Mathematics

For

Rwandan Primary Schools

Teacher's Guide

5

Experimental Version

Kigali, 2022

FOREWORD

Dear teacher,

Rwanda Basic Education Board is honoured to present P5 Mathematics teacher's guide which serves as a guide to competence-based teaching and learning to ensure consistency and coherence in the learning of Mathematics in primary Five. The Rwandan educational philosophy is to ensure that learners achieve full potential at every level of education which will prepare them to be well integrated in society and exploit employment opportunities.

In line with efforts to improve the quality of education, the government of Rwanda emphasizes the importance of aligning teaching and learning materials with the syllabus to facilitate the teaching and learning process.

Many factors influence what pupils learn, how well they learn and the competences they acquire. Those factors include the relevance of the specific content, the quality of teachers, the assessment strategies, and the instructional materials available. The special attention was paid to the activities that facilitate the learning process in which learners can develop ideas and make new discoveries during concrete activities carried out individually or with peers. With the help of the teachers, learners will gain appropriate skills and be able to apply what they have learnt in real life situations. Hence, they will be able to develop certain values and attitudes allowing them to make a difference not only to their own life but also to the nation.

In the regard of competence-based curriculum, learning is considered as a process of active building and developing of knowledge and skills by the learner where concepts are mainly introduced by an activity, situation or scenario that helps the learner to construct knowledge, develop skills and acquire positive attitudes and values.

The book provides active teaching and learning techniques that engage pupils to develop competences. In view of this, your role is to:

- Plan your lessons and prepare appropriate teaching materials as well as a variety of activities at every topic.
- Organize group discussions for pupils considering the importance of social constructivism suggesting that learning occurs more effectively when pupils work collaboratively with more knowledgeable and experienced people.
- Engage pupils through active learning methods such as inquiry methods, group discussions, research, investigative activities, group and individual work activities.
- Provide supervised opportunities for pupils to develop different competences by giving tasks which enhance critical thinking, problem solving, research, creativity and innovation, communication, and cooperation.
- Support and facilitate the learning process by valuing pupils' contributions in the class activities.
- Guide pupils towards the harmonization of their findings.
- Encourage individual, peer and group evaluation of the work done in the classroom and use appropriate competence-based assessment approaches and methods.

To facilitate you in your teaching activities, the content of this book is self-explanatory so that you can easily use it.

Even though this teacher's guide contains the guidance on how to deliver mathematics lessons, you are requested to plan your lessons before delivering them.

I wish to sincerely express my appreciation to the people who contributed towards the development of this P5 Mathematics teacher's guide, particularly REB staff who organized

the whole process from its inception. Special appreciation goes also to other stakeholders in education who supported the exercise throughout.

Any comment or contribution would be welcome to the improvement of this teacher's guide for the next versions.

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Director General of Rwanda Basic Education Board

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PART I. GENERAL INTRODUCTION

1.1 The structure of the guide

The teacher's guide of Mathematics is composed of three parts:
The Part I concerns general introduction that discusses methodological guidance on how best to teach and learn Mathematics, developing competences in teaching and learning, addressing cross-cutting issues in teaching and learning and Guidance on assessment.

Part II presents a sample lesson plan. This lesson plan serves to guide the teacher on how to prepare a lesson in Mathematics.

The Part III is about the structure of a unit and the structure of a lesson. This includes information related to the different components of the unit and these components are the same for all units. This part provides information and guidelines on how to facilitate students while working on learning activities. More other, all application activities from the textbook have answers in this part.

1.2 Methodological guidance

1.2.1 Developing competences

Since 2015 Rwanda shifted from a knowledge based to a competence-based curriculum for pre-primary, primary, secondary education and recently the curriculum for profession options such as TTC, Associate Nurse and Accounting programs. This called for changing the way of learning by shifting from teacher centred to a learner centred approach. Teachers are not only responsible for knowledge transfer but also for fostering students' learning achievement and creating safe and supportive learning environment. It implies also that students have to demonstrate what they are able to transfer the acquired knowledge, skills, values and attitude to new situations.

The competence-based curriculum employs an approach of teaching and learning based on discrete skills rather than dwelling on only knowledge or the cognitive domain of learning. It

focuses on what learner can do rather than what learner knows. Students develop competences through subject unit with specific learning objectives broken down into knowledge, skills and attitudes/ values through learning activities.

In addition to the competences related to Mathematics, students also develop generic competences which should promote the development of the higher order thinking skills and professional skills in Mathematics teaching. Generic competences are developed throughout all units of Mathematics as follows:

Generic competences	**Ways of developing generic competences**
Critical thinking	All activities that require students to calculate, convert, interpret, analyse, compare and contrast, etc have a common factor of developing critical thinking into students
Creativity and innovation	All activities that require students to plot a graph of given data, to collect, organize and interpret statistical data and to apply mathematical skills in solving real life problems have a common character of developing creativity into students
Research and problem solving	All activities that require students to make a research and apply their knowledge and skills to solve problems from the real-life situation have a character of developing research and problem solving skills into students.
Communication	During Mathematics class, all activities that require students to discuss either in groups or in the whole class, present findings, debate …have a common character of developing communication skills into students.
Co-operation, interpersonal relations and life skills	All activities that require students to work in pairs or in groups have character of developing cooperation and life skills among students.

Lifelong learning	All activities that are connected with research have a common character of developing into students a curiosity of applying the knowledge learnt in a range of situations. The purpose of such kind of activities is for enabling students to become life-long students who can adapt to the fast-changing world and the uncertain future by taking initiative to update knowledge and skills with minimum external support.

The generic competences help students deepen their understanding of Mathematics and apply their knowledge and skills in a range of situations. As students develop generic competences they also acquire the set of skills that employers look for in their employees, and so the generic competences prepare students for the world of work.

1.2.2 Addressing cross cutting issues

Among the changes brought by the competence-based curriculum is the integration of cross cutting issues as an integral part of the teaching learning process-as they relate to and must be considered within all subjects to be appropriately addressed. The eight cross cutting issues identified in the national curriculum framework are: *Comprehensive Sexuality Education, Environment and Sustainability, Financial Education, Genocide studies, Gender, Inclusive Education, Peace and Values Education, and Standardization Culture*.

Some cross-cutting issues may seem specific to particular learning areas/subjects but the teacher need to address all of them whenever an opportunity arises. In addition, students should always be given an opportunity during the learning process to address these cross-cutting issues both within and out of the classroom.

Below are examples of how crosscutting issues can be addressed:

Cross-Cutting Issue	**Ways of addressing cross-cutting issues**
Comprehensive Sexuality Education: The primary goal of introducing Comprehensive Sexuality Education program in schools is to equip children, adolescents, and young people	Using different statistical data and related charts on earlier pregnancies Mathematics teacher should lead students to interpret and discuss the effects of earlier pregnancy in the

with knowledge, skills and values in an age appropriate and culturally gender sensitive manner so as to enable them to make responsible choices about their sexual and social relationships, explain and clarify feelings, values and attitudes, and promote and sustain risk reducing behaviour.	society.
Environment and Sustainability: Integration of Environment, Climate Change and Sustainability in the curriculum focuses on and advocates for the need to balance economic growth, society well-being and ecological systems. Students need basic knowledge from the natural sciences, social sciences, and humanities to understand to interpret principles of sustainability.	Using word problems from real life experience, Mathematics Teachers should lead students to solve the mathematical word problem related to tree plantation in a certain district and discuss on the effects of trees in fighting against erosion.
Financial Education: The integration of Financial Education into the curriculum is aimed at a comprehensive Financial Education program as a precondition for achieving financial inclusion targets and improving the financial capability of Rwandans so that they can make appropriate financial decisions that best fit the circumstances of one's life.	Through different examples and calculations on word problems from real life experience of the students, Mathematics Teachers can lead students to discuss on how to make appropriate financial choices and decisions basing on the following key terms "needs, wants, savings and investment".
Gender: At school, gender will be understood as family complementarities, gender roles and responsibilities, the need for gender equality and equity, gender stereotypes, gender sensitivity, etc.	Mathematics Teachers should address gender as cross-cutting issue through assigning leading roles in the management of groups to both girls and boys and providing equal opportunity in the lesson participation and avoid any gender stereotype in the whole teaching and learning process.
Inclusive Education: Inclusion is based on	Firstly, Mathematics Teachers need to

the right of all students to a quality and equitable education that meets their basic learning needs and understands the diversity of backgrounds and abilities as a learning opportunity.	identify/recognize students with special education needs. Then by using adapted teaching and learning resources while conducting a lesson and setting appropriate tasks to the level of students, they can cater for students with special education needs. They must create opportunity where students can discuss how to cater for students with special education needs.
Peace and Values Education: Peace and Values Education (PVE) is defined as education that promotes social cohesion, positive values, including pluralism and personal responsibility, empathy, critical thinking and action in order to build a more peaceful society.	Through a given lesson, a teacher should: ▪ Set a learning objective which is addressing positive attitudes and values, ▪ Encourage students to develop the culture of tolerance during discussion and to be able to instil it in colleagues and cohabitants; ▪ Encourage students to respect ideas from others.
Standardization Culture: Standardization Culture in Rwanda will be promoted through formal education and plays a vital role in terms of health improvement, economic growth, industrialization, trade and general welfare of the people through the effective implementation of Standardization, Quality Assurance, Metrology and Testing.	With different word problems related to the effective implementation of Standardization, Quality Assurance, and Testing, students can be motivated to be aware of health improvement by consuming tested food and beverages/drinks, checking the expiration date of foods and drinks before buying and consumption, etc.

1.2.3 Guidance on how to help students with special education needs in classroom

In the classroom, students learn in different way depending on their learning pace, needs or any other special problem they might have. However, the teacher has the responsibility to

know how to adopt his/her methodologies and approaches in order to meet the learning need of each student in the classroom. Also teachers need to understand that student with special education needs, need to be taught differently or need some accommodations to enhance the learning environment. This will be done depending on the subject and the nature of the lesson.

In order to create a well-rounded learning atmosphere, teachers need to:

- Remember that students learn in different ways so they have to offer a variety of activities (e.g. role-play, music and singing, word games and quizzes, and outdoor activities);
- Maintain an organized classroom and limits distraction. This will help students with special education needs to stay on track during lesson and follow instruction easily;
- Vary the pace of teaching to meet the needs of each student. Some students process information and learn more slowly than others;
- Break down instructions into smaller, manageable tasks. Students with special education needs often have difficulty understanding long-winded or several instructions at once. It is better to use simple, concrete sentences in order to facilitate them understand what you are asking.
- Use clear consistent language to explain the meaning (and demonstrate or show pictures) if you introduce new concepts;
- Make full use of facial expressions, gestures and body language;
- Pair a student who has a disability with a friend. Let them do things together and learn from each other. Make sure the friend is not over protective and does not do everything for the one with disability. Both students will benefit from this strategy;
- Use multi-sensory strategies. As all students learn in different ways, it is important to make every lesson as multi-sensory as possible. Students with learning disabilities might have difficulty in one area, while they might excel in another. For example, use both visual and auditory cues.

Below are general strategies related to each main category of disabilities and how to deal with every situation that may arise in the classroom. However, the list is not exhaustive because each student is unique with different needs and that should be handled differently.

Strategy to help students with developmental impairment:

- Use simple words and sentences when giving instructions;
- Use real objects that students can feel and handle. Rather than just working

abstractly with pen and paper;

- Break a task down into small steps or learning objectives. The student should start with an activity that she/he can do already before moving on to something that is more difficult;
- Gradually give the student less help;
- Let the student with disability work in the same group with those without disability.

Strategy to help students with visual impairment:

- Help students to use their other senses (hearing, touch, smell and taste) and carry out activities that will promote their learning and development;
- Use simple, clear and consistent language;
- Use tactile objects to help explain a concept;
- If the student has some sight, ask him/her what he/she can see;
- Make sure the student has a group of friends who are helpful and who allow him/her to be as independent as possible;
- Plan activities so that students work in pairs or groups whenever possible;

Strategy to help students with hearing disabilities or communication difficulties

- Always get the student's attention before you begin to speak;
- Encourage the student to look at your face;
- Use gestures, body language and facial expressions;
- Use pictures and objects as much as possible.
- Keep background noise to a minimum.

Strategies to help students with physical disabilities or mobility difficulties:

- Adapt activities so that students who use wheelchairs or other mobility aids, can participate.
- Ask parents/caregivers to assist with adapting furniture e.g. the height of a table may need to be changed to make it easier for a student to reach it or fit their legs or wheelchair under;
- Encourage peer support when needed;
- Get advice from parents or a health professional about assistive devices if the student has one.

Adaptation of assessment strategies:

At the end of each unit, the teacher is advised to provide additional activities to help students achieve the key unit competence. These assessment activities are for remedial, consolidation and extension designed to cater for the needs of all categories of students; slow, average and gifted students respectively. Therefore, the teacher is expected to do assessment that fits individual students.

