   4.6kg + 12.6 dag = __ kg

2. Change 3 dag into __ g

3. 31 flowers were planted along a straight line in a garden. The flowers were planted at fixed intervals. The distance of the line was 30 m. What was the length of the intervals? Justify your findings.

4. A square plot has 100 m long sides. Poles were fixed at intervals of 2 m. How many poles were used? Explain the steps followed.

5. A rectangular piece of land measuring 90 m by 6 dam was fenced using posts at intervals of 3 m. How many posts were used? Discuss your findings.

Expected answers for Additional Activity

Remedial Activity

1.

km	hm	dam	m	dm	cm	mm
1	0	0	0	0	0	0
	1	0	0	0		

1 hm = 100 m

2. $(5\,l - 3\,l) + (3 - 1)\,dl = 2\,l\ 2\,dl$

3. 5 x 100 = 500 dm = $\dfrac{\overset{1}{\cancel{500}}}{\underset{1}{\cancel{5}}}$ + 1 = 101 strides

Consolidation Activity

1. (i) 100 dm (ii) 10 000 cm (iii) 10 000 mm

2. 1 000 kg

3. Distance = 10 x 1 000 m = 10 000 m.

   Number of poles = $\dfrac{10\ 00\cancel{0}}{1\cancel{0}}$ + 1 = 1 001 poles

4. $\dfrac{22}{2}$ = 11 poles

5. $4 \times 100 = 400\,l$

    $30 \div 10 = 3l$

    $(400 - 3)\,l = 397\,l$

Extension Activity

1. 100 dag = 1 kg

    $\frac{12.6}{100} = 0.126$

    $\begin{array}{r} 4.600 \\ -\ 0.126 \\ \hline 4.726 \end{array} = 4.726$ kg

2. 10 g = 1 dag

3. Number of intervals = 31 − 1 = 30.

    Interval length $= \dfrac{\text{Distance}}{\text{Number of intervals}} = \dfrac{30\ \text{m}}{30} = 1$ m

4. Perimeter = 100 m x 4 = 400 m. Number of poles $= \dfrac{400}{2} = 200$ poles

5. 10 m = 1 dam

    6 x 10 = 60 m

    Distance = (90 + 90 + 60 + 60)m = 300 m

    Posts $= \dfrac{300}{3} = 100$ posts.

Formative Assessment Support

Set competence-based task for this unit by following these tips. Ensure that all syllabus unit objectives and key unit competences are covered. Check provided assessment criteria from the syllabus. You can then, list the requirement to develop the competence-based task for this unit. Content summary is a quick check to scope and sequence of items learning objectives assist you know the difficulty of your items.

Once you have set a competence-based task/activity for this unit, administer to learners as follows. You can have part of the assessment done in one period and the remaining part be done in another lesson. However, you can have it done in double lesson, where all learners will give their responses. It is important to assess abilities and confidence of the learners by observation. Learners with physical challenges can be assisted to develop and nurture competence. Such include learners with mental challenges, eyesight problems, hearing etc. Organise them to be included with all learners but facilitate their ability to give expected responses in spite of their varied learning abilities. It is important that you prepare all learners before formative assessment. This should be gauged towards measuring rate of learners achievement of competence. Assess both generic and subject based competences spelt per unit.

It is important, you assess different abilities of the learners appropriately as such give enough time to slow or weak learners to do the task and develop expected competence you can re-set same items in the task or use real objects to facilitate learners with different abilities to proceed well. Motivate all learners with different abilities to have positive attitude and achieve expected competence. Fast learners may assist slow learners.

We have provided a sample of competence-based task in Pupil's Book page 120. Revision Activity 7. Use it as a guidance tool for formative assessment of this unit. You are at liberty to improve the material by using locally available materials to cater for all needs in the class and use it to assess your learners. We have provided, its expected answers below to ease your work.

Expected answers for Revision Activity 7

1. (a) Closed   (b) Open

   Accept reasonable explanations.

2. (i) $\dfrac{25}{1\,000} = 0.025$ hm   (ii) $\dfrac{300}{100\,000} = 0.03$ dam

   (iii) $3.45 \times 1\,000 = 3\,450$ kg   (iv) $\dfrac{30}{10} = 3\,l$

3. $1\,000$ cm $= 1$ dam. So, $80 \times 1\,000 = 80\,000$

   $\dfrac{80\,000}{80} + 1 = 1\,001$ strides

4. 720

5. 12 dam $\times 10 = 120$ m. Interval length $= \dfrac{120\text{ m}}{40} = 3$ metres

6. 10 m $= 1$ dam

   $40 \times 10 = 40$ m

   Distance $= (80 + 80 + 40 + 40)$m $= 240$ m

   Number of posts $= \dfrac{240\text{ m}}{3} = 80$ posts.

7. Distance $=$ interval length $\times$ number of intervals $= 5$ m $\times (7 - 1) = 30$ m

8. Distance $=$ Interval length $\times$ number of intervals $= 4$ m $\times 75 = 280$ m

Topic Area: Measurements

Unit 8

Solving problems involving time intervals

Background

The concept of hours, minutes and seconds was introduced in P4. In this unit learners are introduced to the conversion of units of time, finding time intervals and adding and subtracting time. Use practical activities to help learners develop this concept. The learners' concept of the start and end of the day differs from the one they get introduced to. Therefore help the learners to understand the difference between a.m. and p.m. in order to calculate the number of time intervals correctly.

Content summary

This unit covers several sub-topics. They include:

8.1   Converting units of time

  (a)   converting hours into minutes

  (b)   converting minutes into hours

  (c)   converting hours into seconds

8.2   Changing days into hours

8.3   Changing hours into days

8.4   Finding time intervals

8.5   Addition involving time

8.6   Subtraction involving time

Key unit competence

To be able to solve real life problems that involve finding time interval and conversion of units.

Attitudes and values

Be confident and accurate when working with problems involving time.

Assessment criteria

Learners should solve real life problems that involve finding time interval and the conversion of units.

Relevant cross-cutting issues

In this unit, develop the following cross-cutting issues.

- Gender education: have boys and girls work in small groups to do activities. Mix boys and girls so they can interact.
- Inclusive education: have learners of different abilities and special needs work in groups without discrimination.
- Peace and values education: have learners work peacefully in their groups. Emphasise using tourism as investment that tourists come when there is peace (Practice Activity 8.5, question 4).
- Environment and sustainability: allow learners to discuss question 6 Practice Activity 8.5 on importance of conserving environment by planting trees. This is one way that we will have rains and have sustainable food supply programs e.g. compulsory kitchen gardens per household.

Relevant generic competence

In this unit, develop the following generic competences.
- Communication skills – use real objects in groups to enhance learners' communication.
- Cooperation – have learners interact freely in group activities.
- Research and problem solving – by working out time interval problems, learners develop sense of research and problem solving skills.

Notes to the teacher

Conversion of units of time are as follows:
- 1 000 years = 1 millennium
- 100 years = 1 century
- 10 years = 1 decade
- 1 year = 365 or 366 days
- 1 year = 12 months
- 1 month = 4 weeks
- 1 week = 7 days
- 1 day = 24 hours
- 1 hour = 60 minutes
- 1 minute = 60 seconds
- Leap years have 366 days because February has 29 days rather than 28 days.

Duration is the length of time between the start time and end time.

Word list

Reference: Pupil's Book page 135

Use the word list to develop reading, listening and writing skills. Have learners work in pairs to build their vocabulary using the word list.

Use the stated task with suitable vocabulary words from the lessons throughout the unit.

Content

8.1   Converting units of time

Converting hours into minutes

Number of periods: 2

Reference: Pupil's Book page 122

Knowledge and understanding

Learners will be able to:
- Explain the various units of time.
- State the units used in time.

Skills

Learners will be able to convert measurements of time.

Teaching/Learning materials

A real wall clock or an improvised clock face.

Teaching/Learning methods

- Group work activities – work on Activity 8.1 in groups; using a clock face.
- Demonstration – show conversion of hours into minutes.
- Problem solving – solve the problems of Practice Activity 8.1 questions 1 – 6.
- Explanation – explain their findings in groups and the tip.
- Supervised practice – assess their progress as you assist those with learning difficulties by giving them more hints.
- Question and answers – answer questions asked in the activities.

Teaching/Learning preparations

- Provide a real clock face or an improvised clock face.
- Organise learners in small groups of mixed abilities and gender.
- Let the activities be carried out inside the classroom.

Teaching/Learning steps

1. Introduce the lesson by letting learners explain the units of time and their relationship. Use a clock face.
2. Have learners discuss Activity 8.1 and Example 8.1 in small groups.
3. Let learners presents their findings regarding the conversion of hours into minutes in the classroom and explain the tip.
4. Assign group of learners discussion problems from Practice Activity 8.1 questions 1 – 6 as classwork. Assess their progress and assist those with learning difficulties by organising them to discuss with other learners.

5. Have questions 7 – 10 from Practice Activity 8.1 as homework. Learners can do it as individual work.

Assessment of skills, knowledge and understanding

Observe learners as they convert hours into minutes.

Guidance to the teacher

Emphasise these units of time: hour (h), minute (min) and seconds (s)

And their correction to each other as stated below:

1 hour = 60 minutes = 3 600 seconds

1 min = 60 seconds

This lesson requires conversion of hours into minutes. Slow learners can treat multiplication as repeated addition. For example,

Convert 6 hours into minutes.

1 hour = 60 minutes

6 h = 60 + 60 + 60 + 60 + 60 + 60 = 360 minutes

$= 6 \times 60$

Expected answers for Practice Activity 8.1

1. Since 1 h = 60 min,

then 2 h = (2×60) min = 120 min

2. 1 h = 60 min.

So $\frac{1}{2}$ h = 30 min

Hence, $6\frac{1}{2}$ h = (6×60) min + $(\frac{1}{2} \times 60)$ min

$= (360 + 30)$ min = 390 min

3. Since 1 h = 60 min,

then 14 h = (14×60) min = 840 min

4. Since 1 h = 60 min,

then 5 h = (5×60) min = 300 min

5. Since 1 h = 60 min,

then 12 h = (12×60) = 720 min

6. Since 1 h = 60 min,

then 22 h = (22×60) min = 1 320 min

7. Since 1 h = 60 min,

then 2 h = (2×60)min = 120 min

8. From A – B took $5\frac{1}{4}$ h

Now 1 h = 60 min.

So, 5 h = (5×60) min = 300 min

• $\frac{1}{4}$ h = $\frac{1}{4} \times 60$ min = 15 min

Thus, $5\frac{1}{4}$ h = 300 min + 15 min = 315 min

9. Time = $3\frac{1}{2}$ h

• 1 h = 60 min

• 3 h = 3×60 min = 180 min

• $\frac{1}{2}$ h = $\frac{1}{2} \times 60$ min = 30 min

Thus, $3\frac{1}{2}$ h = 180 min + 30 min = 210 min

10. Since 1 h = 60 min, then, 6 h = 6×60 min = 360 min

8.2 Converting minutes into hours

Number of periods: 2

Reference: Pupil's Book page 123

Knowledge and understanding

Learners will be able to:
- Explain the various units of time
- State the units used in time measurement

Skills

Learners will be able to convert measurements of time.

Teaching/Learning materials

A real clock face or an improvised clock face.

Teaching/Learning methods

- Group work activities – work on Activity 8.2 in groups; using a clock face.
- Demonstration – show conversion of minutes to hours.
- Problem solving – in pairs of different abilities, work out Practice Activity 8.2 questions 1 and 2.
- Explanation – explain their findings in groups and the tip.
- Supervised practice – check the pupils work as you assist slow learners by giving them some hints.
- Discussion – discuss questions assigned from Practice Activity 8.2 in their groups.

Teaching/Learning preparations

- Provide a real clock face or an improvised clock face for the lesson.
- Organise learners in small groups of mixed abilities and gender.
- The activities are carried out inside the classroom.

Teaching/Learning steps

1. Introduce the lesson by letting learners explain the units of time and their relationship using a clock face.
2. Have learners discuss Activity 8.2 in their groups.
3. Learners present their findings to the class explaining the steps they have followed.
4. Learners to discuss Example 8.3 from Pupil's Book as a class.
5. Let learners note the tip and explain it.
6. Have learners solve Practice Activity 8.2 questions 1 – 3.
7. Assess their progress and assist those with learning difficulties.
8. Give Practice Activity 8.2 questions 4 and 5 as homework.

Assessment of skills, knowledge and understanding

Observe learners as they convert minutes into days.

Guidance to the teacher

- Emphasise that 1 hour is bigger than 1 minute as 1 hour = 60 minutes
- Guide mentally challenged learners.
- Give fast, gifted and talented learners extra challenging work.
- Assign different tasks in the classroom according to the different special needs and abilities in the classroom.

Expected answers for Practice Activity 8.2

1. (a) 60 min = 1 h

   120 min = ___ h

   So, 120 min = $\left(\frac{120 \times 1}{60}\right)$ h = 2 h

   (b) Since 60 min = 1 h,

   360 min = $\left(\frac{360 \times 1}{60}\right)$ h = 6 h

   (c) 60 min = 1 h

   840 min = ___ h

   840 min = $\left(\frac{840 \times 1}{60}\right)$ h = 14 h

   (d) Since 60 min = 1 h,

   420 min = ___ h

   420 min = $\left(\frac{420 \times 1}{60}\right)$ h = 7 h

   (e) Since 1 h = 60 min

   240 min = ___ h

   240 min = $\left(\frac{240 \times 1}{60}\right)$ h = 4 h

   (f) Since 60 min = 1 h

   720 min = ___ h

   720 min = $\left(\frac{720 \times 1}{60}\right)$ h = 12 h

2. (a) Since 1 h = 60 min,

   72 min = 72 ÷ 60 = 1 h 2 min

   (b) Since 1 h = 60 min

   130 min = $\frac{130 \times 1}{60}$ h = $\frac{13}{6}$ h = $2\frac{1}{6}$ h

   $\frac{1}{6} \times 60 = 10$ min

   Hence, $2\frac{1}{6}$ h = 2 h 10 min

   (c) 1 h = 60 min

   90 min = $\frac{90 \times 1}{60}$ h = $\frac{9}{6}$ h = $1\frac{3}{6}$ h

   $\frac{3}{6} \times 60 = 30$ min

   Hence, 90 min = 1 h 30 min

   (d) 1 h = 60 min

   61 min = $\frac{61 \times 1}{60}$ h = $\frac{61}{60}$ h = $1\frac{1}{60}$ h

   = 1 h 1 min

   (e) 1 h = 60 min

   190 min = $\frac{190 \times 1}{60}$ h = $\frac{19}{6}$ h = $3\frac{1}{6}$ h

   $\frac{1}{6} \times 60 = 10$ min

   Hence 190 min = 3 h 10 min

   (f) 1 h = 60 min

   320 min = $\frac{320 \times 1}{60}$ h = $\frac{32}{6}$ h = $5\frac{1}{3}$ h

   $\frac{1}{3} \times 60 = 20$ min

   Hence 320 min = 5 h 20 min

3. 1 h = 60 min

   100 min = $\frac{100 \times 1}{60}$ h = $\frac{10}{6}$ h = $1\frac{2}{3}$ h

   $\frac{2}{3} \times 60 = 40$ min

   Thus, 100 min = 1 h 40 min

4. 1 h = 60 min

$425 \text{ min} = \frac{425 \times 1}{60} = \frac{85}{12} = 7\frac{1}{12}$

$7 \text{ h} + (\frac{1}{12} \times 60) = 7 \text{ h } 15 \text{ min}$

5. 1 h = 60 min

$725 \text{ min} = \frac{725 \times 1}{60} = \frac{145}{12} = 12\frac{1}{12}$

$\frac{1}{12} \times 60 = 5 \text{ min}$

$= 12 \text{ h } 5 \text{ min}$

8.3 Converting hours into seconds

Number of periods: 2

Reference: Pupil's Book page 124

Knowledge and understanding

Learners will be able to:
- State the various units of time.
- State the units used in time measurement.

Skills

Learners will be able to convert the measurements of time.

Teaching/Learning materials

A real wall clock or an improvised clock face.

Teaching/Learning methods

- Discussion – in small groups, discuss Practice Activity 8.3 assigned questions.
- Explanation – learners to explain their findings in groups and the tip.
- Demonstration – show steps to be followed.
- Group work activities – discussing Activity 8.3 in groups of different learning abilities using a clock face.
- Supervised practice – assess learners' progress. Then pair slow learners with fast learners to discuss concepts in groups.

Teaching/Learning preparations

- Provide a real clock face or an improvised clock face.
- Organise learners in small groups of mixed abilities and gender.

Teaching/Learning steps

1. Introduce the lesson by using a clock to show the learners the hour hand, the minute hand then the second hand. Let the learners relate these items to the information in the stated Tip that follows the activity.
2. Let the learners discuss Example 8.4 from the Pupil's Book as a class.
3. Give more similar examples involving conversion.
4. Let learners do Practice Activity 8.3 questions 1 – 3 as classwork discussion activity.

5. Assess their progress and assist those with learning difficulties.
6. Assign Practice Activity 8.3 questions 4 – 6 to learners.

Assessment of skills, knowledge and understanding

Observe learners as they convert hours into seconds.

Guidance to the teacher

- Emphasise that a clock face has an hour hand, a minute hand and a second hand. The second hand completes one turn round the clock in one minute.

    1 minute = 60 seconds

- Give learners appropriate task according to the abilities.

Expected answers for Practice Activity 8.3

1. (a) 1 h = 60 min
   1 min = 60 s
   - 1 h = (60 × 60)s = 3 600 s
   So $\frac{1}{2}$ h = ($\frac{1}{2}$ × 3 600)s = 1 800 s
   Hence, 1$\frac{1}{2}$ h = 3 600 s + 1 800 s
                = 5 400 s

   (b) 1 h = 3 600 s
   5 h = 5 × 3 600 s = 18 000 s

   (c) 1 h = 3 600 s
   10 h = 10 × 3 600 s = 36 000 s
   $\frac{1}{4}$ h = $\frac{1}{4}$ × 3 600 s = 900 s
   Thus, 10$\frac{1}{4}$ h = (36 000 + 900) s = 36 900 s

2. (a) 1 h = 3 600 s
   So, 3 h = 3 × 3 600 s
            = 10 800 s

   (b) 1 h = 3 600 s
   So, 12 h = 12 × 3 600 s
            = 43 200 s

   (c) 1 h = 3 600 s
   2$\frac{3}{4}$ h = _____ s
   2 × 3 600 s = 7 200 s
   $\frac{3}{4}$ × 3 600 s = 2 700 s
   Thus, 2$\frac{3}{4}$ h = (7 200 + 2 700) s = 9 900 s

3. 1 h = 3 600 s
   10 h = _____ s
   10 × 3 600 s = 36 000 s
   Adding 30 s, we have;
   36 000 s + 30 s = 36 030 s

4. 6 × 3 600 s = 21 600 s.
   Adding 57 s, we have;
   21 600 s + 57 s = 21 657 s

5. 1 h = 3 600 s
   2 h = 2 × 3 600 = 7 200 s

6. $3\frac{1}{2}$ h

   $3 \times 3\,600$ s = 10 800 s

   $\frac{1}{2} \times 3\,600$ s = 1 800 s

   Thus, $3\frac{1}{2}$ h = 10 800 s + 1 800 s = 12 600 s

8.4   Changing days into hours

Number of periods: 2

Reference: Pupil's Book page 126

Knowledge and understanding

Learners will be able to describe how to solve mathematical problems.

Skills

Learners will be able to convert measurements of time.

Teaching/Learning materials

A real wall clock or an improvised clock face.

Teaching/Learning methods

- Practical activity – to count the number of hours in Activity 8.4.
- Group activities – in small group of mixed abilities, discuss Activity 8.4.
- Explanation – to explain their findings and explain the tip.
- Question and answers – to do Practice Activity 8.4 questions 1 – 5.
- Supervised activity – assess their progress and assist where necessary.
- Discussion – discuss Example 8.4.

Teaching/Learning preparations

- Provide all materials required for the lesson.
- Organise learners into small groups of different abilities and gender.
- Instruction takes place inside the classroom.

Teaching/Learning steps

1. Introduce the lesson using Activity 8.4.
2. Let the learners discuss Example 8.4.
3. Let learners explain their findings and the tips.
4. Assign learners Practice Activity 8.4 questions 1 (a – h) for class discussion.
5. Assess their progress and assist those with learning difficulties.
6. Have learners present their findings to wind up the lesson.
7. Assign learners Practice Activity 8.4 questions 2 – 5 as homework.

Assessment of skills, knowledge and understanding

Observe learners as they convert days into hours.

Guidance to the teacher

- Use real life situations that will help learners to change days into hours.
- Give learners tasks according to their learning abilities.

Expected answers for Practice Activity 8.4

1. (a) 1 day = 24 h

    10 days = _____ h

    So, 24 × 10 = 240 h

(b) 1 day = 24 h

    15 days = _____ h

    24 × 15 = 360 h

(c) 1 day = 24 h

    6 days = _____ h

    So, 24 × 6 = 144 h

(d) 1 day = 24 h

    4 days = _____ h

    So, 4 × 24 = 96 h

(e) 1 day = 24 h

    11 days = _____ h

    So, 11 × 24 = 264 h

(f) 1 day = 24 h

    13 days = _____ h

    24 × 13 = 312 h

(g) 1 day = 24 h

    $11\frac{1}{2}$ days _____ h

    Then 11 × 24 = 264 h

    $\frac{1}{2}$ × 24 = 12 h

    So, $11\frac{1}{2}$ days = 264 h + 12 h = 276 h

(h) 1 day = 24 h

    28 days = _____ h

    28 × 24 = 672 h

2. 1 day = 24 h

    14 days = _____ h

    14 × 24 = 336 h

3. 1 day = 24 h

    $5\frac{1}{2}$ day = _____ h

    5 × 24 = 120 h

    $\frac{1}{2}$ × 24 = 12 h

    So, $5\frac{1}{2}$ days = 120 + 12 = 132 h

4. 1 day = 24 h

    $20\frac{1}{2}$ days = _____ h

    24 × 20 = 480 h

    $\frac{1}{2}$ × 24 = 12 h

    So, $20\frac{1}{2}$ days = 480 + 12 = 492 h

5. 1 week = 7 days

    1 day = 24 h

    7 days = _____ h

    So, 7 × 24 = 168 h

8.5 Changing hours into days

Number of periods: 2

Reference: Pupil's Book page 127

Knowledge and understanding

Learners will be able to describe how to solve mathematical problems.

Skills

Learners will be able to convert measurements of time.

Teaching/Learning materials

A real wall clock or an improvised clock face.

Teaching/Learning methods

- Practical activity – to count the number of hours in Activity 8.4.
- Group work activities – in small groups discuss Activity 8.5.
- Explanation – to explain their findings and explain the tip.
- Question and answers – to do Practice Activity 8.5 questions 1 – 2.
- Supervised practice – mark the learners' work while assisting those with learning difficulties by allowing fast learners to help explain the steps.
- Discussion – discuss in small groups of different abilities Example 8.4.

Teaching/Learning preparations

- Provide a real clock face or an improvised clock face.
- Organise learners into small groups of different abilities and gender.
- Let learners carry out the activities inside the classroom.

Teaching/Learning steps

1. Introduce the lesson using Activity 8.5.
2. Have learners discuss Example 8.5 in their small groups.
3. Have learners explain their findings and the tips.
4. Assign learners questions 1 – 2 of Practice Activity 8.5.
5. Assess their progress while assisting learners with learning difficulties.
6. Have learners presenting their findings to wind up the lesson.
7. Assign learners Practice Activity 8.5 questions 3 – 6.

Assessment of skills, knowledge and understanding

Observe learners as they convert hours into days.

Guidance to the teacher

- Emphasise that when changing hours to days, one needs to divide the number of given hours by 24 hours.

  1 day = 24 hours
- Encourage learners to master basic multiplication.
- Mentally challenged learners require more time and assistance, be sure to give them enough time and assistance.

- Assign fast, gifted and talented learners extra challenging work.

Expected answers for Practice Activity 8.5

1. (a) 1 day = h

   _____ = 120 h

   $\dfrac{120}{24}$ days = 5 days

(b) 1 day = 24 h

   _____ = 216 h

   $\dfrac{216}{24}$ days = 9 days

(c) 1 day = 24 h

   _____ = 720 h

   $\dfrac{720}{24}$ days = 30 days

(d) 1 day = 24 h

   _____ = 432 h

   $\left(\dfrac{432}{24}\right)$ days = 18 days

2. (a) 1 day = 24 h

   _____ = 571 h

$$\left(\dfrac{571}{24}\right) = 24\overline{)571\text{ h}} \quad \begin{array}{c} 23 \text{ days} \end{array}$$
$$\begin{array}{r} -\ 48\text{ h} \\ \hline 91\text{ h} \\ -72\text{ h} \\ \hline 19\text{ h} \end{array} = 23 \text{ days } 19 \text{ h}$$

(b) 1 day = 24 h

   _____ = 612

$$\dfrac{612}{24} = 24\overline{)612\text{ h}} \quad \begin{array}{c} 25 \text{ days} \end{array}$$
$$\begin{array}{r} -\ 48\text{ h} \\ \hline 132\text{ h} \\ -120\text{ h} \\ \hline 12\text{ h} \end{array} = 25 \text{ days } 12 \text{ h}$$

(c) 1 day = 24 h

   _____ = 520 h

$$\dfrac{520}{24} = 24\overline{)520\text{ h}} \quad \begin{array}{c} 21 \text{ days} \end{array}$$
$$\begin{array}{r} -\ 48\text{ h} \\ \hline 40\text{ h} \\ -24\text{ h} \\ \hline 16\text{ h} \end{array} = 21 \text{ days } 16 \text{ h}$$

(d) 1 day = 24 h

So, 192 h = (192 ÷ 24) days

    = 8 days

(e) 24 h = 1 day

So, 242 h = (242 ÷ 24) days

$$24\overline{)242\text{ h}} \quad \begin{array}{c} 8 \text{ days} \end{array}$$
$$\begin{array}{r} -\ 24\text{ h} \\ \hline 2\text{ h} \end{array}$$

Hence, 242 h = 10 days 2 h

3. 24 h = 1 day

So, 312 h = (312 ÷ 24) days

$$24\overline{)312\text{ h}} \quad \begin{array}{c} 13 \text{ days} \end{array}$$
$$\begin{array}{r} -\ 24\text{ h} \\ \hline 72\text{ h} \\ -72\text{ h} \\ \hline 0 \end{array}$$

Hence, 312 h = 13 days

4. 24 h = 1 day

    So, 249 h = (249 ÷ 24) days

    $$\begin{array}{r} 10 \text{ days} \\ 24 \overline{\smash{\big)}\ 249 \text{ h}} \\ - \underline{24 \text{ h}} \\ 9 \text{ h} \end{array}$$

    Hence, 249 h = 24 days 9 h

5. 24 h = 1 day

    So, 144 h = (144 ÷ 24) days

    = 6 days

6. 1 day = 24 h

    So, 6 760 h = (6 760 ÷ 24) days

    $$\begin{array}{r} 281 \text{ days} \\ 24 \overline{\smash{\big)}\ 6760 \text{ h}} \\ - \underline{48 \text{ h}} \\ 196 \text{ h} \\ - \underline{196 \text{ h}} \\ 40 \text{ h} \\ - \underline{24 \text{ h}} \\ 16 \text{ h} \end{array}$$

    Hence, 6 760 h = 281 days 16 h

8.6   Finding time intervals

Number of periods: 3

Reference: Pupil's Book page 129

Knowledge and understanding

Learners will be able to explain the meaning of time intervals.

Skills

Learners will be able to find the duration of a time interval.

Teaching/Learning materials

A real wall clock or an improvised clock face.

Teaching/Learning methods

Group work activities – in small groups count the number of hours in Activity 8.6.

Explanation – to explain their findings and explain the tip.

Supervised activities – assess their progress and assist wherever necessary.

Demonstration – show how to calculate the duration of an event using Example 8.6.

Question and answers – to do questions from Practice Activity 8.6.

Teaching/Learning preparations

*   Prepare a chart showing a 24 hour day on a number line.

a.m.   p.m.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

noon
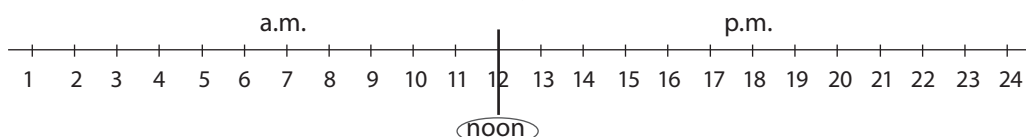
*   Organise pupils into small groups of different abilities and gender.
*   The activity is done inside the classroom.

Teaching/Learning steps

1. Introduce the lesson by having learners discussing Activity 8.6 in their small groups.

2. Let the learners present their findings from Activity 8.6.

3. Let the learners explain their findings and the tips.

4. Work through Example 8.6 in the Pupil's Book page 125 and explain that hours in a.m. are not subtracted from hours in p.m.

5. Explain the meaning of: a.m. and p.m.

a.m. – ante meridiem (before midday)

p.m. – post meridiem (after midday)

6. Give more examples involving p.m. and a.m. For example, how many hours are there from 9 a.m. to 7 p.m.?

7. Let the learners solve Practice Activity 8.6 question 1 (a) – (d).

8. Assess their progress as you assist learners with special needs.

9. Have learners explain their findings to wind up the lesson.

Guidance to the teacher

• Emphasise the difference between hours in the a.m. and hours in the p.m. Help the learners to understand that from midnight to noon there are 12 hours (hours in a.m.) and that from noon (midday) to midnight time there are 12 hours (hour in p.m.).

• Give mentally challenged learners enough time to complete the task and ensure on the use of number line to calculate the duration.

• Assign fast, gifted and talented learners extra challenging work.

Guidance Activity 8.6

• You can use an event that can be timed like;

    (i)   time taken to clap hands 10 times.

    (ii) time you take to go to teachers' room and back to classroom.

• Guide learners to use a clock and record the start time and end time.

Expected answers for Practice Activity 8.6

1. (a)   12 + 3 = 1500 h   (b)   12 + 1 = 1300 h

        1500 – 0900 = 0600 = 6 h   1300 h – 0400 = 0900 = 9 h

   (c)   12 + 4 = 1600 h   (d)   12 + 6 1800 h

        1600 – 0600 = 1000 = 10 h   1800 – 0700 = 1100 = 11 h

2.   10 . 15   3.   12 . 45   4.   3 . 30

    – 8 . 00   – 10 . 45   – 2 .00

       2 . 00 = 2 h   2 . 00 = 2 h   1 . 30 = 1 h 30 min

5.
$$\begin{array}{r} 11.45 \\ -\ 9.45 \\ \hline 2.00 \end{array} = 2\ h$$

6.
$$\begin{array}{r} 6.30 \\ -\ 1.00 \\ \hline 5.30 \end{array} = 5\ h\ 30\ min$$

7.
$$\begin{array}{r} 12.30 \\ -\ 10.00 \\ \hline 2.30 \end{array} = 2\ h\ 30\ min$$

8.7 Addition involving time

Number of periods: 3

Reference: Pupil's Book page 130

Knowledge and understanding

Learners will be able to describe how to solve mathematical problems involving time.

Skills

Learners will be able to add time.

Teaching/Learning materials

A chart

Teaching/Learning methods

• Group activities – to work out Activity 8.7 in small group of different abilities.

• Explanation – to explain the steps to follow.

• Discussion – to discuss Example 8.7 in small groups of mixed abilities.

• Question and answers – to do the questions for Practice Activity 8.7.

• Supervised practice – assign learners Practice Activity 8.7 and assess their progress. Assist slow learners by giving them more hints.

Teaching/Learning preparations

• Prepare a chart showing steps to follow while adding time.

• Organise learners in small groups of different abilities and gender.

Teaching/Learning steps

1. Introduce the lesson by discussing Activity 8.7.

2. Let the learners explain the steps to follow in adding time.

3. Have learners work out Activity 8.7 in their small discussion groups.

4. Let learners discuss Example 8.7 before assigning learners work.

5. Give learners more examples before solving the problems in Practice Activity 8.7.

6. Assign learners questions 1 – 6 of Practice Activity 8.7 to solve in pairs of different abilities.

7. Assess learners' progress assisting where necessary.

8. Let learners explain their findings and wind up the lesson.

Guidance to the teacher

- Remind learners that 1 hour = 60 minutes
- Assign fast, gifted and talented learners extra challenging work and assist mentally challenged learners by guiding them with more hints and allowing them enough time.

Assessment of skills, knowledge and understanding

Observe learners as they add time.

Expected answers for Practice Activity 8.7

1. $(2 + 1)\ h = 3\ h$

2. $(6 + 7)\ h = 13\ h$

3. $(1 + 4)\ h + (30 + 30)\ min$
   $= 5\ h + 60\ min$
   $= 6\ h$

4. $(12 + 3)\ h + (37 + 48)\ min$
   $= 15\ h + 85\ min$
   $= 16\ h + 25\ min$

5. $(10 + 30)\ min + (5 + 5)\ s$
   $= 40\ min\ 10\ s$

6. $(14 + 12)\ h + (18 + 32)\ min$
   $= 26\ h\ 50\ min$
   $= 1\ day\ 2\ h\ 50\ min$

7. $(1 + 1)\ h + (20 + 45)\ min$
   $= 2\ h + 65\ min$
   $= (2 + 1)\ h + 5\ min$
   $= 3\ h\ 5\ min$

8. $(30 + 20) = 50\ min$

9.
$$
\begin{array}{r}
11.\overset{1}{4}5\ a.m \\
+\quad 1.45 \\
\hline
13.30 \\
-\quad 12.00 \\
\hline
01.30 = 1.30\ p.m
\end{array}
$$

10.
$$
\begin{array}{r}
12.\overset{1}{4}5\ a.m \\
+\quad 1.15 \\
\hline
14.00 \\
-\quad 12.00 \\
\hline
02.00 = 2\ p.m
\end{array}
$$

8.8 Subtraction involving time

Number of periods: 3

Reference: Pupil's Book page 132

Knowledge and understanding

Learners will be able to describe how to solve mathematical problems involving time.

Skills

Learners will be able to subtract time.

Teaching/Learning materials

A chart

Teaching/Learning methods

- Group activities – to work out activity 8.8 in their small mixed ability groups.
- Explanation – to explain the steps to follow.
- Discussion – to discuss Example 8.6 in small groups of different abilities.
- Question and answers – to do the questions for Practice Activity 8.8.
- Supervised practice – assess their progress. Assist slow learners by pairing them to discuss with other learners.

Teaching/Learning preparations

- Prepare a chart showing the steps to follow while subtracting time.
- Organise learners in small groups of different abilities and gender.

Teaching/Learning steps

1. Introduce the lesson by discussing Activity 8.8.
2. Let the learners explain the steps to follow in subtracting time.
3. Have learners work out Activity 8.8 in their small groups of mixed abilities.
4. Go through Example 8.8 before assigning learners work.
5. Give learners some more examples before solving the problems in Practice Activity 8.8.
6. Assign learners questions 1 – 5 of Practice Activity 8.8 to solve in pairs.
7. Assess learners' progress and identify learners with different learning abilities. Have the slow learners do the Remedial Activity, average learners do the Consolidation Activity and fast learners do the Extension Activity. This is from Additional Activity 8. Let learners do it as a group discussion and present their answers in class.

Assessment of skills, knowledge and understanding

Observe learners as they add time.

Guidance to the teacher

- Remind learners of the conversion fact 1 hour = 60 minutes where required.
- Listen to learners' ability to discuss and explain the concepts at hand to help build confidence.

Expected answers for Practice Activity 8.8

1. (4 – 2) h = 2 h
2. (8 – 5) h = 3 h
3. (32 – 20) h + (20 – 10) min
   = 12 h 10 min
4. (16 – 12) h + (30 – 45) min
   = 3 h + (60 + 30 – 45) min
   = 3 h 45 min

5. (6 − 3) days + (12 − 9) h

   = 3 days 3 h

6. $\overset{10 \ +60}{\cancel{11}.15}$ a.m.

   −   3.20

       7.55 a.m.

7. $\overset{6 \ +60}{\cancel{7}.15}$ p.m.

   − 2.26

     4.49 p.m.