Remedial activities	After evaluation, slow students are provided with lower order thinking activities related to the concepts learnt to facilitate them in their learning. These activities can also be given to assist deepening knowledge acquired through the learning activities for slow students.
Consolidation activities	After introduction of any concept, a range number of activities can be provided to all students to enhance/ reinforce learning.
Extended activities	After evaluation, gifted and talented students can be provided with high order thinking activities related to the concepts learnt to make them think deeply and critically. These activities can be assigned to gifted and talented students to keep them working while other students are getting up to required level of knowledge through the learning activity.

1.2.4. Guidance on assessment

Assessment is an integral part of teaching and learning process. The main purpose of assessment is for improvement of learning outcomes. Assessment for learning/ Continuous/ formative assessment intends to improve students' learning and teacher's teaching whereas assessment of learning/summative assessment intends to improve the entire school's performance and education system in general.

Continuous/ formative assessment

It is an on-going process that arises during the teaching and learning process. It includes lesson evaluation and end of sub units / topics assessment. This formative assessment should play a big role in teaching and learning process. The teacher should encourage individual, pair and group evaluation of the work done in the classroom and uses appropriate competence-based assessment approaches and methods.

Formative assessment is used to:

- Determine the extent to which learning objectives are being achieved and competences are being acquired and to identify which students need remedial interventions, reinforcement as well as extended activities. The application activities are developed in the student book and they are designed to be given as remedial, reinforcement, end lesson assessment, homework or assignment
- Motivate students to learn and succeed by encouraging students to read, or learn more, revise, etc.
- Check effectiveness of teaching methods in terms of variety, appropriateness, relevance, or need for new approaches and strategies. Mathematics teachers need to consider various aspects of the instructional process including appropriate language levels, meaningful examples, suitable methods and teaching aids/ materials, etc.
- Help students to take control of their own learning.

In teaching Mathematics, formative or continuous assessment should compare performance against instructional objectives. Formative assessment should measure the student's ability with respect to a criterion or standard. For this reason, it is used to determine what students can do, rather than how much they know.

Summative assessment

The assessment can serve as summative and informative depending to its purpose. The end unit assessment will be considered summative when it is done at end of unit and before to start a new one.

It will be formative assessment, when it is done in order to give information on the progress of students and from there decide what adjustments need to be done.

The assessment done at the end of the term, end of year, is considered as summative assessment so that the teacher, school and parents are informed of the achievement of

educational objective and think of improvement strategies. There is also end of level/ cycle assessment in form of national examinations.

When carrying out assessment?

Assessment should be clearly visible in lesson, unit, term and yearly plans.

- Before learning (diagnostic): At the beginning of a new unit or a topic or a section of work; assessment can be organized to find out what students already know / can do, and to check whether the students are at the same level.
- During learning (formative/continuous): When students appear to be having difficulty with some of the work, by using on-going assessment (continuous). The assessment aims at giving students support and feedback.
- After learning (summative): At the end of a section of work or a learning unit, the Mathematics Teacher has to assess after the learning. This is also known as Assessment of Learning to establish and record overall progress of students towards full achievement. Summative assessment in Rwandan schools mainly takes the form of written tests at the end of a learning unit or end of the month, and examinations at the end of a term, school year or cycle.

Instruments used in assessment.

- **Observation:** This is where the Mathematics teacher gathers information by watching students interacting, conversing, working, playing, etc. A teacher can use observations to collect data on behaviours that are difficult to assess by other methods such as attitudes, values, and generic competences and intellectual skills. It is very important because it is used before the lesson begins and throughout the lesson since the teacher has to continue observing each and every activity.

- **Questioning**
  (a) Oral questioning: a process which requires a student to respond verbally to questions
  (b) Class activities/ exercise: tasks that are given during the learning/ teaching process
  (c) Short and informal questions usually asked during a lesson
  (d) Homework and assignments: tasks assigned to students by their teachers to be completed outside of class.

Homework assignments, portfolio, project work, interview, debate, science fair, Mathematics projects and Mathematics competitions are also the different forms/instruments of assessment.

1.2.5. Teaching methods and techniques that promote active learning

The different learning styles for students can be catered for, if the teacher uses active learning whereby students are really engaged in the learning process.

The main teaching methods used in Mathematics are the following:

- **Dogmatic method** (the teacher tells the students what to do, What to observe, How to attempt, How to conclude)
- **Inductive-deductive method:** Inductive method is to move from specific examples to generalization and deductive method is to move from generalization to specific examples.
- **Analytic-synthetic method:** Analytic method proceeds from unknown to known, 'Analysis' means 'breaking up' of the problem in hand so that it ultimately gets connected with something obvious or already known. Synthetic method is the opposite of the analytic method. Here one proceeds from known to unknown.
- **Skills lab method:** Skills lab method is based on the saying / maxim "learning by doing." It is a procedure for stimulating the activities of the students and to encourage them to make discoveries through practical activities.
- **Problem solving method, Project Based Learning and Seminar Method.**

The following are some active techniques to be used in Mathematics:

- Group work
- Research
- Probing questions
- Practical activities (drawing, plotting, interpreting graphs)
- Modelling
- Brainstorming
- Quiz Technique
- Discussion Technique
- Scenario building Technique

What is Active learning?

Active learning is a pedagogical approach that engages students in doing things and thinking about the things they are doing. Students play the key role in the active learning process. They are not empty vessels to fill but people with ideas, capacity and skills to build on for effective learning. Thus, in active learning, students are encouraged to bring their own experience and knowledge into the learning process.

The role of the teacher in active learning	**The role of students in active learning**
- The teacher engages students through active learning methods such as inquiry methods, group discussions, research, investigative activities, group and individual work activities. - He/she encourages individual, peer and group evaluation of the work done in the classroom and uses appropriate competence-based assessment approaches and methods. - He provides supervised opportunities for students to develop different competences by giving tasks which enhance critical thinking, problem solving, research, creativity and innovation, communication and cooperation. - Teacher supports and facilitates the learning process by valuing students' contributions in the class activities.	A learner engaged in active learning: - Communicates and shares relevant information with fellow students through presentations, discussions, group work and other learner-centred activities (role play, case studies, project work, research and investigation); - Actively participates and takes responsibility for his/her own learning; - Develops knowledge and skills in active ways; - Carries out research/investigation by consulting print/online documents and resourceful people, and presents their findings; - Ensures the effective contribution of each group member in assigned tasks through clear explanation and arguments, critical thinking, responsibility and confidence in public speaking - Draws conclusions based on the findings from the learning activities.

Main steps for a lesson in active learning approach

All the principles and characteristics of the active learning process highlighted above are reflected in steps of a lesson as displayed below. Generally, the lesson is divided into three main parts whereby each one is divided into smaller steps to make sure that students are involved in the learning process. Below are those main part and their small steps:

1) Introduction

Introduction is a part where the teacher makes connection between the current and previous lesson through appropriate technique. The teacher opens short discussions to encourage students to think about the previous learning experience and connect it with the current instructional objective. The teacher reviews the prior knowledge, skills and attitudes which have a link with the new concepts to create good foundation and logical sequencings.

2) Development of the new lesson

The development of a lesson that introduces a new concept will go through the following small steps: discovery activities, presentation of students' findings, exploitation, synthesis/summary and exercises/application activities.

❖ **Discovery activity**

Step 1:

- The teacher discusses convincingly with students to take responsibility of their learning
- He/she distributes the task/activity and gives instructions related to the tasks (working in groups, pairs, or individual to prompt / initiate collaborative learning, to discover knowledge to be learned)

Step 2:

- The teacher let students work collaboratively on the task;
- During this period the teacher refrains to intervene directly on the knowledge;

- He/she then monitors how the students are progressing towards the knowledge to be learned and boosts those who are still behind (but without communicating to them the knowledge).

❖ **Presentation of students' findings/productions**

- In this part, the teacher invites representatives of groups to present their productions/findings.
- After three/four or an acceptable number of presentations, the teacher decides to engage the class into exploitation of students' productions.

❖ **Exploitation of students' findings/ productions**

- The teacher asks students to evaluate the productions: which ones are correct, incomplete or false
- Then the teacher judges the logic of the students' products, corrects those which are false, completes those which are incomplete, and confirms those which are correct.

❖ **Institutionalization or harmonization (summary/conclusion/ and examples)**

- The teacher summarizes the learned knowledge and gives examples which illustrate the learned content.

❖ **Application activities**

- Exercises of applying processes and products/objects related to learned unit/sub-unit
- Exercises in real life contexts
- Teacher guides students to make the connection of what they learnt to real life situations.
- At this level, the role of teacher is to monitor the fixation of process and product/object being learned.

3) Assessment / evaluation

In this step the teacher asks some questions to assess / evaluate achievement of instructional objective. During assessment activity, students work individually on the task/activity. The teacher avoids intervening directly. In fact, results from this assessment inform the teacher on next steps for the whole class and individuals. In some cases, the teacher can end with a homework/ assignment. Doing this will allow students to relay their understanding on the concepts covered that day. Teacher leads them not to wait until the last minute for doing the homework as this often results in an incomplete homework set and/or an incomplete understanding of the concept.

SAMPLE LESSON PLAN FOR MATHEMATICS P5

Lesson title: Calculation of equivalent fraction

School Name: ……Teachers name……

Term	**Date**	**Subject**	**Class**	**Unit Nº**	**Lesson Nº**	**Duration**	**Class size**
2	.... /..../....	Math	P5	4	3 of 13	40min	**Boys:25** **Girls:25** **Total:50**
Types/category/number of special Educational need to be catered for in this lesson.				None			
Unit title				Equivalent fractions and operations			
Key Unit Competence				Learners will be able to add, subtract and find equivalent fractions.			
Title of the lesson				Calculation of equivalent fractions			
Instructional Objective				Using playing cards and through the game "**Fraction action"** learners will be able to calculate equivalent fractions accurately with in five minutes reserved for assessment.			
Plan for this Class (location: in / outside)				Inside the classroom			
Learning Materials (for all learners)				Deck of playing cards/flash cards with numbers, fraction chart, 20 number cards (1 to 10) for each pair, sheet of paper, pencil, pens.			
References				REB (2018). Mathematics for Rwandan Primary Schools. Teacher's Guide, 5. 75. Kigali REB (2019). Mathematics for Rwandan Primary Schools. Pupil's Book, 5. p.56. Kigali			

Timing for each steps	**Description of teaching and learning activity**		**Generic competences (G.C).** and **Cross cutting issues (C.C.I)** to be addressed + **a short explanation**
	In the introduction, learners shade different equivalent fractions in their books, page 55 with the guidance of the teacher. In the new lesson, through the game called 'Fraction action', learners make different fractions using playing cards and calculate their equivalent fractions quickly. In conclusion, learners give more examples of the equivalent fractions.		
	Teacher's activities	**Learner's activities**	
Introduction 5 min	Instructions to the teacher: - Ask learners to explain the meaning of equivalent fractions -Ask learners to work out activity 4.5 in the learners' book about shading equivalent fractions in pairs. -Move around to check how they are doing the activity.	Explain the meaning of equivalent fractions *Equivalent fractions are the fractions that have different numerator and denominator but are equal to the same value E.g. 2/4 and 3/6 Shade equivalent fractions in the learner's book and get corrections.	**G.C:** **Creativity and innovation** These are promoted as learners are trying to shade the fractions **CCI:** **Gender education**: as Boys and girls are given equal chance to participate in pair's activity.
Lesson development 30 min **Discovery activity**	Ask the learners to guess the lesson of the day; Tell them that they are going to study how to calculate equivalent fractions. Give learners a shaded fraction in the previous activity and ask them to calculate its equivalent	Guess the lesson of the day Calculate the fraction equivalent to the shaded one	**G.C:** **Creativity and innovation** Learners are trying to make fractions using cards and sheet of papers. **Critical thinking**: When learners are trying to

			understand the procedure of the game, they strategize on steps to follow.
Presentation of learners' productions	Ask a pair of learners to come forward and tell them that they are going to play the game 'Fraction Action'. -Tell them that each pair will create a fraction bar sheet by drawing a straight line across a piece of paper. -Ask one learner from the pair to shuffle the deck of cards and distribute the deck evenly between the two learners. The cards are placed on the table facing down. -They simultaneously turn over a card from their decks and place it above the fraction bar. -The card with smaller number goes to the numerator place and the one with bigger number goes down as a denominator. - Take another card with a denominator and place it aside. -Both learners look at the fraction and quickly calculate the equivalent fraction of the first fraction whose denominator is the number put aside. -If the answer is correct they collect the cards -When they fail, they put the cards aside and go back to their seats, -The pair with many cards is the winner.	A pair of pupils come forward to play the game "Fraction Action" Follow instructions about the game "Fraction action" Shuffle the deck cards and distribute them facing down on the table/desk. Turn over the cards and place them above the fraction bar. Calculate the equivalence very quickly. Collect both cards for the fraction if the answer is correct. Leave the cards go back to their seats if the answer is wrong.	**CCI:** **Peace and value education:** Learners will learn how to work together harmoniously as they play cards together. **GC:** **Critical thinking** through calculation of the equivalent fractions

	Note: cards without numbers may be removed from the set. -Four pairs can play simultaneously for the teacher to follow-up. -Tell the pairs that they have only 3 minutes.		
Exploitation of learner's productions	-Ask all pairs in class to play the game simultaneously as they record the equivalent fractions for 3 minutes. -Move around the class to support and fill in the gaps for those who need support. -Ask learners to tell the strategies they used to get the equivalent fractions. -Ask learners to give examples of equivalent fractions.	-Play in pairs and respect instructions. -Give different examples of equivalent fractions and explain how to get a fraction equivalent to the given one. Examples of equivalent fractions: 3/7=6/14 (multiplying by 2/2) 2/3=6/9 (multiplying by 3/3).	**GC:** **Creativity and innovation** through strategizing to get equivalent fractions **C.C.I** **Peace and values** Learners are reminded of being fair when sharing things among themselves.
Summary/ conclusion	-Ask the learners to recall the lesson of the day. -Ask learners to explain how to get an equivalent fraction. -Tell them that equivalent fractions are equal and represent the equal part of a whole	Recall the lesson of the day. Explain how to get an equivalent fraction. Listen to the teacher's comments.	**GC**: **Critical thinking** Learners are recalling the procedure followed to calculate the equivalent fraction.
Assessment (5 min)	-Ask learners to work out the exercises of calculating the equivalent fraction in the learners' book page 57, activity 4.6. e.g. 2/3= …/24 -Mark learners and give them the feedback **Homework**: -Ask the learners to find three equivalent fractions for the given fractions in the activity	Work out the activity individually. Copy the homework in the notebooks to be done at home.	**G.C.** **Lifelong learning,** This skill is developed through research on the topic learnt even when learners are at home.