8. (a)   (3 + 1) h + 40 min

         = 4:40 = 4 h 40 min

   (b)   3 h − 1 h − 40 min = 2 h − 40 min

         = 1 h 60 min − 40 min

         = 1 h 20 min

9.   16 30 h

   − 10 20 h

      06 10 h = 6.10 a.m

10. (18 h − 4 h) + (15 min − 38 min)

   = 14 h + (15 min − 38 min)

   = 13 h + (60 + 15 − 38) min

   = 13 h 37 min

Additional Activity 8

Remedial Activity

1. Convert 3 hours into minutes

   3 × 60 =

   60 + 60 + 60=

2. A music festival was $2\frac{1}{2}$ hours long. Convert $2\frac{1}{2}$ h into seconds.

   1 h = 3 600 seconds

3. How many hours are there from 8.00 a.m. to 2.00 p.m.? Present your answers.

   8.00 a.m.   9.00 a.m. 10.00 a.m. 11.00 a.m. 12.00   1.00 p.m. 2.00 p.m.
                                                  noon
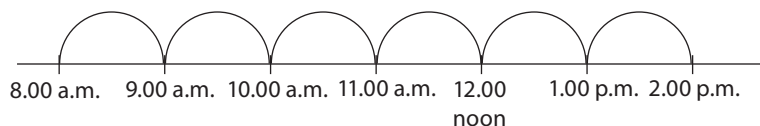
4. Work out. Explain the steps followed.

   1 h 25 min + 1 h 30 min   =

	h	min
+	1	25
	1	30

5. 16 h 30 m − 12 h 15 min   =

	h	min
−	16	30
	12	15

Consolidation Activity

1. How many minutes are there in 4 hours?

2. A music festival was $3\frac{1}{2}$ hours long. Discuss how many seconds are there in $3\frac{1}{2}$ hours?

3. Explain how many hours there are from 8.00 a.m. to 4.00 p.m.

4. Add 2 h 25 min to 3 h 45 min. What do you get?

5. Subtract 16 h 15 min – 2 h 40 min =

Extension Activity

1. How many minutes there are in $7\frac{3}{4}$ hours?

2. During a holiday, James visited his uncle and stayed for $25\frac{1}{2}$ days. How many hours did he stay with his uncle? Discuss your steps.

3. A football match started at 2.45 p.m. and ended at 4.15 p.m. How long did the match take? Give your answer in (i) hours and minutes (ii) m i n u t e s   o n l y (iii) seconds only. Discuss steps to your answers,

4. A tourist spent 15 h 20 min in flight to visit a certain national park. The tourist took 9 h 55 min during her visit to the park before going to the hotel. Find the total time the tourist took to fly and visit the park.

    (a) Give your answer as days, hours and minutes.

    (b) Give your answer as hours and minutes only.

5. A certain family planned to plant maize and beans in their farm. They started the activity at 11 a.m. and completed it at 3 p.m. They had their lunch from 12.30 p.m. up to 2.05 p.m. It is only at lunch time that they were not working in their farm.

    (a) Calculate the duration from the starting time to completion time.

    (b) Calculate the duration for their lunch break.

    (c) Find the time they must have been working in their farm. Give your answer in hours and minutes. Justify your answer.

Expected answers for Additional Activity 8

Remedial Activity

1. $3 \times 60 = 180$ min   2. $2.5 \times 3\,600 = 9\,000$ s

3. $12 + 2 = 1400$

    $1400 - 0800 = 0600 = 6$ h

4.

h	min
1	25
+ 1	30
2	55

= 2 h 55 min

5.

h	min
16	30
− 12	15
4	15

= 4 h 15 min

Consolidation Activity

1. $1 \text{ h} = 60 \text{ min}$

   $60 \times 4 = 240 \text{ min}$

2. $1 \text{ h} = 3\,600 \text{ s}$

   $3\frac{1}{2} \times 3\,600 = 12\,600 \text{ s}$

3. $12 + 4 = 16$

   $1600 \text{ h} - 0800 \text{ h} = 08.00 = 8 \text{ h}$

4. $(2 + 3) \text{ h} + (25 + 45) \text{ min}$

   $= 5 \text{ h} + 1 \text{ h} + 10 \text{ min}$

   $= 6 \text{ h } 10 \text{ min}$

5. $(16 - 2) \text{ h} + (15 - 40) \text{ min}$

   $= 14 \text{ h} + (15 - 40) \text{ min}$

   $= 13 \text{ h} + (60 + 15 - 40) \text{ min}$

   $= 13 \text{ h } 35 \text{ min}$

Extension Activity

1. $1 \text{ h} = 3\,600 \text{ s} = 60 \text{ min}$

   $(7 \times 60) \text{ h} + (\frac{3}{4} \times 60) \text{ h} = (420 + 45) \text{ h} = 465 \text{ h}$

2. $1 \text{ day} = 24 \text{ h}$

   $25\frac{1}{2} \times 24 = (25 \times 24) \text{ h} + (\frac{1}{2} \times 24) \text{ h} = 600 \text{ h} + 12 \text{ h} = 612 \text{ h}$

3. (i)
   $$\begin{array}{r} \overset{3\;7}{4.\cancel{15}} \text{ p.m} \\ - \quad 2.45 \text{ p.m} \\ \hline 1.30 \;= 1 \text{ h } 30 \text{ min} \end{array}$$

   (ii) $1 \text{ h} = 60 \text{ min}$

   Thus, $1 \text{ h } 30 \text{ min} = (60 + 30) \text{ min}$

   $= 90 \text{ min}$

   (iii) $1 \text{ min} = 60 \text{ s}$

   $90 \times 60 = 5\,400 \text{ s}$

4. (a) $(15 + 9) \text{ h} + (20 + 55) \text{ min} = 24 \text{ h} + 75 \text{ min}$

   $= 24 \text{ h} + 1 \text{ h} + 15 \text{ min}$

   $= 1 \text{ day } 1 \text{ h } 15 \text{ min}$

   (b) $25 \text{ h } 15 \text{ min}$

5. (a) $3 \text{ p.m is } 3 \text{ h} + 1200 \text{ h} = 1500 \text{ h}$

   $1500 \text{ h} - 1100 \text{ h} = 0400 \text{ h} = 4 \text{ h}$

   (b) $12 \text{ h} + 2.05 \text{ h} = 1405 \text{ h}$

   $1405 \text{ h} - 1230 \text{ h} = 1 \text{ h } 35 \text{ min}$

   (c) $(4 - 1) \text{ h} + (0 - 35) \text{ min}$

   $= 3 \text{ h} + (0 - 35) \text{ min}$

   $= 2 \text{ h} + (60 - 35) \text{ min}$

   $= 2 \text{ h } 25 \text{ min}$

   They were working in the farm except during the lunch.

Formative Assessment Support

Set competence-based task for this unit by following these tips. Ensure that all syllabus unit objectives and key unit competences are covered. Check provided assessment criteria from the syllabus. You can then list the requirement to develop

the competence-based task for this unit. Content summary is a quick check to scope and sequence of items.

Once you have set a competence-based task activity for this unit administer to learners as follows. You can have part of the assessment done in another lesson. However, you can have it done in double lesson, where all learners will give their responses. It is important to assess abilities and confidence of the learners by observation. Learners with physical challenges can be assisted t develop and nature competence. Such include learners with mental challenges, eyesight problems, hearing etc. Organise this to be included with all learners but facilitate this ability to give expected responses in spite of their values learning abilities. It is important that you prepare all learners before formative assessment. This should be gauged towards measuring rate of learners achievement of competences. Assess both generic and subject based competences spelt per unit.

It is important you assess different abilities of the learners appropriately. As such give enough time to slow or weak learners to do the task and develop expected competence. You can re-set some items in the task or use real objects to facilitate learners with different abilities to proceed well. Motivate all learners with different abilities to have positive attitudes and achieve expected competence. Fast learners may assist slow learners if necessary to develop class cooperation. We have provided a sample of competence-based task in Pupil's Book page 134, Revision Activity 8. Use it as a guidance tool for formative assessment of this unit. You are at liberty to improve the materials by designing activities that can cater for all needs in the class and use it to assess your learners. We have provided its expected answers below to ease your work.

Expected answers for Revision Activity 8

1. (a) $12 + 3 = 15$
        $1500 - 0900 = 0600 = 6$ h
   (b) $12 + 1 = 13$
        $1300 - 0400 = 0900 = 9$ h
   (c) $12 + 4 = 16$
        $1600 - 1000 = 0600 = 6$ h
   (d) $12 + 3 = 15$
        $1500 - 0300 = 1200 = 12$ h
   (e) $12 + 4 = 16$
        $1600 - 0600 = 1000 = 10$ h

2. (a) $1200 - 0400 = 0800 = 8$ h   (b) $1200 - 0800 = 0400 = 4$ h
   (c) $1200 - 0600 = 0600 = 6$ h
   (d) $11 + 12 = 23$ (e) $1200 - 0700 = 0500 = 5$ h
        $2300 - 1100 = 1200 = 12$ h

3. $\quad$ 3 . 00 a.m
$\quad$ + 2 . 00 h
$\quad\overline{\quad\quad\quad\quad}$
$\quad\quad$ 5 . 00 = 5.00 a.m.

4. (a) 1 day = 24 h

$\quad\quad\quad$ _____ = 168 h

$\quad\quad\quad\dfrac{168}{24}$ days = 7 days

(b) $\dfrac{480}{24}$ days = 20 days

(c) $\dfrac{720}{24}$ days = 30 days

(d) $\dfrac{285}{24}$ days = $11\dfrac{21}{24}$ = 11 days 21 h

5. (a) 1 day = 24 h

$\quad\quad\quad$ 5 days _____ h

$\quad\quad\quad$ 5 × 24 = 120 h

(b) 12 × 24 = 288 h

(c) 1 h = 60 min

$\quad\quad\quad$ _____ = 180 min

$\quad\quad\quad\dfrac{180}{60}$ h = 3 h

(d) 1 h = 60 min

$\quad\quad\quad$ _____ = 1 440 min

$\quad\quad\quad\dfrac{1440}{60}$ h = 24 h

(e) 1 h = 3 600 s

$\quad\quad\quad$ _____ = 3 600 s

$\quad\quad\quad\dfrac{3600}{3600}$ h = 1 h

(f) 1 h = 3 600 s

$\quad\quad\quad$ _____ = 7 200 s

$\quad\quad\quad\dfrac{7200}{3600}$ h = 2 h

(g) 1 h = 60 min

$\quad\quad\quad$ _____ = 360 min

$\quad\quad\quad\dfrac{360}{60}$ h = 6 h

(h) 1 h = 3 600 s

$\quad\quad\quad$ _____ = 25 200 s

$\quad\quad\quad\dfrac{25200}{3600}$ h = 7 h

6. (a) 1 h = 60 min

$\quad\quad\quad$ _____ = 206 min

$\quad\quad\quad\dfrac{206}{60}$ = 3 h 26 min

(b) 1 h = 60 min

$\quad\quad\quad$ _____ = 156 min

$\quad\quad\quad\dfrac{156}{60}$ = 2 h 36 min

(c) 1 h = 60 min

$\quad\quad\quad$ _____ = 236 min

$\quad\quad\quad\dfrac{236}{60}$ = 3 h 56 min

7. (a) 15 × 60 = 900 min

(b) 6 × 60 = 360 min

(c) 10 × 60 = 600 min

(d) 15 × 60 = 900 min

8. (a) 2 × 60 = 120 s

(b) 5 × 60 = 300 s

(c) 6 × 3 600 = 21 600 s

(d) 3 × 3 600 = 10 800 s

9. (4 + 3) h = 7 h

10. $\quad$ 9.55 a.m
$\quad$ 8.40 a.m
$\quad\overline{\quad\quad\quad\quad}$
$\quad$ 1 h 15 min = 1 h 15 min

Topic Area: Measurement

Unit 9

Money and its financial applications

Background

The topic for this unit was covered in Primary 4. In Primary 5, learners will build on the concept of money and its financial application. Learners will be guided to state the roles of money and the services of money. Learners will also be guided to set priorities while budgeting and state various ways of transferring money.

By the end of the unit, learners will be expected to apply the knowledge acquired in solving problems in real life situations.

Content summary

This unit will cover several sub-topics these are:

9.1 Uses and the role of money in our lives.

9.2 Budgeting and setting priorities.

9.3 Ways of transferring money.

9.4 Saving and borrowing money

9.5 Different currencies.

9.6 Converting currencies.

Key unit competence

Learners will be able to explain money and its financial applications.

Attitudes and values

Learners will appreciate the importance of money in daily life.

Relevant Cross-cutting issues

Inclusive education: During the activities, learners with special need should be integrated so they don't feel secluded.

Financial education: Learners should be enlightened on the need to prioritise needs and wants.

Relevant Generic Competences

Critical thinking: The conversion of money from one currency to another using an exchange rate table will enhance critical thinking amongst learners.

Research and problem solving: By learning how to save and how to borrow money, learners will be able to apply the concept and develop their problem solving ability in real life situations. Discussing content from real life experiences develops learners' ability to carry out research.

Assessment of attitudes and values

Observe learners stating the role of money, sources of money and use of money in real life situations.

Notes to the teacher

Guide learners to state the role of money and sources of money. The teacher should guide learners to explain budgeting and how to set priorities. This will be best understood once learners can distinguish between wants and needs so that they don't waste money.

Ensure you use reliable transfer methods such as mobile phone transfer when explaining how to transfer money from one destination to another.

Learners should also be guided on practical ways of saving and borrowing money within their locality/community.

Emphasise to learners that borrowed money is not free. It has to be fully repaid.

In guiding learners to understand the conversion of different currencies, the teacher should use real currency or pictures of the currencies to help learners convert from one currency to another. The conversion table in the Pupil's Book should be used to help learners convert the different currencies.

Word list

Reference: Pupil's Book page 147

Use the word list to develop reading, listening and writing skills. Let learners work in pairs to develop their vocabulary using the word list.

Do the stated task using suitable vocabulary from the lessons throughout the unit.

Content

9.1   Uses and role of money in our lives

Number of periods: 2
Reference: Pupil's Book page 136

Knowledge and understanding

Stating the role of money in our lives.

Skills

Describe the sources of money and state the roles of money.

Teaching/Learning materials

- Textbooks
- Paper money

Teaching/Learning methods

- Group work activities – learners role play about the uses and roles of money.
- Discussion – learners discuss learning Activity 9.1 on the roles and use of money.
- Practical approaches – learners make a presentation on the uses and role of money.

Lesson preparation

Prepare a chart showing the uses and roles of money.

Teaching/Learning steps

1. Ask learners to discuss the roles and uses of money.
2. Ask learners to role play the roles and uses of money
3. Learners to suggest how they can spend 500 Frw
4. Learners will discuss in pairs, Practice Activity 9.1 questions 1 – 3
5. Go round the class assessing learners' progress.

Assessment of skills, knowledge and understanding

Observe learners as they role play the roles and uses of money.

Guidance to the teacher

Guide the learners to understand the uses and roles of money in our lives such as:
- Buying clothes
- Buying food.
- Paying rent
- Paying for transport.
- Constructing a house.
- Constructing a classroom
- Assign fast learners more work from Practice Activity 9.1 questions 3 to 5 in pairs.
- Add more points on the uses and roles of money in the expected answers.
- Encourage learners to add more points on the uses and roles of money from their discussion groups.

Guidance to Activity 9.1

- Role-play on uses of money, organise the class so that learners will play different roles to show the uses and roles of money in our lives.
- Organise each group to have two learners (boy and girl) play the role of parents where the rest play the role of children in a family.
- Let the children (learners) ask their parents about the various needs they have both at home and at school.
- Let the parents (learners; the boy and girl) tell children how they plan to take care of learners' needs.
- Ask one of the groups to present their role play to the class.

Expected answers to Practice Activity 9.1

1. (a) Buy food for the family.
   (b) Buy clothes for herself and the children.
   (c) Buy pens for her children.
2. (a) Buy pens.
   (b) Buy a geometry set.
3. (a) Buying food for the family.
   (b) Doing repairs or improving the family house.
   (c) Buying clothes for family members.
   (d) Paying for school requirements such as uniform.
4. (a) Buy clothes for the underprivileged in the local community.
   (b) Buy food for the underprivileged in the local community.
5. (a) Paint the classroom.
   (b) Construct toilets.
   (c) Dig a well of water.

9.2   Sources of money

Number of periods: 3

Reference: Pupil's Book page 137

Knowledge and understanding

Learners will identify the sources of money.

Skills

Describe the sources of money.

Teaching and learning materials

Prepare pictures of money in advance.

Suggested materials

- Manila paper
- Pictures of money
- Flash cards
- A pair of scissors.

Teaching/Learning methods

- Group work activities – Discuss different ways through which an individual can get money.
- Class discussion – Discuss ways through which a family can get money.
- Demonstration – Learners will discuss examples of sources of money.

Lesson preparation

Prepare a chart showing sources of money

Teaching/Learning steps

1. Ask learners to discuss ways through which an individual can get money.
2. Ask learners to discuss ways a family can get money
3. Learners to make a presentation to the class.
4. Ask learners to discuss in pairs Practice Activity 9.2 questions 1 – 3 for classwork.
5. Go round the class to assess learners' progress.

Assessment of skills, knowledge and understanding

Observe learners as they identify and describe sources of money

Guidance to the teacher

- You can add more points to the expected answers, guide learners to understand that they should only get money through legal ways. Some of the legal ways of getting money are working on farms and doing business.
- Allow learners to discuss in groups to enhance co-operation.
- Allow learners to make their presentation to enhance communication.
- Assign fast learners Practice Activity 9.2 questions 4 and 5.

Guidance to Activity 9.2

Roleplay on source of money

1. Organise the learners to play different roles. The class will be divided into three groups. Each group will be assigned a role play as follows:
   - Group 1 – How an individual can get money.
   - Group 2 – How a family can get money

- Group 3 – How a school can get money.

Group 1: Roleplay how an individual can get money

This group can roleplay:

- People working on a farm
- People walking to places of work
- A group of mechanics repairing vehicles
- People working at a construction site

Group 2: Roleplay how a family can get money

This can include:

- Working on a family farm
- Engaging in salaried employment
- Working for other people for a wage

Group 3: Roleplay how a school can get money

This group will role play:

- A group of learners cultivating the school farm.
- Organise for a walk to raise funds for the school.

2. One of the learners in each group will present a list of ways on how;

(i) Individual can get money

(ii) A family can get money

(iii) A school can get money.

3. Remind learners, that the ways through which people get money are called sources of money.

Expected answers to Practice Activity 9.2

1. A bad source of money – Begging.
2. (a) By selling farm produce.
   (b) By doing manual jobs.
   (c) By engaging in salaried employment.
3. (a) By cultivating crops in the school farm for sale.
   (b) By engaging in income generating activities such as creative arts by making items such as drums, cooking sticks, chairs, drawings and paintings for sale.
4. (a) By forming working groups to engage in farming jobs such as planting, weeding and harvesting crops such as maize and beans on large farms for pay.
   (b) Starting small scale business activities that generate income such as preparing snacks and food for sale.

(c)   Engaging in groups such as micro-finance organisations such as table banking, groups saving and credit co-operative societies.

5.   (a)   Picking tea leaves for sale.   (b)   Stealing bananas; taking a bribe.

9.3   Budgeting and setting priorities

Number of periods: 3

Reference: Pupil's Book page 138

Knowledge and understanding

Learners will be able to explain budgeting and how to set priorities.

Skills

Explain the reasons for setting priorities while using money.

Teaching/Learning materials

Low cost or no cost materials prepared in advance by using locally available materials.

Suggested materials

•   Flash cards

•   Manila papers

•   Pictures of a car, television, aeroplane, house, clothes, water.

Teaching/Learning methods

•   Group work activities – study the needs and wants in Activity 9.3.

•   Class discussion – in groups, discuss the needs and wants in order of priority

•   Demonstration – learners list the needs and wants in order of priority.

Lesson preparation

Prepare in advance pictures of needs and wants using locally available materials. The learners can also use real items around them such as classroom, clothes etc.

Teaching/Learning steps

1.   In groups, learners will study the needs and wants under Activity 9.3.

2.   Learners will identify needs and wants from the list in Activity 9.3.

3.   In groups, learners will list the needs and wants in order of priority.

4.   In pairs, learners will discuss Practice Activity 9.3 questions 1 – 3.

5.   Assessing learners' progress.

Assessment of skills, knowledge and understanding

Observe as learners explain the reasons for setting priorities while using money.

Guidance to the teacher

•   Allow learners to discus in groups to enhance co-operation.

- Clearly explain to learners the meaning of needs and want.
- Explain to learners that money is scarce and therefore one has to spend the money on the most important things first.
- Needs are things we cannot do without. These are food, shelter and clothing
- Wants are things we would like to have, but we can do without. These may include television, car, toys, shoes and ice cream.
- Explain to learners that on the list of learners wants, education should top the list.
- Allow learners to make a presentation of their findings in class.
- Assign fast learners Practice Activity 9.3 questions 4 – 5.

Expected answers to Practice Activity 9.3

1. (a) Food   (b) Shelter   (c) Clothing
2. (a) (i) Buy food for family
        (ii) Construct a house
        (iii) Buy clothes
   (b) (i) Buy a television set
        (ii) Buy a car
        (iii) Pay for a holiday trip
3. (a) Buy food for the family
   (b) Buy school requirements for the children
   (c) Buy seeds for planting
4. (a) Buy food
   (b) Buy clothes
   (c) Buy a pen
   (d) Buy a geometry set
5. (a) (i) Construct a toilet   (ii) Buy pupils' desks
        (iii) Dig a water well   (iv) Paint the classroom
   (b) 5 000 Frw   (c) Paint classrooms

9.4 Ways of transferring money

Number of periods: 3

Reference: Pupil's Book page 140

Knowledge and understanding

State various ways of transferring money

Skills

Describe various ways of transferring money.

Teaching and Learning materials

Use low cost or no cost materials prepared in advance using locally available materials.

Suggested materials

- A picture of an ATM booth
- A picture of a mobile phone showing money received.
- A picture of a cheque/or a real cheque
- A picture of a person in a banking hall.

Teaching/Learning methods

- Group work activities – Discuss Activity 9.4 in small groups
- Discussion – learners discuss various ways of sending money.
- Demonstration – learner observe the process of sending money from one destination to another.

Lesson preparation

Prepare a chart showing ways of transferring money from one destination to another.

Teaching/Learning steps

1. The learners will study and name the pictures in Activity 9.4.
2. In groups, the learners will discuss how money can be transferred using the picture in Activity 9.4.
3. Learners will make a presentation on ways of transferring money.
4. In pairs learners will discuss Practice Activity 9.4 questions 1 to 3 for classwork.
5. Go round assessing learners' progress.

Assessment of skills, knowledge and understanding

Observe as learners state and describe various ways of sending money from one destination to another. See how well they understand the concept.

Guidance to the teacher

- The teacher should guide learners on the most convenient ways of transferring money from one destination to another. The learners should also be guided on convenient ways to transfer small amounts of money and large amounts of money. For example large amount of money will best be transferred using a cheque or doing a bank transfer. On the other hand, small amounts of money will best be transferred using the mobile phone.
- Allow learners to discuss in groups.
- Allow learners to make presentations in class.

Under the expected answers you may add any other ways of transferring money.

Assign quick learners Practice Activity 9.4 questions 4 – 5.

Guidance to Activity 9.4

Ways of transferring money

- Organise the class into three groups
- Group 1: Roleplay the use of ATM as a way of transferring money.
- Group 2: Roleplay the process of transferring money using a mobile phone
- Group 3: Roleplay using a cheque as a way of transferring money.
- A member from each group will make a presentation to the class.

Expected answer to Practice Activity 9.4

1. • Use a mobile phone
   • Send to his bank account
2. • Writing a cheque to the school account
   • Transfer the amount directly from his account to the school account
3. Use a mobile phone to transfer the money
4. Mobile phone
5. Mobile phone

9.5   Saving and borrowing money

Number of periods: 3

Reference: Pupil's Book page 141

Knowledge and understanding

Explain the importance of saving and borrowing money

Skills

Appreciate the importance of saving money.

Teaching/Learning materials

Use low cost or no cost materials prepared in advance using locally available materials.

Suggested materials

- Flash cards
- Pictures of money

Teaching/Learning methods

- Group work activities – Discuss Activity 9.5 in groups.
- Class discussion – A group member makes a presentation to the class.

Lesson preparation

Prepare charts showing ways of saving and borrowing money.

Teaching/Learning steps

1. In groups of five, learners will discuss the importance of saving money.
2. Learners will discuss the ways of saving money.
3. Learners will listen and ask questions as the teacher explains Example 9.4.
4. In pairs, learners will discuss Practice Activity 9.5 questions 1(a) and (b).

Assessment of skills, knowledge and understanding

Observe as learners explain the importance of borrowing and saving money.

Guidance to the teacher

- Allow learners to discuss in groups.
- Explain to learners that money is a scarce commodity and therefore it is important to save for future use and in times of need. Guide learners to understand that borrowed money must be refunded/repaid.
- Enlighten learners on good ways of borrowing money. Money can sometimes be borrowed from friends and relatives since they understand each other well.
- Allow learners to make a presentation to the class.
- Assign fast learners Practice Activity 9.5 questions 2 and 3.

Expected answers to Practice Activity 9.5

1. (a) (i) Flash card A
        (ii) Flash card C
        (iii) Flash card D
        (iv) Flash card F
    (b) • Flash card B
        • Flash card E
2. • For future use
   • For emergency purposes
   • To take care of family needs, such as buying food and clothes
   • For future expansion of housing when the need arises
   • To avoid wastage
3. • To do a project where you do not have enough money at the time the project is being done.
   • Borrowing is useful when the money is needed to address an emergency.

4. (i)   (20 000 + 25 000 + 15 000 + 18 000) Frw = 78 000 Frw

    (ii) 100 000 Frw – 78 000 Frw = 22 000 Frw

9.6   Different currencies and converting currencies

Number of periods: 5

Reference: Pupil's Book page 144

Knowledge and understanding

Different currencies and converting currencies.

Skills

Convert currencies in a practical context

Teaching and Learning materials

*   Flash cards
*   Manila papers/charts showing currency conversion tables from a Forex shop.
*   Pictures of different currencies.
*   Real currencies of different countries.

Teaching/Learning methods

*   Group activities – studying in groups Activity 9.5.
*   Discussion – discussing Activity 9.6 in groups.
*   Demonstration – learners to discuss Example 9.5

Teaching/Learning steps

1. Have learners study different currencies using Activity 9.5. Assist them to identify real currencies and their country.
2. Have learners discuss Activity 9.6. Use the currency exchange rates table.
3. Have learners discuss Example 9.5.
4. Assign learners Practice Activity 9.6 question 1 (i) – (iv) for classwork. Assess learners' progress and guide where necessary.
5. Give further Practice Activity 9.6 questions 2 – 5 as homework.

Assessment of skills, knowledge and understanding

Observe learners as they convert between the different currencies in their respective groups.

Guidance to the teacher

*   Give fast learners Extension Activity from Additional Activity 9 at the end of this unit.
*   Assign the Remedial Activity of Additional Activity 9 to slow learners. Slow learners should be given more time to study and understand the exchange rate

table under the supervision of the teacher. Allow fast learners to assist slow learners by discussing with them in mixed ability groups.

- Learners with special needs should be given more time to use appropriate materials such as a Braille exchange rate table.
- Assign learners with average ability the Consolidation Activity of Additional Activity 9.
- Assign fast learners the Extension Activity. This activity contains questions with higher order thinking.

Guidance on Example 9.5 and Activity 9.6

Practical context of conversion of currencies

Currency	Small denominations available
USD	Coins: 1¢, 5¢, 10¢, 25¢, Notes: $1, $5, $10, $20
Euros	Cents: 1, 2, 5, 10, 20, 50 1 Euro, 2 euro, 5 euro etc
Ugandan shillings	1, 2, 5, 10, 50, 100, 200, 500 etc
Kenyan shillings	Cents: 5 ct, 10 ct, 50 ct (rarely used) KSh: 1, 5, 10, 20, 40, 50, etc

In a practical context, guide learners to know that:

(i) 13.51 USD is given at forex shop as 13 USD or 14 USD if one tops up with 370 Frw.

(ii) It is possible to have 11.96 EUR since there are 1 ct and 2 ct coins for euros.

(iii) KSh 1 379.31 can be given as KSh 1 379.30. Since 0.30 is rarely available, you will be given KSh 1 379.

- Point out the variation of values of different currencies in different forex shops and banks.

Expected answers to Practice Activity 9.6

1. (i) $\dfrac{5000 \text{ Frw}}{7.25} = \text{KSh } 689.6$

   (ii) $(5\ 000 \times 4.60) \text{ UGX} = 23\ 000 \text{ UGX}$

   (iii) $\left(\dfrac{5000}{836}\right) \text{EUR} = 5.98 \text{ EUR}$ (iv) $\left(\dfrac{5000}{740}\right) \text{USD} = 6.75 \text{ USD}$

2. $(740 \times 100) \text{ Frw} = 74\ 000 \text{ Frw}$ 3. $(836 \times 50) \text{ Frw} = 41\ 800 \text{ Frw}$

4. $\left(\dfrac{20000}{4.60}\right) \text{Frw} = 4\ 347.8 \text{ Frw}$ 5. $(2\ 000 \times 7.25) \text{ Frw} = 14\ 500 \text{ Frw}$

Additional Activity 9

In this activity, use the exchange rate below. They were got from a forex shop at 11 a.m. on 20th January 2016.

Currency	Rate (Frw)
1 USD	740
1 EUR	830
KSh 1	7.25
4.60 UGX	1

Remedial Activity

1. List two ways a Primary 5 pupil can use 500 Frw.
2. State two ways (sources) a primary five pupil can get money
3. List 3 very important needs in a family.
4. State one method of transferring money from one destination to another.
5. Give one reason for saving money
6. Convert KSh 500 to Frw

Consolidation Activity

1. State 1 role of money in a family.
2. State two ways a family can get money.
3. Tuyisenge has 1 000 Frw he has to make a choice between buying a toy and buying a geometry set. Which one would you advise him to buy?
4. State two ways of saving money.
   (a) _____   (b) _____
5. State two ways of borrowing money.
   (a) _____   (b) _____
6. Convert the following currencies to Frw. Explain your steps.
   (a) 200 USD   (b) 100 EUR

Extension Activity

1. List two ways a pupil can save money. Discuss your answers.
   (a) _____   (b) _____
2. A family wants to spend money on the following:
   (a) Painting the house
   (b) Digging a water well
   (c) Buying a new television set
   List the above according to priority. Justify your answers.

3. State one method Sibomana can use to send a large amount of money.

4. On 20th January 2016,I visited Kigali from Kenya. I had KSh 3 100, 80 USD and 50 EUR for my usage. At Remera Forex Shop, I converted all the money into Rwandan Francs.

   (a) How much Rwandan Francs did I get from 80 USD?

   (b) How much Frw did I get from 50 EUR?

   (c) How much Frw did I get from KSh 3 100? Discuss your steps.

   (d) How much Rwandan Francs did I get altogether?

   (e) I paid 20 000 Frw at a hotel to book a room for 2 days. How much money did I remain with for other uses?

   (f) I later converted 31 520 Frw into Euros. That was the money I remained with before leaving Kigali. How much Euros did I get? Justify your answer.

   (g) What could I have used the other money for? How much money in Frw were those? Justify your answer.

Expected answers to Additional Activity 9

Remedial Activity

1. (a) Buy an ink pen

   (b) Buy snacks at school

2. (a) By borrowing from your parents

   (b) By working on a farm for pay

3. (a) Food

   (b) Shelter

   (c) Clothing

4. Using a mobile phone

5. For future use

6. (500×7.25) Frw = 3 625 Frw

Consolidation Activity

1. Buying food for the family

2. (a) By borrowing from a bank

   (b) By borrowing from relatives

3. A geometry set

4. (a) By spending on very important things first

   (b) Avoid impulse buying

5. (a) Borrowing from a savings and credit co-operative society

   (b) Taking a bank loan

6. (a) (200×740) Frw = 148 000 Frw   (b) (100×830) Frw = 83 000 Frw

Extension Activity

1. (a) By walking to school instead of paying for transport
   (b) By avoiding buying unnecessary things such as sweets
2. Digging a water well, painting the house, buying a television set
3. Writing a cheque
4. (a) (80×740) Frw = 59 200 Frw   (b) (50×830) Frw = 41 500 Frw
   (c) $(3\ 100 \times 7.25)$ Frw = 22 475 Frw
   (d) Total $(59\ 200 + 41\ 500 + 22\ 475)$ Frw = 123 175 Frw
   (e) $(123\ 175 - 40\ 000)$ Frw = 83 175 Frw
   (f) $\left(\dfrac{31520}{830}\right)$ EUR = 37.97 EUR
   (g) Use to buy food and drinks, traveling to places etc.

   It is $(83\ 175 - 31\ 520)$Frw = 51 655 Frw.

   Because he remained with 31 520 Frw before leaving Kigali.

Formative Assessment Support

* Ensure all the unit objectives and key unit competences are covered i.e. generic and subject based.

   The formative assessment should go in line with the assessment criteria provided for in the syllabus.

   Use the content summary to check the scope and sequence of items.

   A part from the competence-based task provided, the teacher is at liberty to come up with more questions based on the unit. The assessments should take care of slow learners, average learners and quick learners.

* The teacher should inform learners of the assessment in advance so that the learner can prepare adequately by ensuring for the assessment. This should be done preferably the weekend prior to the assessment week.

   The teacher should plan to administer the assessment a day when there is a double lesson.

   Learners with special needs should be assisted to develop and nurture competence.

   They should be mixed with the rest of the learners. However, the teacher should facilitate their ability to give the expected responses.

* While administering the assessment, the teachers should give enough time to slow learners to perform the task in order to develop the expected competence.

   Learners with different abilities should be motivated so as to achieve the expected competence.

   Fast learners may assist slow learners to enhance class co-operation.

The competence-based task should be used as a guidance tool for formative assessment. The teacher may improve the material or use it to assess the learners different abilities by varying to test different levels of thinking.

- The teacher should set aside at least one lesson to revise the exam after marking.

The teacher can mark any answer other than the ones provided in the expected answers of the revision activity provided its relevant.

Expected answers to Revision Activity 9

Number of periods: 2

1. (i) Buy school requirement such as geometry set, pens, pencils
   (ii) repair school shoes, uniform
2. (i) Buy food   (ii) Buy clothes
3. (i) Paint classroom   (ii) Repair desks
4. (i) From business proceeds
   (ii) By selling farm produce
5. (i) By engaging in employment
   (ii) By selling farm produce
6. (i) By cultivating the school farm and selling the farm produce
   (ii) By making hardwood craft items and selling them
7. Stealing from a friend
8. Food
9. (i) Food   (ii) Clothes
   (iii) School fees   (iv) Holiday camp
10. (i) By writing a cheque
    (ii) Using a mobile phone
    (iii) Transferring the amount from one's bank account to another person's bank account.
11. (i) By spending according to priorities
    (ii) By comparing prices of items before buying to avoid overspending.
12. (i) From a saving and credit co-operative societies (SACCO)
    (ii) Taking a bank loan
13. So that one can only spend what is within his/her income.
14. (a) (i) $\left(\frac{5000}{830}\right)$ EUR = 18.07 EUR   (ii) $\left(\frac{15000}{740}\right)$ USD = 20 USD

    (iii) KSh $\left(\frac{15000}{725}\right)$ = 2 069   (iv) (15 000 × 4.6) UGX = 69 000 UGX

    (b) (500 × 7.25) Frw = 3 625 Frw   (c) (20 000 ÷ 4.6) Frw = 4347.82 Frw

Topic Area: Algebra

Unit 10
Sequences that include whole numbers, fractions and decimals

Background

In Primary 4, learners studied sequences that included whole numbers sequenced according to their size in an increasing and a decreasing order. This unit will build on the Primary 4 work. Learners will be able to write sequences that include whole numbers, fractions and decimals.

By the end of the unit, learners will be required to apply their knowledge and understanding of sequences to solve problems in real life situation.