	4.8 A, on page 59.		
Self assessment	The lesson was successfully delivered because learners managed to calculate the equivalent fractions from a given one.		

PART III: UNIT DEVELOPMENT

Note: The introductory activities are new for P5 Learners and they are not in the student book. As a teacher, use the suggested unit introductory activity or design your own where need be to arouse the learners' motivation.

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

1.1 Key unit competence: Read, write and compare whole numbers beyond 1,000,000.

1.2 Prerequisite

Pupils will easily learn this unit, if they have a good background on the following: to count, read, write, order, compare, add, subtract, multiply and divide numbers from 0 to 100, 000.

1.3 Cross-cutting issues to be addressed

Peace and values education: In a society, it's 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.

1.4 Introductory activity and guidance

A. Introductory activity for unit 1

In daily situations, numbers are used to count, record, compare things or objects. Big numbers to million are also used in daily situation such as counting a big sum of money less than or equal to a million.

(a) In your experience give other real life situations where numbers less than or equal to a million are used.
(b) From your experience, are numbers to million useful in daily life? Explain your answer.

B. Guidance on introductory activity for unit 1

In this unit, we are dealing with reading, writing and comparing whole numbers which are important in our daily life. For example, counting, recording and comparing egg production on a poultry farm. Here you may predict what will be seen throughout this unit by providing challenging questions. Take learners through the introductory activity to help them to have an open mind about the general idea of this unit through the following questions. (a) What do you think may be your challenge to answer the question related to the introductory activity? (b) As P5 learners, give the advice on how you may overcome that challenge?

Suggested answer for the introductory activity 1

1.5 List of lessons/sub-heading

#	Lesson title	Learning objectives	Number of periods 32
0	**Introductory activity 1**	**To arouse the curiosity of students on the content of unit 1**	**1**
1.	**Reading and writing numbers up to 1,000,000 in words**	▪ Read written numerals correctly in English. ▪ Correctly translate from written numerals to spoken in words in English	1
2.	**Forming and reading numbers by the use of number cards**	Compose smallest /largest/odd/prime/even 6-digit number from the given digits	**1**
3.	**Reading and writing numbers up to 1,000,000 in figures**	Correctly write numbers from words to figures	**1**
4.	**Place Values of whole Numbers up to 7 digits**	Name and Identify the place values in written numerals.	1
5.	**Comparing Numbers using <, > or =**	Compare numbers of any size using place values.	2
6.	**Addition of 3 or more whole numbers of 7 digits without carrying**	▪ Explain the concept and process of addition of 3 numbers of 6 digits without carrying. ▪ Carry out addition of 3 or more whole numbers.	1
7.	**Using a local abacus to add whole numbers**	Use the local abacus to add and subtract whole numbers when solving problems in real life situations.	**1**
8.	**Addition of 3 or more whole numbers of 7 digits with carrying**	Carry out addition of 3 or more whole numbers.	1
9.	**Solve real life problems involving addition of numbers**	Apply the knowledge of addition in solving mathematical problems in daily situations.	**1**
10.	**Subtraction of 2 numbers of 7 digits without borrowing**	▪ Explain the concept and process of subtraction of 2 numbers of 6 digits or more	**1**

		without borrowing. ▪ Carry out subtraction of 2 whole numbers	
11.	**Subtraction of 2 numbers of 7 digits with borrowing**	▪ Explain the concept and process of subtraction of 2 numbers of 6 digits or more with or without borrowing. ▪ Carry out subtraction of 2 whole numbers	**1**
12.	**Solve real life problems involving subtraction**	Apply the knowledge of subtraction in solving mathematical problems in daily situations.	**1**
13.	**Product of a 3 digit number by 5 and quick multiplication by 5**	▪ Explain the concept and process of multiplication of a 3 digit number by 5. ▪ Apply the knowledge of multiplication in solving mathematical problems in daily situations.	**2**
14.	**Product of a 3 digit number by 90 and quick multiplication by 9**	▪ Explain the concept and process of multiplication of a 3 digit number by 9. ▪ Apply the knowledge of multiplication in solving mathematical problems in daily situations	**1**
15.	**Product of a 3 digit number by 11 and quick multiplication by 11**	▪ Explain the concept and process of multiplication of a 3 digit number by11. ▪ Apply the knowledge of multiplication in solving mathematical problems in daily situations	**1**
16.	**Product of a 3 digit number by 19 and quick multiplication by 19**	▪ Explain the concept and process of multiplication of a 3 digit number by 19. ▪ Apply the knowledge of multiplication in solving mathematical problems in daily situations	**1**

17.	**Product of a 3 digit number by 25 and quick multiplication by 25**	▪ Explain the concept and process of multiplication of a 3 digit number by 25. ▪ Apply the knowledge of multiplication in solving mathematical problems in daily situations	**1**
18.	**Product of a 3 digit number by 49 and quick multiplication by 49**	▪ Explain the concept and process of multiplication of a 3 digits number by 49. ▪ Apply the knowledge of multiplication in solving mathematical problems in daily situations	**1**
19.	**Product of a 3 digit number by 99 and quick multiplication by 99**	▪ Explain the concept and process of multiplication of a 3 digit number by 99. ▪ Apply the knowledge of multiplication in solving mathematical problems in daily situations	**1**
20.	**Multiplying whole numbers by a 3 digits number**	▪ Explain the concept and process of multiplication of a whole number by a 3 digits number. ▪ Apply the knowledge of multiplication in solving mathematical problems in daily situations.	**2**
21.	**Solve real life problems involving multiplication**	Apply the knowledge of multiplication in solving mathematical problems in daily situations.	**1**
22.	**Division without a remainder of a 3 digits number by a 2 digit number**	Explain the concept and process of division of numbers without a remainder.	**2**
23.	**Division by a 2 digit number with a Remainder**	Explain the concept and process of division of numbers with a remainder.	2

24.	**Solve real life problems involving addition, subtraction, multiplication or division of whole numbers**	Apply addition, subtraction, multiplication or division of numbers up to 1,000,000 in solving real life word problems.	2
25.	**End unit assessment**	To verify if the key unit competences such as; read, write and compare whole numbers beyond 1,000,000 have been well developed.	1

Guidance on different lessons/subheading outlined above

Lesson 1: Reading and Writing Numbers in Words up to 1 000 000

a) Learning objectives

- Read written numerals correctly in English.
- Correctly translate between written numerals and spoken English.

b) Teaching resources

Slips of papers with a 6-digit number

c) Learning activities

- 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. Organize 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.

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.

Lesson 2: Forming and reading numbers by the use of number cards

Note: This is a practical activity. As a teacher refer to the Mathematics kits, practical activities and experiments user guide for P4-P6 and facilitate leaners to do the practical activity on composition of numbers, see Pages 84 -86.

a) Learning objectives

To compose smallest /largest/odd/prime/even 6-digit number from the given digits

b) Teaching resources

Number cards of the following numbers 3; 5; 7; 9; 0 and 6.

c) Learning activities

Activity: Use the given number cards to form a smallest possible 6-digits number from the given digits.

Guidance to teacher: In small groups, facilitate learners to follow the given steps and do the activity.

Step 1: Take the number cards of different colors of the following digits: **3; 5; 7; 9; 0; 6**. Then place them on the table for easy manipulation.

Step 2: Read and discuss the following instructions to identify the number card which to start by, to get the correct number.

Lesson 3: Reading and Writing Numbers in Figures

a) Learning objectives

- Write numerals correctly in English.
- Correctly translate between written numerals and spoken English.

b) Teaching resources

A chart showing solution to Activity 1.2

c) Learning activities

- 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 – Organize 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.

Organize 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.

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 thousand 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

Lesson 4: Place Value of Numbers up to 7 Digits

a) Learning objectives

- 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.

b) Teaching resources

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

c) Learning activities

- 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.

Organize 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

Guidance to the teacher

- Let learners identify place value of numbers.
- Emphasize 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 thousand (b) 1 – Hundred thousands
   6 – Ten thousands 8 – Ten thousands
   0 – Thousands 9 – Thousands
   4 – Hundreds 2 – Hundreds

3 – Tens
8 – Ones

7 – Tens
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

Lesson 5: Comparing Numbers using <, > or =

a) Learning objectives

- Compare numbers of any size using place values.
- Apply comparison of numbers in daily life.

b) Teaching resources

Cut-outs of numbers in Activity 1.4.

c) Learning activities

- 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.

Organize 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.

Guidance to the teacher

Emphasize 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

Lessons 6,7, 8 and 9: Addition of 3 or more whole numbers of 7 digits with or without carrying

Note: Guidance of the lessons 6, 7, 8 and 9 in the table above are given in this lesson. As a teacher you may refer to this lesson and facilitate learners, in 4 different lessons, to do as many activities as possible on addition without carrying, addition with carrying, practical addition using abacus and word problems involving addition. While doing practical activities on addition using abacus, refer to the Mathematics kits, practical activities and experiments user guide for P4-P6 and facilitate leaners to do the practical activity on composition of numbers, see Pages 87 - 90.

a) Learning objectives

- Explain the concept and process of addition of 3 numbers of 6 digits with or without carrying.
- Carry out addition of 3 or more whole numbers.
- Apply the knowledge of addition in solving mathematical problems in daily situations.

b) Teaching resources

Abacus, objects of different colours

c) Learning activities

- 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.

Organize learners to work in small groups for Activity 1.5.

Prepare abacus and objects of different colours.

Teaching/Learning steps

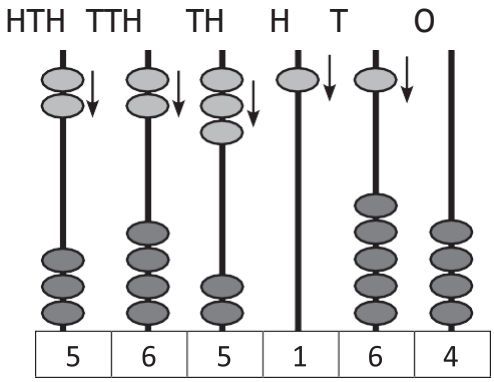
1. Have groups of learners add numbers given in Activity 1.5. Have learners do a quick presentation.
2. Use Example 1.5 to demonstrate how to add 3 or more whole numbers.
3. Assign learners to solve problems in Practice Activity 1.5 questions 1 and 2 as classwork. Go round assessing learners' progress. 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.

Guidance to the teacher

Teacher can use an abacus to illustrate addition. For example,

Add: 342 054 + 223 110



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

Lesson 10, 11, 12: Subtraction of 2 whole numbers of 7 digits with or without borrowing

Note: Guidance of the lessons 10, 11 and 12 in the table above are given in this lesson. As a teacher you may refer to this lesson and facilitate learners, in 3 different lessons, to do as many activities as possible on subtraction without borrowing, subtraction with borrowing, and word problems involving subtraction.

a) Learning objectives

- Explain the concept and process of subtraction of 2 numbers of 6 digits or more with or without borrowing.
- Apply the knowledge of subtraction in solving mathematical problems in daily situations.
- Carry out subtraction of 2 whole numbers.

b) Teaching resources

Abacus, objects of different colours.

c) Learning activities

- 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.