Content summary

10.1   Ordering whole number according to their size in increasing order

10.2   Ordering whole numbers according to their size in decreasing order

10.3   Simple sequences that include fractions

10.4   Simple sequences that include decimals

10.5   Sequences with constant differences

10.6   Sequences with constant ratios

10.7   Sequences with regularly changing differences

10.8   Sequences where the difference is geometric

Key unit competence

Be able to write sequences of whole numbers, fractions and decimals.

Attitudes and values

Appreciate the importance of orderliness when writing number patterns.

Relevant cross-cutting issues

Gender education: During class activities ensure gender balance or equity of boys and girls. Each group should comprise of girls and boys where possible in equal numbers. Both genders should be encouraged to participate without bias.

Inclusive education: Learners with special needs should participate freely during class activities.

Relevant generic competences

Co-operation: Fast learners, slow learners and learners with special needs should assist each other during class activities. This will enhance the spirit of co-operation

Research and problem solving: By getting to discover the patterns used in the sequences, learners get to develop their problem solving and research skills in real life situation. Discovering patterns is necessary in research skills.

Assessment of attitudes and values

Observe as learners write sequences of whole numbers, fractions and decimals.

Notes to the teacher

- In the previous year (Primary 4) learners only learnt how to order whole numbers according to size in an increasing order and decreasing order. The teacher should build on that foundation as to carefully introduce writing sequences that involve fractions and decimals. Teachers can do this using the activities shown in the Pupil's Book. The teacher should endeavour to make examples as practical as possible to help learners understand.

- Slow learners should be given more time. Remedial activities should also be given to slow learners to help them catch up with the rest of the learners.

- Learners with special needs should be actively engaged. The teacher should ensure that learners with special needs are given suitable learning materials that will enhance their learning to be at per with the rest of the learners.

- Use the example below to help learners develop the concept of patterns with a regularly changing difference.

  Find the next number in the sequence below:

  21,   22,   25,   31,   41, ___, ___

  Difference   1   3   6   10
                       2   3   4
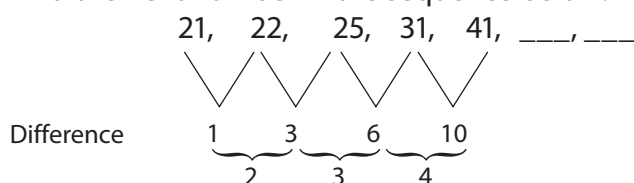
Observation: The difference is increasing by a sum greater than 1 from the previous number. That is; we add 2, then 3, then 4; so add 5, then 6 as shown.

21,   22,   25,   31,   41,   56,   77

Changing
difference   1   3   6   10   15   21

Arithmetic   2   3   4   5   6
difference   +1   +1   +1   +1
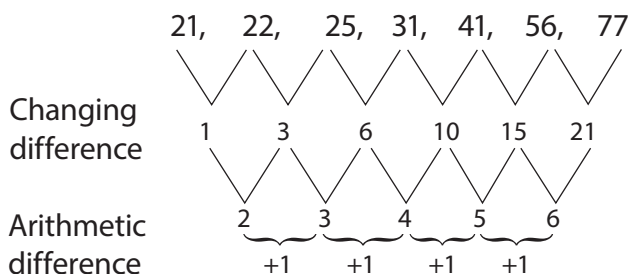
Therefore the sequence is 21, 22, 25, 31, 41, 56, 77, ...

In other cases the changing difference can be geometric.

Word list

Reference: Pupil's Book page 159

Have learners work in pairs to develop their reading, listening and writing skills using the word list.

Use the stated task with suitable vocabulary through out the unit.

Content

10.1   Ordering whole numbers according to their size in increasing order

Number of periods: 2

Reference: Pupil's Book page 148

Knowledge and understanding

Explain how to order whole numbers according to their size in an increasing order.

Skills

Explain how sequences are worked out.

Teaching and learning materials

*   Flash cards
*   Manila papers

Teaching/Learning methods

*   Group work activities – learners discuss in groups
*   Demonstration – learners discuss the example given.

Lesson preparation

Prepare flash cards – showing the races

Teaching/Learning steps

1.   Ask learners to study the races in group.
2.   Learners to arrange the races given on flash cards according to their size in an increasing order.
3.   Learners to discuss Example 10.1.
4.   Assign learners Practice Activity 10.1 questions 1 – 5 for classwork and questions 6 – 10 for homework.
5.   Go round assessing learners' progress.

Assessment of knowledge, skills and understanding

Observe as learners arrange whole numbers according to their size in an increasing order.

Guidance to the teacher

- Allow learners to discuss in groups to enhance co-operation.
- Explain how to order the numbers.
- Assign the Remedial Activity to slow learners.
- Assign average learners and fast learners the Consolidation and the Extension activities.
- Allow fast learners to discuss with slow learners.

Expected answers to Practice Activity 10.1

1. 4 000 m, 5 000 m, 9 000 m
2. 637 045, 637 450, 673 045, 705 365
3. 137 004, 397 080, 491 279, 491 792
4. 26 734, 62 347, 62 374, 63 437
5. 413 029, 413 209, 431 209, 431 290
6. 458 309, 548 039, 584 039, 854 390
7. 731865, 738 165, 783 165, 783 615
8. 627 558, 627 585, 672 558, 672 855
9. 78 962, 83 052, 97 628, 97 862
10. 134 500, 351 400, 413 500, 431 500

See the learners individual and group explanations to check the answers.

10.2 Ordering whole number according to their size in decreasing order

Number of periods: 2

Reference: Pupil's Book page 149

Knowledge and understanding

Explain how to order whole numbers according to their size in a decreasing order.

Skills

Explain how sequences are worked out.

Teaching/Learning materials

- Flash card
- Charts
- Scissors

Teaching/Learning methods

- Group work activities – learners will discuss Activity 10.2 in groups.
- Discussion – learners discuss Practice Activity 10.2 in pairs.

Teaching/learning steps

1. Have learners study Activity 10.2 in groups of five.
2. Have learners discuss how to order the number of farms in a decreasing order.
3. Have learners discuss Example 10.2.
4. Assign learners classwork from Practice Activity 10.2; questions 1 – 5 for classwork and questions 6 – 10 for homework.
5. Go round assessing learners' progress.

Assessment of skills, knowledge and understanding

Observe as learners arrange whole numbers according to size in a decreasing order.

Guidance to the teacher

- Allow learners to discuss in groups.
- Assign slow learners the Remedial Activity from the additional activities found at the end of the unit.
- Assign average learners the Consolidation Activity and fast learners the Extension Activity.
- Learners with special needs should be allowed more time as required to use their respective learning materials such as braille and hearing aids to complete their tasks.

Expected answers to Practice Activity 10.2

1. (a) 213 645, 213 564, 213 546, 213 456
   (b) 23 514, 23 451, 23 415, 23 145
   (c) 860 720, 860 270, 860 027, 806 720
2. (a) 632 097, 602 097, 602 039, 600 397
   (b) 785 040, 780 504, 708 540
   (c) 243 567, 235 467, 234 567
3. (a) 155 100, 150 150, 150 015, 115 500
   (b) 2nd farmer. Got 155 100 Frw

10.3 Simple sequences that include fractions

Number of periods: 2
Reference: Pupil's Book page 150

Knowledge and understanding

Explain sequences of fraction

Skills

Explain how sequences of fractions are worked out.

Teaching/Learning materials

- Flash cards
- Charts

Teaching/Learning methods

- Group work activities – discuss learning activities in groups
- Class discussion – discuss practice activities in pairs.

Lesson preparation

Prepare a chart showing simple sequences that includes fraction.

Teaching/Learning steps

1. Learners will discuss sequences given in Activity 10.3.
2. On flash cards learners write more numbers with a pattern that follows $1\frac{1}{2}$ in an increasing order.
3. Learners will discuss Example 10.3 in their respective groups.
4. Assign learners Practice Activity 10.3 questions 1 – 5 for classwork and questions 6 – 10 for homework.
5. Go round the class, assessing learners' progress.

Assessment of skills, knowledge and understanding

Observe as learners explain how sequences involving fractions are worked out.

Guidance to the teacher

- Allow learners to discuss in groups to enhance co-operation.
- The teacher should allow learners to practice more numbers on flash cards and formulate more tasks on sequences that include fractions.
- Allow learners to make presentations from their respective groups.

Expected answers from Practice Activity 10.3

1. The sequence increases by $1\frac{1}{2}$. Thus, next number is $21 + 1\frac{1}{2} = 22\frac{1}{2}$. It is followed by $22\frac{1}{2} + 1\frac{1}{2} = 24$.
2. Clearly, $36 - 34\frac{1}{2} = 34\frac{1}{2} - 33 = 1\frac{1}{2}$. The sequence decreases by $1\frac{1}{2}$. The next number is $30 - 1\frac{1}{2} = 28\frac{1}{2}$. It is followed by $28\frac{1}{2} - 1\frac{1}{2} = 27$.

3. The sequence increases by $1\frac{1}{2}$. Next number is $29\frac{1}{2} + 1\frac{1}{2} = 31$. It is followed by $31 + \frac{1}{2} = 32\frac{1}{2}$.

4. The sequence increases by $1\frac{1}{2}$. Next number is $66 + 1\frac{1}{2} = 67\frac{1}{2}$. It is followed by $67\frac{1}{2} + 1\frac{1}{2} = 69$.

5. The sequence increases by $2\frac{1}{2}$. Next number is $60 + 2\frac{1}{2} = 62\frac{1}{2}$. It is followed by $62\frac{1}{2} + 2\frac{1}{2} = 65$.

6. The sequence decreases by $\frac{1}{4}$. Next number is $24\frac{1}{4} - \frac{1}{4} = 24$.

7. The sequence increases by $1\frac{1}{2}$. Next number is $47\frac{1}{2} + 1\frac{1}{2} = 79$.

8. The sequence increases by $1\frac{1}{2}$. Next number is $77\frac{1}{2} + 1\frac{1}{2} = 49$.

9. The sequence increases by $1\frac{1}{2}$. Next number is $107\frac{1}{2} + 1\frac{1}{2} = 109$.

10. The sequence increases by $2\frac{1}{2}$. Next number is $90 + 2\frac{1}{2} = 92\frac{1}{2}$.

10.4 Simple sequences that include decimals

Number of periods: 2

Reference: Pupil's Book page 152

Knowledge and understanding

Explain sequences of decimals.

Skills

Explain how sequences of decimals are worked out.

Teaching/Learning materials

- Flash cards
- Manila cards
- Scissors

Teaching/Learning methods

- Discussion – Discuss in groups
- Group work activities – Perform activities in groups

Teaching/Learning steps

1. Ask learners to study Activity 10.4.
2. Ask learners to discuss in groups and discover the pattern used.
3. Ask learners to carry out more activities/tasks involving decimals.

4. Assign learners Practice Activity 10.4 questions 1 – 5 as classwork and questions 6 – 10 for homework.

5. Go round the class assessing learners' progress.

Assessment of skills, knowledge and understanding

Observe as learners discuss and discover number sequences.

Guidance to the teacher

- Allow learners to discuss in groups.
- Emphasise on working out the sequences using the correct pattern.
- Allow fast learners to assist slow learners by discussing.
- Assign fast learners the Extension Activity.
- Guide slow and learners with special needs to attempt Practice Activity 10.4 in pairs at their own pace.
- Learners with special needs should be allowed more time as needed to use learning materials such as braille, hearing aids, audio-visual materials.

Expected answers to Practice Activity 10.4

1. The sequence increases by 0.5. Next number is 4 + 0.5 = 4.5. It is followed by 4.5 + 0.5 = 5.0

2. The sequence decreases by 1.5. Next number is 7 − 1.5 = 5.5. It is followed by 5.5 − 1.5 = 4.0.

3. The sequence increases by 2.5. Next number is 10 + 2.5 = 12.5.

4. The sequence increases by 0.5. Next number is 23 + 0.5 = 23.5.

5. The sequence increases by 3.5. Next number is 87.5 + 3.5 = 91. It is followed by 91 + 3.5 = 94.5.

6. The sequence decreases by 0.5. The next number is 16 − 0.5 = 15.5.

7. The sequence increases by 0.5. The next number is 32.5 + 0.5 = 33.

8. The sequence increases by 0.5. The next number is 92.5 + 0.5 = 93. It is followed by 93 + 0.5 = 93.5.

9. The sequence increases by 0.5. Next number is 82.5 + 0.5 = 83. It is followed by 83 + 0.5 = 83.5.

10. The sequence increases by 0.5. The next number is 52.5 + 0.5 = 53.

Check learners' explanations for questions 5 to 10.

10.5   Sequences with constant differences

Number of periods: 2

Reference: Pupil's Book page 153

Knowledge and understanding

Show the pattern used.

Skills

Describe how the numbers are arranged in different patterns

Teaching/Learning materials

- Flash cards
- Manila cards

Teaching/Learning methods

- Group work activities – Discuss class activities in groups.
- Questions and answers – learners will do the activities and give answers.

Teaching/Learning steps

1. Ask learners to discuss the sequence given.
2. Ask learners to discuss the pattern used in order to find the next number.
3. Ask learners to discuss more tasks that involve extending the number pattern to sequences using Example 10.5.
4. Assign learners' progress.

Assessment of skills, knowledge and understanding

Observe as learners discuss and display the pattern used in extending the patterns.

Guidance to the teacher

- Allow learners to discuss their activities in groups.
- Emphasise learners working out the correct patterns.
- Assign learners more tasks to help them discover patterns.
- Discuss the pattern used in extending number patterns to sequences using Example 10.5.
- Allow fast learners to assist slow learners in working out the problems.

Expected answers to Practice Activity 10.5

1. Constant difference is +2. Next number is 43 + 2 = 45, followed by 45 + 2 = 47
2. Constant difference is +4. Next number is 23 + 4 = 27, followed by 27 + 4 = 31
3. Constant difference is +5. Next number is 40 + 5 = 45, followed by 45 + 5 = 50
4. Constant difference is +4. Next number is 86 + 4 = 90, followed by 90 + 4 = 94
5. Constant difference is +3. Next number is 28 – 25 = 3, followed by 37 + 3 = 40, 40 + 3 = 43.
6. Constant difference: 43 – 40 = +3. Next number is 49 + 3 = 52, followed by 52 + 3 = 55.
7. Constant difference: 64 – 60 = 4. Next number is 72 + 4 = 76, followed by 76 + 4 = 80.

8. Constant difference: 5 – 2 = 8 – 5 = 3. The next number is 14 + 3 = 17

9. Constant difference: 57 – 52 = 62 – 57 = 5. The next number is 67 + 5 = 72, followed by 72 + 5 = 77

10. Constant difference: 28 – 22 = 6. Next number is 46 + 6 = 52, followed by 52 + 6 = 58

Check the explanations given by learners for questions 5 – 10.

10.6 Sequences with constant ratios

Number of periods: 2

Reference: Pupil's Book page 155

Knowledge and understanding

Show the pattern used

Skills

Describe how the numbers are arranged in different patterns.

Teaching/Learning materials

- Manila cards
- Charts

Teaching/Learning methods

- Group work activities – learners discuss activities in groups.
- Demonstration – learners use the demonstration in the discussion to help them understand the concept.

Teaching/Learning steps

1. Ask learners to discuss the sequence with constant ratios in Activity 10.6.
2. Ask learners to perform more tasks that involve using constant ratios to extend the sequences.
3. Learners to discuss Example 10.6.
4. Assign learners Practice Activity 10.6 questions 1 – 6 for homework. Assign fast learners questions 7 – 10.
5. Go round the class assessing learners' progress.

Assessment of skills, knowledge and understanding

Observe as learners show the patterns used.

Guidance to the teacher

- Allow learners to discuss in groups to enhance co-operation.
- Emphasise learners discovering the patterns used.

- Ensure that the learners are able to find the next numbers in a given sequence and extend sequences with ease.

Expected answers to Practice Activity 10.6

1. Clearly, $\frac{4}{2} = \frac{8}{4} = 2$. Thus, next number is $2 \times 8 = 16$. This is followed by $16 \times 2 = 32$.

2. Constant ratio is $\times 2$. So, the next number is $64 \times 2 = 128$

3. Constant ratio is $\times 3$. Thus, next number is $81 \times 3 = 243$

4. Constant ratio is $\times 4$. So, the next number is $64 \times 4 = 256$

5. Constant ratio is $\times 5$, So, the next number is $125 \times 5 = 625$

6. Constant ratio is $\times 10$. $10 \times 1000 = 10\ 000$

7. Constant ratio is $\times \frac{1}{2}$. Next number is $\frac{22}{2} = 11$, followed by $\frac{11}{2} = 5.5$

8. Constant ratio is $\times 4$. Next number is $32 \times 4 = 128$, followed by $128 \times 4 = 512$

9. Constant ratio is $\times 9$. Next number is $243 \times 9 = 2\ 187$

10. Constant ratio is $\times 2$. Next number is $24 \times 2 = 48$, followed by $48 \times 2 = 96$

10.7   Sequences with regularly changing differences

Number of periods: 2

Reference: Pupil's Book page 156

Knowledge and understanding

Show the pattern used in sequences.

Skills

Describe how whole number are arranged in different patterns.

Teaching/Learning materials

- Manila cards
- charts

Teaching/Learning methods

- Demonstration – learners use the examples to discuss.
- Group work activities – learners discuss the class activities in groups.

Lesson preparation

Prepare a chart showing sequences with regularly changing differences.

Teaching/Learning steps

1. Ask learners to discuss the pattern in the sequences in Activity 10.7.

2. Learners to use Example 10.7 to discuss sequences with regularly changing differences.

3. Ask learners to determine the missing numbers in the sequences.
4. Learners to discuss Practice Activity 10.7 in pairs.
5. Go round the classroom assessing learners' progress.

Assessment of skills, knowledge and understanding

Observe as learners describe the patterns used in sequences with regularly changing differences.

Guidance to the teacher

- Allow learners to discuss the activities to enhance co-operation.
- Guide learners to discuss the pattern and place an emphasis on the sequences with regularly changing differences.
- Help slow learners by giving the Remedial Activity.
- Allow fast learners to assist slow learners in discussing the activities.

Expected answers to Practice Activity 10.7

1. 1, 4, 10, 19

   1,   4,   10,   19,   ___, ___

   3   6   9 3×4 3×5
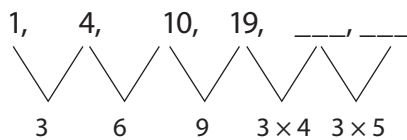
   Next number is $19 + 3 \times 4 = 31$

   Followed by $31 + 3 \times 5 = 46$

2. 12, 13,   16, 22, 32, 47, 68
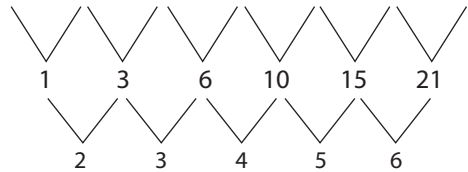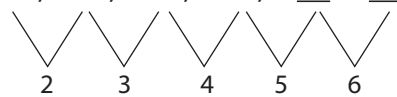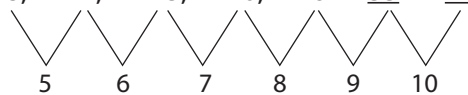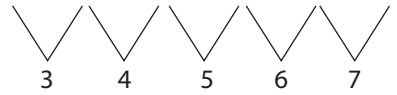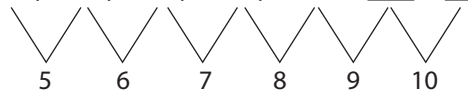
   1   3   6   10   15   21

   2   3   4   5   6

3. 50, 52, 55, 59, 64 70

   2   3   4   5   6

4. 8,   11,   15,   20,   26   33   41

   5   6   7   8   9   10

5. 20, 23, 27, 32, 38 45

   3   4   5   6   7

6. 70, 75, 81,   88, 96   105   115

   5   6   7   8   9   10

7. 31, 32, 35, 41, 51   66

   1   3   6   10   15

8. 44, 45, 48, 54, 64   79

   1   3   6   10   15

9. 62, 63,   66, 72, 82

   1   3   6   10

10.   100, 101,   104, 110, 120   135

1   3   6   10   15
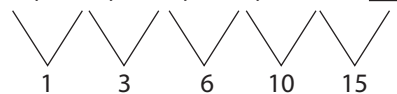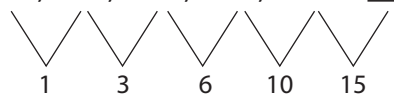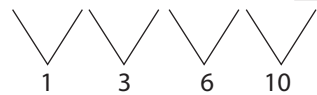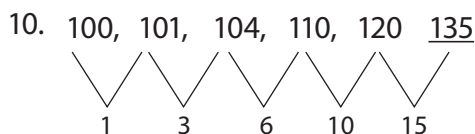
10.8   Sequences where the difference is geometric

Number of periods: 2

Reference: Pupil's book page 157

Knowledge and understanding

Showing the pattern used

Skills

Describe how whole number are arranged in geometric patterns.

Teaching/Learning materials

- Manila cards
- Charts

Teaching/Learning methods

- Group work activities – learners discuss the activities in groups.
- Discussion – learners discuss the Practice Activity in pairs.

Lesson preparation

Prepare a chart showing sequences where the differences is geometric.

Teaching/Learning steps

1.   Learners to study the chart showing pattern where the difference is geometric.
2.   Learners to discuss sequences where the difference is geometric using Activity 10.8.
3.   Learners to discuss the sequences in Example 10.8 where the difference is geometric.
4.   Assign learners Practice Activity 10.8.
5.   Go round the classroom assessing learners' progress.
6.   Assign Additional Activity 10 as assignment to be presented in class. Have slow learners discuss the Remedial Activity, average learners discuss the Consolidation Activity and fast learners discuss the Extension Activity.

Assessment of skills, knowledge and understanding

Observe as learners describe whole number sequences where the difference is geometric.

Guidance to the teacher

- To enhance communication, allow learners to make a presentation in class.

- Emphasise that learners discover sequences where the difference is geometric. Guide them on how to extend such sequences.
- Assist slow learners by assigning fast learners to help them.

Expected answers to Practice Activity 10.8

1. 1,   3,   7,   15,   <u>31</u>,   <u>63</u>
     2   4   8   16   32

2. 2,   5,   11,   23,   <u>47</u>   <u>95</u>
     3   6   12   24   48

3. 3   7,   15,   31,   <u>63</u>,   <u>127</u>
     4   8   16   32   64

4. 6,   13,   27,   55,   <u>111</u>
     7   14   28   56

5. 12,   25,   51,   103,   <u>207</u>
     13   26   52   104

6. 5,   11,   23,   47,   <u>95</u>
     6   12   24   48

7. 8,   17,   35,   71,   <u>143</u>
     9   18   36   72

8. 20,   41,   83,   167,   <u>335</u>
     21   42   84   168

9. 7,   15,   31,   63,   <u>127</u>
     8   16   32   64

10. 4,   9,   19,   39,   <u>79</u>
      5   10   20   40
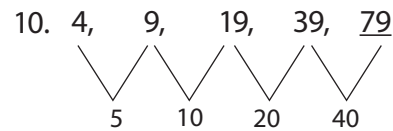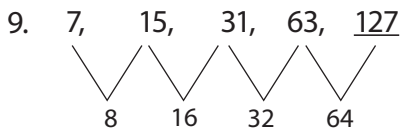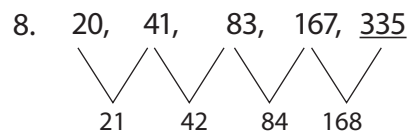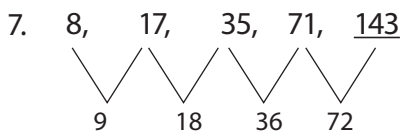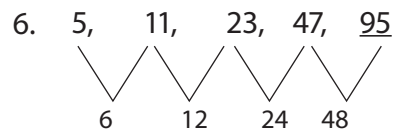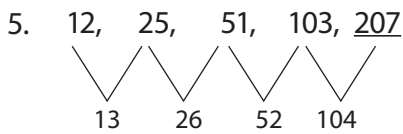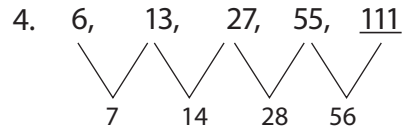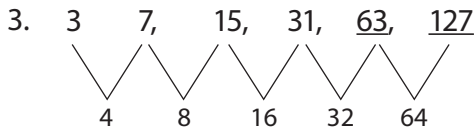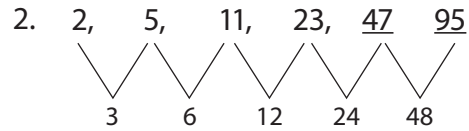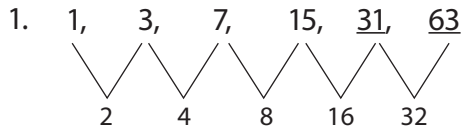
Additional Activity 10

Remedial Activity

1. Arrange the following in an increasing order 500 m, 400 m, 900 m
2. Arrange the following in a decreasing order 3 502, 3 250, 2 420, 3 052

Find the next number in the sequences below.

3. $5, 6\frac{1}{2}, 8, 9\frac{1}{2}$, _____
4. $20, 21\frac{1}{2}, 23, 24\frac{1}{2}$, _____

Explain the steps involved in finding the next number in the sequences below:

5. 10, 10.5, 11, 11.5, _____
6. 12, 14, 16, 18, _____
7. 25, 27, 29, 31, _____, _____
8. 30, 35, 40, 45, _____, _____
9. 1, 3, 9, 27, _____
10. 11, 12, 14, 18, _____

Consolidation Activity

Arrange the following in increasing order.

1. 81 389, 81 839, 81 983

2. 13 500, 15 300, 10 350

Arrange the following in a decreasing order. Discuss your answers.

3. 50 502, 50 520, 50 052

4. 22 020, 20 202, 20 002

Explain the steps involved in finding the next number in the sequence:

5. 60, $60\frac{1}{2}$, 63, $64\frac{1}{2}$, _____

6. 90, 90.5, 91, 91.5, _____

7. 1, 3, 6, 12, 24, _____

8. 4, 5, 8, 14, _____

9. 60, 62, 65, 69, _____

10. 10, 21, 43, 76, _____

Extension Activity

1. Arrange the following in an increasing order. Discuss your answers.

    (a)   12 345, 12 020, 13 045, 13 450

    (b)   92 490, 94 290, 92 294, 92 409

2. Arrange the following in a decreasing order. Explain your answers.

    23 970, 23 097, 20 397, 20 793

3. Explain the steps involved in finding the next number in the sequences below.

    (a)   16, $17\frac{1}{2}$, 19, $20\frac{1}{2}$, 22, _____

    (b)   40, 40.5, 41, 41.5, _____

    (c)   28, 31, 34, 37, _____

    (d)   15, 19, 23, 27, _____

    (e)   20, 41, 83, 167, _____

4. A farmer observed and recorded the mass of his goat as below. This was following feeding program on his goat.

Age (years)	2	$2\frac{1}{2}$	$3\frac{1}{2}$	4	$4\frac{1}{2}$
Mass (kg)	18	21	25	30	

    Determine the pattern of mass increase. Then find the mass at $4\frac{1}{2}$ years recorded.

5. A rally car race was set to have 4 different levels. The distance to cover at different levels were recorded as below.

Race level	1st	2nd	3rd	4th
Distance to cover (km)	43	87	175	
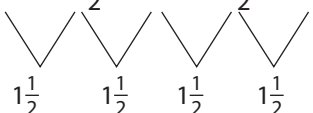
Determine a pattern used to get distance for each level. Find the possible distance to cover in race level 4. Justify your answer.
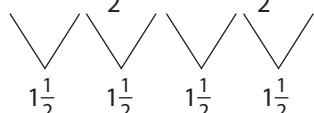
Expected answers to Additional Activity 10
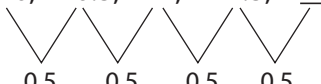
Remedial Activity
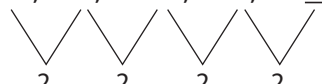
1. 400 m, 500 m, 900 m
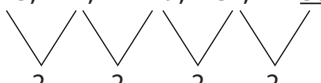
2. 3 502, 3 250, 3 052, 2 420
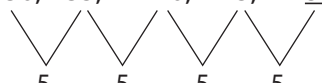
3. $5,\quad 6\frac{1}{2},\quad 8,\quad 9\frac{1}{2},\quad \underline{11}$

$1\frac{1}{2}\quad 1\frac{1}{2}\quad 1\frac{1}{2}\quad 1\frac{1}{2}$

4. $20,\quad 21\frac{1}{2},\quad 23,\quad 24\frac{1}{2},\quad \underline{26}$

$1\frac{1}{2}\quad 1\frac{1}{2}\quad 1\frac{1}{2}\quad 1\frac{1}{2}$
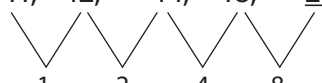
5. 10, 10.5, 11, 11.5, $\underline{12}$

0.5   0.5   0.5   0.5

6. 12, 14, 16, 18, $\underline{20}$

2   2   2   2

7. 25, 27, 29, 31, $\underline{33}$

2   2   2   2

8. 30, 35, 40, 45, $\underline{50}$

5   5   5   5

9. 1, 3, 9, 27, $\underline{81}$

×3   ×3   ×3   ×3

10. 11, 12, 14, 18, $\underline{26}$

1   2   4   8
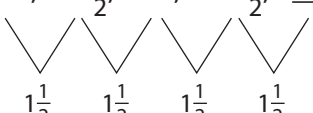
Consolidation Activity
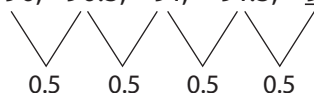
1. 81 389, 81 839, 81 983

2. 10 350, 13 500, 15 300

3. 50 052, 50 502, 50 520

4. 22 020, 20 202, 20 002

5. $60,\quad 60\frac{1}{2},\quad 63,\quad 64\frac{1}{2},\quad \underline{66}$

$1\frac{1}{2}\quad 1\frac{1}{2}\quad 1\frac{1}{2}\quad 1\frac{1}{2}$

6. 90, 90.5, 91, 91.5, $\underline{92}$

0.5   0.5   0.5   0.5

7. 1, 3, 6, 12, 24, $\underline{48}$

×2   ×2   ×2   ×2   ×2

8. 4, 5, 8, 14, $\underline{23}$

1   3   6   9

9. 60, 62, 65, 69, <u>74</u>

    2   3   4   5

10. 10, 21, 43, 76, 120

    11   22   33   44
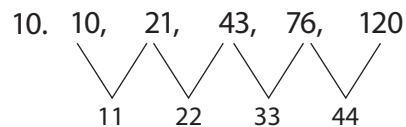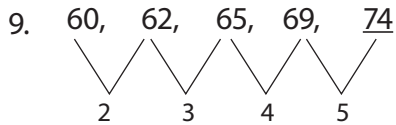
Extension Activity

1. (a) 12 020, 12 345, 13 045, 13 450

    (b) 92 294, 92 409, 92 490, 94 290

2. 23 970, 23 097, 20 793, 20 397

3. (a) 16, $17\frac{1}{2}$, 19, $20\frac{1}{2}$, 22, $23\frac{1}{2}$

    $1\frac{1}{2}$ $1\frac{1}{2}$ $1\frac{1}{2}$ $1\frac{1}{2}$ $1\frac{1}{2}$

    (b) 40, 40.5, 41, 41.5, <u>42</u>

    0.5 0.5 0.5 0.5

    (c) 28, 31, 34, 37, 40

    3   3   3   3

    (d) 15, 19, 23, 27, <u>31</u>

    4   4   4   4

    (e) 20, 41, 83, 167, <u>335</u>

    20   42   84   168

4. 18, 21, 25, 30, <u>36</u>

    3   4   5   6

    The mass is 36 kg.

5. 43, 87, 175, <u>351</u>

    44   88   176
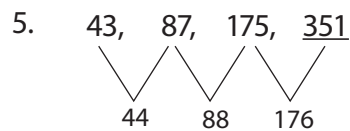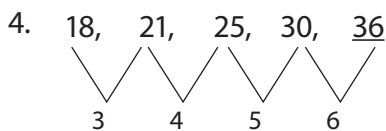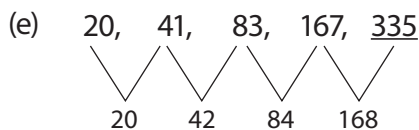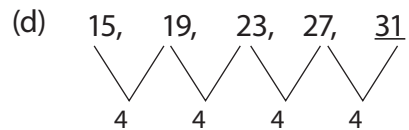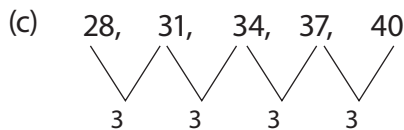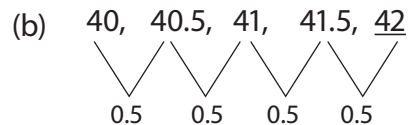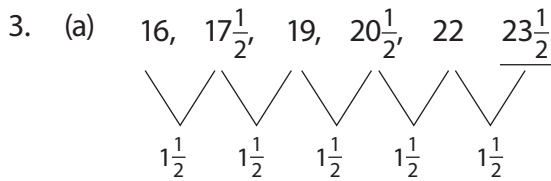
    Possible distance is 351 km.

Formative Assessment Support

• Ensuring all unit objectives and key unit competences in syllabus are covered.

• This unit is comprised of eight sub-topics as shown in the content summary. In constructing the revision activity, ensure that the eight sub-topics are included in the assessment. Ensure questions that will cater for slow learners, average learners and fast learners are included.

• Ensure all the eight sub-topics covered under this unit are well taught before conducting the revision activity. Remind the learners in good time to carry out revision of the entire unit before the activity is taken.

• Conduct the assessment preferably when there is a double lesson so that adequate time is given to slow learners. Allocate at least two lessons to revise the activity adequately. Use Revision Activity 10 from Pupil's Book page 158.
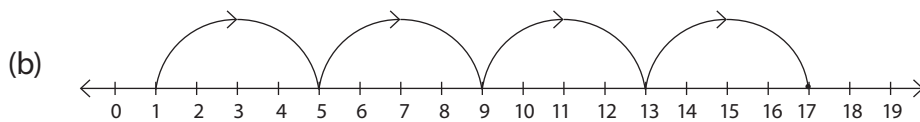
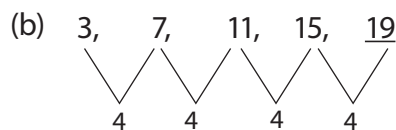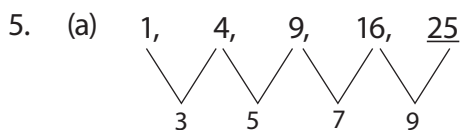## Expected answers to Revision Activity 10

1. (a) 2 003, 2 300, 3 002, 3 200

(b)　5 372, 5 732, 7 352, 7 532

2.　(a)　9 841, 9 481, 9 148, 9 099

　　(b)　25 254, 23 452, 23 425, 23 245

　　(c)　10 001, 10 010, 10 100, 11 000

3.　(a)　$5, \quad 6\frac{1}{2}, \quad 8, \quad 9\frac{1}{2}, \quad \underline{11}$

　　　　$1\frac{1}{2} \quad 1\frac{1}{2} \quad 1\frac{1}{2} \quad 1\frac{1}{2}$

　　(b)　$30, \quad 31\frac{1}{2}, \quad 33, \quad 34\frac{1}{2}, \quad 36 \quad \underline{37\frac{1}{2}}$

　　　　$1\frac{1}{2} \quad 1\frac{1}{2} \quad 1\frac{1}{2} \quad 1\frac{1}{2} \quad 1\frac{1}{2}$

　　(c)　$40, \quad 41\frac{1}{2}, \quad 43, \quad 44\frac{1}{2}, \quad 46 \quad 47\frac{1}{2}$

　　　　1.5　　1.5　　1.5　　1.5　　1.5

　　(d)　7,　7.5,　8,　8.5,　9,　9.5

　　　　0.5　　0.5　　0.5　　0.5　　0.5

　　(e)　14,　17,　20,　23,　26

　　　　3　　3　　3　　3

　　(f)　52,　60,　68,　76,　84

　　　　8　　8　　8　　8

　　(g)　30,　31,　33,　37,　45　61

　　　　1　　2　　4　　8　　16

　　(h)　12,　13,　16,　22,　32,　47

　　　　1　　3　　6　　10　　15

　　(i)　11,　23,　47,　95,　191

　　　　12　　24　　48　　96

　　(j)　21,　43,　87,　175,　351

　　　　22　　44　　88　　176

　　(k)　7,　15,　31,　63,　127

　　　　8　　16　　32　　64

4.　(a)

The answer is 15.

　　(b)

The answer is 17.

5.　(a)　1,　4,　9,　16,　25

　　　　3　　5　　7　　9

　　(b)　3,　7,　11,　15,　19

　　　　4　　4　　4　　4
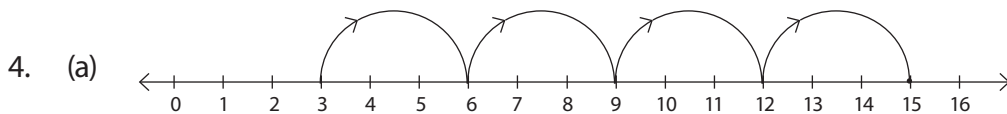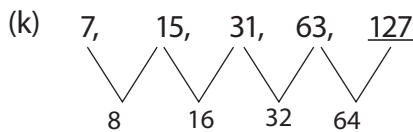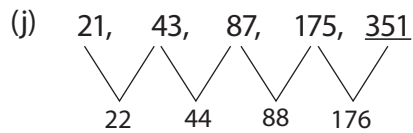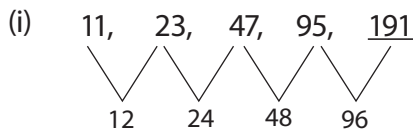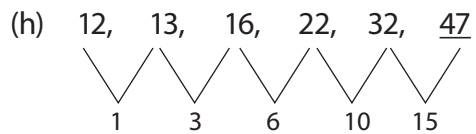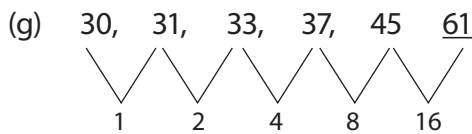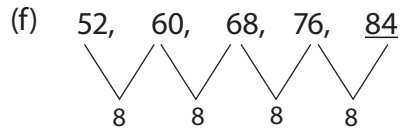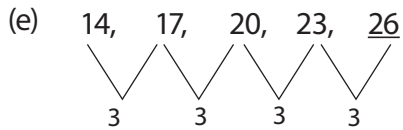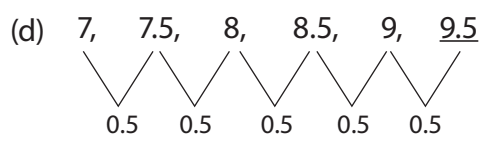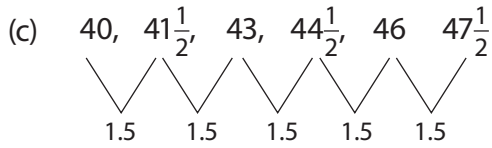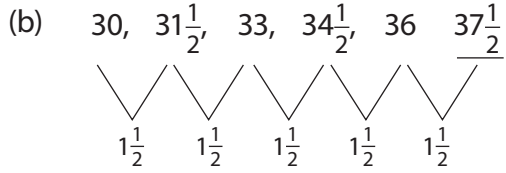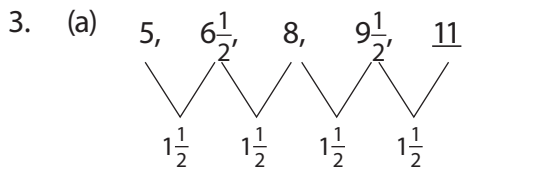
Unit 11 Drawing and constructing angles

Background

In Primary 4, learners were introduced to the basics of constructions. Learners will build on the same principle to develop more geometry concepts. This is a unit that involves geometric construction and therefore the teacher should ensure the learners have the materials required in advance before they embark on the unit.

By the end of this unit, the learners will be required to apply the knowledge acquired in solving problems in real life situations.

Content summary

This unit will cover several sub-topics. These are:

11.1   Parallel lines, intersecting lines and transversal lines.

11.2   Perpendicular lines.

11.3   Properties related to angles formed by intersecting lines.

11.4   Corresponding angles.

11.5   Alternate angles.

11.6   Co-interior angles.

11.7   Drawing angles with a protractor.

11.8   Bisecting angles using folding.

11.9   Bisecting angles using a pair of compasses and a ruler.

11.10 Constructing 90°, 45° and 22.5° angles.

11.11 Constructing 60°, 30° and 15° angles.

11.12 Constructing 120° and 150° angles.

11.13 The angle sum of a triangle.

Key unit competence

Be able to draw and construct different angles.

Attitudes and values

Appreciate the importance and use of lines and angles in daily life and in drawing.

Relevant cross-cutting issues

Inclusive education

Ensure learners with special needs mix freely with other learners during class activities.

Gender education

During class activities, each group should be comprised of boys and girls to ensure there is gender equity. Also, have boys and girls perform similar task during the classwork activities.

Relevant generic competences

Co-operation: Allow learners to discuss and assist each other in their groups to carry out activities as a group.

Research and problem solving: Emphasise the importance of accuracy in geometric construction in relation to real life situations. For example the walls of classroom may collapse if the constructor of the class fails to make accurate measurements of the angles where the walls meet. Thus accuracy in construction and solving problems in building is required.

Assessment of attitudes and values

Observe learners as they draw and construct different angles accurately.

Notes to the teacher

- Geometry requires a practical approach. The activities should always be learner-centered. Ensure geometrical instruments are in place before any geometry lesson begins. Each learner should actively participate in the class activities by discussing in their respective groups.

- Use the figure below to help learners develop the concept of the angle properties of parallel lines.
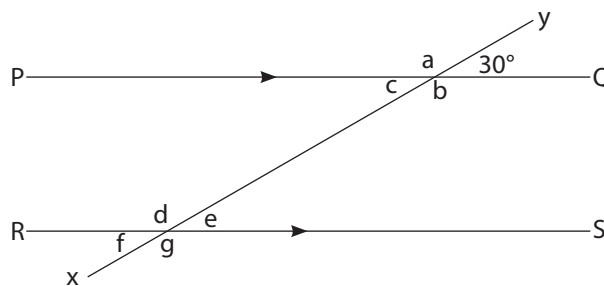
Line PQ is parallel to line RS.

Line XY is a transversal.

Ask learners to measure the angles from the diagram above. These are the properties to draw:

(i) Angle a = Angle b they are vertically opposite angles.

(ii)   Angle a + 30° = 180° – They are supplementary angles.

(iii) Angle b + Angle e = 180° – They are co-interior angles.

(iv)   Angle c = Angle e – They are alternate angles.

(v)   Angle a = Angle d – They are corresponding angles.

How to handle multi-ability learning

At the end of the sub-topic, assign learners activities as follows;

- Remedial Activity: For slow learners to help them catch up with the rest of the learners.
- Consolidation Activity – For average learners.
- Extension Activity – This is given to fast learners. The questions here should be challenging to help them develop creative thinking.

Word list

Reference: Pupil's Book page 195

- Have learners work in pairs to develop their reading, listening and writing skills using the word list.
- Use the stated task with suitable vocabulary throughout the unit.

Content

11.1   Parallel lines, intersecting lines and transversals

Number of periods: 1

Reference: Pupil's Book page 160

Knowledge and understanding

Explain the concept of parallel lines, transversal lines and intersecting lines.

Skills

Measure angles using a protractor.

Teaching/learning materials.

- Geometry set.
- Exercise book.
- Boxes
- Chairs
- Walls
- Windows

Teaching/Learning methods

- Group work activities – carry out activities in groups by observing different materials e.g tables, chairs

- Discussion – learners discuss activities involving different types of lines.
- Practical approaches – learners identify and show lines.

Lesson preparation

- Ask learners to move around the classroom observing the walls, chairs and windows.
- Ask learners to move outside the classroom in small groups to observe the walls, windows and doors of the classrooms.
- Provide the learners with the suggested materials.

Teaching/Learning steps

1. Ask learners to observe materials such as boxes, chairs, tables and windows.
2. From the materials observed, ask learners to identify straight lines, lines that meet and lines that do not meet.
3. Have learners use Example 11.1 to identify parallel lines, intersecting lines and a transversal.
4. Assign learners Practice Activity 11.1 questions 1 – 2 for classwork to work in pairs.
5. The teacher should assess learners performance(s). Give additional activities for different learning activities and homework.

Assessment of skills, knowledge and understanding

Observe learners as, they identify parallel lines, intersecting lines and a transversal. See if they are able to identify the mentioned types of lines.

Guidance to the teacher

- Allow learners to discuss the activities in groups.
- Clearly explain to the learners the following;
    (i)   parallel lines; lines that do not meet even when they are extended.
    (ii) intersecting lines; lines which cut each other forming an angle.
    (iii) transversal lines; lines that cut two or more parallel lines.
- Allow learners to discuss the activities in groups and make presentations to the class.

Expected answers to Practice Activity 11.1

1. (a)   Line AB is parallel to line CD.
   (b)   Line OS is parallel to line PT.
   (c)   Line IJ is parallel to line KL
   (d)   Line UW is parallel to line VX.
2. (a)   AF is a transversal.
   (b)   KL is a transversal.

3. Straight lines
   Line EF, line TS, line KL

   Parallel lines
   AB is parallel to CD   KG is parallel to LH
   MN is parallel to OP   WV is parallel to ZU

   Intersecting lines
   Line QR intersects MN and OP
   Line JI intersects line KG and LH
   Lines XY and TS intersect lines WV and ZU
4. (a)   Line KJ intersects lines GF and HI
   (b)   Line CD intersects AB
   (d)   Line PQ intersects QR
   (f)   Line MO intersects ON

11.2   Perpendicular lines

Number of periods: 1

Reference: Pupil's Book page 163

Knowledge and understanding

Explain the concept of perpendicular lines.

Skills

Measure angles formed by perpendicular lines.

Teaching/Learning materials

- Walls of a classroom.
- Window frames.
- Tables

Teaching/Learning methods

- Group work activities – observe the materials given.
- Discussion – Discuss the finding from the group work.
- Demonstration – Demonstrate the example in groups.

Lesson preparation

Prepare a chart showing parallel lines, intersecting lines and transversal lines.

Teaching/Learning steps

1. Learners will observe the corners of the walls and window frames of the classroom in Activity 11.2.
2. Learners will discuss their observations.

3. Learners will follow the demonstration in Example 11.2.
4. In pairs learners will discuss Practice Activity 11.2 questions 1 – 2 for classwork.
5. Go round the class assessing learners' progress.

Assessment of skills, knowledge and understanding

Observe as learners measure the angles and identify perpendicular lines.

Guidance to the teacher

- Allow learners to discuss the activities.
- Emphasise measuring the angles at the corners for learners to practice and identify perpendicular lines.
- Explain the concept of perpendicular lines i.e. perpendicular lines are lines which intersect forming a right angle (90°).
- Allow fast learners to assist slow learners by explaining any areas of difficulties.
- Assign additional activities to the learners i.e. slow learners to do the Remedial Activity, fast learners to do the Extension Activity and average learners to do the Consolidation Activity at the end of the subtopic.

Expected answers to Practice Activity 11.2

1. (a) Lines PS, SR, RQ and QP.
   (b) Lines AB, BD, DC and CA.
   (c) Lines CG, DH, AB and EF.
   (d) Lines PQ, RS, and VW.
2. (i) Line AB is perpendicular to line BD.
   (ii) Line BC is perpendicular to BD.
   (iii) Line ED is perpendicular to DB.

11.3   Properties related to angles formed by intersecting lines

Number of periods: 2

Reference: Pupil's Book page 165

Knowledge and understanding

Explain the concept of angles formed by intersecting lines.

Skills

Measure angles related to angles formed by intersecting lines.

Teaching/Learning materials

- Ruler
- Protractor
- Chalkboard geometrical instruments.

Teaching/Learning methods

- Group work activities – Carry out activities in groups
- Discussion – Discuss the properties related to angles formed by intersecting lines.
- Demonstration – Learners study and demonstrate Example 11.3.

Lesson preparation

Prepare a chart showing lines that intersect to form angles.

Teaching/Learning steps

1. In groups, learners will study the intersecting lines under Activity 11.3.
2. In pairs, have learners measure angles a, b, c and d using a protractor.
3. Have learners discuss Example 11.3.
4. Assign learners Practice Activity 11.3 question 1 for classwork and questions 2 – 3 for homework.
5. Go round the pairs assessing learners' progress.

Assessment of skills, knowledge and understanding

Observe learners measuring angles related to angles formed by intersecting lines.

Guidance to the teacher

- Allow and encourage learners to discuss the activities.
- Ensure slow learners are given more time to measure the angles. Fast learners can assist the slow learners.
- Guide the learners to discover that angles on opposite sides of intersecting lines are always equal.
- Ensure learners measure the angles using the right scale.
- Assign learners additional activities given at the end of the unit depending on ability.

Expected answers to Practice Activity 11.3

1. (a) a = 120°   (b) 60°   (c) 60°   (d) 120°
   (e) They are equal.
2. (a) (i) 180 – 65 = 115°   (ii) 115°   (iii) 65°
   (b) Angle z   (c) 180°
3. f = 180 – 140 = 40°
   g = 140°   Vertically opposite
   H = 40°   Vertically opposite
            Angles on a straight line add up to 180°

11.4   Angle properties of parallel lines

Corresponding angles

Number of periods: 2

Reference: Pupil's Book page 168

Knowledge and understanding

Explain the concept of corresponding angles.

Skills

Measuring corresponding angles.

Teaching/Learning materials

- Chalkboard geometry set.
- 1 metre ruler
- Geometry set
- Protractor

Teaching/Learning methods

- Group work activities – Discuss corresponding angles in groups.
- Class discussion – Identify corresponding angles by discussing in groups.
- Demonstration – Discuss the examples given.

Lesson preparation

Prepare a chart showing corresponding angles.

Teaching/Learning steps

1. Have learners measure the angles marked with letters in Activity 11.4.
2. Have learners discuss what they have noticed in the angles measured in Activity 11.4.
3. Have learners follow the demonstration by discussing Example 11.4.
4. Assign learners Practice Activity 11.4 questions 1 – 5 for classwork.
5. Go round assessing learners' progress.

Assessment of skills, knowledge and understanding

Observe as learners measure corresponding angles. Assess their accuracy.

Guidance to the teacher

Ensure all learners participate in group activities. Encourage every individual's participation to enhance co-operation. Slow learners should be given the Remedial Activity as average learners and fast learners are given the Consolidation and the Extension Activities respectively.

Expected answers to Practice Activity 11.4

1. $a = 50°$
2. $b = 120°$
3. $c = 70°$ corresponding angles
4. $d = 80°$ corresponding angles
5. $e = 45°$ corresponding angles

11.5 Alternate angles

Number of periods: 1

Reference: Pupil's Book page 170

Knowledge and understanding

Explain the concept of parallel lines and transversal lines.

Skills

Measure angles using a protractor.

Teaching/Learning materials

- Geometry set
- 1 metre ruler
- Manila paper

Teaching/Learning methods

- Group work activities – Discuss the activity in small groups.
- Demonstration – Discuss the example in small groups.

Lesson preparation

Prepare charts showing parallel lines and a transversal line. Show how they form alternate angles.

Teaching/Learning steps

1. Have learners measure the angles marked with letters.
2. Have learners discuss the angles marked with letters in Activity 11.5.
3. Let learners discuss the Example 11.5.
4. Assign learners Practice Activity 11.5 questions 1 to 7 for classwork.
5. Go round the class assessing learners' progress.

Assessment of skills, knowledge and understanding

Observe as learners measure angles on the opposite sides of the transversal and parallel lines.

Guidance to the teacher

- Allow learners to discuss the activities in groups.
- Guide learners to discover the alternate angles. The alternate angles are on the opposite sides of the transversal. Encourage learners to measure so as to discover that alternate angles are equal.
- Allow learners to make their presentation on alternate angles after the discussion.

Expected answers to Practice Activity 11.5

1. a = 70° alternate
2. b = 115° alternate
3. c = 120° alternate
4. d = 67° alternate
5. e = 100° alternate
6. X = 80° alternate
7. y = 115° alternate

11.6   Co-interior angles

Number of periods: 2

Reference: Pupil's Book page 172

Knowledge and understanding

Explain the concept of a parallel line and a transversal and how they form co-interior angles.

Skills

Measuring angles using a protractor.

Teaching/Learning materials

*   Metre ruler
*   Protractor
*   Manila paper

Teaching/Learning methods

*   Group work activities – Discuss the Activity 11.6 in Pupil's Book.
*   Demonstration – Discuss the examples given in small groups.

Lesson preparation

Prepare charts showing parallel lines, transversal lines and co-interior angles.

Teaching/Learning steps

1. In small groups, learners measure the angles marked with letters.
2. Have learners discuss the angles marked with letters.
3. Learners discuss the demonstration in Example 11.6.
4. Assign learners Practice Activity 11.6 questions 1 – 5.
5. Go round the class assessing learners' progress.

Assessment of skills, knowledge and understanding

Observe learners as they measure co-interior angles. Notice how accurate they are in measuring.

Guidance to the teacher

*   Allow learners to discuss co-interior angles.

- Emphasise the fact that when a transversal intersects two parallel lines, two pairs of angles are formed. The two angles are called co-interior angles. The two angles lie on the same side of the transversal.

- The two angles formed will always add up to 180°.

Expected answers to Practice Activity 11.6

1. 180° − 115° = 65°   2. 180° − 60° = 120°

        b = 65°   c = 120°

        a = 65°

3. 180° − 95° = 85°

        d = 85° Co-interior angles

4. 180° − 70° = 110°

        f = 110° Angles on a straight line

        e = 110° Alternate angle

5. 180° − 100° = 80°

        g = 80° Co-interior angles

11.7   Drawing angles using a protractor

Number of periods: 2

Reference: Pupil's Book page 174

Knowledge and understanding

Describe the process of drawing angles with a protractor.

Skills

Measure angles using a protractor.

Teaching/Learning materials

- Protractor
- Manila paper
- Geometry set
- Ruler

Teaching/Learning methods

- Group work activities – Discuss Activity 11.7.
- Demonstration – Discuss Example 11.7.

Lesson preparation

- Prepare the geometrical instruments in advance.
- Prepare a chart showing how to measure angles using a protractor.

Teaching/Learning steps

1. In small groups, have learners measure an angle at a given point using a protractor.

2. Discuss the process introduced by measuring the angle from both the right side and the left side.

3. Learners will discuss and demonstrate Example 11.7 with the guidance of the teacher.

4. Assign learners Practice Activity 11.7 questions 1 – 10 for classwork.

5. Go round the class assessing learners' progress in drawing the angles.

Assessment of skills, knowledge and understanding

Observe as learners draw and explain the process of drawing angles using a protractor.

Guidance to the teacher

• Allow learners to discuss the activities on drawing angles.

• Use Example 11.7 to take learners through the process of drawing an angle using a protractor.

• Ask fast learners to assist slow learners by discussing and explaining the concepts.

• Learners with special needs should work with the rest of the learners to enhance co-operation and inclusive education.

• Slow learners should be given the Remedial Activity at the end of the lesson to help them do more practice on the sub-topic.

• Average learners and fast learners will be given the Consolidation and the Extension Activity respectively at the end of the lesson.

Guidance on Activity 11.7

A protractor has two scales. Guide learners to ensure that they practice properly.

(i) The inner scale measures angles from the right to the left. We use it to draw angles from the right hand side.

(ii) The outer scale measures angles from the left to the right hand side. We use it to draw angles from the left hand side.

Expected answers to Practice Activity 11.7

• Check each pairs' work and insist on accuracy.

• The learners answers may vary depending on the level of accuracy.

11.8   Bisecting angle using folding

Number of periods: 2
Reference: Pupil's Book page 175

Knowledge and understanding

Describe the process of the bisecting an angle by folding.

Skills

Carry out the process of bisection of an angle by folding.

Teaching/Learning materials

- Protractor
- Manila paper
- A pair of scissors
- Ruler

Teaching/Learning methods

- Group work activities – Carry out Activity 11.8 in groups.
- Demonstration – Discuss the demonstration in pairs.

Lesson preparation

Prepare a chart showing the process of bisecting an angle by folding.

Teaching/Learning steps

1. Have learners draw 120°, 90° and 80° angles on manila paper.
2. Have learners cut out the angles on the manila paper and fold each of the angles into two equal parts.
3. Have learners cut out the angles along the line created after folding.
4. The learners will measure the angles of each of the two halves.
5. Assign learners Practice Activity 11.8.
6. Go round assessing learners' progress.

Assessment of skills, knowledge and understanding

Observe as learners bisect angles by folding manila papers.

Guidance to the teacher

- Allow learners to discuss bisecting angles.
- Allow fast learners to assist slow learners by discussing and explaining to them.
- Learners with special needs should be given more time to use audio-visual materials to help them grasp the concept.

Expected answers to Practice Activity 11.8

- Check on pairs and assist where necessary. Accept an error of ±1°.
- The learners' answers may vary depending on construction accuracy.

11.9 Bisecting angles using a pair of compasses and a ruler

Number of periods: 2

Reference: Pupil's Book page 177

Knowledge and understanding

Describe the process of bisecting angles using a pair of compasses and a ruler.

Skills

Carry out and explain the process of bisecting an angle using a pair of compasses and a ruler.

Teaching/Learning materials

- Protractor
- A pair of compasses
- Manila paper

Teaching/Learning methods

- Group work activities – Have learners discuss Activity 11.9 in groups.
- Demonstration – Discuss Example 11.9 in small groups.

Lesson preparation

Prepare a chart showing the process of bisecting an angle using a pair of compasses and a ruler.

Teaching/Learning steps

1. In groups of five, learners discuss the process of bisecting an angle using a pair of compasses and a ruler.
2. Learners discuss and demonstrate Example 11.9.
3. Assign learners Practice Activity 11.9 questions 1 to 5.
4. Go round the class assessing learners' progress.

Assessment of skills, knowledge and understanding

Observe as learners bisect angles using a pair of compasses and a protractor.

Guidance to the teacher

- Emphasise the importance of accuracy in the process of bisecting angles.
- Allow fast learners to discuss and explain to slow learners.

Expected answers to Practice Activity 11.9

- Check the learners' constructions and insist on accuracy.
- Emphasise that the two angles after bisection should add up to the original angles (before bisection).

11.10   Constructing 90°, 45° and 22.5° angles

Number of periods: 2

Reference: Pupil's Book page 179

Knowledge and understanding

Describe the process of constructing 90°, 45° and 22.5° angles using a pair of compasses and a ruler.

Skills

Construct angles using a ruler and a pair of compasses.

Teaching/Learning materials

- Ruler
- A pair of compasses
- Manila paper

Teaching/learning methods

- Group work activities – Carry out activities in small groups.
- Practical activities – Have learners construct 90°, 45° and 22.5° angles.
- Demonstration – Learners discuss the example given in small groups.

Lesson preparation

Prepare a chart showing the construction of 90°, 45° and 22.5° angles.

Teaching/ learning steps

1. Have learners study the chart showing the process of constructing 90°, 45° and 22.5° angles.
2. Let learners discuss the procedure involved in constructing 90°, 45° and 22.5° angles in groups.
3. Learners discuss the demonstration in Example 11.10, 11.11 and 11.12.
4. Assign learners Practice Activity 11.10 questions 1 – 3 for classwork.

Assessment of skills, knowledge and understanding

Observe as learners construct 90°, 45° and 22.5° angles using a pair of compasses and a ruler. Assess their accuracy.

Guidance to the teacher

- Allow learners to discuss bisection of angles in groups.
- Encourage learners to participate in group activities and fast learners to assist slow learners to enhance the spirit of co-operation.
- Assign slow learners the Remedial Activities so that they can catch up with the rest of the learners. Assign average learners the Consolidation Activity and the Extension Activity to the fast learners to promote creative thinking.

- Clearly explain to the learners that;
    (i)   to construct 45°, construct 90° first then bisect.
    (ii) To construct 22.5°, construct 90°, bisect the 90° to get 45° and then bisect 45° to get 22.5°.

Expected answers to Practice Activity 11.10
- Check the constructions in learners' exercise books.
- Insist on accuracy.

11.11   Constructing 60°, 30° and 15° angles

Number of periods: 2

Reference: Pupil's Book page 184

Knowledge and understanding

Describe the process of constructing 60°, 30° and 15° angles using a ruler and a pair of compasses.

Skills

Construct angles using a ruler and a pair of compasses.

Teaching/Learning materials
- Ruler
- Geometry set
- Manila paper

Teaching/Learning methods
- Group work activities – Discuss Activity 11.11 in small groups.
- Demonstration – Discuss and demonstrate Example 11.13 and 11.14 in small groups.

Lesson preparation

Prepare a chart showing the process of constructing 60°, 30° and 15° angles.

Teaching/ learning steps
1. Learners study the charts showing the process of construction 60°, 30° and 15° angles.
2. Learners discuss the process of constructing 60°, 30° and 15° angles.
3. Learners discuss Examples 11.13 and 11.14.
4. Assign learners Practice Activity 11.11 questions 1 – 3 for classwork.
5. Go round the class assessing learners' progress.

Assessment of skills, knowledge and understanding

Observe as learners construct 60°, 30° and 15° angles using a pair of compasses and a ruler.

Guidance to the teacher

• Allow learners to discuss bisection of angles.

• Guide learners to accurately construct 60° angles.

• Guide learners to understand that to construct 30°, you have to construct 60° and then bisect it to get 30°.

• To construct 15°, construct 60°, bisect the 60° to get 30° and then bisect 30° to get 15°.

Expected answers to Practice Activity 11.11

• Check the learners construction for accuracy.

11.12   Constructing 120° and 150° angles

Number of lesssons: 2

Reference: Pupil's Book page 188

Knowledge and understanding

Describe the process of constructing 120°, 150° angles using a ruler and a pair of compasses.

Skills

Construct angles using a ruler and a pair of compasses.

Teaching/Learning materials

• Ruler

• A pair of compasses

• Manila paper

Teaching/Learning methods

• Group work activities – Discuss activities in groups.

• Discussion – Discuss the Practice Activity in pairs.

Lesson preparation

Prepare a chart showing the process of constructing 120° and 150° angles.

Teaching/Learning steps

1. Have learners study the chart showing the process of constructing 120° and 150° angles.

2. Have learners discuss the construction of 120° and 150° angles using a ruler and a pair of compasses.

3. Learners discuss and demonstrate in Example 11.15.

4. Assign learners Practice Activity 11.12.

5. Go round assessing learners' progress.

Guidance to the teacher

- Allow learners to discuss the activities in groups.

- Demonstrate the process of constructing 120° by constructing 60° on one side of point P on line QPR (see Example 11.15).

- Demonstrate the process of constructing 150° by constructing 120° at point B on line ABC. Bisecting angle 60° to get 30°, so that 120° + 30° = 150° (see Example 11.15).

- Allow fast learners to discuss and explain to slow learners.

Expected answers to Practice Activity 11.12

Check learners' work and insist on accuracy.

11.13   Angle sum of a triangle

Number of periods: 2

Reference: Pupil's Book page 191

Knowledge and understanding

Explain how to solve problems involving angles.

Skills

Apply the knowledge of constructing angles to solve mathematical problems in daily life.

Teaching/Learning materials

- Ruler
- Protractor
- Pair of compasses
- Manila paper

Teaching/Learning methods

- Group work activities – Discuss the activity in groups.
- Discussion – Solve problems by discussing in pairs.

Lesson preparation

Prepare a chart showing the angle sum of a triangle.

Teaching/Learning steps

1. Have learners study the chart showing the angle sum of a triangle.

2. Have learners discuss the angles of a triangle by measuring the angles of different triangles.

3. Have learners discuss the demonstration in Example 11.16.

4. Have learners discuss Practice Activity 11.13, questions 1 – 9 for classwork.

5. Organise groups of learners according to their different learning abilities. Then assign Additional Activity 11. Have slow learners discuss the Remedial Activity, average learners do the Consolidation Activity while fast learners do the Extension Activity. Let each group make class presentation.

Guidance to the teacher

- Allow learners to discuss the angles sums of a triangle.
- Guide learners to understand that angles on a straight line add up to 180°.

Expected answers to Practice Activity 11.13

1. 70° + 70° = 140°. Thus, P = 180° − 140° = 40°

2. $x = 180° − 130° = 50°$

3. $y = 180° − 125° = 55°$

4. a = 180° − 130° = 50°

5. 65° + 45° = 110°. Thus, b = 180° − 110° = 70°

6. 95° + 55° = 150°
   Thus, c = 180° − 150° = 30°

7. 90° + 45° = 135°
   Thus, d = 180° − 135° = 45°

8. e = 80° + 68° = 148°
   Thus, e = 180° − 148° = 32°

9. 180° − 60° = 120° = 2a
   Hence, a = $\frac{120°}{2}$ = 60°

Additional Activity 11

Remedial Activity

1. Identify the following from the lines given below;
   (i) parallel lines
   (ii) intersecting lines
   (iii) transversal lines

   (a)

   (b)

   (c)

   (d)

(e)

(f)

x ———————— y
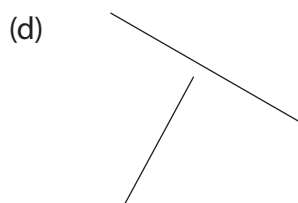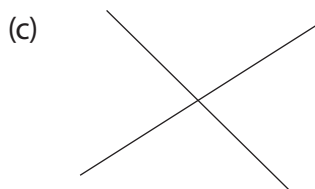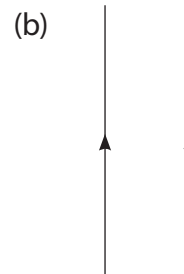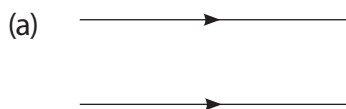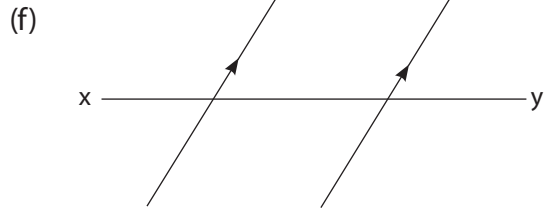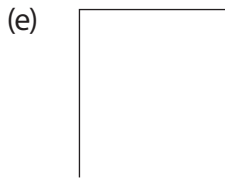
2. Measure the angles in the diagram below.

I

a =
b =
c =
d =
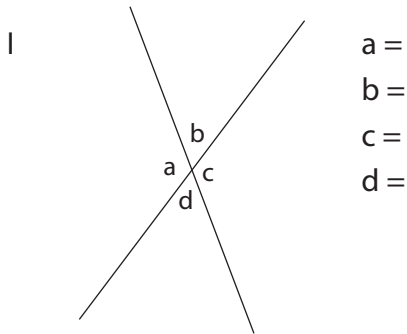
II   Find;
     (i)   a + b   (iii)   c + d
     (ii)   b + a   (iv)   d + b
     What do you notice?
III   What do you notice about angle a and angle c?
IV   What do you notice about angle b and d?

3. Study the diagram below.

p 50°
q r

s t
u v
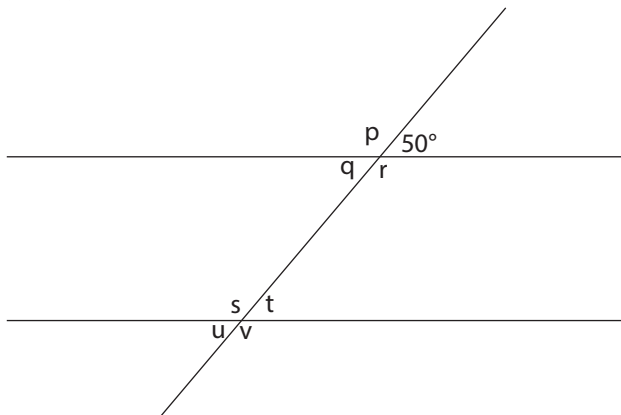
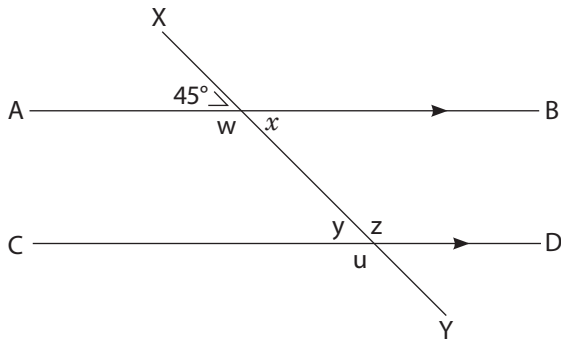Explain the steps involved in finding the following angles.
(i)   p   (ii)   q   (iii)   r   (iv)   s
(v)   t   (vi)   u   (vii)   v

4. Construct angle 90°.

5. Discuss the steps involved in finding the angles marked with letters.

(a)

x 130°

(b)

120°

y
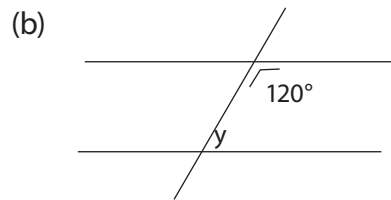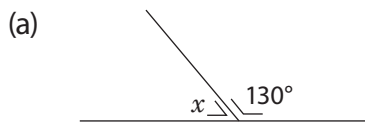
Consolidation Activity

1. Draw each of the following lines.

    (i)   Parallel lines   (ii)   Intersecting lines

    (iii) Perpendicular lines

2. Use the diagram below to answer the following questions.

X

A ————— 45° ————————— B
         w x

C ————— y z ————————— D
         u

Y

Find the value of angles below.

    (i)   u ___   (ii)   w ___   (iii)   x ___

    (iv) y ___   (v)   z ___   (vi)   Angle x + z = ___

3. Explain the steps involved in finding the angles marked.

    (i)   (ii)

    a   b   c
           110°   d
                                                 120°

                                            e f
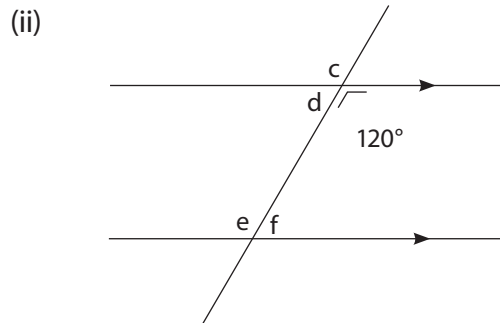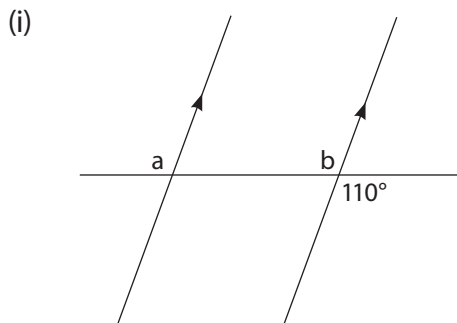
4. Draw angle 70° at point B using a protractor.