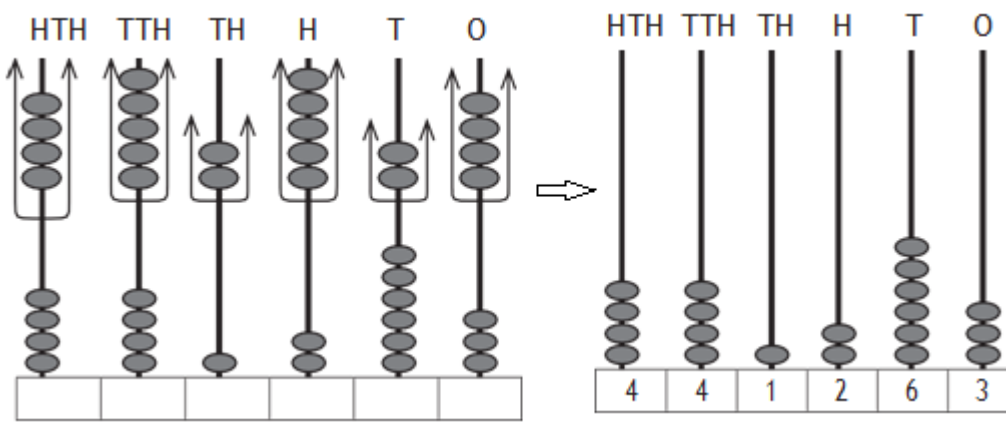
Teaching/Learning steps

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.

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*

Lesson 13, 14, 15, 16, 17, 18, and 19: Quick multiplication of a 3-digit number by 5, 9, 11, 19, 25, 49 and 99

Note: Guidance of the lessons 13, 14, 15, 16, 17, 18 and 19 about quick multiplication are given with examples in this lesson. As a teacher you may refer to this lesson and facilitate learners, in 7 different lessons, to do as many activities as possible on quick multiplication of a 3-digit number by 5, 9, 11, 19, 25, 49 and 99. As quick multiplication of a 3-digit number by each number above has its own particularities o hints, as a teacher you have to give to learners many activities for practice.

a) Learning objectives

- Explain the concept and process of multiplication of a 3 digit number by 5, 9, 11, 19, 25, 49 and 99.
- Apply the knowledge of multiplication in solving mathematical problems in daily situations.

b) Teaching resources

A chart showing worked out examples.

c) Learning activities

- 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.

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) $817 \times 5 = 4\,085$ $536 \times 49 = 26\,264$

(b) $764 \times 9 = 6\,876$ $228 \times 25 = 5\,700$

(c) $312 \times 11 = 3\,432$ $457 \times 99 = 45\,243$

(d) $635 \times 19 = 12\,065$ $520 \times 5 = 2\,600$

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 x 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 × 49 = (125 × 50) – 125 = 6 125
8. For every week, (25 × 5) packets = (25 × 10) ÷ 2 = 250 ÷ 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.

Lesson 20, 21: Multiplication of whole numbers by a 3-digit number

Note: Guidance of the lessons 20 and 21 in the table above are given in this lesson. As a teacher you may refer to this lesson and facilitate learners, in 2 different lessons, to do as many activities as possible on multiplication of whole numbers by a 3-digit number and solving real life problems involving multiplication.

a) Learning objectives

- Explain the concept and process of multiplication of a 3 digit number by a 3 digit number.
- Apply the knowledge of multiplication in solving mathematical problems in daily situations.

b) Teaching resources

A chart showing worked out examples.

c) Learning activities

- 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.

Guidance to the teacher

Emphasize multiplication according to place values.

Guidance on Activity 1.8

Finding solution to the problem: 350 × 112

$$\begin{array}{rl} & 350 \\ \times & 112 \\ \hline & 700 \quad (2 \times 350) \\ & 3500 \quad (10 \times 350) \\ & 35000 \quad (100 \times 350) \\ \hline & 39200 \end{array}$$

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

Lessons 22: Division of a 3 digit number by a 2 digit number without a remainder

a) Learning objectives

- Explain the concept and process of division of numbers.
- Apply the knowledge of division in solving mathematical problems in daily situations.

b) Teaching resources

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

c) Learning activities

- 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

- Class discussion – Discuss practice activities and present their answers.

Lesson preparation

Lesson will take place in class.

Organize 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.

Guidance to the teacher

- To enhance communication, allow learners to make a class presentation.
- Emphasize 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

Lessons 23: Division of a 3 digit number by a 2 digit number with a remainder

Note: Guidance of the lessons 23 in the table above are given in this lesson. As a teacher you may refer to this lesson and facilitate learners, in 2 different lessons, to do as many activities as possible on division of whole numbers by a 3-digit number and solving real life problems involving division

a) Learning objective

- Explain the concept and process of division of numbers with a remainder.

b) Teaching resources

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

c) Learning activities

- Group work activities – Discuss learning activities in groups.

- Supervised practice – Learners divide 3 digit numbers by 2 digit numbers with a remainder. Check the progress of the learners
- Class discussion – Discuss practice activities and present their answers.

Lesson preparation

Lesson will take place in class.

Organize learners to work in small groups and refer to Activity 1.9 in the student book, adapt it by including numbers to divide and have a remainder.

Prepare a chart of worked out examples.

Teaching/Learning steps

1. Ask learners to share the 121 sweets among 12 students.
2. Let learners discuss and find out that there will be 1 remaining sweet after sharing.
3. Display the chart showing worked out examples on division with a remainder of a 3-digits number by a 2-digits number.
4. Prepare Practice Activity on division with a remainder of a 3-digits number by a 2-digits number and ask learners to work out them.
5. Allow the different groups of learners to make a class presentation and Have learners give important points they have learnt.
6. Assign learners additional Practice Activity on division with a remainder of a 3-digits number by a 2-digits number for more practice as homework.

Guidance to the teacher

- To enhance communication, allow learners to make a class presentation.
- Emphasize 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.

Lessons 24: Solve real life problems involving addition, subtraction, multiplication or division of whole numbers

a) Learning objectives

- Apply addition and subtraction of numbers up to 1,000,000 in solving real life word problems.

b) Teaching resources

- A chart showing worked out examples.

c) Learning activities

This lesson will help students to learn how to solve step-by-step the word problems on addition and subtraction of whole numbers. Students need to do addition, subtraction, multiplication and division in their daily life. As a teacher, help them to be familiar with solving word problem involving more than one operation such as word problems that involving both addition and subtraction, problems that involving both addition, subtraction and multiplication, problems that involving both multiplication and division, etc.

Examples of problems than involving more than one operation:
Example 1: Problem that involving addition and division

Aloys got an envelope of 22,500 Frw on his birthday party and his twin brother, Emmy, got 26,550 Frw. When the twins reached home, they combined their money and divided it evenly between themselves and their younger Sister Ella. How much money did each get?

Answer:

Step 1: First we generate the expression that yield the amount of money each person received. The keyword "combine" tells us we are going to add the amount of money from Aloys and Emmy. Then, the keyword "divide" means we will divide that sum by the number (3) of all people to share the money.

(22,500 Frw + 26,550 Frw) ÷3

Step 2: Using the order of operations, we evaluate the expression

- (22, 500 Frw + 26, 550 Frw) ÷3, original expression.
- (49, 050 Frw) ÷3, addition in parentheses
- 16, 350 Frw, After division

Step 3: Present the answer for the word problem

Each kid received 16, 350 Frw.

Example 2: Problem that involving addition and subtraction

a) The number of adults in a certain district was 361958. The number of children was 613 989 for the same district. Out of the adults and children in that district, 250325 people were not educated. How many people were educated?

Solution:

Support students to understand that the total population in that district is made up with the addition of adults and the children.

Hence, Total number of people = (361958 + 613989). To get the educated people, we subtract the number of those who were not educated; 250325.

Therefore, educated people are = (361958 + 613989) – 250325

= 975947- 250325

= **725622 people were educated**.

Example 3: Problem that involving addition and multiplication

b) A school bought 32 boxes of text books. Each box had 144 test books. On the same day that school was donated 24 cartons of text books; each carton had 288 books. How many text books did that school get on that day? Explain your answer.

Solution:

Support students to understand that the total number of text books got that day is got by finding the total text books in each 32 boxes and then the total number of text books in the 24 cartons.

Therefore; 1 box contained 144 text books, hence, 32 boxes contained (32 x 144) text books.

Also 1 carton contained 288 text books, hence, 24 cartons contained (24x 288) text books.

Now, the total number of text books got by the school on that day were:

= (32 x 144) + (24x 288)

= 4608 + 6912

= **11520 text books**

Example 4: Problem that involving addition, subtraction and multiplication

c) Umutoni is a poultry farmer in a sector. On Monday her chicken laid 3600 eggs, on Tuesday 4200 eggs were laid and on Wednesday 4750 eggs were laid. If Umutoni has 5000 layers of this on Thursday 4375 layers laid an egg each.

I. How many eggs were laid in four days?

Solution:

In four days, 3600 + 4200 + 4750 + (4375 x 1)

= **16925 eggs laid in four days.**

II. If an egg costs 85 Frw, calculate how much money Umutoni got in four days.

Solution:

Amount of money Umutoni got from the eggs in four days

= cost per egg times the total number of eggs in four days

= 85Frw (3600 + 4200 + 4750 + 4375)

= 85Frw x 16925

= **1, 438, 625 Frw Umutoni got from eggs.**

III. How many eggs were not laid on her farm in the four days?

Solution:

Support students to understand that Umutoni keeps 5000 chicken on her farm and they are all layers. Hence;

On Monday the number of eggs not laid were (5000 – 3600) eggs

On Tuesday the number of eggs not laid were (5000 – 4200) eggs

On Wednesday the number of eggs not laid were (5000 – 4750) eggs

On Thursday the number of eggs not laid were (5000 – 4375) eggs

Therefore, the total eggs not laid in four days

= (5000 – 3600) + (5000 – 4200) + (5000 – 4750) + (5000 – 4375)

= 1400 + 800 + 250 + 625

= **3075 eggs were not laid in four days on Umutoni's poultry farm**

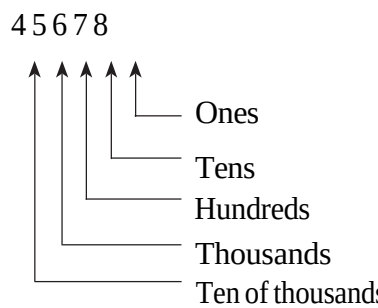
1.5 Additional information for the teacher

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 digit in the number below.



Moreover, across the whole unit emphasize 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

1.6 Guidance on End unit assessment or Revision activity 1

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 for End Unit assessment or 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) 9 7 7 631 (b) 482 765
3. (a) 9 hundred thousand
   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

1.7 **Additional activities**

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) 4̲04 04̲0 (b) 19̲2 9̲97
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 64̲2 (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 =

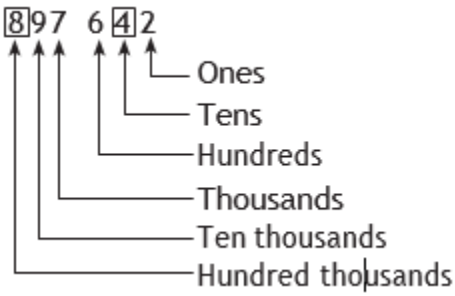
Expected answers to Consolidation Activity

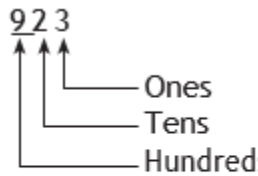
1. (a) Nine hundred and ninety-nine thousand and ninety-nine.

   (b) Eight hundred and sixty-four thousand, six hundred and twenty-seven decilitres.

2. (a)
$$\begin{array}{r} 565\,000 \\ +\quad 836 \\ \hline 565\,836 \end{array}$$

(b)
$$\begin{array}{r} 707\,000 \\ +\quad 407 \\ \hline 707\,407 \end{array}$$

3. (a) 

(b) 

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) $894 \times 7 =$ (b) $123 \times 6 =$ (c) $582 \times 147 =$

Unit 2: **Addition and subtraction of integers**

2.1 Key unit competence: Add and subtract integers

2.2 Prerequisite

Pupils will easily learn this unit, if they have a good background on the following: to count, read, write, order, compare, add and subtract whole numbers.

2.3 Cross-cutting issues to be addressed

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.

2.4 Introductory activity and guidance

A. Introductory activity for unit 2

In Mathematics, operations in integers are used in a range of situations. For example, you are moving and counting strides from point A to point B forward for a distance of 3 strides. Consider point A as a starting point (zero).

(a) What happens if you reach the point B and go forward 2 more strides to reach point C? Is the movement showing number of strides increasing or decreasing?

(b) What happens if you reach point C, face backwards and go 5 strides?

(c) Now you have reached point A , continue in the same direction for 3 strides to point D. What can you say about the two directions from point A to C and from Point A to D?

B. Guidance on introductory activity for unit 2

Emphasize 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 to present negatives and positives number cards. This unit 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.

Note: Let learners differentiate positive direction from Negative direction based on the two key words "**Forward** and **Backward**".

Suggested answer for the introductory activity 2

(a) If you reach the point B and go forward 2 more strides to reach point C:

i. Distance from A to C becomes longer than from A to B.

ii. There is an increase of number of strides by 2 more strides from B.

iii. There is a continuation in direction from B to C.

iv. The movement shows number of strides increasing from A to C.