5. Explain and show the steps involved in constructing 30° at point c.

6. In each of the following, explain how to find the angles marked with letters.
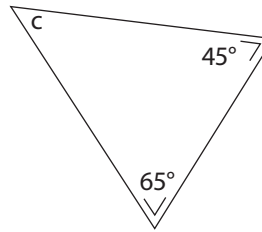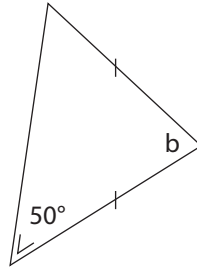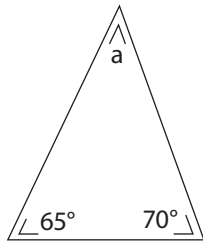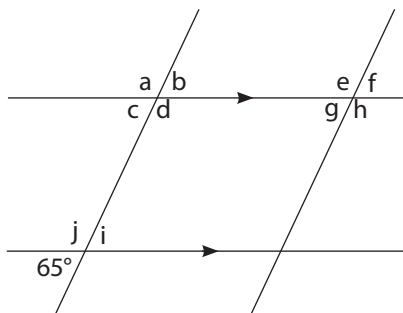
Extension Activity

1. From the diagram below identify the following.
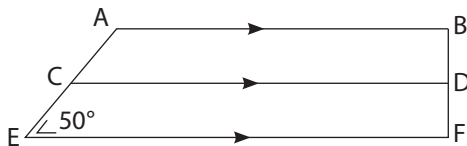
    (i)   Parallel lines

    (ii)   Intersecting lines

    (iii)   Perpendicular lines

2. Explain the steps involved in finding the value of the angles marked with letters.

a = ___   b = ___   c = ___   d = ___   e = ___

f = ___   g = ___   h = ___   i = ___   j = ___

Find d + i

3. Discuss the process of constructing 30° at point A.
4. Explain the steps involved in constructing angle 45° at point B.
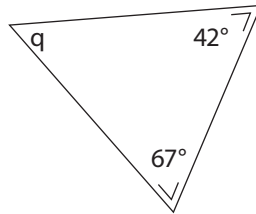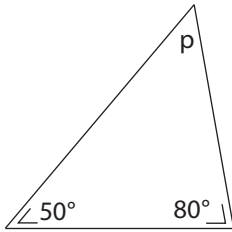5. Discuss and justify the value of the angle marked y.
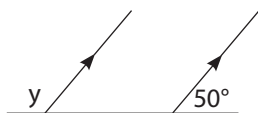
6. Using a ruler and a pair of compass, construct angle 120° at point X. Discuss your steps.

7. Explain the process of finding angle P.
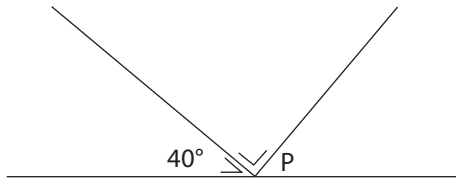
8. Explain the steps involved in finding the value of the angles marked with letters.

## Expected answers to Additional Activity 11

Remedial Activity

1. (i) Parallel lines

   a, b and f

   (ii) Intersecting lines

   c and e

   (iii) Transversal line

   line xy

2. I   a = 120°, b = 60°, c = 120°, d = 60°

   II   (i)   a + b   (ii)   b + a

              120° + 60° = 180°   60° + 120° = 180°

        (iii) c + d   (iv)   d + b

              120° + 60° = 180°   60° + 120° = 180°

   The sum of the two angles is 180° (they are co-interior angles).

   III Angle a and angle c are equal.

   IV   Angle b and d are equal (they are vertically opposite).

3. (i)   p = 18° − 50° = 130°   (ii)   q = 180° − 130° = 50°

   (iii) r = 180° − 50° = 130°   (iv)   q + s = 180°

                                                  s = 180° − 50 = 130°

   (v)   t = alternate with q = 50°   (vi)   u is vertically opposite. Thus, u = 50°.

   (vii) v is vertically opposite s. Hence v = 130°.

4. (i)
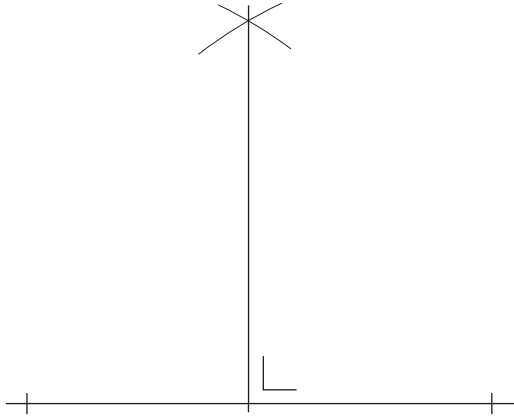
5. (a) $x = 180° - 130° = 50°$ (b) $y = 180° - 120° = 60°$ co-interior angles

Consolidation Activity
1. (i)

(ii)

(iii)
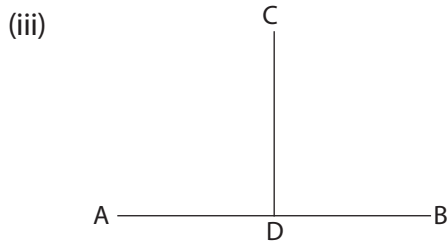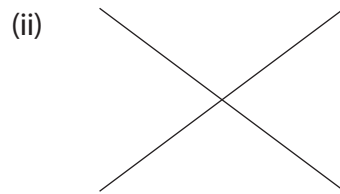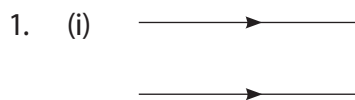
2. (i) u = 180° − 45° = 135°. = angle (w). u = corresponds with angle w
   (ii) w = 180° − 45° = 135°   (iii) $x = 45°$ (vertically opposite 45°).
   (iv) y = 180° − 135° = 45°
   (v) z = 180° − 45° = 135°(co-interior with x)
   (vi) Angle x + z = 45° + 135° = 180°
3. (i) b = 110° vertically opposite
        a = 110° corresponding to angle b
   (ii) c = 120° vertically opposite
        d = 180° − 120° = 60° supplement of c
        e = 180° − 60° = 120° co-interior with d
        f = 180° − 120° = 60° or alternate to d.

4.

$70°$
B

5.

$30°$
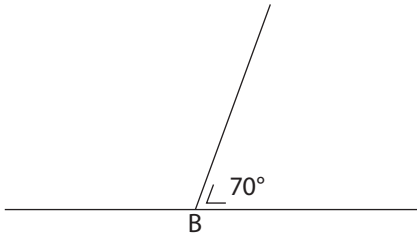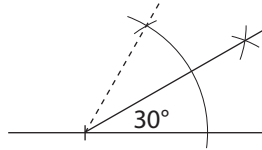
6. a = $180° - (65° + 70°) = 45°$
b = $180° - 100° = 45°$
c = $180° - (65° + 45°) = 70°$

Extension Activity

1. (i) Parallel lines
        Lines AB, CD and EF.
   (ii) Intersecting lines
        AB and BD, BD and DC, DF and FE, CD and DF.
   (iii) Perpendicular lines
        AB and BD, BD and CD
        DF and FE

2. a = $115°$ vertically opposite d
   b = $65°$ vertically opposite c
   c = $180° - 115° = 65°$
   d = $180° - 65° = 115°$ co-interior with i
   e = $180° - 65° = 115°$ co-interior with b
   f = $180° - 115° = 65°$ (angles on straight line with e).
   g = $65°$ vertically opposite angle f
   h = $115°$ vertically opposite angle e
   i = $65°$ vertically opposite
   j = $180° - 65° = 115°$
   d + i = $115° + 65° = 180°$

3.

$30°$
A

4.

$45°$
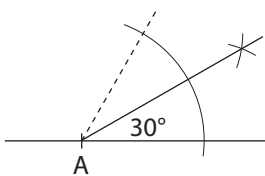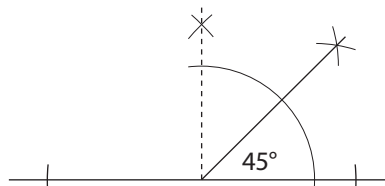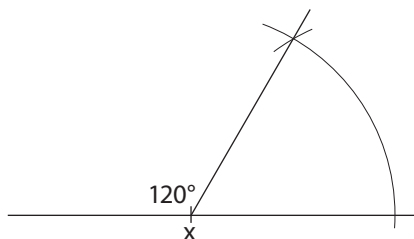
Consider the explanation given by the learners under each of the questions discussed.

5. y = $180° - 50° = 130°$. This is because, the angle on a straight line with y is $50°$.

6.

7. $P = 180° - (40° + 90°) = 50°$

8. $p = 180° - (50° + 80°) = 50°$

   $q = 180° - (67° + 42°) = 71°$

Formative Assessment Support

Guide to setting a formative assessment

- Ensuring all unit objectives and key unit competences in syllabus are covered.
- It should go in line with the assessment criteria provided for in the syllabus.
- Use the content summary for this unit to come up with the scope and sequence for constructing the assessment.
- Ensure the assessment caters for slow learners, average learners and fast learners. It should also cater for learners with special needs.

How to construct assessment

- Consider the assessment after covering all the sub-topics covered in drawing and constructing angles.
- Allow learners adequate time to revise for the assessment. Remind learners, at least three days before the assessment is administered.
- This is a lengthy unit and involves a lot of practical work, therefore adequate time should be set aside for learners to do the assessment and later on revise.
- Suggested number of period of the assessment – 2 lessons.
  Allocate 2 lessons for doing the assessment.

Multi-ability learning

- The assessment should cater for multi-ability learners.
- Slow learners should be given more time to answer the questions.
- Learners with special needs should also be given more time and appropriate materials to attempt the assessment.

Expected answers to Revision Activity 11

1. – Classroom walls
   – Chairs, tables
2. (a) Line PQ and RS, line PR and QS.
   (b) Line AB and CD, line AD and BC.
3. (a) Line AB and CD, line AD and BC.
   (b) Angle XWZ and angle YXW.
4. (i) p = 70° vertically opposite

(ii)   q = 180° − 70° = 110°

(iii)   r = 110° vertically opposite angle q

5. (i)   a = 180° − 50° = 130°   (ii)   b = 50°

    (iii)   c = 180° − 50° = 130°

6. (i)   e = 150° corresponding to b   (ii)   f = 180° − 150° = 30°

7. (a)   g = 130° alternate angles   (b)   h = 40° corresponding angles

    (c)   j = 70° corresponding angles

8.

80°

9.

60°

C

10.

150°

W   X   30°   Y
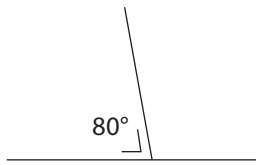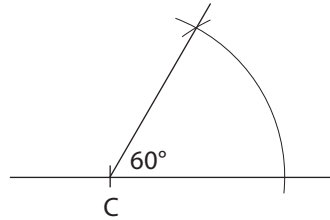
Topic Area: Geometry

Unit 12 — Interpreting and constructing scale drawings

Background

At this level, learners have already acquired the basic ideas of geometry. They have solved problems involved in measurements of length. They have also drawn and constructed angles.

This unit aims to build on the knowledge and skills that were acquired earlier in the geometry related units.

By the end of the unit learners should be able to solve problems involving interpretation and construction of scale drawings and see the application in real life.

Content summary

This unit will cover the following sub-topics:

12.1 Concept of scale drawings

12.2 Finding scale

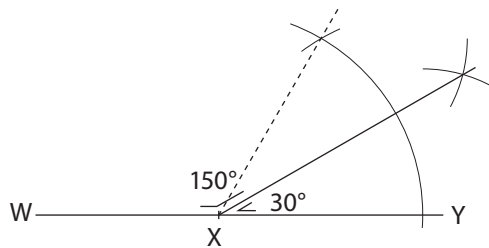12.3 Constructing scale drawings

12.4 Finding the actual distance

12.5 Finding the drawing length

Key unit competence

Learners to be able to interpret and construct scale drawings.

Attitudes and values

Learners to able to appreciate the importance of scale drawing in daily life.

Assessment of attitudes and values

Observe as learners show respect to one another in discussions.

Relevant cross-cutting issues

Peace and values education

As learners discuss activities in small groups, they develop a sense of respect for one another. This promotes peace and good values in learners.

Inclusive education

Learners are encouraged to interact with each other freely. Slow learners, fast learners and learners with special needs should always perform the group activities together.

Relevance generic competence

Communication skills: Allow learners to present findings of their activities and discuss their results.

Co-operation: Use group work activities to enhance cooperation among learners.

Research and problem solving: Emphasise the importance of being accurate in scale drawings and taking the right measurements. This will enhance the development of accuracy in problem solving and research.

Assessment criteria

Learners should solve problems involving interpretation and construction of scale drawings.

Notes to the teacher

- This is a unit that requires a practical approach in teaching and learning.
- Ensure learners have geometry sets before teaching/ learning begins.
- Use the demonstration below to help learners find the actual distance in scale drawing;

On a map, the distance between three towns P, Q and R are represented by the line below. (Drawn to scale)
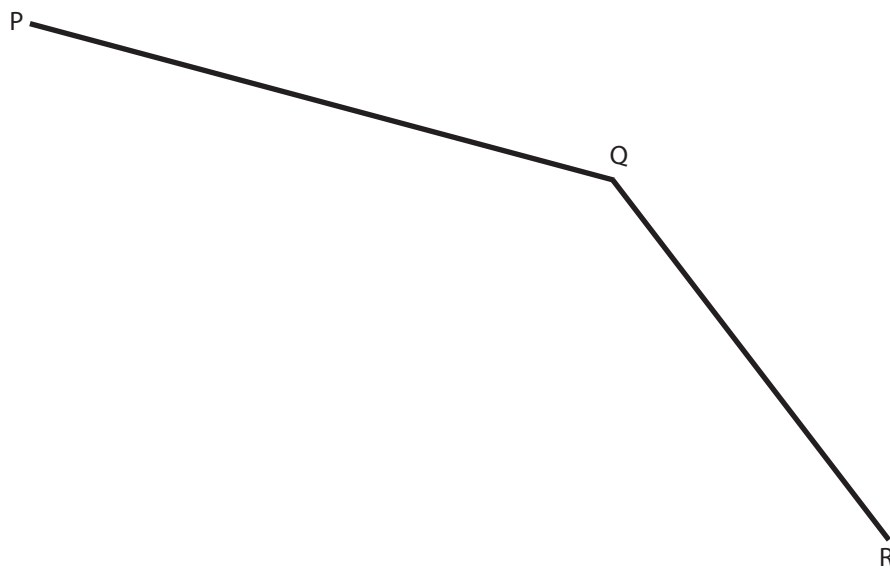
(a) The scale used on the map is 1: 10 000.
   Measure the distance in cm from PQ, QR and P to Q to R.
(b) Interpret the scale. What is the actual distance from
   (i) town P to Q?
   (ii) town Q to R?
   (iii) town P to town R through Q?

Solution

(a) The drawing length of town P to Q = 8 cm

Q to R = 6 cm

From line P to Q to R = 8 cm + 6 cm = 14 cm

(b) The scale 1: 10 000 means; 1 cm drawing length represents 10 000 cm or 100 m on the road.

(i) Actual distance from town P to town Q.

1 cm represents 100 m

8 cm = 8 × 100m = 800 m

(ii) Actual distance from town Q to town R:

1 cm represents 100 m.

6 cm will represent 100 m × 6 = 600 m

(iii) Actual distance from town P to R through Q:

8 cm + 6 cm = 14 cm

1 cm represents 100 m

14 cm will represent 14 × 100 m = 1 400 m

Multi-ability learning

At the end of this unit, assign learners Additional Activity 12 as follows;

1. Remedial Activity

This is for slow learners. It is designed to help them catch up in areas they might not have understood in the course of learning. Allow discussion and have learners make a class presentation.

2. Consolidation Activity

This is prepared for average learners. It is meant to give them more practice on the sub-topic. Give it as a class discussion work and then have the group make a presentation.

3. Extension Activity

This is prepared for fast learners. It is meant to stimulate their critical thinking ability. The activity should contain questions that involve a higher level of reasoning. Give it as assignment for discussion and class presentation.

Word list

Reference: Pupil's Book page 209

Have learners work in pairs to develop their reading, listening and writing skills using the word list.

Use the stated task with suitable vocabulary through out the unit.

Content

12.1 Concept of scale drawings

Number of periods: 2

Reference: Pupil's Book page 196

Knowledge and understanding

Explain the concept of scale drawing.

Skills

Calculate the scale of a map.

Teaching/Learning materials

- 1 metre ruler
- Tape measure
- Maps

Teaching/Learning methods

- Group work activities – Learners perform activities in groups.
- Practical approaches – Learners carry out actual measurements of diagrams.
- Problem solving – Learners solve problems involving scale.

Lesson preparation

This activity will be performed both inside the classroom and outside the classroom. Ensure the 1 metre ruler and the tape measure is availed in advance for learners to use in measuring longer distances. Assign learners the activities in small groups.

Teaching/Learning steps

1. Ask learners to draw the diagrams in Activity 12.1 in their exercise books.
2. Ask learners to measure and record the actual measurements of the objects they have drawn. Ask the learners to compare their drawing measurements to the actual measurements.
3. Ask learners to do Activity 12.2 in small groups.
4. Assign learners Practice Activity 12.1 in pairs for classwork.
5. Go round the class assessing learners' progress.

Assessment of skills, knowledge and understanding

Observe as learners make scale drawings.

Guidance to the teacher

- Allow learners to discuss the activity in groups.
- Clearly explain the following to learners.

(i) Drawing measurements: the distance drawn by learners on paper to represent the objects. For example the distance from the classroom to the office on paper is 3 cm.

(ii) Actual measurements: The real distance of the objects. For example, the real distance from the classroom to the office is 30 m.

Expected answers to Practice Activity 12.1

(a) Actual measurements vary depending on specific objects available.
1. 20 m to 50 m long
2. About 15 cm
3. About 4 m
4. About 12 m or longer.

(b) Drawing lengths

1.	5 cm	2.	7.7 cm
3.	4 cm	4.	6 cm

(c) Yes. The actual sizes cannot fit into a book.

Check the explanation given for each question.

12.2   Finding scale

Number of periods: 2

Reference: Pupil's Book page 197

Knowledge and understanding

Explain how to find the scale of drawings and maps.

Skills

Convert between measurements of length in order to get the same units when finding scale.

Teaching/Learning materials

- Ruler
- Charts
- Desk
- Classroom
- Sheets of paper

Teaching/Learning methods

- Group work activities – Perform activities in small groups.
- Practical activities – Measure the objects.
- Demonstration – Use examples to solve problems.
- Supervised practice – Give classwork to learners.

Lesson preparation

Organise learners to perform Activity 12.3 outside the classroom.

Teaching/Learning steps

1. Ask learners to do Activity 12.3 in small groups.
2. Ask learners to measure and record the actual length and width of the desk.
3. Ask learners to discuss Example 12.1 to help them find the scale used.
4. Assign learners Practice Activity 12.2 questions 1 (a) – (f) for classwork and questions 2 to 5 for homework.
5. Go round assessing learners' progress.

Assessment of skills knowledge and understanding

Observe as learners find the scale used in drawings.

Guidance to the teacher

- Allow learners to discuss the activities in groups.
- Use Example 12.1 to clearly explain to learners how to find scale through these steps:
    1. Measure the drawing length.
    2. Convert the actual length to be in the same units as drawing length (centimetres).
    3. To find the scale used $= \dfrac{\text{Drawing length}}{\text{Actual length}}$
    4. Write scale in ratio form as

        Drawing length: Actual length

Expected answers to Practice Activity 12.2

1. (a) 1:100

   (b) $\dfrac{5\text{ cm}}{1.5\text{ m}} = \dfrac{\overset{1}{\cancel{5}}\text{ cm}}{\underset{30}{\cancel{150}}\text{ cm}} = \dfrac{1}{30} = 1:30$

   (c) $\dfrac{\overset{1}{\cancel{10}}\text{ cm}}{\underset{3}{\cancel{30}}\text{ cm}} = \dfrac{1}{3} = 1:3$

   (d) $\dfrac{3.5\text{ cm}}{7\text{ cm}} = \dfrac{\overset{1}{\cancel{35}}\text{ cm}}{\underset{2}{\cancel{70}}\text{ cm}} = \dfrac{1}{2} = 1:2$

   (e) $\dfrac{10\text{ cm}}{40\text{ km}} = \dfrac{10\text{ cm}}{400000} = 1:40\,000$

   (f) $\dfrac{30\text{ cm}}{6\text{ dam}} = \dfrac{\overset{1}{\cancel{30}}\text{ cm}}{\underset{2}{\cancel{6}} \times 1000\text{ cm}} = \dfrac{1}{200} = 1:200$

2. $\dfrac{5\text{ cm}}{25\text{ km}} = \dfrac{\overset{1}{\cancel{5}}\text{ cm}}{\underset{5}{\cancel{25}} \times 100000\text{ cm}} = \dfrac{1}{500000} = 1:500\,000$

3. $\dfrac{5\text{ cm}}{10\text{ m}} = \dfrac{\overset{1}{\cancel{5}}\text{ cm}}{\underset{200}{\cancel{1000}}\text{ cm}} = \dfrac{1}{200} = 1:200$

4. $\dfrac{30 \text{ cm}}{300 \text{ km}} = \dfrac{\overset{1}{\cancel{30}} \text{ cm}}{\underset{10}{\cancel{300}} \times 100000} = \dfrac{1}{1000000} = 1{:}1\ 000\ 000$

5. (a) Length $= 6$ cm   Width: 4 cm

   (b) Perimeter $= 2(4 + 6) = 20$ cm

   (c) $\dfrac{4 \text{ cm}}{20 \text{ m}} = \dfrac{\overset{1}{\cancel{4}} \text{ cm}}{\underset{5}{\cancel{20}} \times 100 \text{ cm}} = \dfrac{1}{500} = 1{:}500$

Check the explanation for each of the questions where the learners have been asked to explain or discuss.

12.3   Constructing scale drawings

Number of periods: 1

Reference: Pupil's Book page 199

Knowledge and understanding

Explain how to find the actual distance on the ground.

Skills

Calculating the actual distance on the ground.

Teaching/Learning materials

- Classroom
- Office
- Tape measure
- Ruler

Teaching/Learning methods

- Group activities – Learners perform activities in groups.
- Practical approaches – Learners measure distance using a ruler.
- Supervised activity – Assign learners classwork and homework.

Lesson preparation

Organise learners to do activities in small groups outside the classroom.

Teaching/Learning steps

1. Ask learners to perform Activity 12.4 in small groups.
2. Ask learners to discuss the process involved in making the scale drawing by using Example 12.2 and 12.3.
3. Ask learners to discuss Practice Activity 12.3 in pairs (questions 1 – 2 for classwork and questions 3 – 5 for homework).
4. Go round the classroom to assess learners' progress.

### Assessment skills, knowledge and understanding

Observe as learners make scale drawing of the classroom and office.

Guidance to the teacher

- Allow learners to discuss the activities in groups.
- Explain to learners the process involved in making scale drawings as follows:
  - (i) Interpret the scale to find what actual measurement will be represented by drawing a length of 1 cm.
  - (ii) Use the interpretation of the scale to find the drawing measurements of the length and the width.
  - (iii) Use the drawing measurements to make the drawings.

Expected answers to Practice Activity 12.3

1. (a) 7 m by 3 m

7 cm

3 cm

(b)

5 cm

5 cm

5 cm

(c)

4 cm

4 cm
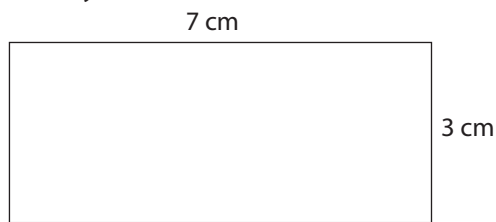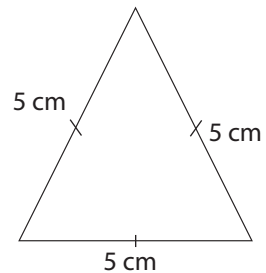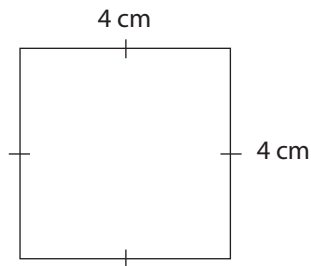
2. (a)

3 cm

(b)

5.3 cm

(c)

9 cm

(d)

2 cm

3. Assess length of drawn lines. They are:

(a) $\frac{7200 \text{ cm}}{1000 \text{ cm}} = 7.2$ cm   (b) $\frac{8000 \text{ cm}}{1000 \text{ cm}} = 8$ cm   (c) $\frac{6800 \text{ cm}}{1000 \text{ cm}} = 6.8$ cm

4. Accept relevant answers in practical context.

5. (a) A to B = 10 m

Scale = 1:400

$\frac{10 \text{ m}}{400 \text{ cm}} = \frac{10 \times 100}{400} = 2.5$ cm

(b) A to E = 40 m

Scale = 1:400

$\frac{40 \text{ m}}{400 \text{ cm}} = \frac{\overset{10}{40} \times 100}{\underset{1}{400}} = 10$ cm

Check the explanation given against each question.

12.4   Finding the actual distance

Number of periods: 1

Reference: Pupil's Book page 202

Knowledge and understanding

Explain how to find the actual distance on the ground.

Skills

Calculating the actual distance on the ground.

Teaching/Learning materials

- Ruler
- Tape measure
- Maps

Teaching/Learning methods

- Group work – Discuss the activities in small groups.
- Practical activities – Measuring real distance using tape measure.
- Demonstration – Discuss Example 12.4 given in Pupil's Book.

Lesson preparation

Prepare a chart showing a diagram drawn to a given scale.

Teaching/Learning steps

1. Ask learners to study the chart.
2. Ask learners to discuss the process involved in finding the actual distance.
3. Learners to discuss the Example 12.4 given in Pupil's Book.
4. Assign learners Practice Activity 12.4 question 1 – 3 for classwork. Assessing learners' progress as they solve the questions.

Guidance to the teacher

- Allow learners to discuss the activities in groups.
- Guide the learners to find the actual distance on the ground by;
    (i)   measuring the drawing length.
    (ii)   interpreting the scale.
    (iii) use the formula;
        Actual distance = Drawing length × value of scale (represents 1 cm)
- Assign slow learners the Remedial Activity.
- Assign average learners the Consolidation Activity.

- Assign fast learners the Extension Activity to help them develop critical thinking.

Expected answers to Practice Activity 12.4

1. Scale 1:2500

   Drawn length = 10 cm

   $\dfrac{2500 \text{ cm}}{10 \text{ cm}} = 250 \text{ m}$

2. (a) Actual distance

   $4.5 \text{ cm} \times 100\,000 = \dfrac{450000 \text{ cm}}{100000} = 4.5 \text{ km}$

   (b) $\dfrac{800000 \text{ cm}}{100000} = 8 \text{ km}$ (c) $\dfrac{600000 \text{ cm}}{100000} = 6 \text{ km}$

   (d) $\dfrac{1850000 \text{ cm}}{100000} = 18.5 \text{ km}$

3. (a) $200\,000 \times 5 = \dfrac{1000000 \text{ cm}}{100000} = 10 \text{ km}$

   (b) $200\,000 \times 2.5 = \dfrac{500000 \text{ cm}}{100000} = 5 \text{ km}$

   (c) $3.2 \text{ cm} \times 200\,000 = \dfrac{640000 \text{ cm}}{100000} = 6.4 \text{ km}$

   (d) $8 \text{ cm} \times 200\,000 = \dfrac{160000 \text{ cm}}{100000} = 16 \text{ km}$

4. (i) $AB = 4 \text{ cm} \times 40\,000 = \dfrac{160000 \text{ cm}}{100} = 1\,600 \text{ m}$

   (ii) $BC = 5 \text{ cm} \times 40\,000 = \dfrac{200000 \text{ cm}}{100} = 2\,000 \text{ m}$

   (iii) $CD = \dfrac{5 \text{ cm} \times 40000 \text{ cm}}{100} = 2\,000 \text{ m}$ (iv) $DE = \dfrac{4 \text{ cm} \times 40000 \text{ cm}}{100} = 1\,600 \text{ m}$

   (v) $AH = \dfrac{4 \text{ cm} \times 40000 \text{ cm}}{100} = 1\,600 \text{ m}$ (vi) $FE = \dfrac{5 \text{ cm} \times 40000 \text{ cm}}{100} = 2\,000 \text{ m}$

   (vii) $AD = \dfrac{14 \text{ cm} \times 40000 \text{ cm}}{100} = 5\,600 \text{ m}$ (viii) $GE = \dfrac{10 \text{ cm} \times 40000 \text{ cm}}{100} = 4\,000 \text{ m}$

Check the explanation given where it is required in the activities.

12.5 Finding the drawing length

Number of periods: 1

Reference: Pupil's Book page 204

Knowledge and understanding

Use of scale drawing in solving mathematical problems involving measurement.

Skills

Solve problems involving scale drawings.

Teaching/Learning materials

- Geometry set
- Ruler
- Maps
- Charts

Teaching/Learning methods

- Group work activities – Discuss in small groups.
- Practical approaches – Learners to measure real distances.
- Demonstration – Learners to demonstrate using the examples given.

Lesson preparation

Organise learners to do the activities outside the classroom.
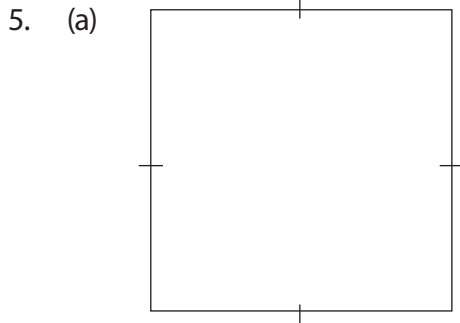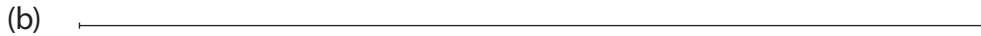
Teaching/Learning steps

1. Ask learners to do Activity 12.6 in small groups.
2. Have learners use Example 12.5 to discuss the steps involved in finding the drawing length.
3. Assign learners in pairs to discuss Practice Activity 12.5 questions 1 – 3 for classwork and questions 4 – 6 for homework.
4. Go round assessing learners' progress.

Guidance to the teacher

- Allow the learners to discuss the activities in groups.
- Guide learners to get the drawing measurement as follows:
  - (i) Interpret the scale to find out the distance represented by 1 cm on the scale.
  - (ii) Find the drawing measurements of the diagram.
  - (iii) Make the scale drawings.

Expected answers to Practice Activity 12.5

1. (a) $\dfrac{350 \text{ m} \times \cancel{100}}{\cancel{10000}} = 3.5$ cm   (b) $\dfrac{820 \text{ m} \times \cancel{100}}{\cancel{10000}} = 8.2$ cm

   (c) $\dfrac{225 \text{ m} \times \cancel{100}}{\cancel{10000}} = 2.25$ cm

2. (a) $\dfrac{60 \text{ km} \times \cancel{100000}}{\cancel{100000}} = 60$ cm   (b) $\dfrac{225 \text{ km} \times \cancel{100000}}{\cancel{100000}} = 225$ cm

   (c) $\dfrac{200 \text{ km} \times \cancel{100000}}{\cancel{100000}} = 200$ cm

3. $\dfrac{\cancel{120}^{40} \text{ km} \times \cancel{100000}}{\cancel{300000}_{1}} = 40$ cm

4. (a)

(b) |————————————————————————————————|

5. (a)

(b) |————————————————————|
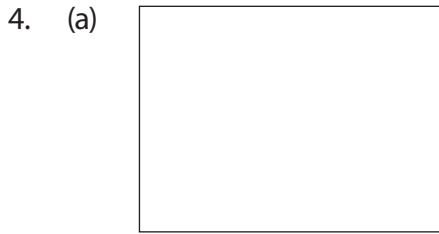
6. $\dfrac{56 \text{ km} \times \cancel{100000}}{\cancel{1000000}} = 5.6 \text{ cm}$

Check the explanations given against each question.

Additional Activity for unit 12

Remedial Activity

1. Draw a diagram to represent the Primary 5 Maths Pupil's Book.
2. Measure the actual length of the Primary 5 Maths Pupil's Book.
3. Measure the actual width of the Primary 5 Maths Pupil's Book.

Fill the following table

Item	Actual length	Drawing length	Scale used
Primary 5 Maths Pupil's Book	20 cm	4 cm	$\dfrac{4}{20} = \dfrac{1}{5} = 1{:}5$
4. Chalkboard	5 m	5 cm	_____
5. Length of a road	10 km	10 cm	_____

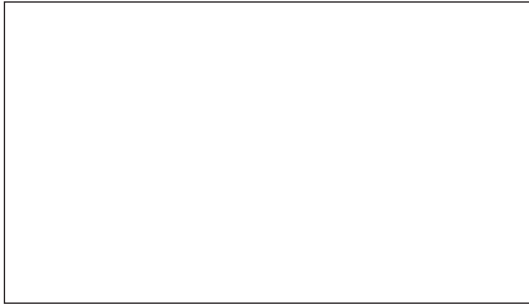6. Using a scale of 1:100, for example, the drawing length of a length of a path is 25 m will be as follows

   $25 \times 100 = 2\,500$

   $= \dfrac{2\cancel{500}}{\cancel{100}} = 25 \text{ cm}$

   Using a scale 1:100, the drawing length of a classroom 7 m long will be ___.

7. The diagram below is drawn to scale.

The scale used is 1:200.
(a) Explain how to find the actual length of the rectangle (in metres).
(b) Explain how to find the actual width of the rectangle (in metres).
(c) Explain how to find the actual perimeter in metres.

Consolidation Activity

Fill in the table below.

	Item	Actual length	Drawing length	Scale used
1.	Length of the chalkboard	6 m	6 cm	_____
2.	Width of the chalkboard	2 m	2 cm	_____
3.	Length of the teacher's table	3 m	3 cm	_____
4.	Length of a road	8 km	20 cm	_____

5. A piece of land measures 800 m long by 500 m wide. Use the scale 1:10 000 to find the drawing length and the drawing width.

6. A distance between two towns is represented on a map by a scale of 1:10 000. The drawing measurement of the town is 15 cm. Explain how to find the actual distance between the two towns in kilometres?

7. The scale used to draw the rectangular plot below is 1:5 000.
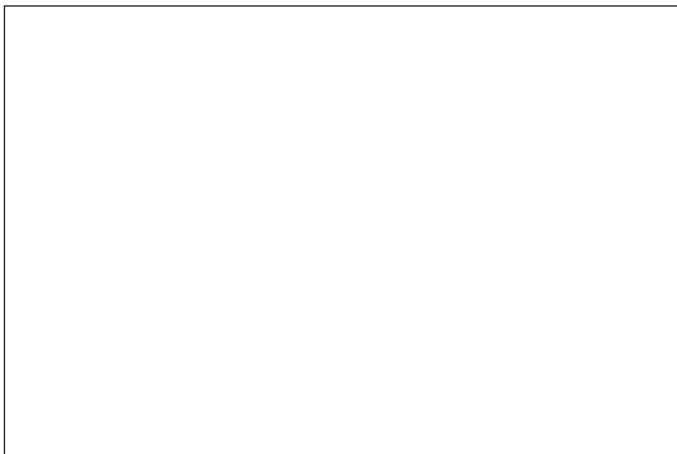
(a) Discuss how to find the actual length in metres.

(b) Discuss how to find the actual width in metres.

(c) Discuss how to find the actual perimeter of the figure in metres.

8. The sketch below shows the actual distance between three schools A, B and C.
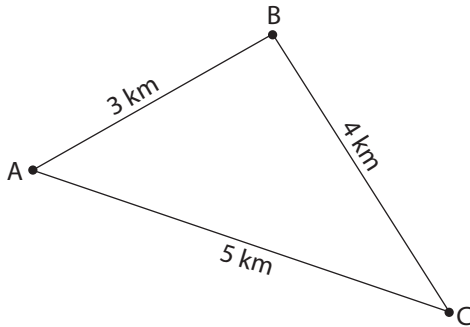
The scale used in drawing the map is 1:100 000.

(a) What is the drawing measurement between schools A and B?

(b) What is the drawing measurement between schools B and C?

(c) What is the shortest distance from schools A to C?

Extension Activity

1. The length of a classroom 7 m is represented by 7 cm. What is the scale used?

2. On a map 5 cm represent 5 km on the ground. What is the scale used?

3. A drawing length of 10 cm is used to represent a road 30 km long. What is the scale used?

4. The diagram below represents a school farm. It is drawn to scale.
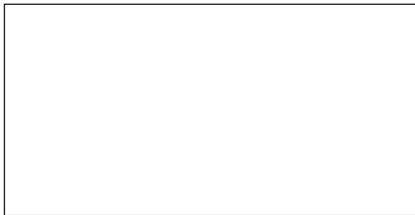
If the scale used to draw the farm is 1:50 000,

(a) what is the actual length of the farm in metres?

(b) what is the actual width of the farm in metres?

(c) what is the perimeter of the farm in metres?

5. A scale of 1:5 000 was used to draw the diagram below.

600 m

300 m
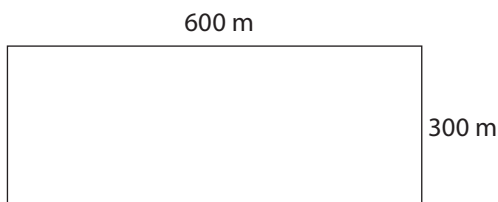
(a)   Explain how to find the drawing length of the diagram in cm.

(b)   Explain how to find the drawing width of the diagram in cm.

6.   Using a scale of 1:200 000 draw lines to represent

(a)   10 km   (b)   5 km   (c)   25 km   (d)   22 km

7.   The drawing length for a road is 20 cm. The scale used is 1:20 000. Discuss how to find the actual length in kilometres?

8.   (a)   Using the scale 1:2 000, make scale drawings of the following.

(i)   A triangular field measuring 60 m by 80 m by 100 m.

(ii)   A rectangular field measuring 20 m by 100 m.

(iii)   A square field measuring 400 m by 400 m.

(b)   From your scale drawings, calculate the perimeter of each figure.

Expected answers to Additional Activity 12

Remedial Activity

1.   Check what the learners drew.

2.   Check the learners' measurements in their books.

3.   Check the learners' measurements.

4. $\dfrac{5\ \text{cm}}{5\ \text{m} \times 100} = \dfrac{\cancel{5}^{1}}{\underset{1}{\cancel{500}}} = \dfrac{1}{100} = 1{:}100$ 5. $\dfrac{\cancel{10}\ \text{cm}}{\cancel{10} \times 100000} = \dfrac{1}{100000} = 1{:}100\ 000$

6. $7 \times 100 = \dfrac{\cancel{700}}{\cancel{100}} = 7\ \text{cm}$

7.   (a) $7 \times 200 = \dfrac{\cancel{1400}}{\cancel{100}} = 14\ \text{m}$ (b) $4 \times 200 = \dfrac{\cancel{800}}{\cancel{100}} = 8\ \text{m}$

(c) $2 \times (14 + 8) = 44\ \text{m}$

Consolidation Activity

1. $\dfrac{6\ \text{cm}}{6\ \text{m}} = \dfrac{\cancel{6}^{1}}{\underset{100}{\cancel{600}}} = \dfrac{1}{100} = 1{:}100$ 2. $\dfrac{2\ \text{cm}}{2\ \text{m}} = \dfrac{\cancel{2}^{1}}{\underset{100}{\cancel{200}}} = \dfrac{1}{100} = 1{:}100$

3. $\dfrac{3\ \text{cm}}{3\ \text{m}} = \dfrac{\cancel{3}^{1}}{\underset{100}{\cancel{300}}} = \dfrac{1}{100} = 1{:}100$ 4. $\dfrac{20\ \text{cm}}{8\ \text{km}} = \dfrac{\overset{1}{\cancel{20}}\ \text{cm}}{\underset{40000}{\cancel{800000}}} = \dfrac{1}{40000} = 1{:}40\ 000$

5.   Length $= \dfrac{\cancel{800}\ \text{m} \times \cancel{100}}{\cancel{10000}} = 8\ \text{cm}.$ Width $= \dfrac{\cancel{500}\ \text{m} \times \cancel{100}}{\cancel{10000}} = 5\ \text{cm}.$

6. $15 \times 10\ 000 = \dfrac{\cancel{150000}}{\cancel{100000}} = 1.5\ \text{km}$

7.   (a) $9\ \text{cm} \times 5\ 000 = \dfrac{\cancel{45000}\ \text{cm}}{\cancel{100}} = 450\ \text{m}$

(b) $6\ \text{cm} \times 5\ 000 = \dfrac{\cancel{30000}\ \text{cm}}{\cancel{100}} = 300\ \text{m}.$

8. (a) $3 \times 100\ 000 = \dfrac{300000 \text{ cm}}{100000} = 3$ cm

   (b) $4 \times 100 = \dfrac{400000 \text{ cm}}{100000} = 4$ cm

   (c) $5 \times 100\ 000 = \dfrac{500000 \text{ cm}}{100000} = 5$ cm

Extension Activity

1. $\dfrac{7 \text{ cm}}{7 \text{ m}} = \dfrac{\overset{1}{7}}{\underset{100}{700}} = \dfrac{1}{100} = 1{:}100$

   2. $\dfrac{5 \text{ cm}}{5 \text{ km}} = \dfrac{\overset{1}{5}}{\underset{100000}{500000}} = \dfrac{1}{100000} = 1{:}100\ 000$

3. $\dfrac{10 \text{ cm}}{30 \text{ km}} = \dfrac{\overset{1}{10 \text{ cm}}}{\underset{300000}{3000000}} = \dfrac{1}{300000} = 1{:}300\ 000$

4. (a) $6 \text{ cm} \times 50\ 000 = \dfrac{300000 \text{ cm}}{100} = 3\ 000$ m

   (b) $3 \text{ cm} \times 50\ 000 = \dfrac{150000 \text{ cm}}{100} = 1\ 500$ m

   (c) $2(3\ 000 + 1\ 500) \text{ m} = 9\ 000$ m

5. (a) Scale $1{:}5000 = 1$ cm rep 50 m

   $\dfrac{\overset{12}{600} \text{ m}}{\underset{1}{50} \text{ m}} = 12$ cm

   (b) $\dfrac{5000}{100} = 1$ cm rep 50 m

   $\dfrac{\overset{6}{300}}{\underset{1}{50}} = 6$ cm

6. (a) |———————————————————————|

   (b) |———————————————|

   (c) |——|

   (d) |———————————————————————————————————————|

7. $200 \text{ cm} \times 20\ 000 = \dfrac{400000 \text{ cm}}{100000} = 4$ km

8. (a) (i)
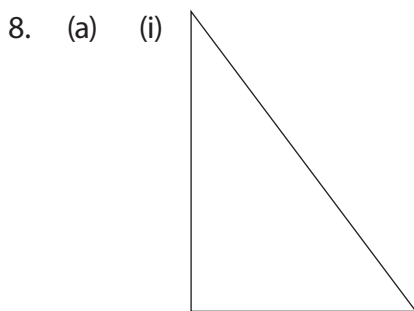
(ii)
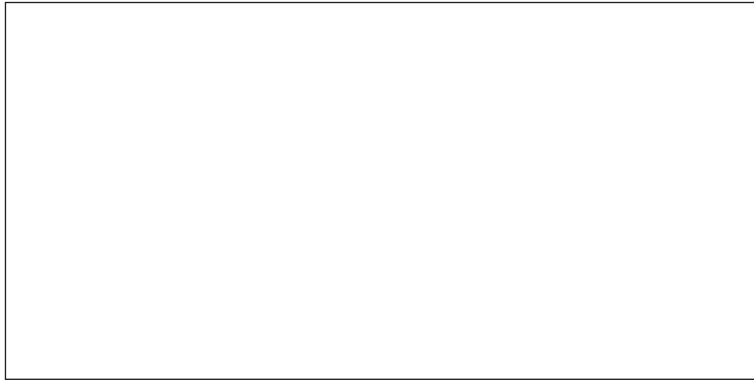
(iii)
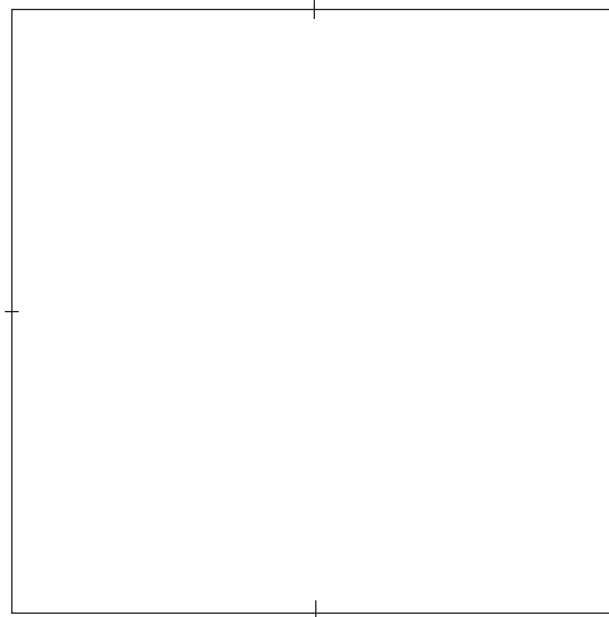
(b) (i) perimeter = (3 + 4 + 5)cm = 12 cm

(ii)   perimeter = 2(10 + 5)cm = 30 cm

(iii)   perimeter = 4 × 8 cm = 32 cm

Formative Assessment Support

This unit is composed of five sub-topics. In constructing the formative assessment, ensure all the five sub-topics are general in the assessment.

The questions should cater for all levels of learners, namely; slow learners, average learners, fast learners and learners with special needs.

- Ensuring all unit objectives and key unit competences in syllabus are covered.
- The assessment should be conducted in double lessons.
- Ensure the sub-topics are well covered before the assessment is administered.

- Remind learners to carry out revision for the entire unit before administering the assessment.
- Mark and ensure you go through with learners to guide them on the concepts they might have scored below your expectation.

Expected answers to Revision Activity 12

1. $\dfrac{17.2 \text{ cm} \times 10}{1720 \text{ m} \times 1000} = \dfrac{\cancel{172}^{1}}{\cancel{1720000}_{10000}} = \dfrac{1}{10000} = 1{:}10\ 000$

2. 1 cm rep 1 m or 1: 100

   $\dfrac{24 \text{ m}}{100 \text{ cm}} = \dfrac{\cancel{2400}}{\cancel{100}} = 24 \text{ cm}$

   Scale 1:100

   $\dfrac{10 \text{ m}}{100 \text{ cm}} = \dfrac{\cancel{1000}}{\cancel{100}} = 10 \text{ cm}$

   Scale 1:100

3. (a) $\dfrac{820 \text{ cm}}{100 \text{ cm}} = 8.2 \text{ cm} = 1{:}100$ (b) $\dfrac{\cancel{6000} \text{ cm}}{\cancel{1000} \text{ cm}} = 6 \text{ cm} = 1{:}1\ 000$

   (c) $\dfrac{\cancel{4000000}^{20} \text{ cm}}{\cancel{200000}_{1} \text{ cm}} = 20 \text{ cm} = 1{:}200\ 000$

4. (a) $\dfrac{\cancel{12}^{1} \text{ cm}}{\cancel{6000}_{500} \text{ cm}} = 1{:}500$ (b) $\dfrac{\cancel{8}^{1} \text{ cm}}{\cancel{40}_{5} \times 100} = 1{:}500$ 5. $\dfrac{\cancel{840}^{4.2} \times \cancel{100}}{\cancel{20000}_{1}} = 4.2 \text{ cm}$

6. (i) PQ = 4 cm   (ii) QR = 3 cm   (iii) RS = 5 cm

   (iv) ST = 6 cm   (v) TU = 5 cm   (vi) UV = 4 cm

7. (a) 6 cm   (b) 4 cm   (c) 1 cm represents 5 m

   (d) 30 m   (e) 20 m
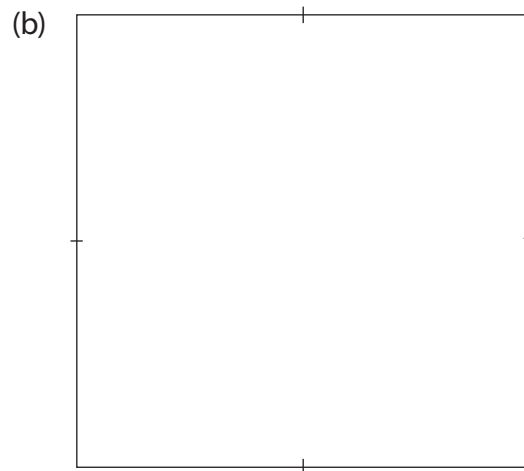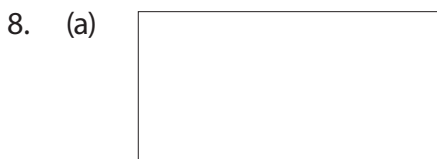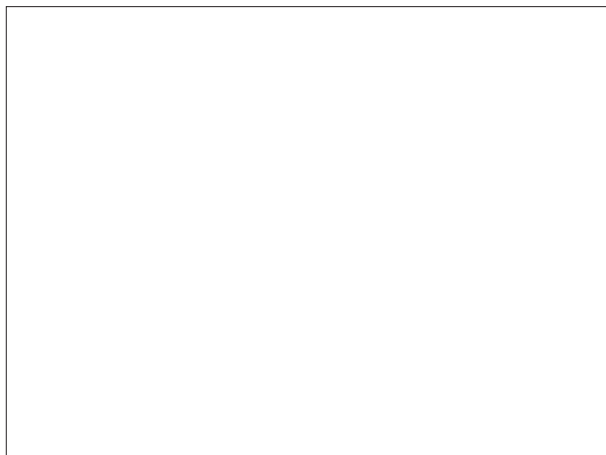
8. (a)   (b)

(c)

9. (a) $\dfrac{\overset{7}{\cancel{21}} \times \cancel{100000}}{\underset{1}{\cancel{300000}}} = 7$ cm

    (b) $\dfrac{\overset{9}{\cancel{27}} \times \cancel{100000}}{\underset{1}{\cancel{300000}}} = 9$ cm

    (c) $\dfrac{\overset{12}{\cancel{36}} \times \cancel{100000}}{\underset{1}{\cancel{300000}}} = 12$ cm

    (d) $\dfrac{\overset{5}{\cancel{15}} \times \cancel{100000}}{\underset{1}{\cancel{300000}}} = 5$ cm

See the explanation given under each question.

Topic Area: Geometry

Unit 13

Calculating the circumference of a circle and the volume of cuboids and cubes

Background

Learners have already acquired basic ideas on length in previous units. This unit will build on the concept acquired in Primary 4 and earlier units on length in Primary 5.

By the end of the unit, learners are expected to calculate the circumference of a circle and the volume of cuboids and cubes. They should also be able to apply the concepts learned in their day to day life.

Content summary

13.1   Circumference of a circle

13.2   Finding pi (π)

13.3   Calculating the circumference of a circle

13.4   Cubes and cuboids

13.5   Properties of cubes and cuboids

13.6   Nets of cubes and cuboids

13.7   Calculating the volume of cubes and cuboids

13.8   Finding one dimension of a cuboid

13.9   Finding the height of a cuboid given its volume and base area

13.10   Finding the area of a face of a cuboid.

Key unit competence

To be able to calculate the circumference of a circle and the volume of cuboids and cubes.

Attitudes and values

Appreciate the importance of circumference in daily life.

Assessment of attitudes and values

Observe as learners promote the spirit of teamwork, co-operation, mutual respect and tolerance in discussion.

Relevant cross-cutting issues

- Peace and values education: Learners will develop peace and values by promoting the spirit of teamwork and tolerance in discussion.

- Standardisation culture: Emphasise the use of standard measurements and tools when doing activities.
- Inclusive education: Average learners, slow learners, learners with special needs and fast learners should interact freely during class discussion and group activities.

Relevant Generic Competences

Co-operation: Through group activities, have learners work together in carrying out activities.

Research and problem solving: Encourage all learners to participate actively in solving questions of activities in their respective group. This will help develop their ability to solve problem in real life. Guide learners to make accurate measurements when calculating the circumference, the volume of cuboids and cubes.

Assessment criteria

Learners should calculate the circumference of a circle and the volume of cuboids and cubes.

Notes to the teacher

- Ensure this unit is handled with a lot of practical activities. Learning/teaching materials must be prepared in advance.
- Organise for activities and specify where they are to be carried out.
- Use the demonstration below to help learners develop the concept of pi (π).

  Measure the diameter of circular object available as shown below. The distance must pass through the centre of the circle.
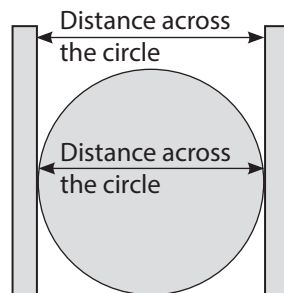
Measure the circumference and diameter of each object in the chart.

Divide the circumference by the diameter. We have provided a sample table of data learners may collect.

Object	Circumference (c)	Diameter (D)	Ratio: C ÷ D
Plate	44 cm	14 cm	$\frac{44}{14} = \frac{22}{7}$ or $3\frac{1}{7}$
Mug	22 cm	7 cm	$\frac{22}{7}$ or $3\frac{1}{7}$
Cup	11 cm	$3\frac{1}{2}$ cm	$\frac{11}{3\frac{1}{2}} = \frac{22}{7}$

You will notice that circumference ÷ diameter is a constant close to $\frac{22}{7}$ or $3\frac{1}{7}$ or 3.14. The constant of $\frac{C}{D}$ is called pi. The symbol for pi is π.

$$\text{pi } (\pi) = \frac{\text{Circumference (C)}}{\text{Diameter (D)}}; \qquad \pi = \frac{C}{D}$$

Multi-ability learning

At the end of each sub-topic, in this unit, assign learners the activities as follows;

Remedial Activity

This activity is meant to assist slow learners catch up with the rest of the learners.

It is mostly restricted to guided questions.

Consolidation Activity

This is prepared for average learners. It is meant to give average learners more practice on this sub-topic

Extension Activity

This is meant for fast learners. It comprises questions that require a higher level of reasoning. It is meant to help fast learners develop their critical thinking.

Word list

Reference: Pupil's Book page 238

Have learners work in pairs to develop their reading, listening and writing skills using the word list.

Use the stated task with suitable vocabulary throughout the unit.

Content

13.1   Circumference of a circle

Number of periods: 1

Reference: Pupil's Book page 210

Knowledge and understanding

Explain the concept of circumference

Skills

Practically measure the circumference of a circle.

Teaching/Learning materials

- Car tyre
- Bottle tops
- Cups
- Plates
- Roundabout or circle in football pitch
- Tape measure, strings and rulers

Teaching/Learning methods

- Practical approaches – measuring the circumferences of different objects.
- Group activities – working together in small groups.
- Discussion – Discussing the examples and activities.

Lesson preparation

Organise learners outside the classroom.

In small groups, let learners measure the distance of circular paths like a roundabout, a circle in football pitch, etc.

Teaching/Learning steps

1. Ask learners to measure the circumference of different objects.
2. Ask learners to measure the circumference of the other circular objects they have.
3. Have learners discuss Activity 13.1 in small groups.
4. Assign learners Practice Activity 13.1 as classwork.

Assessment of skill, knowledge and understanding

Observe as learners measure the circumference of various circular objects on the school compound.

Guidance to the teacher

- Allow learners to discuss the activities in groups.
- Circumference – the distance round any circular object.
- Guide learners with special needs to participate actively in group activities with roles they are able to do.

Expected answers to Practice Activity 13.1

This activity is performed outside the classroom. It involves learners making practical measurements of circumference of various objects around the school compound.

Supervise the learners and check their records.

13.2   Finding pi(π) and calculating the circumference of a circle

Number of periods: 3

Reference: Pupil's Book page 211

Knowledge and understanding

Explain the concept of circumference

Skills

Explain the value of pi by measuring the circumference of a circle.

Teaching/Learning materials

Ruler, ropes, markers, tape measure, various circular objects e.g. bottle tops, tins, plates, cups, drum, water containers

Teaching/Learning methods

- Group work activities – perform activities in groups.
- Practical approaches – measuring the circumference and the diameter.
- Division – Discuss the examples and practical activities assigned.

Lesson preparation

Prepare a chart showing the measurements of the circumference, diameter and circumference ÷ diameter

Teaching/Learning steps

1. Ask learners to discuss Activity 13.2 in small groups. Emphasise accuracy in measuring and recording.
2. Ask learners to discuss the measurements of the circumference in relationship to the diameter under Activity 13.3.
3. Ask learners to divide the circumference and the diameter i.e. $\frac{\text{circumference}}{\text{diameter}}$. Ensure the concept of π is clear at this point. Let learners proceed to Activity 13.3 and 13.4.
4. Work out Examples 13.1 to 13.3 in steps.
5. Assign learners Practice Activities 13.2 to 13.4, one for each lesson. They can do some questions as classwork and others as homework.

Assessment of skill, knowledge and understanding

Observe as learners measure the circumference and the diameter of various circular objects.

Guidance to the teacher

- Ensure learners in each group take measurements of the circumference and the diameter of the objects in turns.

- Guide them through the activity to discover that $\frac{\text{circumference}}{\text{diameter}}$ is always pi (π)
- Guide them to discover that $C = \pi d$ and $d = \frac{C}{\pi}$.

Expected answers to Practice Activity 13.2

A. 1. $\frac{22}{\cancel{7}_1} \times \cancel{77}^{11}$ cm = 242 cm 　　　2. $\frac{22}{\cancel{7}_1} \times \cancel{56}^{8}$ cm = 176 cm

　　3. $\frac{22}{\cancel{7}_1} \times \cancel{14}^{2}$ cm = 44 cm 　　　4. $\frac{22}{\cancel{7}_1} \times \cancel{21}^{3}$ cm = 66 cm

B. 1. 13.14 × 42 cm = 131.88 cm
　　2. 13.14 × 28 cm = 87.92 cm
　　3. 13.14 × 35 cm = 109.9 cm

C. 1. $\frac{22}{\cancel{7}_1} \times \cancel{21}^{3}$ cm = 66 cm 　　　2. $\frac{22}{\cancel{7}_1} \times \cancel{98}^{14}$ cm = 308 cm

　　3. (a) $\frac{22}{\cancel{7}_1} \times \cancel{9.8}^{1.4}$ m = 30.8 m 　　(b) 30.8 × 3 m = 92.4 m

Expected answers to Practice Activity 13.3

1. (a) $2\pi r$ 　　　　　　　　　　　　(b) $2\pi r$

　　$2 \times \frac{22}{\cancel{7}_1} \times \cancel{21}^{3}$ cm = 132 cm 　　　　$2 \times \frac{22}{\cancel{7}_1} \times \cancel{63}^{9}$ cm = 396 cm

　(c) $2\pi r$

　　$2 \times \frac{22}{\cancel{7}_1} \times \cancel{14}^{2}$ cm = 88 cm

2. $C = 2\pi r$ 　　　　　　　　　　3. $C = 2\pi r$

　　$= 2 \times \frac{22}{\cancel{7}_1} \times 15$ cm = 94.3 cm 　　　　$= 2 \times \frac{22}{\cancel{7}_1} \times 45$ cm = 282.9 cm

4. $C = 2\pi r$
　　$= 2 \times 3.14 \times 3.5$ m = 21.98 cm

Expected answers to Practice Activity 13.4

1. $D = C \div \pi$

　　$D = 154 \div \frac{22}{7} = \cancel{154}^{7} \times \frac{7}{\cancel{22}_1}$

　　$D = 7 \times 7 = 49$ m

　　$r = D \div 2$
　　　$= 49 \div 2 = 24.5$ m

2. $D = 77 \div \frac{22}{7} = \cancel{77}^{3.5} \times \frac{7}{\cancel{22}_1} = 24.5$ cm

　　$R = \frac{24.5}{2} = 12.25$ cm

3. $D = 44 \div \frac{22}{7} = \overset{2}{\cancel{44}} \times \frac{7}{\underset{1}{\cancel{22}}} = 14$ cm

$R = \frac{14}{2} = 7$ cm

4. $D = 110 \div \frac{22}{7} = \overset{5}{\cancel{110}} \times \frac{7}{\underset{1}{\cancel{22}}} = 35$ m

5. $D = 30.8 \div \frac{22}{7} = \overset{1.4}{\cancel{30.8}} \times \frac{7}{\underset{1}{\cancel{22}}} = 9.8$ m

$R = \frac{9.8}{2} = 4.9$ m

6. $D = \frac{439.6 \times 10}{3.14 \times 10} = \frac{4396}{31.4} = 140$ cm

7. $D = \frac{628 \times 100}{3.14 \times 100} \times \frac{62800}{314} = 200$ m

$R = \frac{200 \text{ m}}{2} = 100$ m

8. $D = 88 \div \frac{22}{7} = \overset{4}{\cancel{88}} \times \frac{7}{\underset{1}{\cancel{22}}} = 28$ cm

Consider the explanation given for each of the questions.

13.3   Cubes and cuboids and their properties

Number of periods: 2

Reference: Pupil's Book page 217

Knowledge and understanding

Establish the relationship between cubes and cuboids.

Skills

Solve mathematical problems related to finding the volume of cuboids and cubes.

Teaching/Learning materials

- Cubes
- Cuboids
- Ruler

Teaching/Learning methods

- Practical approaches – measuring dimensions of cubes and cuboids.
- Discussion – discuss examples and the findings of activities.
- Group work activities – working out activities in small groups.

Lesson preparation

Prepare a chart showing the sides of cubes and cuboids.

Teaching/Learning steps

1. Ask learners to discuss Activity 13.5 in small groups.
2. Ask learners to discuss Activity 13.6 in small groups.
3. Ask learners to discuss Activity 13.7 in small groups.

4. Assign learners Practice Activity 13.5 questions 1 to 4 as classwork and questions 5 – 7 as homework.

5. Go round assessing learners' progress. Identify different learning abilities and give guidance.

Assessment of skill, knowledge and understanding

Observe as learners discover the difference between cubes and cuboids.

Guidance to the teacher

• Allow learners to discuss the activities.

• Through Activity 13.5 guide learners to identify cubes and cuboids.

• Use Activity 13.6 to guide learners to discover properties of cuboids and cubes.

• Use Activity 13.7 to help learners study the properties of cubes and cuboids.

Expected answers to Practice Activity 13.5

1. 8   2. 12   3. 6

4. 6   5. 96

6. Assess learners' responses from classroom objects.

13.4   Nets of cubes and cuboids

Number of periods: 2

Reference: Pupil's Book page 219

Knowledge and understanding

Establish the relationship between cubes and cuboids.

Skills

Solve mathematical problems related to finding the volume of cuboids and cubes.

Teaching/Learning materials

• Ruler

• Paper squares

• Boxes

• Charts

Teaching/Learning methods

• Group work activities – working out activities.

• Practical approaches – making nets of cubes and cuboids.

• Discussion – discussing steps to make nets and vice-versa.

Lesson preparation

Organise learners in small groups and assign them cubes and cuboids

Teaching/Learning steps

1. Ask learners to discuss Activity 13.8 in groups. Have them make nets from given solids.
3. Ask learners to discuss Activity 13.9 in groups. Have them make solids from given nets.
4. Assign learners Practice Activity 13.6 questions 1 to 2 as classwork and question 3 as homework.

Go round assessing learners' progress.

Assessment of skill, knowledge and understanding

Observe as learners make cubes and cuboids from the nets.

Guidance to the teacher

• Allow the learners to discuss the activities in groups.
• Emphasise to learners the following:
   (i) To make a cube or a cuboid, we must prepare a net first.
   (ii) The faces of a cube have the same measurements.
   (iii) The face of a cuboid have different measurements.

Expected answers to Practice Activity 13.6

1. In this activity, you can use manila paper or other stiff paper available. Assess the cubes and cuboids made by learners. Ensure the dimensions are accurate.
2. Nets that made cubes are from: (ii) and (v).
3. Nets that made cuboids are from: (i) and (iii).

13.5   Calculating the volume of cubes and cuboids

Number of periods: 2

Reference: Pupil's Book page 223

Knowledge and understanding

Explain how to find the volume of cubes and cuboids

Skills

Solve mathematical problems related to finding the volume of cuboids and cubes.

Teaching/Learning materials

• Manila paper
• Square cards
• Cubes
• Cuboids

Teaching/Learning methods

- Group work activities – perform activities in small groups.
- Practical approaches – count the cubes
- Discussion – discuss the examples and activities.

Lesson preparation

Prepare a chart showing how to find the volume of cubes and cuboids.

Teaching/Learning steps

1. Ask learners to discuss Activity 13.10 and 13.11 in small groups.
2. Ask learners to discuss Examples 13.4 and 13.5. Guide learners to realise volume of cubes and cuboids by formula.
3. Assign learners Practice Activity 13.7 for classwork and Practice Activity 13.8 for homework.
4. Assess learners' progress and guide where necessary.

Assessment of skill, knowledge and understanding

Observe as learners calculate the volume of cubes and cuboids.

Guidance to the teacher

- Allow learners to discuss and explain the activities.
- The space occupied by the stack of papers is called the volume. Generally, volume is the amount of space for an object. It is measured in unit cubes or cubic units.
- For cube and cuboid, Volume = cubes along the length × cubes along the width × cubes along the height.
- Give proper guidance to learners with poor eyesight – they can sit at the front of the class.

Expected answers to Practice Activity 13.7

1. Volume = length × width × height

   $= 5 \text{ cm} \times 5 \text{ cm} \times 5 \text{ cm} = 125 \text{ cm}^3$

2. $(24 \times 15 \times 10) \text{ cm} = 3\ 600 \text{ cm}^3$ 3. $15 \text{ cm} \times 15 \text{ cm} \times 15 \text{ cm} = 3\ 375 \text{ cm}^3$

4. $32 \text{ cm} \times 18 \text{ cm} \times 18 \text{ cm} = 10\ 368 \text{ cm}^3$

5. $4.3 \text{ m} \times 2.4 \text{ m} \times 1.5 \text{ m} = 15.48 \text{ m}^3$

6. $64 \text{ cm} \times 32 \text{ cm} \times 30 \text{ cm} = 61\ 440 \text{ cm}^3$

7. $8 \text{ m} \times 5 \text{ m} \times 5 \text{ m} = 200 \text{ m}^3$

8. $18 \text{ cm} \times 18 \text{ cm} \times 4.5 \text{ cm} = 1\ 458 \text{ cm}^3$

9. $3 \text{ m} \times 4 \text{ m} \times 1 \text{ m} = 12 \text{ m}^3$

10. $4 \text{ m} \times 8 \text{ m} \times 1 \text{ m} = 32 \text{ m}^3$

Expected answers to Practice Activity 13.8

1. 20 cm × 20 cm × 20 cm = 8 000 cm³
2. 4 m × 3 m × 2 m = 24 m³
3. 20 cm × 15 cm × 8 cm = 2 400 cm³
4. 35 cm × 22 cm × 12 cm = 9 240 cm³
5. 8 m × 6 m × 10 m = 480 m³

13.6　Finding one dimension of a cuboid

Number of periods: 2

Reference: Pupil's Book page 227

Knowledge and understanding

Explain how to find the volume of cube and cuboids.

Skills

Solve mathematical problems related to finding the volume of cuboids and cubes

Teaching/Learning materials

- Cubes and cuboids like cartons, boxes, etc.
- Manila paper
- Charts

Teaching/Learning methods

- Group work activities – working out activities in groups.
- Practical approaches – measuring one side of cubes/cuboids once volume and other dimensions are known.
- Discussion – discuss the examples and activities.

Lesson preparation

Prepare learners to arrange the cubes and find the missing dimension.

Teaching/Learning steps

1. Ask learners to discuss Activity 13.12 in small groups.
2. Ask learners to study and discuss Example 13.6.
3. Assign learners Practice Activity 13.9 questions 1 to 6 for classwork and questions 7 – 10 for homework
4. Go round the class assessing learners' progress. Guide where needed.

Assessment of skill, knowledge and understanding

Observe as learners find the missing dimension

Guidance to the teacher

- Allow the learners to discuss the activities and make a presentation.

- Allow fast learners to assist slow learners to promote the spirit of co-operation/ teamwork.

- Emphasise the following for cubes/cuboids.

    (i)   Volume $= L \times W \times H$

    (ii)   Height $= \dfrac{\text{Volume}}{\text{length} \times \text{width}}$

    (iii) Width $= \dfrac{\text{Volume}}{\text{length} \times \text{height}}$

    (iv)   Length $= \dfrac{\text{Volume}}{\text{height} \times \text{width}}$

- You can determine the volume of a carton and then ask learners to measure the length of two sides. They then calculate the missing dimension.

Expected answers to Practice Activity 13.9

1. $4\text{ m} \times 5\text{ m} \times 22\text{ m} = 240\text{ m}^3$

2. $12\text{ m} \times 6\text{ m} = 72\text{ m}^3$
    $288\text{ m}^3 \div 72\text{ m}^2 = 4\text{ m}$

3. $36\text{ cm} \times 50\text{ cm} = 1\ 800\text{ cm}^2$
    $25\ 200\text{ cm}^2 \div 1\ 800\text{ cm}^2 = 14\text{ cm}$

4. $50\text{ cm} \times 50\text{ cm} = 2\ 500\text{ cm}^2$
    $125\ 000\text{ cm}^3 \div 2\ 500\text{ cm}^2 = 50\text{ cm}$

5. $36\text{ cm} \times 72\text{ cm} = 2\ 592\text{ cm}^2$
    $142\ 540\text{ cm}^3 \div 2\ 592\text{ cm}^2 = 55\text{ cm}$

6. $144\text{ cm} \times 36\text{ cm} = 5184\text{ cm}^2$
    $414\ 720\text{ cm}^3 \div 5\ 184\text{ cm}^2 = 80\text{ cm}$

7. $35\text{ cm} \times 30\text{ cm} = 1\ 050\text{ cm}^2$
    $25\ 200\text{ cm}^3 \div 1\ 050\text{ cm}^2 = 24\text{ cm}$

8. $40\text{ cm} \times 18\text{ cm} = 720\text{ cm}^2$
    $21\ 600\text{ cm}^3 \div 720\text{ cm}^2 = 30\text{ cm}$

9. $8\text{m} \times 5\text{ m} = 40\text{ m}^2$
    $160\text{ m}^3 \div 40\text{m}^2 = 4\text{ m}$

10. $3.8\text{ m} \times 2.5\text{ m} = 9.5\text{ m}^2$
    $38\text{ m}^3 \div 9.5\text{ m}^2 = 4\text{ m}$

13.7   Finding the height of a cuboid given its volume and base area

Number of periods: 1

Reference: Pupil's Book page 230

Knowledge and understanding

Explain how to find the volume of cubes and cuboids.

Skills

Solve mathematical problems related to finding the volume of cubes and cuboids.

Teaching/Learning materials

- Cube and cuboid objects
- Manila charts

Teaching/Learning methods

- Problem solving – learners solve problem about volume.

- Group work activities – discuss activities in group.
- Practical approaches – finding the height of a real object.

Lesson preparation

Prepare a chart showing the steps involved in finding the height.

Teaching/Learning steps

1. Ask learners to discuss Activity 13.13.
2. Ask learners to study and discuss Example 13.
3. Assign learners Practice Activity 13.10 questions 1 to 5 for classwork and questions 6 – 9 for homework.
4. Go round the class assessing learners' progress.

Assessment of skill, knowledge and understanding

Observe as learners calculate the heights of a cuboid given its volume and base area.

Guidance to the teacher

- Allow learners to discuss the activities in groups.
- Have fast learners assist slow learners.
- We have provided additional activity to address the following:
    (i) Assign fast learners the Extension Activity.
    (ii) Assign slow learners the Remedial Activity.
    (iii) Assign average learners the Consolidation Activity.

Expected answers to Practice Activity 13.10

1. $3150 \text{ cm}^3 \div 315 \text{ cm}^2 = 10 \text{ cm}$ 2. $576 \text{ cm}^3 \div 144 \text{ cm}^2 = 4 \text{ cm}$
3. $250 \text{ m}^3 \div 50 \text{ m}^2 = 5 \text{ m}$
4. (a) $30 \text{ cm} \times 30 \text{ cm} = 900 \text{ cm}^2$ (b) $18\ 000 \text{ cm}^3 \div 900 \text{ cm}^2 = 20 \text{ cm}$
5. $90 \text{ cm} \times 50 \text{ cm} = 4\ 500 \text{ cm}^2$
    $10\ 000 \text{ cm}^3 \div 4\ 500 \text{ cm}^3 = 2.2 \text{ cm}$
6. $8\ 000 \text{ cm}^3 \div 160 \text{ cm}^2 = 50 \text{ cm}$
7. $8 \text{ m} \times 7 \text{ m} = 56 \text{ m}^2$
    $168 \text{ m}^3 \div 56 \text{ m}^2 = \quad 3 \text{ m}$
8. $34 \text{ m} \times 22 \text{ cm} = 748 \text{ cm}^2$
    $11\ 220 \text{ cm}^3 \div 748 \text{ cm}^2 = 15 \text{ cm}$
9. $84 \text{ m}^3 \div 28 \text{ m}^2 = 3 \text{ m}$

13.8   Finding the area of a face of a cuboid

Number of periods: 2
Reference: Pupil's Book page 232

Knowledge and understanding

Explain how to find the volume of cubes and cuboids.