(b). If you reach point C, then face backwards and go 5 strides,

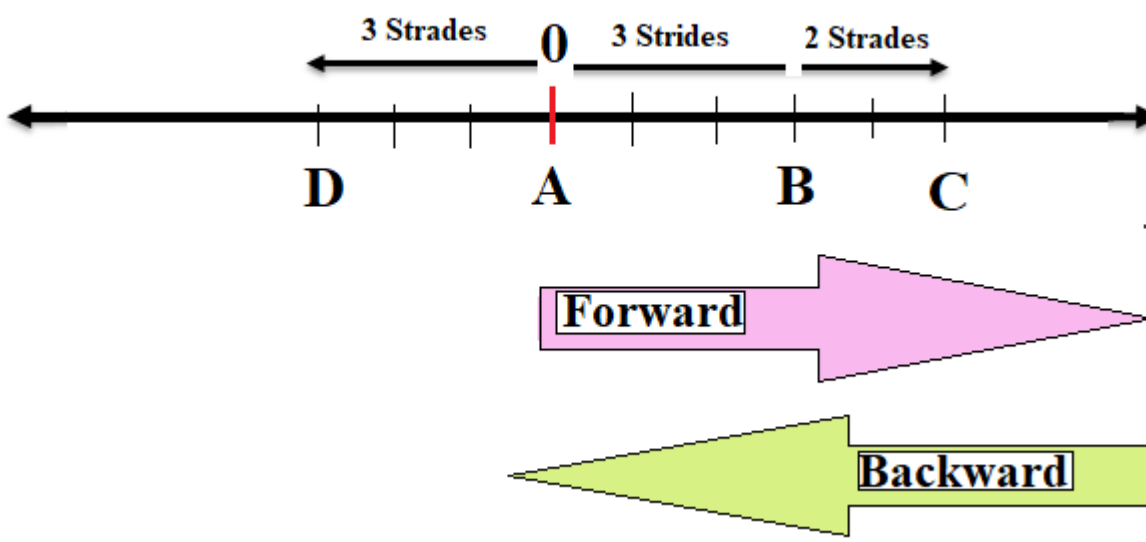
i. Direction changes from C to A.

ii. From C to A 5 strides stop at A.

(c). When you have reached point A, continue in the same direction for 3 strides to point D.

There is a change in direction from A to C is forward direction. A to D backwards direction

The two directions from point A to C and from Point A to D are each in opposite direction from point A.



2.5 List of lessons/sub-heading

#	Lesson title	Learning objectives	Number of periods 16
0	**Introductory activity 2**	Prepare and motivate learners about integers.	1

1.	Location of positive and negative numbers on a number line	Explain and demonstrate how to locate positive and negative numbers on the number line.	1
2.	Comparing integers using a number line and symbols <, > or =	▪ Explain that when two numbers have opposite signs they are located on opposite sides of the number line. ▪ Compare integers physically and mentally using a number line.	2
3.	Ordering integers using a number line and symbols < or >	▪ Explain that when two integers have opposite signs they are located on opposite sides of 0. ▪ Compare integers physically and mentally.	1
4.	Addition of integers: Using a counters and a number line	▪ Describe the concept of addition of integers. ▪ Calculate the distance between 2 integers using the position of numbers on the number line.	1
5.	Addition of integers by calculations	▪ Describe the concept of addition of integers ▪ Calculate the distance between 2 integers using the position of numbers on a number line.	2
6.	Subtraction of integers: using counters and a number line	▪ Describe the concept of subtraction of integers. ▪ Solve mathematical problems involving subtraction of integers.	1
7.	Subtraction of integers: without using counters and a number line (calculations)	▪ Describe the concept of subtraction of integers ▪ Solve mathematical problems involving subtraction of integers.	2
8.	Additive inverses (opposite) of numbers	Calculate the distance between 2 integers using the position of numbers on the number line	2
9.	Solve problems involving addition and subtraction of integers.	▪ Describe the concept of addition and subtraction of integers. ▪ Solve mathematical problems involving addition and subtraction of integers	2

10.	**End unit assessment**	To assess and verify if key unit competence such as add and subtract integers are well developed	1

Guidance on different lessons outlined above

Lesson 1: Location of positive and negative numbers on a number line

a) Learning objectives

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

b) Teaching resources

- A set of numbers on paper cutouts.
- Manila paper with the number line for Activity 2.1

c) Learning activities

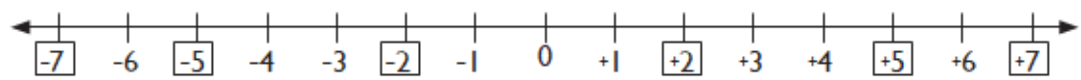
1. Ask learners to fix paper cutouts with numbers on the manila paper for Activity

2.1 and Activity 2.2.

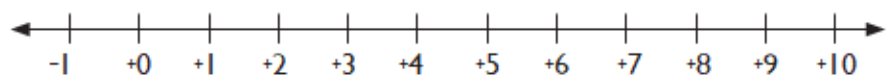
2. Let learners repeat the activity on the board. Let the class assess correctness as individuals locate numbers on the number line.
3. Let learners discuss steps to follow in locating integers using Example 2.1.
4. Assign learners Practice Activity 2.1 question 2 as classwork to discuss and present 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.

Expected answers for Practice Activity

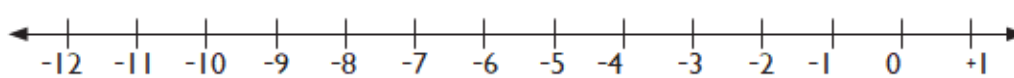
1.



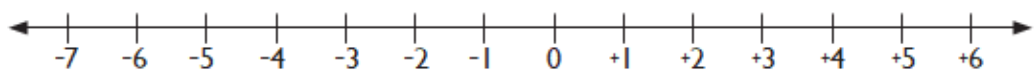
2. (a)



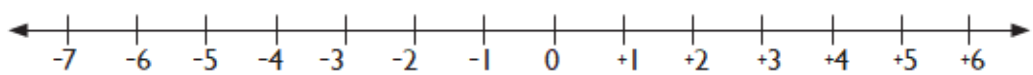
(b)



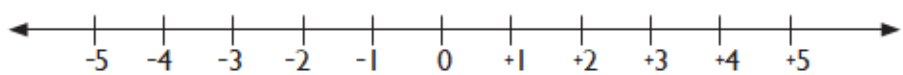
(c)



(d)



(e)



Lesson2: Comparing integers using a number line and symbols <, > or =

a) **Learning objectives**

- Explain that when two numbers have opposite signs they are located on opposite sides of the number line.
- Compare integers physically and mentally using a number line.

b) **Teaching resources**

- A set of numbers on paper cutouts.
- Manila paper with the number line for Activity

c) **Learning activities**

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

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).

Guidance to the teacher

Emphasize 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.

Lesson3: Ordering integers using a number line and symbols < or >

a) **Learning objectives**

- Explain that when two integers have opposite signs they are located on opposite sides of 0.
- Compare integers physically and mentally.

b) **Teaching resources**

- Number cards from $^{+}10$ to $^{-}10$.

c) Learning activities

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

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 $+9$.

(b) $0 < +8$, 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)** $-1, -3, -5, -8$

Lesson4: Addition of integers: Using counters and a number line

Note: This is a practical activity. As a teacher refer to the Mathematics kits, practical activities and experiments user guide for P4-P6 **Practical activity 3** page 91, 92, 93, 94, 95 and facilitate leaners to do the practical activity on addition of integers using **counters** to achieve learning objectives.

a) Learning objectives

- Describe the concept of addition of integers.
- Calculate the distance between 2 integers using the position of numbers on the number line.

b) Teaching resources

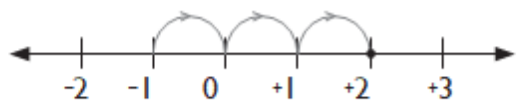
- White powder or dry loose soil.
- Lesson will take place out of class in an open space

c) Learning activities

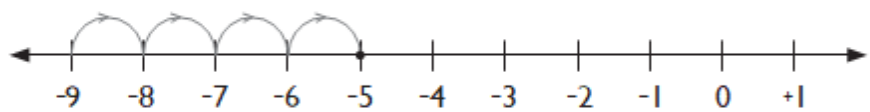
1. Ask learners to use white powder or loose soil to mark a number line on the field.

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.

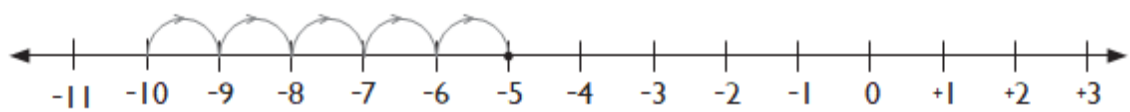
Expected answers to Practice Activity 2.4

1. 

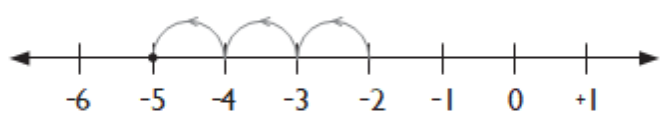
(-1) + (+3) = +2

2. 

(-9) + (+4) = -5

3. 

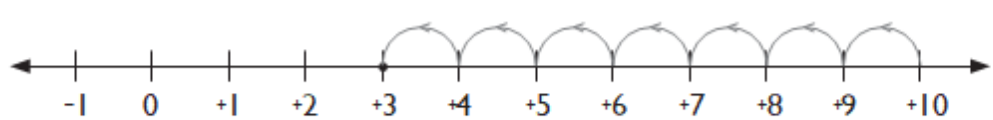
(-10) + (+5) = -5

4. 

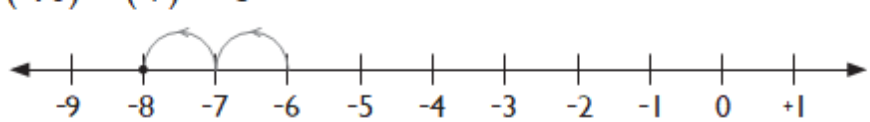
(-2) + (-3) = -5

5. 

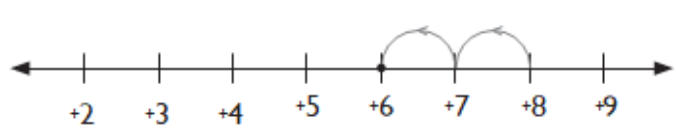
(+3) + (-4) = -1

6. 

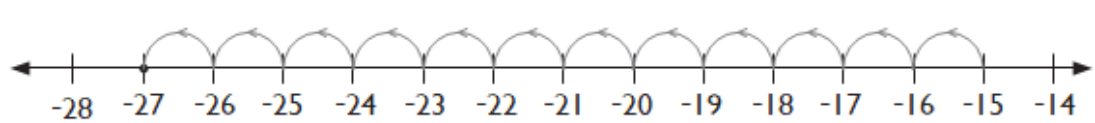
(+10) + (-7) = +3

7. 

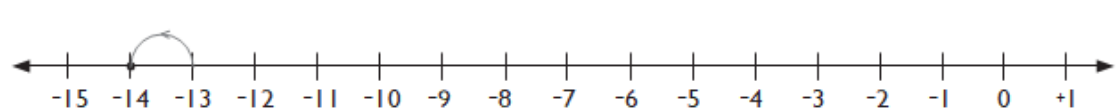
(-6) + (-2) = -8

8. 

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

9. 

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

10. 

(-13) + (-1) = -14

Lesson 5: Addition of integers by calculations

a) Learning objectives

- Describe the concept of addition of integers.
- Calculate the distance between 2 integers using the position of numbers on a number line.

b) Teaching resources

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

c) Learning activities

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

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.** $^{-}(9 - 4) = {}^{-}5$

Lesson 6: Subtraction of integers: Using counters and a number line

Note: This is a practical activity. As a teacher refer to the Mathematics kits, practical activities and experiments user guide for P4-P6 **Practical activity 4;** page 96, 97, 98. Facilitate and engage leaners to do the practical activity on subtraction of integers using **counters** achieve learning objectives.

a) Learning objectives

- Describe the concept of subtraction of integers.
- Solve mathematical problems involving subtraction of integers.

b) Teaching resources

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

c) Learning activities (activities when using counters)

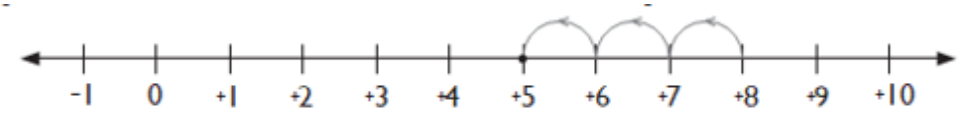
1. Ask learners to use white powder or dry loose soil to mark a number line on the field.