Skills

Solve mathematical problems related to finding the volume of cubes and cuboids.

Teaching/Learning materials

- Cubes
- Cuboids
- Manila charts illustrating the concept.

Teaching/Learning methods

- Group work activities – working activities in group.
- Discussion – discussing activities.
- Demonstration – using examples to illustrate the concept.

Lesson preparation

Prepare a chart with one of the faces shaded.

Teaching/Learning steps

1. Ask learners to discuss Activity 13.14 in small groups.
2. Ask learners to discuss Example 13.8. They can do it in small groups.
3. Assign learners Practice Activity 13.11 questions 1 to 2 for classwork. Go round assessing learners' progress.
4. Assign learners Practice Activity 13.11 questions 3 – 5 as homework.

Assessment of skill, knowledge and understanding

Observe as learners find the area of the shaded faces on the cuboids.

Guidance to the teacher

- Allow learners to discuss the activities.
- Guide learners to find the area of the shaded faces.
- Guide learners to calculate the area of the shaded faces as below.

    (i) Area of shaded face of cuboid $= \frac{\text{Volume of cuboid}}{\text{given dimension}}$. The dimension can be length, width or height of the cuboid.

    (ii) Area of shaded face of cube $= \frac{\text{Volume of cube}}{\text{length of cube}}$

## Expected answers to Practice Activity 13.11

1. (a) $3\ 120\ \text{cm}^3 \div 15\ \text{cm} = 208\ \text{cm}^2$ (b) $1\ 428\ \text{cm}^3 \div 7\ \text{cm} = 204\ \text{cm}^2$
2. (a) (i) $13\ \text{cm} \times 33\ \text{cm} = 429\ \text{cm}^2$

    $8\ 151\ \text{cm}^3 \div 429\ \text{cm}2 = 19\ \text{cm}$

    $19\ \text{cm} \times 33\ \text{cm} = 627\ \text{cm}^2$

(ii) 8 151 cm³ ÷ 429 cm² = 19 cm

(b) (i) 3 cm × 5 cm = 15 cm²

90 ÷ 15 = 6 cm

6 cm × 3 cm = 18 cm²

(ii) 90 cm ÷ 15 cm = 6 cm

(c) (i) 3.6 m × 3.6 m = 12.96 m²

41.472 cm³ ÷ 12.96 m² = 3.2 cm

3.2 m × 3.6 m = 11.52 m²

(ii) 41.472 m³ ÷ 12.96 m² = 3.2 m

3. (a) 1.5 m × 0.8 m = 1.2 m²

1.44 m³ ÷ 1.2 m2 = 1.2

1.5 m × 1.2 m = 1.8 m²

(b) 1.44 m³ ÷ 1.2 m² = 1.2 m
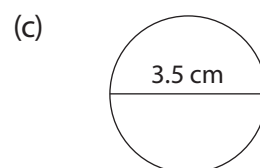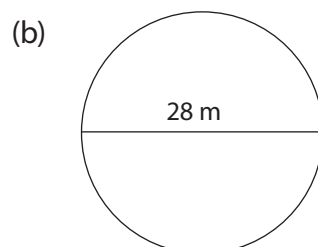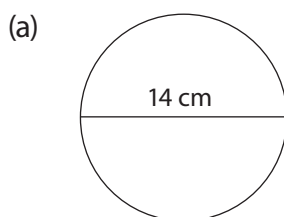
Additional Activity 13

Remedial Activity

1. Study the diagram below.
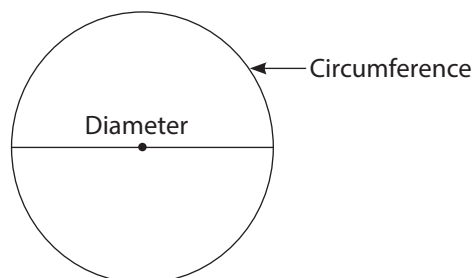
How many times does a diameter fit on the circumference? _____.

2. The radius is half of the _____.

The circumference of a circle = $\pi \times d$

3. Find the circumference of circles with the following diameters.

(a)
14 cm

(b)
28 m

(c)
3.5 cm

4. Find the circumference of a circle with a radius of 5.6 cm.

5. Fill in the blanks. Explain your answer.

	Circumference	Diameter	Radius
(a)	—	—	7 cm
(b)	—	70 cm	—
(c)	154 m	—	—

6. A cuboid has _____ faces.

7. A cube has _____ vertices.

8. Explain how to find the volume of a cube whose sides measure 8 cm.

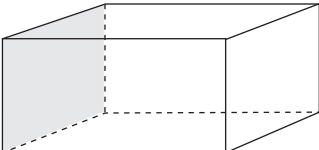9. Find volume of a cuboid whose length is 5 m, width 4 m and height 3 m.

Consolidation Activity

1. Find the circumference of a circle whose diameter is 35 cm.
2. Find the circumference of a circle whose radius is 11.2 cm.
3. The circumference of a circle is 44 cm. What is the diameter of the circle?
4. What is the sum of the faces and edges of a cube?
5. Find the volume of a cuboid measuring 8 m by 6 m by 4 m.
6. The volume of a cuboid is 90 000 cm³. It has a length of 30 m and 20 cm wide. What is the height of the cuboid?
7. Fill the table below.
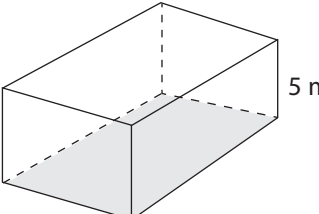
	Length	Width	Height	Volume
(a)	—	50 cm	36 cm	25 200 cm³
(b)	4 m	3 m	12 m	—
(c)	5 m	—	12 m	240 m³

8. The volume of a cuboid is 720 000 cm³. Its base area is 2 400 cm². Explain the steps involved in finding the height.

Explain the steps involved in finding the area of the shaded faces below.

9. Volume = 2 618 cm³

17 cm

10. Volume = 60 m³

5 m

Extension Activity

1. Fill in the table below.

	Circumference	Diameter	Radius
(a)	—	1.4 m	—
(b)	—	—	49
(c)	154	—	—

2. The circumference of a circle is 308 cm find the radius of the circle.

3. Find the circumference of the following circles.

(a)   (b)   (c)

10 cm   30 m   25 cm

4. Find the product of the number of faces and vertices of a closed cube.

5. Find the sum of number of faces and edges of a cuboid.

6. A cuboid has a volume of 11 970 cm³. It is 38 cm long and 21 cm wide. Find its height. Explain your steps.

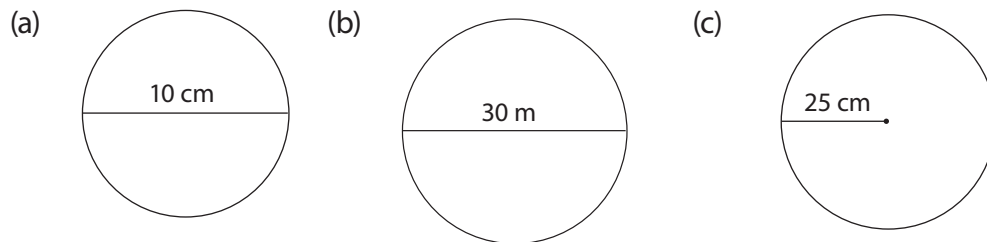7. A box is 30 cm long and 15 cm high. Its volume is 9 000 cm³. Find its width in decametres. Discuss your steps.

8. The volume of a cuboid is 3 150 cm³. Its base area is 315 cm². Calculate its height in decametres. Justify your answer.

9. Find the area of the shaded face in the diagram below given its volume is 3 120 cm³.

15 cm
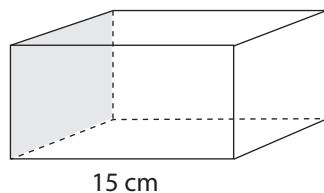
10. In order to harvest and conserve rainwater, a farmer made a tank. The tank had a rectangular base 3.5 m long and 2 m wide. Its height was 1.5 m. Find the volume of water it can hold when full. Discuss your steps.

Expected answers to Additional Activity 13

Remedial Activity

1. $3\frac{1}{7}$ times or 3.14   2.   Diameter

3. (a) $\dfrac{22}{\cancel{7}_1} = \dfrac{\overset{2}{\cancel{14}} \text{ cm}}{} = 44 \text{ cm}$ (b) $\dfrac{22}{\cancel{7}_1} = \overset{4}{\cancel{28}} = 88 \text{ cm}$

   (c) $\dfrac{22}{\cancel{7}_1} = \overset{0.5}{\cancel{3.5}} \text{ cm} = 11 \text{ cm}$

4. $\dfrac{22}{\cancel{7}_1} = \overset{0.8}{\cancel{5.6}} \text{ cm} \times 2 = 35.2 \text{ cm}$

5. (a) $7 \text{ cm} \times 2 = 14 \text{ cm}$

   $\dfrac{22}{\cancel{7}_1} = \overset{2}{\cancel{14}} \text{ cm} = 44 \text{ cm}$

   (b) $70 \text{ cm} \div 2 = 35 \text{ cm}$

   $\dfrac{22}{\cancel{7}_1} = \overset{10}{\cancel{70}} \text{ cm} = 220 \text{ cm}$

   (c) $D = 154 \text{ cm} \div \dfrac{22}{7}$

   $49 \text{ m} = \overset{7}{\cancel{154}} \times \dfrac{\overset{7}{\cancel{22}}}{1}$

   $R = \dfrac{49 \text{ m}}{2} = 24.5 \text{ m}$

6. 6   7. 8

8. $8 \text{ cm} \times 8 \text{ cm} \times 8 \text{ cm} = 512 \text{ cm}^3$ 9. $5 \text{ m} \times 4 \text{ m} \times 3 \text{ m} = 60 \text{ m}^3$

Consolidation Activity

1. $\dfrac{22}{\cancel{7}_1} = \overset{5}{\cancel{35}} = 110 \text{ cm}$ 2. $\dfrac{22}{\cancel{7}_1} = \overset{1.6}{\cancel{11.2}} \times 2 = 70.4 \text{ cm}$

3. $D = 44 \div \dfrac{22}{7} = \overset{2}{\cancel{44}} \times \dfrac{\overset{7}{\cancel{22}}}{1} = 14 \text{ cm}$ 4. 18

5. $8 \text{ m} \times 6 \text{ m} \times 4 \text{ m} = 192 \text{ m}^3$

6. $30 \text{ m} \times 20 \text{ cm} = 600 \text{ cm}^2$
   $90\,000 \text{ cm}^3 \div 600 \text{ cm}^2 = 150 \text{ cm}$

7. (a) $\dfrac{25200 \text{ cm}^3}{50 \text{ cm} \times 36 \text{ cm}} = 14 \text{ cm}$ (b) $4 \text{ m} \times 3 \text{ m} \times 12 \text{ m} = 144 \text{ m}^3$

   (c) $\dfrac{240 \text{ m}^3}{5 \text{ m} \times 12 \text{ m}} = 4 \text{ m}$

8. $\dfrac{720000 \text{ cm}^3}{2400 \text{ cm}^2} = 300 \text{ cm}$ 9. $\dfrac{26.8 \text{ cm}^3}{17 \text{ cm}} = 154 \text{ cm}^2$

10. $\dfrac{60 \text{ cm}^3}{5 \text{ m}} = 12 \text{ m}^2$

Extension Activity

1. (a) Radius $= \dfrac{1.4 \text{ m}}{2} = 0.7 \text{ m}$, $C = \dfrac{22}{\cancel{7}_1} = \overset{0.2}{\cancel{1.4}} \text{ m} = 4.4 \text{ cm}$

(b)　$D = 49 \times 2 = 98$, $C = \dfrac{22}{\cancel{7}_{1}} = \cancel{98}^{14} = 308$ cm

(c)　$D = 154 \div \dfrac{22}{7} = \cancel{154}^{7} = \dfrac{7}{\cancel{22}_{1}} = 49$ cm, $R = \dfrac{49}{2} = 24.5$ cm

2.　$D = 308 \div \dfrac{22}{7} = \cancel{308}^{7} = \dfrac{7}{\cancel{22}_{1}}$

　　$R = \dfrac{98}{2} = 49$ cm

3.　(a)　$3.14 \times 10 = 31.4$ cm　　(b)　$3.14 \times 30 = 94.2$ cm
　　(c)　$3.14 \times 50 = 157$ cm

4.　$6 \times 8 = 48$　　　　　　　5.　$6 + 12 = 18$

6.　$\dfrac{11970 \text{ cm}^3}{38 \text{ cm} \times 21 \text{ cm}} = 15$ cm

7.　$\dfrac{9000 \text{ cm}^3}{30 \text{ cm} \times 15 \text{ cm}} = 20$ cm. Now, 20 cm $= \dfrac{20}{1000}$ dam $= 0.02$ dam

8.　$3150 \text{ cm}^3 \div 315 \text{ cm}^2 = 10$ cm. Hence, 10 cm $= \dfrac{10}{1000}$ dam $= 0.01$ dam

9.　$3\,120 \text{ cm}^3 \div 15 \text{ cm} = 208 \text{ cm}^2$　　　　10.　$3.5 \times 2 \text{ m} \times 1.5 \text{ m} = 10.5 \text{ m}^3$

Formative Assessment Support

- When setting the Formative Assessment Support, ensure that all unit objectives and key unit competences in syllabus are covered.

- The question should cater for all levels i.e. slow learners, average learners, learners with special needs and fast learners. Allow learners with disabilities in hands to work on nets with learners without disability.

- Ensure it is conducted in two lesson. Conduct it on a day where there is a double lesson for maths. Remind learners to carry out revision for the entire unit before administering the activity.

- We have provided Revision Activity 13 as the unit assessment tool. You can adjust assessment items to accommodate different learning abilities.

Expected answers to Revision Activity 13

1.　(a)　154 cm　　　　　　　(b)　49 cm

2.　$\dfrac{22}{\cancel{7}_{1}} \times \cancel{28}^{4}$ cm $= 88$ cm 3.$\dfrac{22}{\cancel{7}_{1}} \times \cancel{15.4}^{2.2}$ m $= 48.4$ m

4.　5 faces　　　　5.　$8 \times 12 = 96$

6.　(a)　Cuboid　(b)　None　　(c)　Cube　　　(d)　Cube　　(e)　None

7.　$D = 88 \div \dfrac{22}{7}$

　　$= \cancel{88}^{4} \times \dfrac{7}{\cancel{22}_{1}} = 28$ m

8.
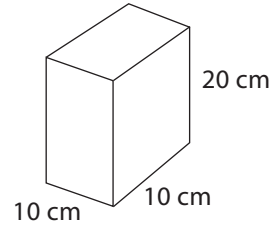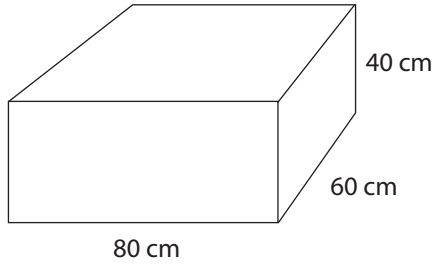
$$\frac{80 \text{ cm}}{10 \text{ cm}} = 8 \text{ cm} \qquad \frac{60 \text{ cm}}{10 \text{ cm}} = 6 \text{ cm} \qquad \frac{40 \text{ cm}}{20 \text{ cm}} = 2 \text{ cm}$$

$8 \times 6 \times 2 = 96$

9. $7.2 \text{ m} \times 5.5 \text{ m} \times 2 \text{ m} = 79.2 \text{ m}^3$

10. $18 \text{ cm} \times 18 \text{ cm} \times 18 \text{ cm} = 5\ 832 \text{ cm}^3$

11. $7 \text{ m} \times 3 \text{ m} \times 4.2 \text{ m} = 88.2 \text{ m}^3$

12. $4 \text{ cm} \times 4 \text{ cm} \times 4 \text{ cm} = 64 \text{ cm}^3$

13. $\dfrac{405 \text{ m}^3}{15 \text{ m} \times 9 \text{ m}} = 3 \text{ m}$

14. $\dfrac{4530 \text{ m}^3}{5 \text{ m}} = 906 \text{ m}^2$

15. $\dfrac{87360 \text{ cm}^3}{48 \text{ cm} \times 35 \text{ cm}} = 52 \text{ cm}$

16. $\dfrac{32 \text{ m}^3}{8 \text{ m}^2} = 4 \text{ m}$

17. $\dfrac{19285 \text{ cm}^3}{35} = 551 \text{ cm}^2$

See the explanations given under each question.

Topic Area: Statistics and elementary probability

Unit 14 — Statistics

Background

This topic deals with data collection where a learner gets first hand information and records it. The data is then represented in a bar graph and line graph. Lastly, this data is interpreted in order to answer questions. Learners will have an opportunity of collecting data, representing it then interpreting it. Data collection was done in P4. In this class we work with quantitative data.

Content summary

14.1 Continuous and discrete quantitative data.

14.2 Representing data on bar charts.

14.3 Interpreting bar charts.

14.4 Representing data using line graphs.

14.5 Interpreting line graphs.

Key unit competence

To collect data, represent and interpret it in order to answer a question or explore a hypothesis.

Attitudes and values

Appreciate that data can be used to answer questions or explore hypothesis and that the representation of data should aid interpretation. Adopt a systematic and organised approach to dealing with data.

Assessment of attitude and values

Observe the behavior of learners response in regards to this unit of statistics.

Relevant cross cutting issues

Gender education: Learners will have an equal opportunity to attain desired behaviour and attitude irrespective of whether they are male or female. In class, organise learners in groups of mixed gender so as to learn together.

This gender harmony will facilitate learners to achieve the desired competence.

Standardisation culture: Learners are expected to give accurate answers to questions and problems. Develop a standard culture in learners to investigate or do research to solve problems objectively.

Inclusive education: Have learners of different abilities work together in groups. The physically challenged, learners with hearing problems and sight problems are included in the same learning environment. They are assisted to nurture and develop the desired attitudes, skills knowledge and understanding.

Relevant Generic Competence

Communication skills: In the classroom, learners always have an opportunity to communicate their findings while carrying out activities. Also learners discuss examples. Some times there is presentation in class. This helps learners achieve effective communication.

Cooperation: Learners work together carrying out activities and working out problems.

Research and problem solving develop in every lesson by having learners solve problems in practice activities during supervised activity and homework or more practice. Collecting data is a way of solving problem and initiating to research to a given problems.

Assessment criteria

Learners will be able to collect data, represent and interpret it in order to answer a question or explore a hypothesis.

Notes to the teacher

- Guide the learners into discussing hypothesis or questions so that they can collect raw data. Guide them further to represent the data on bar graphs and line graphs. Guide learners in analyzing and interpreting information from the graphs.
- Discrete quantitative data assumes whole number values only (in steps). Continuous quantitative data assumes any numerical value including decimals (no steps in data values).

Word List

Reference: Pupil's Book page 252

Refer to the words list at the end of this unit. Let learners work in pairs to develop their vocabulary using the word list. Use it to develop reading, listening and writing skills. Let learners carry out the stated tasks with suitable vocabulary words.

Content

14.1 Continuous and discrete quantitative data

Number of periods: 2
Reference: Pupil's Book page 239

Knowledge and understanding

Distinguish between continuous and discrete data.

Skills

Decide what to collect data about to answer a question. Collect data and record it in a table.

Teaching/Learning material

Tape measure, ruler, stopwatches, string.

Teaching Learning methods

- Practical activities – Learners carry out Activity 14.1 and 14.2
- Group work – Collecting data in group activities.
- Explanation – Explain the conclusion of activities using Example 14.1.
- Supervised Practice – Learners solve problems as you assess their progress.

Lesson preparation

Lesson will take place in class.

Organise learners to work in small groups for Activity 14.1 and Activity 14.2. Provide materials for practical data collection.

Teaching/Learning steps

1. Ask learners to carry out Activity 14.1 in small groups. Let learners measure their height and record data in a table.
2. Let learners develop a questionnaire and collect data on distance to school and time taken to get to school. Ask learners to carry out Activity 14.2.
3. Let learners discuss the differences in types of data from Activity 14.1 and 14.2.
4. Let learners give a summary on types of quantitative data.
5. Let learners discuss Example 14.1 to understand the difference between discrete and continuous data as a class.
6. Assign learners Practice Activity 14.1 questions 1 and 2 as classwork. Go round assessing their progress. Have learners give important points they have learnt.

Assign learners Practice Activity 14.1 question 3 for more practice as homework.

Assessment of skills, knowledge and understanding

Observe learners as they collect continuous and discrete data.

Guidance to the teacher

Emphasise that data with numerical values is called quantitative data. When numerical data is recorded in whole numbers only, then it is called discrete data.

When numerical data has any value including decimal numbers, then it is called continuous data.

Expected answers for Practice Activity 14.1

1. **(i)** Quantitative data
    (ii) Continuous
        Values include decimals
2. **(i)** Continuous data – Time taken to run round the field.
        Distance from home to school for a group member.
    (ii) Discrete – Shoe size worn by pupils in class.
        Number of parents for different pupils in a class
3. **(a)** Discrete   **(b)** Discrete – Values can be whole numbers only

Guidance on Activity 14.1 and 14.2

• Guide pupils to measure height in cm and possibly have decimal rulers. Decimal values can help to show continuous data, (i.e it can take any value). For example height of learners.

• Guide learners to discover that discrete data values are strictly fixed whole numbers. For example, shoe sizes.

14.2 Representing data on bar charts

Number of periods: 2

Reference: Pupil's Book page 242

Knowledge and understanding

Explain that bar charts should have gaps between the bars.

Skills

Represent data in a bar chart

Teaching/Learning materials

• Ruler   • Graph or grid papers
• A chart showing solution to problem in Activity 14.3

Teaching/Learning methods

• Group work – Carrying out Activity 14.3.
• Demonstration – How to draw bar charts using Example 14.2.
• Supervised Practice – learners represent data in bar graphs while teacher checks their progress.

Lesson Preparation

Lesson will take place in class. Organise learners to work in groups for Activity 14.3.

Teaching/Learning steps

1. Ask learners to carry out Activity 14.3. Let learners present data in a bar chart.

2. Let learners discuss Example 14.2 to understand the steps of drawing a bar chart.

3. Assign learners to draw bar charts in Practice Activity 14.2 questions 1 and 2 as classwork. Go round checking progress.

4. Have learners give important points they have learnt.

5. Assign learners question 3 of Practice Activity 14.2 as homework.

Assessment of skills, knowledge and understanding

Observe learners as they represent data on bar charts.
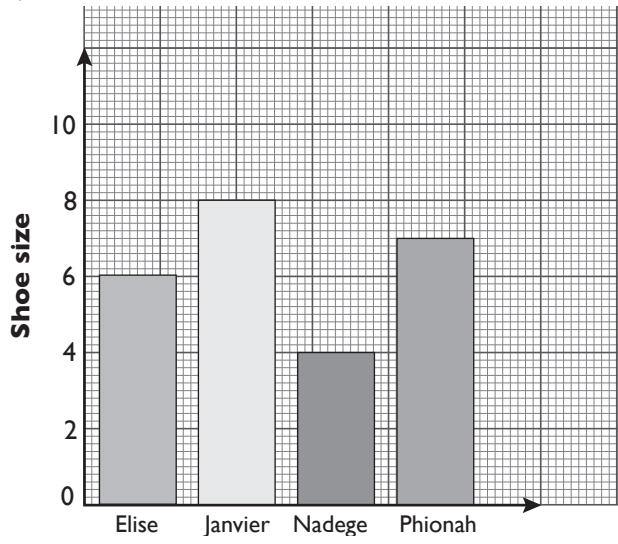
Guidance to the teacher

• On a bar chart the vertical axis represents the number of items.

• The horizontal axis represents the items represented.

• The scale on the vertical axis should allow for representation of all data. Intervals on the horizontal axis are consistent for easy reading.
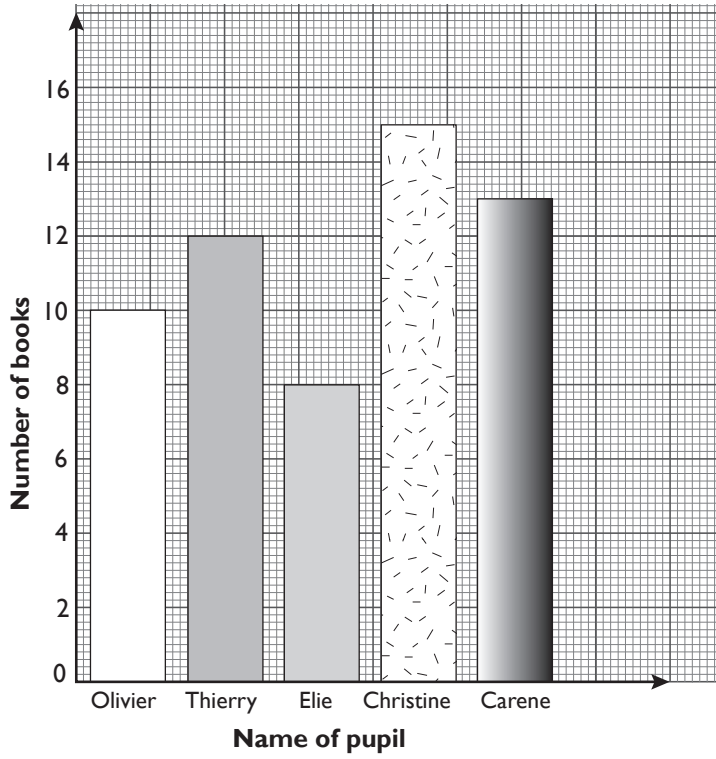
Expected Answers for Practice 14.2

1.
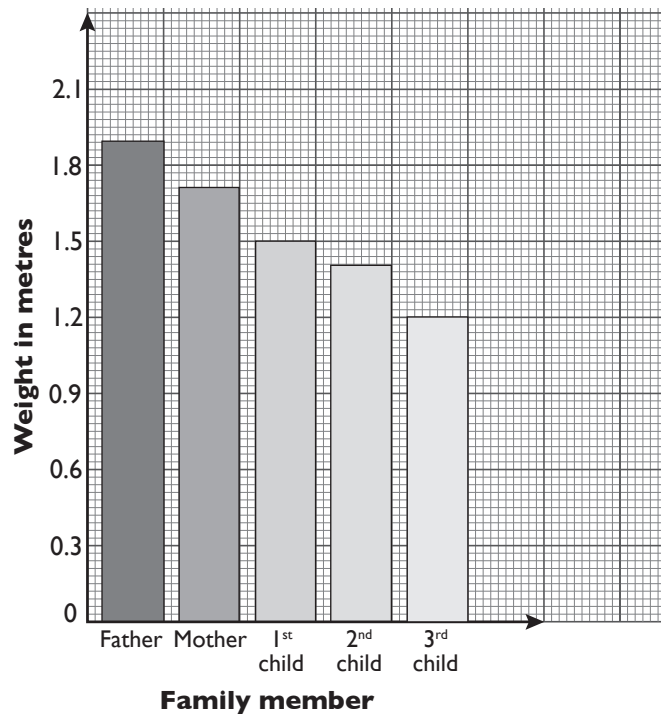
2.

3.

4. Discrete data

14.3 Interpreting bar charts

Number of periods: 2

Reference: Pupil's Book page 243

Knowledge and understanding

Explain that a bar chart should have gaps between the bars.

Skills

Interpret representations of data to draw conclusions.

Teaching/Learning materials

A chart showing solutions to Activity 14.4.

Teaching/Learning Methods

*   Group work activities – Learners carry out Activity 14.4 in small groups.
*   Supervised Practice – Learners solve problems as you assess their progress.
*   Demonstration – demonstrate how to interpret data using the example.

Lesson preparation

Lesson will take place in class. Organise learners to work in small groups for Activity 14.4. Prepare the chart for Activity 14.4.

Teaching/Learning steps

1. Ask learners to carry out Activity 14.4 in small groups.
2. Let learners discuss Example 14.3 in pairs.
3. Assign learners Practice Activity 14.3 question 1 as classwork. Go round assessing individual progress.
4. Give Practice Activity 14.3 question 2 as homework.

Assessment of skills, knowledge and understanding

Observe learners as they interpret information from the chart.

Guidance to the teacher

Emphasise that when interpreting a bar chart, one reads the height of the bars and the information they represent. Check the vertical axis. State the information represented by each bar. Check the horizontal axis.

Expected answers to Practice Activity 14.3

1. **(a)** 5 Pupils   **(b)** Height of pupils
    (c) Aline   **(d)** 1.7 metres
    (e) Linda and Albert

2. **(a)** Marks scored in mathematics (out of 10).

   (b) 8 pupils   **(c)** 10 marks

   (d) Paul   **(e)** Michele and Amir

   (f) Ruth   **(g)** 4.5   **(h)** 9.5

14.4 Representing data using line graphs

Number of periods: 2

Reference: Pupil's Book page 246

Knowledge and understanding

Explain that the line graph represents data over time

Skills

Interpret representations of data to draw conclusions

Teaching/Learning materials

Metre ruler or tape measure, graph/grid papers

Teaching/Learning methods

- Group work activities – Learners carry out Activity 14.5 in groups.
- Supervised practice – Learners represent data as you check their progress.
- Discussion – Learner discusses Example 14.4.

Lesson Preparation

Lesson will take place inside class. Organise learners into groups of mixed ability and gender for Activity 14.5. Get a metre ruler or tape measure.

Teaching/Learning steps

1. Ask learners to carry out Activity 14.5. Discuss tips for drawing a line graph.
2. Let learners discuss Example 14.4.
3. Assign learners Practice Activity 14.4 question 1 – 3 as classwork. Go round checking progress.
4. Have learners give important points they have learnt.
5. Assign learners Practice Activity 14.4 question 4 as homework.

Assessment of skills, knowledge and understanding

Observe learners as they represent data using a line graph.

Guidance to the teacher

Emphasise that when drawing a line graph, it is important to follow these steps:

(a) Choose a good scale. Length of axes should allow you to have all data values.

(b) Draw the axes and label.

(c) Plot points on the graph then join the points using a straight line.

Expected answers for Practice Activity 14.4

1.
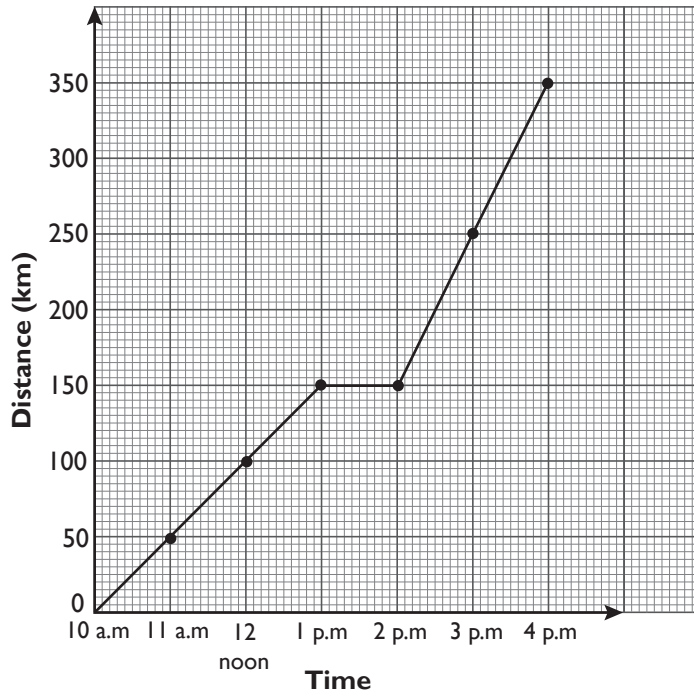
2. (a)
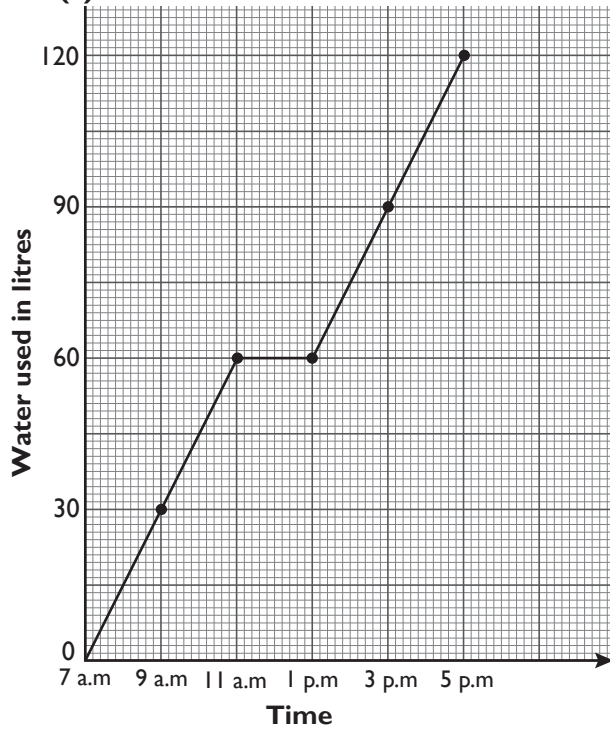
(b) Water was not being used.

3.

Yes, marks was improving every week.

Week
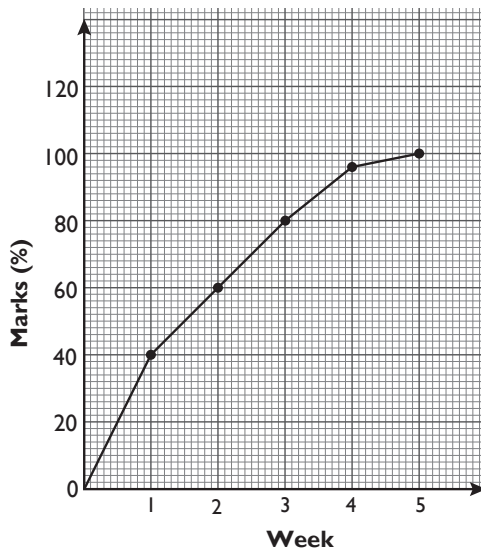
4.

- Plot the height of the crop.
- Join the dots.

Time in months
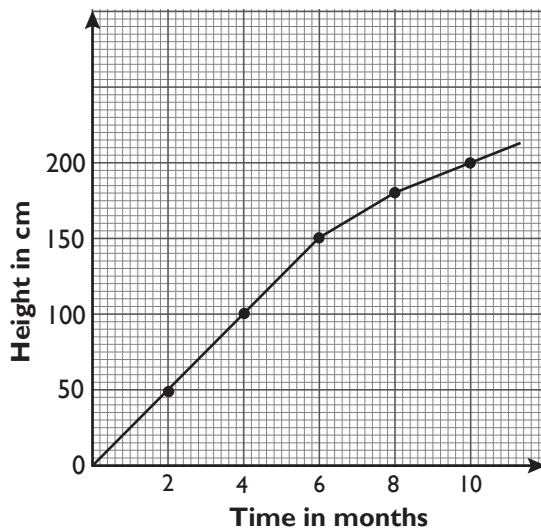
14.5 Interpreting line graphs

Number of periods: 2

Reference: Pupil's Book page 248

Knowledge and understanding

Explain that a line graph represents data over time.

Skills

Interpret representations of data to draw conclusions.

Teaching/Learning materials

- Illustrated chart
- Grid or graph papers

Teaching/Learning methods

- Group work – in groups, learners carry out Activity 14.6.
- Discussion – learners discuss Example 14.5.
- Supervised Practice – Learners solve problems as you check their progress.

Lesson preparation

Lesson takes place inside class. Organise learners to work in small groups in Activity 14.6. Prepare the chart to use in discussions.

Teaching/Learning steps

1. Ask learners to carry out Activity 14.6 in small groups.
2. Let learners discuss Example 14.5.
3. Assign learners Practice Activity 14.5 question 1 as classwork. Go round assessing their progress.
4. Let learners state important points they have learnt.
5. Assign learners Practice Activity 14.5 question 2 as homework.
6. Identify different levels of learners' ability. Group them so that you give an extra assignment from Additional Activity 14. For slow learners, assign the Remedial Activity, for average learners, assign the Consolidation Activity and for fast learners, assign the Extension Activity. Learners sit in their respective groups, discuss and then make a class presentation.

Assessment of skills, knowledge and understanding

Observe learners as they interpret information from line graphs.

Guidance to the teacher

- Guide learners to interpret information from line graphs. Interpreting the scale used is vital.
- Read information on both horizontal and vertical axis and apply correct scaling.

Expected answers for Practice Activity 14.5

1. **(a)** Weight of children (mass)
   (b) $2\frac{1}{2}$ kg (child at birth is 0 months old).
   (c) 6 kilograms
   (d) 4 months

(e) 1 kg

2. **(a)** 300 km

  (b) 8 : 00 a.m.

  (c) 11 a.m.

  (d) 0 km. No distance was covered. He was resting.

  (e) $1\frac{1}{2}$ hour or 1 h 30 min.

Additional Activity 14

Remedial Activity

1. The P5 class collected numerical data on the following

  (a) Size of clothing worn by each pupil.

  (b) Number of parents in each class of the school.

  (c) Time spent travelling from home to school by each pupil.

  (d) Distance round the school compound.

Question

  (i) Name continuous data from the list above. Explain.

  (ii) Name the discrete data from the list above. Explain.

2. Data was collected about pupils' favourite fruits and then represented in a bar graph.
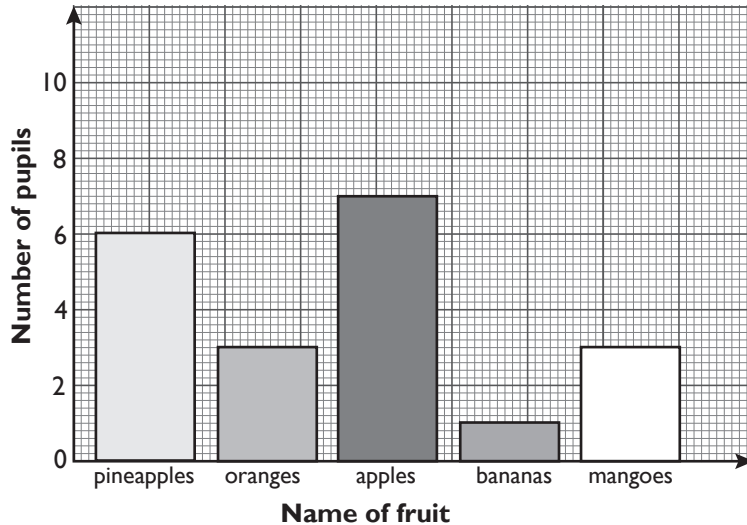
(a) How many learners prefer bananas?

(b) Which was the most popular fruit?

(c) Name the two fruits preferred by an equal number of children.

(d) How many pupils participated and gave their data?

(e) What is the graph about?

3. Study the table below.

Time	6:00 a.m	7:00 a.m	8:00 a.m	9:00 a.m	10: 00 a.m	11: 00 a.m	12: 00 p.m
Distance (km)	0	10	20	30	40	40	60

The table above shows distance covered by a motorist.

(a) Represent the data using a line graph.

(b) What time did the rest start?

(c) How many kilometres were covered by 9 a.m.?

Expected Answers

1. (i) Continuous data is from (c) and (d).

(ii) Discrete data is from (a) and (b).

2. (a) 1

(b) Apples

(c) Oranges and mangoes

(d) 20 pupils

(e) Pupils' favourite fruits.

3. (a)
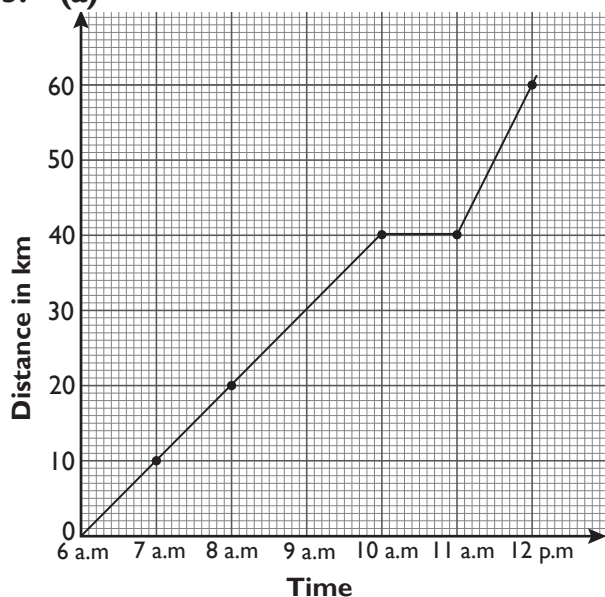
(b) 10 a.m.   **(c)** 30 km

Consolidation Activity

1. The following is the shoe size for different people. Represent the data on a bar chart.

Person	John	James	Anne	Miriam
Shoe size	8	7	4	3

2. Study the bar chart below.
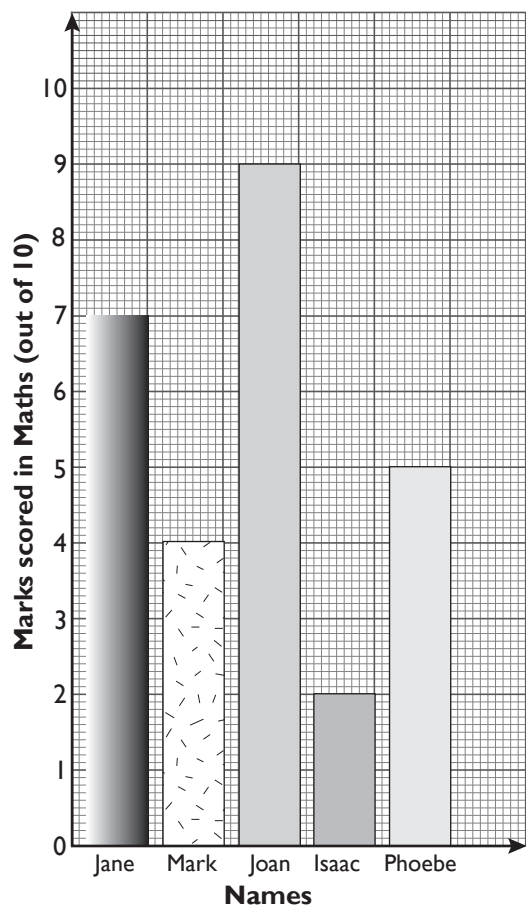
(a) Who scored the highest marks and how many marks?

(b) Who scored 2 marks out of 10 marks?

(c) Name the learners who scored 5 marks or more.

3. Study the data in the table below.

It shows distance travelled by a motorist.

Time	9.00 a.m.	10.00 a.m.	11.00 a.m.	12.00 p.m.	1.00 p.m.	2.00 p.m.
Distance covered (km)	0	100	150	150	200	250

    (a) Represent the data using a line graph.

    (b) What was going on between 11.00 a.m. and 12.00 p.m.? Explain.

4.
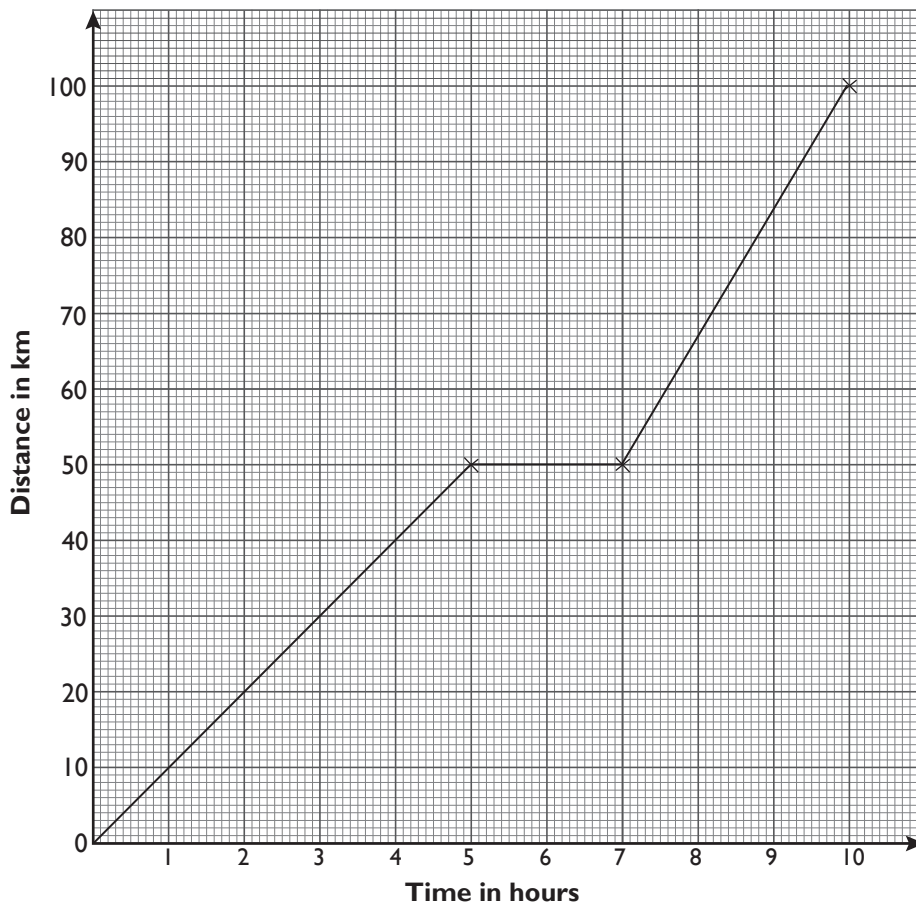
    (a) What distance did the motorist cover from the 5th hour to the 7th hour?

    (b) What distance had the motorist covered in 10 hours? Explain.

Expected Answers

1.
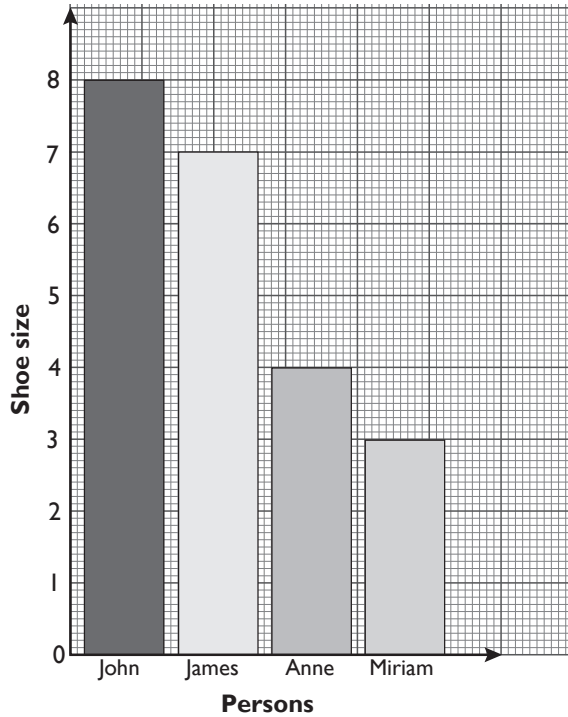
2. (a) Joan, 9 marks out of 10

(b) Isaac

(c) Jane, Joan, Phoebe

3. (a)
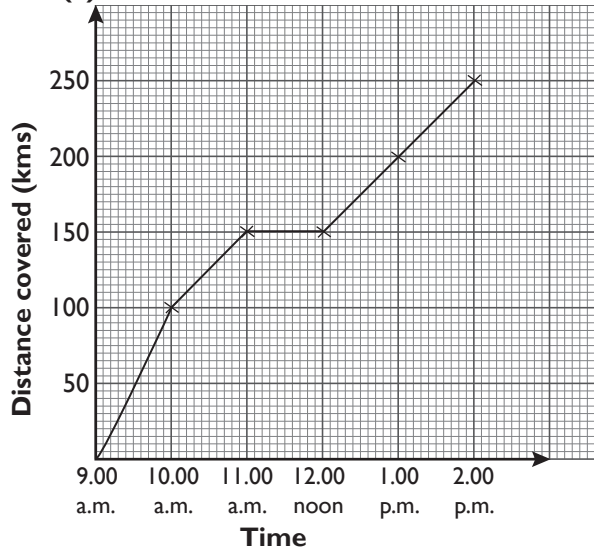
(b) Between 11:00 a.m. and 12:00 p.m. the motorist was resting.

4. **(a)** 0 km.

(b) 100 km.

Extension Activity

1. A motorist started a journey from town A to B. The data is represented in the graph below.
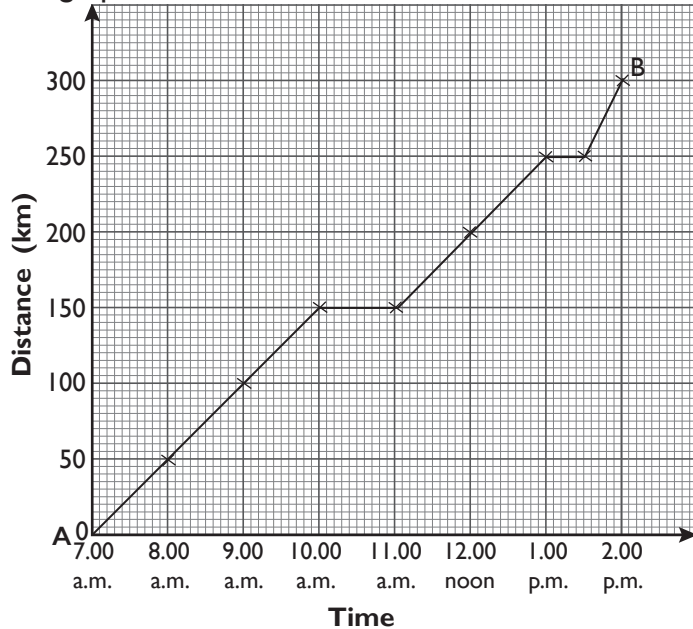
(a) How far is town A from B?

(b) At what time did the motorist start to rest?

(c) Find the total rest time. Explain.

(d) What distance did the motorist cover from 10.00 a.m. to 1.30 p.m.?

2. P5 pupils collected data on the favourite ball game in the class. The table below shows their findings.

Name of ball game	Football	Netball	Volleyball	Hockey	Basketball
Number of pupils	10	8	4	3	8

(a) Present this data on a bar chart.

(b) Which was the most popular sport in class? Explain.

(c) Which sport was least popular in the class? Explain.

(d) Name the games that the same number of pupils chose.

3. A class collected data on the following:

(a) Number of cars in the school compound.

(b) Number of buildings in the school compound.

(c) Time taken during break time.

(d) Distance from main gate to the school field.

From the data:

(i) List the continuous data. Explain.

(ii) List the discrete data. Explain.

Expected Answers

1. (a) 300 km. **(b)** 10.00 a.m.

(c) Total rest time.

10.00 a.m. to 11.00 a.m. = 1 h

1.00 p.m. to 1.30 p.m. = 30 min

(d) Total resting time = 1 h + 30 min = 1 h 30 min or $1\frac{1}{2}$ h.

250 km – 150 km = 100 km.

2. (a)
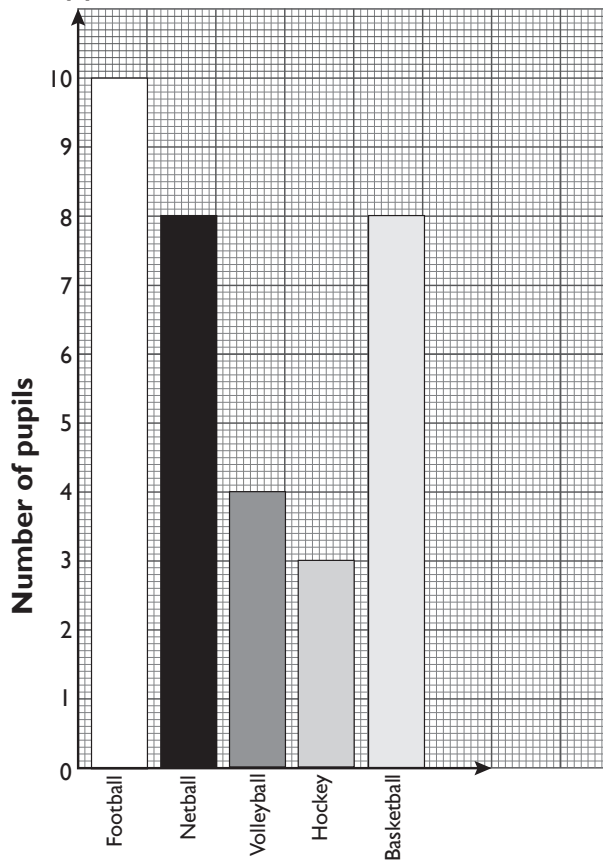
     (b) Football   **(c)** Hockey

     (d) Netball and basketball

3. **(ii)** Time taken during break time.

          Distance from main gate to school field.

     (ii) Number of cars in the compound.

          Number of buildings in the school compound.

Formative Assessment Support

- Tips to form a competence-based task for the unit are as follows.

  Ensure that all unit objectives and key unit competences in the syllabus are covered. Check assessment criteria from syllabus. Then list the requirements to develop competence-based task. A quick check is content summary. To Know the difficulty of items learning objectives are great assistance.

- Administer the set task to learners as follows:

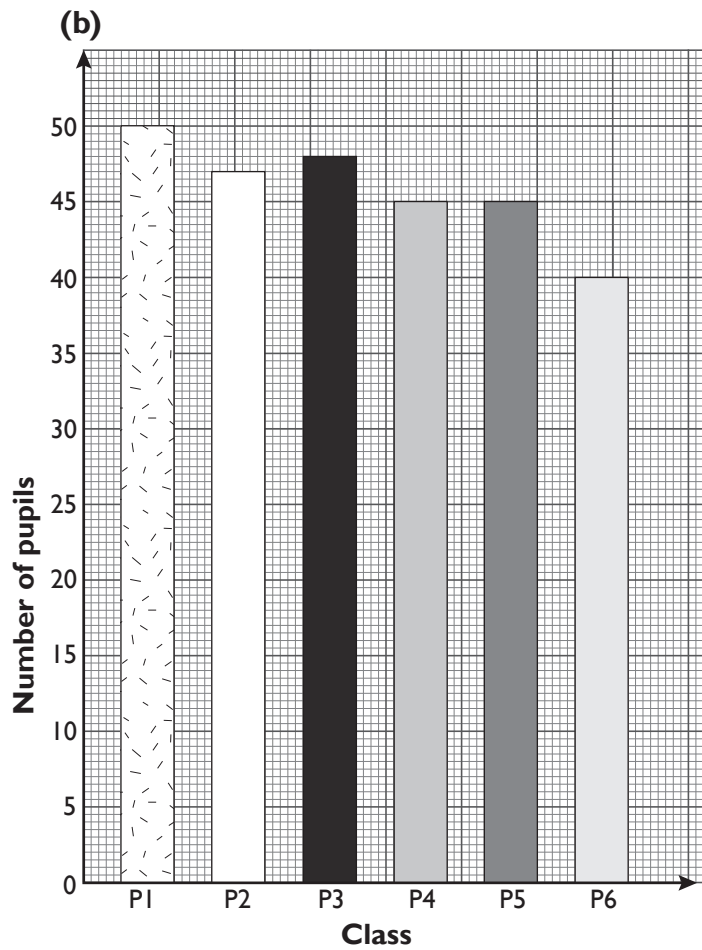 Have it done in a double lesson where all learners give their response. Alternatively have it dine one lesson. Asses the ability and confidence of learners by observation.

- Learners with special needs can be assisted to nurture and develop competence. They should be included with all the rest. Facilitate their ability to give expected response in spite of raring learning abilities. Prepare all learners before formative assessment.

- Assess both generic and subject based competence in the unit. Accord weak learners more time to complete the task motivate all learners with different abilities to have positive attitude and achieve expected competence.

- A sample of competence-based task has been provided in Pupil's Book. Use it as a guidance tool for formative assessment of this unit. You can improve the material to cater for all level of learning and suit the environment and use it to assess your learners. Expected answers have been provided to ease your work.

Expected Answers to Revision Activity 14

1. **(a)** Discrete data   • Data has whole numbers only.

(b)

A bar chart titled with y-axis "Number of pupils" (0 to 50) and x-axis "Class" (P1 to P6):
- P1: 50
- P2: 47
- P3: 48
- P4: 45
- P5: 45
- P6: 40

    (c) **(i)** P1

        (ii) P4 and P5

2. **(a)** 30 km   **(b)** 8:00 a.m.

    (c) 6:00 a.m.   **(d)** 15 km   **(e)** 6:30 a.m

3. (a) Continuous data

(b)
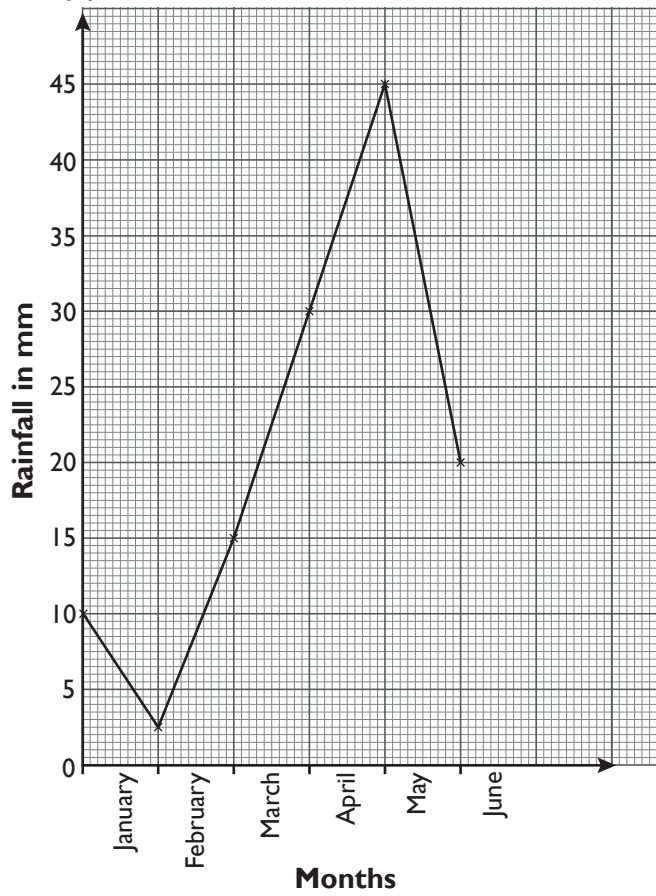
(c) May.

Topic Area: Statistics and elementary probability

Unit 15 — Probability

Background

In P4, you learn about games and chance. You interacted with playing games and deciding if rules of the game are fair or unfair to the player.

We continue into probability where we will collect data from simple experiments of events. Then learners will compute probability from simple experiments.

We will use the term the chance of an event to refer to the probability of the event.

Content summary

This unit covers two subtopics. These include:

15.1 Vocabulary of chance.

15.2 Conducting experiments and chance.

Key unit competence

Conduct experiments to decide how likely something is to happen.

Attitude and values

- Appreciate that random events cannot be predicated.
- Take care to record experiments accurately.

Relevant cross cutting issues

- Peace and values education – provide enough teaching and learning materials to enable learners to do activities harmoniously.
- Gender education – have learners work in groups, boys and girls work together in their small groups. Allow them to interact freely and carry out similar activity roles.
- Inclusive education – have learners work in groups of learners with different abilities

Relevant generic competence

- Cooperation – have learners interact while playing games of chance.
- Critical thinking – develop closed questions about probability to allow learners to give various answers but carry out an experiment to find the correct answers.

- Communication skills – develop this through group discussion and present the outcomes of various groups.
- Creativity and innovation – have learners explore various ways to carry out experiments and recording results. Give them freedom to discover outcome e.g. in tossing a coin several times. They can have several trials on tossing a coin as they can invent.

Assessment criteria

Assess the likelihood of an event happening and the use of the language of chance.

Notes to the teacher

In this unit we focus on probability from data obtained from simple experiments. It is important to note the deviation of empirical probabilities from theoretical probabilities. For example,

From simple experiment of tossing a coin 10 times.

Possible outcomes are Heads (H) or Tails (T). The results may be 4T and 6H.

Total possible outcomes are 10.

So probability of H $= \frac{\text{Heads observed}}{\text{Total outcomes}} = \frac{6}{10} = 0.6$.

However from theoretical probability, for a fair coin toss.

Probability of head $= \frac{1}{2}$. So we expect 5H and 5T, which is not always the outcome in practice.

Teach probability from practical events, not theoretical probability at this level.

Word list

Reference: Pupil's Book page 259

Have learners work in pairs to develop their reading, listening and writing skills using the word list. Build on learners vocabulary using the word list.

The stated task with suitable vocabulary words through out the unit.

Content

15.1 Vocabulary of chance

Number of periods: 1

Reference: Pupil's Book page 253

Knowledge and understanding

Explain that random events have different likelihoods of occurring and recognise the associated vocabulary.

Skills

- Learners will be able to conduct experiments and record outcomes systematically.
- Use the vocabulary of likelihood to compare events.

Teaching/Learning materials

Bottle tops, coins, dice (improvise by using wooden cubes and label the sides as required)

Teaching/Learning methods

- Group work – in small groups work out Activity 15.1 and Activity 15.2.
- Practical activity – in small groups toss a coin and record.
- Discussion – in small groups discuss their finding and the meaning of the vocabulary of chance.
- Supervised practice – learners do activities and you assess their progress.
- Problem solving – solving problems from examples and practice activity.

Teaching/Learning preparations

- Provide enough coins for the lesson.
- Organise pupils in small groups of mixed abilities and gender.
- The instruction is done outside the classroom.

Teaching/Learning steps

1. Introduce the concept of vocabulary of chance using Activity 15.1 and 15.2.
2. Have learners carry out Activity 15.2 (c).
3. Let learners discuss their findings and the provided tip.
4. Have learners do questions 1 – 5 of Practice Activity 15.1 and supervise their progress.
5. Give Additional Activities to different learning abilities from Additional Activity 15.

Guidance to the teacher

- This sub-topic requires a lot of practical activities, therefore provide enough materials for the lesson and provide enough time and equal chances to all learners of different abilities.
- Provide visually impaired learners with large print materials.
- Hearing impaired learners may use finger spelling sign language and oral methods.
- Learners with problems of tossing coins can observe and record the data.

Assessment of skills, knowledge and understanding

Observe learners as they assess the likelihood of an event happening and use the language of chance.

Expected answers for Practice Activity 15.1

1. likely   2. likely   3. impossible
4. likely   5. unlikely

15.2   Conducting experiments and chance

Number of periods: 2

Reference: Pupil's Book page 254

Knowledge and understanding

Learners will be able to explain that random events have different likelihoods of occurring and recognise the associated vocabulary.

Skills

Learners will be able to conduct experiments and record the outcomes systematically and use the vocabulary of likelihood to compare events.

Teaching/Learning materials

Bottle tops, coins, dice (improvise by using wooden cubes and label the sides as required)

Teaching/Learning methods

- Practical activity – in small groups carry out Activities 15.3, 15.4 and 15.1 at a time
- Group work activities –work on Activities 15.3, 15.4 and 15.5 in groups.
- Supervised practice – assess their progress as they toss and record data.
- Discussion – discussing observations in small groups.
- Explanation – explain the outcomes and the provided tips.
- Demonstration – show the tossing of a coin, bottle tops and dice and how to record the outcome.
- Problem solving – working out Practice Activity 15.2 questions 1 and 2.
- Question and answer – answer oral questions.

Teaching/Learning preparations

- Provide enough materials for the lesson.
- Organise pupils in small groups of mixed abilities and gender.
- The instruction is done outside the classroom.

Teaching/Learning steps

1. Introduce the concept of experiments and chances using Activity 15.2
2. In small groups let the learners do Activity 15.3 and Activity 15.4
3. Have learners discuss the tips for experiments and chance.
4. Let learners explain their findings and do Activity 15.5.
5. In pairs, let the learners do Practice Activity 15.2 question 1 and 2.
6. Assess learners and give them Additional Activity 15 according to their abilities.
7. Let them discuss the activity in their small groups and present their answers to the class.
6. Supervise their progress and assist those with learning difficulties.
7. Assign questions 3 and 4 of Practice Activity 15.2 as homework.

Assessment of skills, knowledge and understanding

Observe learners as they toss coins, dice or bottle tops and record their results on a table and represent the result on a bar graph.

Guidance to the teacher

This is a practical activity, therefore provide enough materials and provide learners with equal opportunities and enough time to conduct experiments to decide how likely something is to happen. Ask oral questions to provoke thinking but allow them to answer them through the practical activity. The referee tosses a coin before starting a football match. This is very important as it gives players an equal chance of starting a game.

Expected answers for Practice Activity 15.2

1. (i) either tails or heads.

    (ii) $\frac{1}{2}$

2. (i) 10 (ii) 10 (iii) $\frac{1}{2}$

    (iv) $\frac{1}{2}$ (v) No

3. (i)
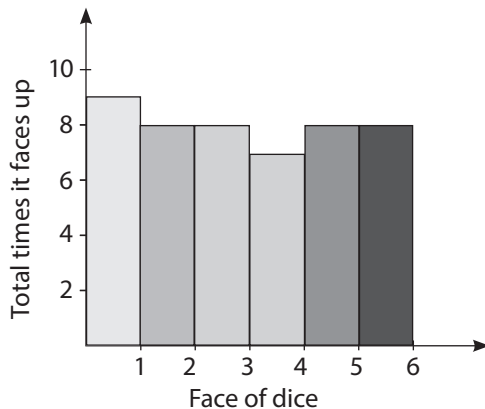
(ii) $1, \dfrac{9}{48} = \dfrac{3}{16}$ (iii) $4, \dfrac{7}{48}$ (iv) $\dfrac{8}{48} = \dfrac{1}{6}$

4.   (i)   10   (ii)   2   (iii)   8

    (iv)   No – The results show us the outcome is favouring facing up almost all the time.

Additional Activity 15

Remedial Activity

1. Learners went for a football match competition. Use vocabulary of chance to fill the following:

    (i)   It is _____ all pupils were sleeping. (impossible, unlikely)

    (ii)   It is _____ some pupils were playing (likely, unlikely)

2. In an experiment, two pupils toss a dice 24 times. They recorded their results as below. Explain your findings.

Face of dice	1	2	3	4	5	6	Total
Total times it faced up	3	4	5	9	2	1	

    (i)   Find the total number of results observed.

    (ii)   Find the chance of having 6 as the score.

3. A group of learners conducted an experiment. They tossed a coin twenty times. They recorded their results below.

Throw	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Head faced up	ü		ü	ü		ü		ü	ü	ü			ü				ü	ü	ü	
Tail faced up		ü			ü		ü				ü	ü		ü	ü	ü				ü

    (i)   How many times did the head face up?

    (ii)   Find the chance of getting a tail facing up.

Consolidation Activity

1. Learners went for a football match competition. Use vocabulary of chance to fill in the following

    (i)   It is _____ that all pupils were playing football. (likely, unlikely)

    (ii)   It is _____ that the referee was sleeping in the field. (possible, impossible)

2. In an experiment two pupils toss a dice 24 times. They recorded their results below. Explain their findings.

Face of dice	1	2	3	4	5	6
Total times faced up	3	4	5	9	2	1

(i)   How many times did face 4 face up?

(ii)   What was the total chance of observing 3 as the score?

4.   A group of learners conducted an experiment. They tossed a coin twenty times. They recorded their results below. Discuss your findings.

Throw	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Head faced up	ü	ü			ü	ü	ü	ü				ü			ü			ü	ü	
Tail faced up			ü	ü					ü	ü	ü		ü	ü		ü	ü			ü

(i)   How many times did the head face up?

(ii)   Find the total chance of getting a head face up.

Extension Activity

1.   Learners went for a football match competition. Use vocabulary of chance to fill in the following.

(i)   It is _____that one learner was playing in the football match competition alone. (impossible, possible)

(ii)   It is _____ that players were using hands to play football. (likely, unlikely)

2.   In an experiment, two pupils tossed a dice 24 times. They recorded their results as below.

Face of dice	1	2	3	4	5	6
Total times faced up	3	4	5	9	2	1

(i)   Represent the data in a bar graph.

(ii)   Which face had the highest chance of facing up? What was its chance?

(iii) Find the chance of getting face 2.

3.   A group of learners conducted an experiment. They tossed a coin twenty times. They recorded their results below. Discuss their findings.

Throw	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Head faced up	ü				ü				ü	ü		ü	ü		ü	ü				
Tail faced up		ü	ü	ü		ü	ü	ü			ü			ü	ü			ü	ü	ü

(i)   What as the total number of observations made?

(ii)   Find the total number of times the head faced up.

(iii) Did the previous result affect the next result?

(iv)   What was the chance of getting a head in a toss?

(v)   What was the chance of getting a tail in a toss?

Expected Answers for additional Activity

Remedial Activity

1. (i) impossible (ii) likely

2. (i) 24 (ii) $\dfrac{1}{24}$
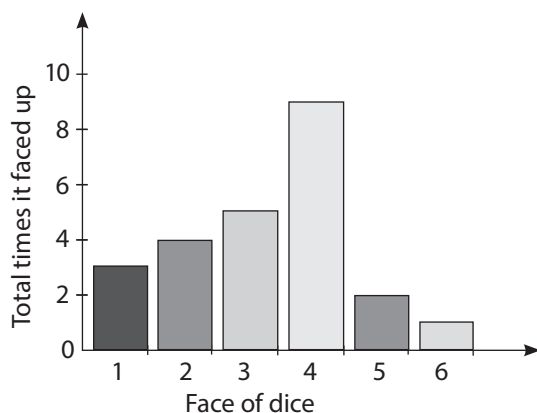
3. (i) 11 (ii) $\dfrac{9}{20}$

Consolidation Activity

1. (i) unlikely (ii) impossible

2. (i) 9 (ii) $\dfrac{5}{24}$

3. (i) 10 (ii) $\dfrac{10}{20} = \dfrac{1}{2}$

Extension Activity

1. (i) impossible (ii) unlikely
   (iii) 20

2. (i)

(ii) 4, $\dfrac{9}{24}$ (iii) $\dfrac{4}{24} = \dfrac{1}{6}$

3. (i) 20 (ii) 8 (iii) No
   (iv) $\dfrac{8}{12} = \dfrac{2}{5}$ (v) $\dfrac{12}{20} = \dfrac{3}{5}$

Formative assessment support

Set competence-based task for this unit by following these tips. Ensure that all syllabus unit objective and key unit competences are covered. Check provided assessment criteria from the syllabus. You can then, list the requirement to develop the competence-based task for this unit. Content summary is a quick check to scope and sequence of items learning.

Objective assist you know the difficulty of your items. Once you have set a competence-based task activity for this unit administer to learners as follows. Have

it done in one lesson, where all learners will give this response. It is important to assess abilities and confidence of the learners by observation. Learners with physical challenges can be assisted to develop and nurture competence such include learners with mental challenges, eye sight problem, hearing etc. Organise them to be include with all learners but facilitate their ability to give expected response in spite of their varied learning abilities. It is important that you prepare all learners before formative assessment. This should be guided toward measuring rate of learners achievement of competences. Assess both generic and subject based competence spelt per unit.

It is important you assess different abilities of the learners appropriately. As such give enough time to slow or weak learners to do the task and develop expected competence. You can re-set some items in the task or use real object to facilitate learners with different abilities to proceed well. Motivate all learners with different abilities to have positive attitude and achieve expected competence. Gifted learners may assist slow learners, if necessary to develop a class cooperation.

We have provided a sample of competence-based task in Pupil's Book. It is named as Revision Activity 15. Use it as a guidance tool for formative assessment of this unit. You are at liberty to improve the materials by designing more activities according to the level of your learners in the class. This will help in mastering of concept through practical approach. We have provided, its expected answers below to ease your work.

Expected answers for Revision Activity 15

1. (i)   certain   (ii) impossible   (iii)   likely
    (iv) equally likely   (v)   unlikely

2. (i)   6   (ii) 4   (iii)   10
    (iv) $\frac{3}{5}$ (v) $\frac{2}{5}$
    (vi) No, impossible
    (vii) No – a bottle top, always has one side face up.