2. Let a learner stand at $^{-}1$ then move three steps backward (to $^{-}4$ to the left) to demonstrate subtraction.

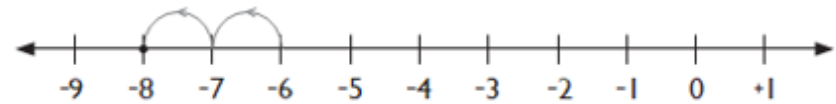
3. Let a learner again stand at $^{-}1$ then move 3 steps backward of backward (Forward) to the right to ($^{+}2$).

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.

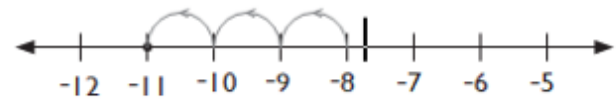
Expected answers to Practice Activity 2.6

1. 

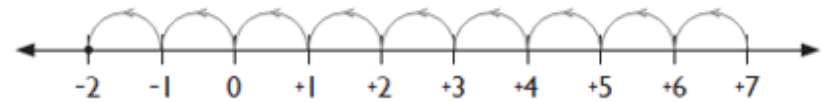
(+8) – (+3) = +5

2. 

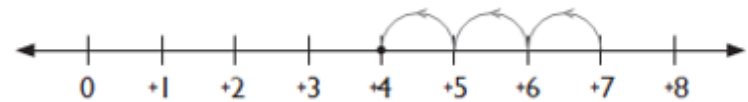
(-6) – (+2) = -8

3. 

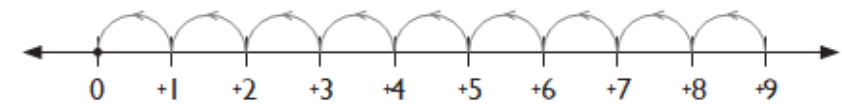
(-8) – (+3) = -11

4. 

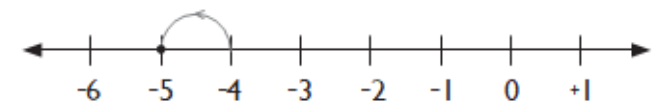
(+7) – (+9) = -2

5. 

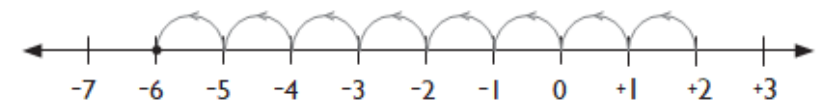
(+7) – (+3) = +4

6. 

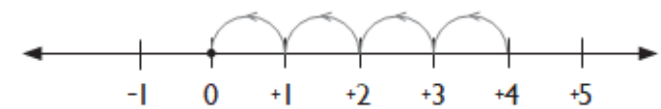
(+9) – (+9) = 0

7. 

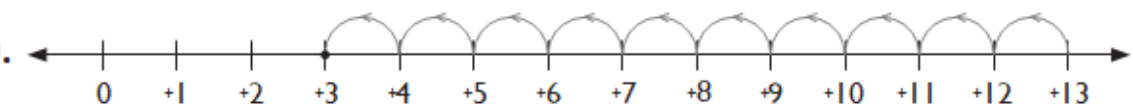
(-4) – (+1) = -5

8. 

(+2) – (+8) = -6

9. 

(+4) – (+4) = 0

10. 

(+13) – (+10) = +3

Note: For questions 7 - 10, assess learners' ability to explain starting point, number of steps and direction, then stopping point.(Using counters)

Lesson 7: Subtraction of integers without using counters and a number line (calculations)

a) Learning objectives

- Describe the concept of subtraction of integers
- Solve mathematical problems involving subtraction of integers.

b) Teaching resources

- A chart showing the solution to Activity 2.8.

- Flash cards on subtraction of integers.

c) Learning activities

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.

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

Lesson 8: Additive inverses (opposite) of numbers

a) Learning objectives

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

b) Teaching resources

- Chart with worked out examples, flash cards

c) Learning activities

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.

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.

Lesson 9: Solve problems involving addition and subtraction of integers.

a) Learning objectives

- Describe the concept of addition and subtraction of integers.
- Solve mathematical problems involving addition and subtraction of integers

b) Teaching resources

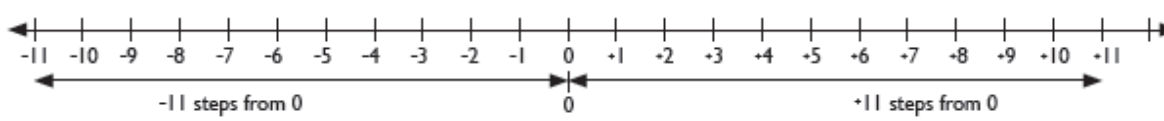
- Chart with worked out examples on a number line.

c) Learning activities

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.

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 = 15ºC – 6ºC = $^{+}9$ºC
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 $^{-}5$.

2.5.1 Additional information for the teacher

Guidance 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.

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.

Integers on the right side of 0 are greater than those on the left. Positive numbers are greater than negative numbers. The further you go in Positive direction, the greater the integer becomes. The further you go in Negative direction, the smaller the integer becomes. 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.

Support 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.

When integers with similar signs are added the answer takes that sign.

For example; +3 + +6 = +9, -4 + -7 = -11.

When adding integers with different signs the answer takes the sign of the larger number. For example; +9 + -4= +5, -8 ++3= -5

When subtracting integers; 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.

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

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

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

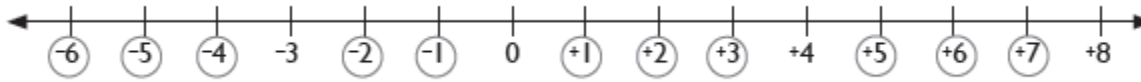
(ii) Encourage learners with movement problems to observe other learners' steps while working together in groups.

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

2.6 End unit assessment

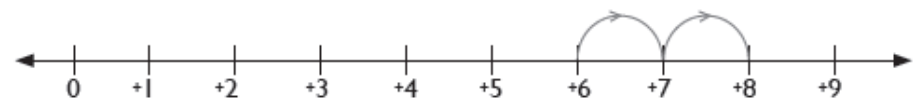
Expected answer for revision activity 2

1.



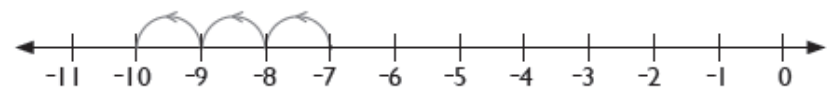
2. **(a)** +4 is greater than –4 **(b)** –3 is greater than –9
   (c) +10 is greater than +6 **(d)** +7 is greater than –5
3. **(a)** +5 < +11 **(b)** –8 < –2 **(c)** +11 > –11 **(d)** –9 < +4

4. **(a)**



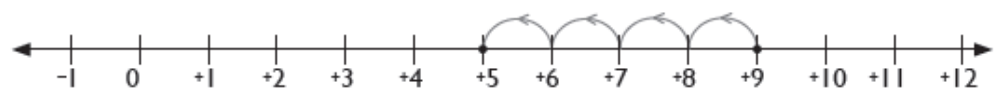
(+6) + (+2) = +8

(b)



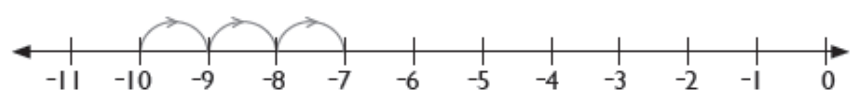
(−7) – (+3) = −10

(c)



(+9) – (+4) = +5

(d)



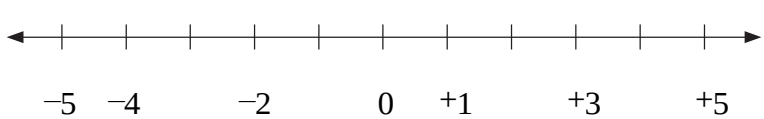
(−10) + (+3) = −7

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.

2.7 Additional activities

Remedial Activities:

1. Write missing numbers.



−5 −4 −2 0 +1 +3 +5

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)** $(+9) - (+4)$

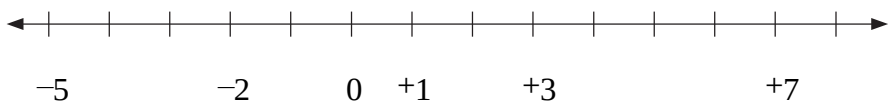
6. Write the additive inverse of:

(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 activities:

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

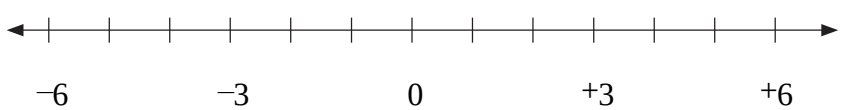
6. Add or subtract. Discuss your steps.

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

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

Extended activities:

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 $^{-}$ 6ºC in the morning. After 2 hours, the temperature rose by $^{+}$10ºC. Find the temperature of the town after 2 hours.

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

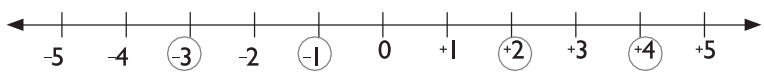
(c) The temperature of an ice was $^{-}$7ºC in the evening. The following morning, the ice temperature had reduced by $^{-}$3ºC. What was the final temperature of ice that morning?

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 for additional activities

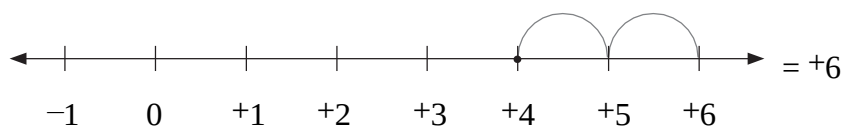
Remedial Activity

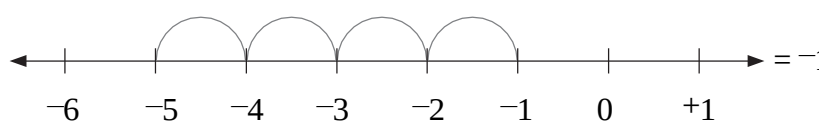
1. 

2. **(a)** $^{+}$3 greater than $^{-}$1.

(b) $^{+}$1 greater than $^{-}$4.

3. **(a)** $^{+}6 > {}^{-}2$ **(b)** $^{+}10 = {}^{+}10$ **(c)** $^{-}4 < {}^{-}1$

4. **(a)** 

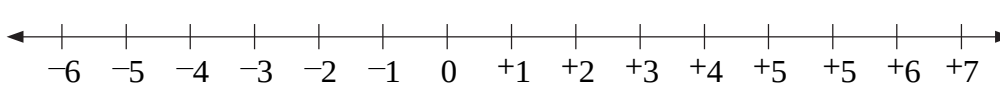
(b) 

5. **(a)** $^{-}$5 **(b)** $^{+}$5

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

7. $^{-}$4

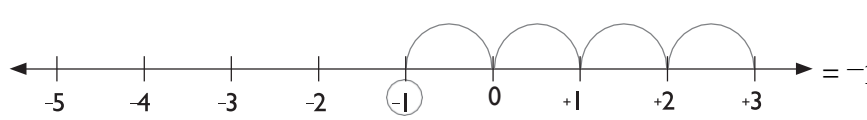
Consolidation Activity

1. 

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)** 

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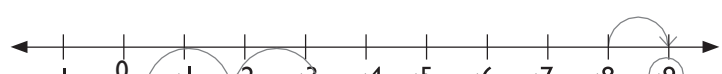

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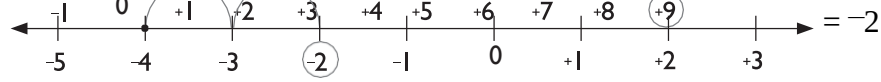
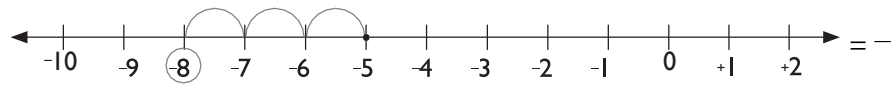
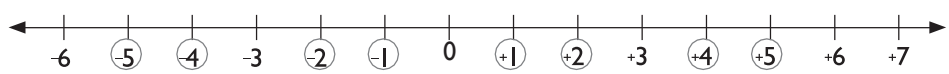


(d)



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)** $(-6^oC) + (+10^oC) = +4^oC$ **(b)** $(+5^oC) - (+3^oC) = +2^oC$

(c) $(-7^oC) + (+3^oC) = -10^oC$

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 $-4 < +14$.

Unit 3: **Prime factorization and divisibility tests**

3.1 Key unit competence: Prime factorise, show the rule of divisibility tests less than 13, find the Lowest Common Multiple (LCM) and the Greatest Common Factor (GCF) of whole numbers.

Prerequisite: Pupils will easily learn this unit, if they have a good background on the following: multiply and divide whole numbers.

3.2 Cross-cutting issues to be addressed

- **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 to work and discus, ensure to mix boys and girls to share responsibilities equally. As they receive and explore to get information, create gender sensitivity.

3.3 Introductory activity and guidance

A. Introductory activity for unit 3

In a certain country, suppose in lower primary, each lesson takes 30 minutes while in upper primary, a lesson takes 40minutes each. If the two bells for lower and upper primary ring at the same time at 8:40 am;

(a) After how long (minutes) will the two bells ring together?
(b) At what time will they ring together?

B. Guidance on introductory activity for unit 3

The unit deals with prime factorization of numbers and importance of LCM and GCF in solving mathematical problems such as the calculation of the Least Common Multiple (LCM) and the Greatest Common Factors (GCF) of numbers. Also, the unit deals with the divisibility test of whole numbers less than 13.

Through this unit, learners will have a clear understanding of number concepts. They will also have an opportunity to relate these mathematical concepts to real life experiences.

Note: Emphasize the definition of factors of a number, prime factors and prime numbers (a prime number is a number that has only two factors: 1 and that number itself).

Suggested answer for the introductory activity 3

(a) The two bells will ring together after 120 minutes.
(b) They will ring together at 10:40am

3.4 List of lessons/sub-heading

#	Lesson title	Learning objectives	Number of periods 16
0	Introductory activity unit 3.	Prepare and motivate learners for the new unit.	1
1.	Prime factorization of numbers and its uniqueness	▪ Explain prime numbers. ▪ Factorise numbers using prime factors.	1
2.	Using indices as short form for repeated factors	Explain the concept of indices (powers) as short form for repeated factors.	1
3.	Calculation of the Lowest Common Multiple (LCM)	▪ Explain the LCM. ▪ Establish the relationship between the LCM and the GCF. ▪ Explain the importance of the LCM in daily life situations. ▪ Calculate the LCM of numbers	1
4.	Calculation of Greatest Common Factors (GCF)	▪ Establish the relationship between the LCM and the GCF. ▪ Explain the Greatest Common Factor. ▪ Calculate the GCF of numbers	1
5.	Divisibility test for 2	▪ Explain and memorise the rule of	1

		divisibility test for 2. ▪ Calculate and show the rule of divisibility test for 2.	
6.	Divisibility test for 3	▪ Explain and memorise the rule of divisibility test for 3. ▪ Calculate and show the rule of divisibility test for 3.	1
7.	Divisibility test for 4	▪ Explain and memorise the rule of divisibility test for 4. ▪ Calculate and show the rule of divisibility test for 4.	1
8.	Divisibility test for 5	▪ Explain and memorise the rule of divisibility test for 5. ▪ Calculate and show the rule of divisibility test for 5.	1
9.	Divisibility test for 6	▪ Explain and memorise the rule of divisibility test for 6. ▪ Calculate and show the rule of divisibility test for 6.	1
10.	Divisibility Test for 8	▪ Explain and memorise the rule of divisibility test for 8. ▪ Calculate and show the rule of divisibility test for 8.	1
11.	Divisibility Test for 9	▪ Explain and memorise the rule of divisibility test for 9. ▪ Calculate and show the rule of divisibility test for 9.	1
12.	Divisibility Test for 10	▪ Explain and memorise the rule of divisibility test for 10. ▪ Calculate and show the rule of divisibility test for 10.	1
13.	Divisibility test for 11	▪ Explain and memorise the rule of divisibility test for 11. ▪ Calculate and show the rule of divisibility test for 11.	1
14.	Divisibility test for 12	▪ Explain and memorise the rule of divisibility test for 12.	1

		▪ Calculate and show the rule of divisibility test for 12.	
15.	**End unit assessment**	To assess skills developed in learners such as prime factorise, show the rule of divisibility tests less than 13, find the Lowest Common Multiple (LCM) and the Greatest Common Factor (GCF) of whole numbers.	1

Guidance on different lessons outlined above

Lesson1: Prime factorization of numbers and its uniqueness

a) Learning objectives

- Explain prime numbers.
- Factorise numbers using prime factors.

b) Teaching resources

- Flash cards

c) Learning activities

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.
5. Assign learners Practice Activity 3.1 questions 8 – 15 for more practice and homework

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

Lesson 2: Using indices as shorthand for repeated factors

a) Learning objectives

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

b) Teaching resources

- Chart showing worked out examples of Activity 3.2.

c) Learning activities

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.

Expected answers to 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. $74 = 2 \times 37$

Lesson 3: Calculation of the Lowest Common Multiple (LCM)

a) Learning objectives

- Explain the LCM.
- Establish the relationship between the LCM and the GCF.
- Explain the importance of the LCM in daily life situations.
- Calculate the LCM of numbers

b) Teaching resources

- Flash cards

c) Learning activities

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.

Expected answers to 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 $2 \times 3^2 \times 5 = 90$

Lesson 4: Calculation of Greatest Common Factors (GCF)

a) Learning objectives

- Establish the relationship between the LCM and the GCF.

- Explain the Greatest Common Factor.
- Calculate the GCF of numbers

b) Teaching resources

Flash cards

c) Learning activities

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.

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 $2 \times 3^2 \times 5 = 90$

Lesson 5: Divisibility test for 2

a) Learning objectives

- Explain and memorise the rule of divisibility test for 2.
- Calculate and show the rule of divisibility test for 2.

b) Teaching resources

Number cards

c) Learning activities

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

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)

Lesson 6: Divisibility test for 3

a) Learning objectives

- Explain and memorise the rule of divisibility test for 3.
- Calculate and show the rule of divisibility test for 3.

b) Teaching resources

- Number cards

c) Learning activities

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.

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)

Lesson 7: Divisibility test for 4

a) Learning objectives

- Explain and memorise the rule of divisibility test for 4.
- Calculate and show the rule of divisibility test for 4.

b) Teaching resources

Number cards

c) Learning activities

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

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)

Lesson 8: Divisibility test for 5

a) Learning objectives

- Explain and memorise the rule of divisibility test for 5.
- Calculate and show the rule of divisibility test for 5.

b) Teaching resources

Number cards

c) Learning activities

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.

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)

Lesson 9: Divisibility test for 6

a). **Learning objectives**

- Explain and memorise the rule of divisibility test for 6.
- Calculate and show the rule of divisibility test for 6.

b) Teaching resources

Number cards

c) Learning activities

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

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)

Lesson 10: Divisibility Test for 8

a) Learning objectives

- Explain and memorise the rule of divisibility test for 8.
- Calculate and show the rule of divisibility test for 8.

b) Teaching resources

Number cards

c) Learning activities

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.

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)

Lesson 11: Divisibility test for 9

a) Learning objectives

- Explain and memorise the rule of divisibility test for 9.
- Calculate and show the rule of divisibility test for 9.

b) Teaching resources

Number cards

c) Learning activities

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

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)

Lesson 12: Divisibility Test for 10

a) Learning objectives

- Explain and memorise the rule of divisibility test for 10.
- Calculate and show the rule of divisibility test for 10.

b) Teaching resources

Number cards

c) Learning activities

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

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

Lesson 13: Divisibility test for 11

a) Learning objectives

- Explain and memorise the rule of divisibility test for 11
- Calculate and show the rule of divisibility test of 11.

b) Teaching resources

Number cards

c) Learning activities

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.

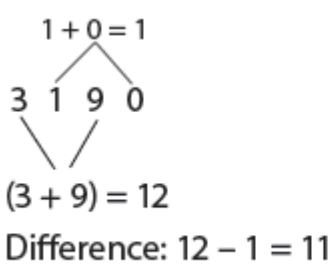
Guidance to the teacher

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.

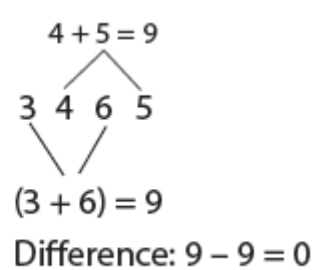
Guidance to Activity 3.13

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

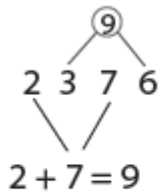
(a)



(b)

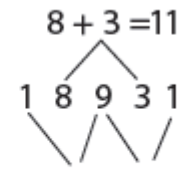


(c)



Difference: 9 – 9 = 0

(d)



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

Lesson 14: Divisibility test for 12

a) Learning objectives

- Explain and memorise the rule of divisibility test for 12.
- Calculate and show the rule of divisibility test for 12.

b) Teaching resources

Number cards

c) Learning activities

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).

3.5 Additional information for the teacher

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.

3.6 End unit assessment

Expected answers for Revision Activity 3

1. (a) 240 = 24 × 3 × 5 (b) 300 = 22 × 3 × 52
   (c)1 000 = 23 × 53
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

3.7 Additional activities

Remedial Activities:

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 (b) 99 328
   – Sum digits in alternate positions – Sum digits in alternate positions 1 +

3 + 8 = 12

0 + 6 + 6 = 12

– Difference

12 – 12 = 0

Thus, 103 686 is divisible by 11

9 + 3 + 8 = 20

9 + 2 = 11

– Difference

20 – 11 = 9

Thus, 99 328 is not divisible by 11

(d) 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 activities:

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

Extended activities:

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) $\text{LCM} = 2^4 \times 3^2 \times 5 = 2\,160$

$\text{GCF} = 2^2 \times 3^2 = 36$

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

UNIT 4: Equivalent fractions and operations

4.1 Key unit competence: Add, subtract and find equivalent fractions.

4.2 Prerequisite: Pupils will easily learn this unit, if they have a good background on the fractions they studied the previous year and finding the Lowest Common Multiples of numbers learnt in the previous unit.

4.3 Cross-cutting issues to be addressed

- 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.

4.4 Introductory activity and guidance

A. Introductory activity for unit 4

In real life, people share many things. For example, people share food, drinks, money, land and so many other things. When people are sharing, each person receives a portion of a whole and this portion is called a fraction in Mathematics. Suppose that a pineapple is shared equally among 4 students.

(a) What portion/fraction does each student get?

(b) If two of them decide to combine their portions, what mathematical operations do they carry out?

(c) Find out some examples of equal sharing involving Mathematical operations in real life, and present it using fractions.

B. Guidance on introductory activity for unit 4

This unit comprises the operation on fractions. It is important to deal with it because it is all about sharing. This unit is aimed to help learners to understand why it is necessary to study fractions so that they know how fractions may be applied in real life situation. In the above situation, emphasize that the pineapple has to be cut into **4 equal** parts because there 4 students sharing it equally. Give students time to go through the introductory activity above.

NOTE:

I. Through this unit, learners will have a clear understanding of fraction concepts. They will also have an opportunity to relate these mathematical concepts to real life experiences.

II. Emphasize the definition of a fraction, equivalent fraction, addition and subtraction of fractions

Suggested answers for introductory activity in unit 4:

a) Each student will get a quarter or ¼ or one over four as a fraction.

b) The mathematical operation that can be carried out is addition.

4.5 List of lessons/sub-heading

#	Lesson title	Learning objectives	Number of periods 24
0	Introductory activity 4	Motivate learners to have and use fractions in real life.	1
1.	Exploring and comparing fractions using models	Compare various fractions practically	1
2.	Concept and determination of equivalent fractions using models.	▪ Explain the concept of equivalent fractions ▪ Give examples of equivalent fractions.	3
3.	Calculation of equivalent fractions	Explain how to find equivalent fractions. Determine equivalent fractions	1
4.	Addition of fractions with different denominators using models or circle set fractions	Add fractions of different denominators using models or circle set fractions.	1
5.	Subtraction of fractions with different denominators using models or circle set fractions	Subtract fractions of different denominators using models or circle set fractions.	1
6.	Addition of fractions with different denominators using equivalent fractions	Add fractions with different denominators using equivalent fractions.	1
7.	Addition of fractions with different denominators using the LCM	Add fractions with denominators using LCM	2
8.	Addition of more fractions or mixed fractions with different denominators	Add mixed fractions with denominators using LCM	1
9.	Word problems for addition of fractions	Calculate LCM and use it to add fractions with different	2

		denominators.	
10.	Subtraction of fractions with different denominators using equivalent fractions	Subtract fractions with different denominators using equivalent fractions.	1
11.	Subtraction of fractions with different denominators using LCM	Subtract fractions with different denominators using LCM	2
12.	Subtraction of mixed fractions with different denominators	Subtract mixed fractions using LCM.	2
13.	Word problems on subtraction of fractions	Solve problems about subtraction of fractions	2
14.	**End unit assessment**	To assess if skills like to add, subtract and find equivalent fractions have been attained.	2

Guidance on different lessons outlined above

Lesson 1: Exploring and comparing fractions using models

a) **Learning objectives**
Explore, understand and compare various fractions practically

b) **Teaching resources**
A set of 8 circular sheets of equal sizes which are divided into 1, 2, 3, 4, 6, 8, 12 and 16 equal parts respectively

c) **Learning activities**
.

Note: This is a practical activity. As a teacher refer to the Mathematics kits, practical activities and experiments user guide for P4-P6 **Practical activity 5;** page 99, 100, 101and 102. Facilitate and engage leaners to do the practical activity on exploring and comparing fractions using models.
.

Lesson 2: Concept and determination of equivalence of fractions using models

a) Learning objectives
- Explain the concept of equivalent fractions
- Give examples of equivalent fractions.

b) Teaching resources
Equal strips of paper cut-outs

c) Learning activities

- Group work activities – working in small groups discuss Activity 4.1;4.2; 4.3;4.4 or 4.5.
- Demonstration – comparing sizes of shaded fractions in examples 4.1; 4.2 ; 4.3; 4.4 or 4.5.
- Practical approach – folding and paper cutouts of $\frac{1}{2}, \frac{2}{4}, \frac{4}{8}$ for example.
- Supervised practice – learners shade equivalent fractions. Teacher checks responses and gives feedback.

Lesson preparation

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

Teaching/Learning steps

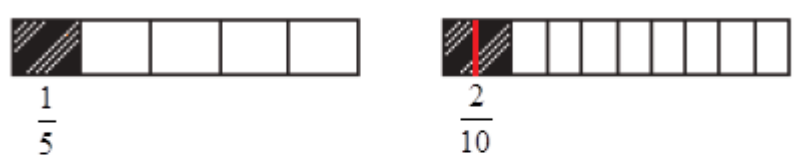
1. Ask learners to get 3 equal strips of paper and work out Activities 4.1; 4.2; 4.3; 4.4 and 4.5.
2. Let learners discuss Examples 4.1; 4.2; 4.3; 4.4 and 4.5.
3. Assign learners Practice Activities 4.1; 4.2; 4.3; 4.4 or 4.5 as classwork or homework for more practice.
4. Have learners state important points they have learnt.

Guidance to the teacher

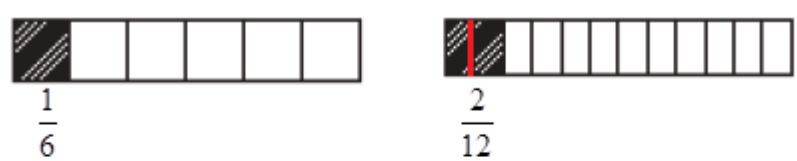
Emphasise that:

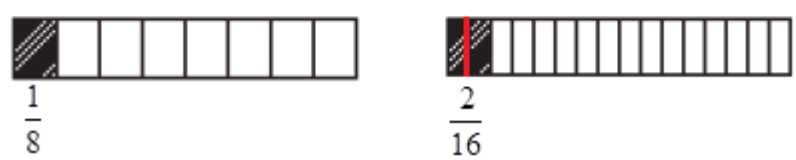
- The shaded strips are equal. There are more parts, but the shaded part is equal. Equivalent fractions are equal.
- Learners shade the equivalent fractions after carefully checking
- For equivalent fractions both the numerator and the denominator are multiplied by the same number.

Expected answer for Practice Activity 4.1

1. 

2. 

3. 

4. 

5.  $\frac{1}{7}$  $\frac{2}{14}$

6.  $\frac{1}{2}$  $\frac{3}{6}$

7.  $\frac{1}{9}$  $\frac{2}{18}$

8.  $\frac{2}{8}$  $\frac{4}{16}$

Expected answer for Practice Activity 4.2

1.  $\frac{2}{5}$  $\frac{4}{10}$  $\frac{8}{20}$

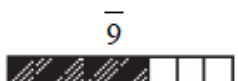
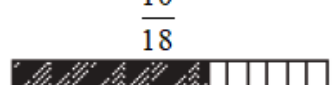
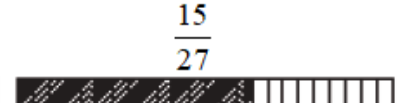
2.  $\frac{3}{7}$  $\frac{6}{14}$  $\frac{9}{21}$

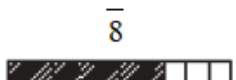
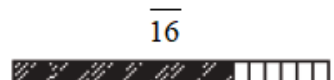
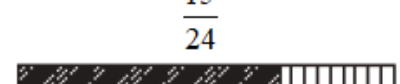
3.  $\frac{2}{9}$  $\frac{4}{18}$  $\frac{6}{27}$

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

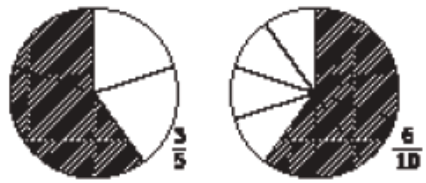
5.  $\frac{3}{8}$  $\frac{6}{16}$  $\frac{9}{24}$

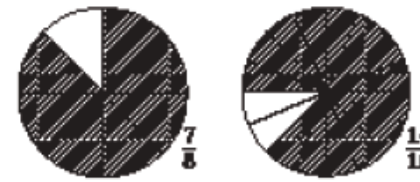
6.  $\frac{5}{9}$  $\frac{10}{18}$  $\frac{15}{27}$

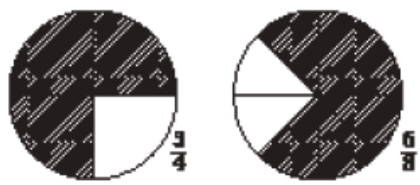
7.  $\frac{5}{8}$  $\frac{10}{16}$  $\frac{15}{24}$

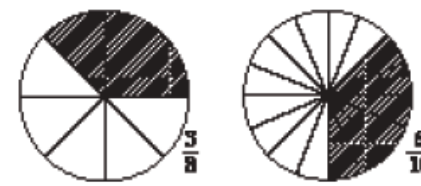
8.  $\frac{7}{10}$  $\frac{14}{20}$  $\frac{21}{30}$

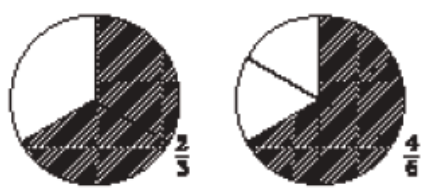
Expected answer for Practice Activity 4.3

1. 

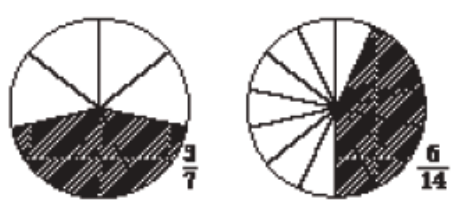
2. 

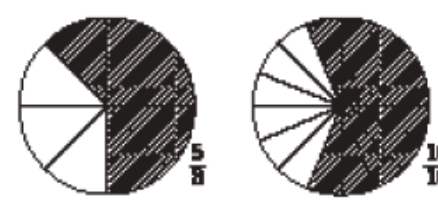
3. 

4. 

5. 

6. 

7. 

8. 

Expected answer 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. $\frac{5}{16}, \frac{10}{32}$

Expected answer 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) $\frac{3}{4}, \frac{9}{12}$

Lesson 3: Calculation of equivalent fractions

a) Learning objectives

- Explain how to find equivalent fractions.
- Calculating equivalent fractions

b) Teaching resources

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

c) Learning activities

1. Ask learners to work out Activities 4.6; 4.7, 4.8 and 4.9. Display the chart of worked out examples for Activities 4.6; 4.7; 4.8 and 4.9.
2. Let learners discuss Examples 4.6; 4.7; 4.8 and 4.9.
3. Assign learners Practice Activities 4.6; 4.7; 4.8 and 4.9 as classwork and homework for more practice. 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.

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. $\frac{16\div4}{28\div4}=\frac{4}{7}$ 6. $\frac{27\div9}{27\div9}=\frac{3}{9}$ 7. $\frac{34\div2}{50\div2}=\frac{17}{50}$ 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. $\frac{4\div2}{6\div2}=\frac{2}{3}$ 14. $\frac{7}{8}\times\frac{4}{4}=\frac{28}{32}$ 15. $\frac{3}{4}\times\frac{3}{3}=\frac{9}{12}$

Expected answers to Practice Activity 4.7

A. 1. $\frac{5}{8}\times\frac{2}{2}=\frac{5\times2}{8\times2}=\frac{10}{16}$, $\frac{5}{8}\times\frac{3}{3}=\frac{5\times3}{8\times3}=\frac{15}{24}$ 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. $\frac{4}{6}\times\frac{2}{2}=\frac{8}{12}$, $\frac{4}{6}\times\frac{3}{3}=\frac{12}{18}$

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

B. 1. $\frac{3}{8}\times\frac{2}{2}=\frac{6}{16}$, $\frac{3}{8}\times\frac{3}{3}=\frac{9}{24}$, $\frac{3}{8}\times\frac{4}{4}=\frac{12}{32}$

2. $\frac{4}{5}\times\frac{2}{2}=\frac{8}{10}$, $\frac{4}{5}\times\frac{3}{3}=\frac{12}{15}$, $\frac{4}{5}\times\frac{4}{4}=\frac{16}{20}$

3. $\frac{3}{4}\times\frac{2}{2}=\frac{6}{8}$, $\frac{3}{4}\times\frac{3}{3}=\frac{9}{12}$, $\frac{3}{4}\times\frac{4}{4}=\frac{12}{16}$

C. 1. $\frac{7}{16}\times\frac{2}{2}=\frac{14}{32}$, $\frac{7}{16}\times\frac{3}{3}=\frac{21}{48}$, $\frac{7}{16}\times\frac{4}{4}=\frac{28}{64}$

2. $\frac{1}{2}\times\frac{2}{2}=\frac{2}{4}$, $\frac{1}{2}\times\frac{3}{3}=\frac{3}{6}$, $\frac{1}{2}\times\frac{4}{4}=\frac{4}{8}$

3. $\frac{5}{8}\times\frac{2}{2}=\frac{10}{16}$, $\frac{5}{8}\times\frac{3}{3}=\frac{15}{24}$, $\frac{5}{8}\times\frac{4}{4}=\frac{20}{32}$

4. $\frac{7}{8}\times\frac{2}{2}=\frac{14}{16}$, $\frac{7}{8}\times\frac{3}{3}=\frac{21}{24}$, $\frac{7}{8}\times\frac{4}{4}=\frac{28}{32}$

Expected answers 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) $\frac{2}{96}=\frac{2\div2}{96\div2}=\frac{1}{48}$

   (e) $\frac{1}{8}=\frac{1}{8}\times\frac{6}{6}=\frac{6}{48}$

3. (a) $\frac{2}{3}=\frac{2\times20}{3\times20}=\frac{40}{60}$ (b) $\frac{3}{4}=\frac{3\times15}{4\times15}=\frac{45}{60}$

   (c) $\frac{4}{5}=\frac{4\times12}{5\times12}=\frac{48}{60}$ (d) $\frac{20}{600}=\frac{10\div20}{600\div10}=\frac{2}{60}$

   (e) $\frac{10}{120}=\frac{10\div2}{120\div2}=\frac{5}{60}$ (f) $\frac{7}{15}=\frac{7\times4}{15\times4}=\frac{28}{60}$

Lesson 4: Addition of fractions with different denominators using models or circle set fractions

a) **Learning objectives**
- To be able to add fractions of different denominators using models or circle set fractions.

b) Teaching resources
- Plain papers, pencil, pair of scissors, plastic circle and set fractions

c) Learning activities

Note: This is a practical activity. As a teacher refer to the Mathematics kits, practical activities and experiments user guide for P4-P6 **Practical activity 6;** page 103, 104, 105, and 106. Facilitate and engage leaners to do the practical activity on addition of fractions with different denominators using models or circle set fractions to achieve learning objectives.

Lesson 5: Subtraction of fractions with different denominators using models or circle set fractions

a) **Learning objectives**
- To be able to add fractions of different denominators using models or circle set fractions

b) Teaching resources
- Plain papers, pencil, pair of scissors, plastic circle and set fractions

c) Learning activities

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Note: This is a practical activity. As a teacher refer to the Mathematics kits, practical activities and experiments user guide for P4-P6 **Practical activity 7;** page 107, 108, 109, and 110. Facilitate and engage leaners to do the practical activity on subtraction of fractions with different denominators using models or circle set fractions to achieve learning objectives.

Lesson 6: Addition of fractions with different denominators using equivalent fractions

a) Learning objectives

- Explain how to add fractions with different denominators using equivalent fractions
- Add fractions with different denominators using equivalent fractions.

b) Teaching resources

Flash cards

c) Learning activities

1. Ask learners to work out Activities 4.10; 4.11 and 4.12.
2. Let learners discuss Examples 4.10; 4.11 and 4.12.
3. Assign learners Practice Activities 4.10; 4.11 and 4.12 as classwork and homework for more practice. Go round assessing their progress.
4. Ask learners to state important points they have learnt.

Expected answers to Practice Activity 4.10

1. $\frac{1}{10}+\frac{3}{5}=\frac{1}{10}+\frac{6}{10}=\frac{1+6}{10}=\frac{7}{10}$
2. $\frac{3}{8}+\frac{1}{2}=\frac{3}{8}+\frac{4}{8}=\frac{3+4}{8}=\frac{7}{8}$
3. $\frac{2}{3}+\frac{1}{9}=\frac{6}{9}+\frac{1}{9}=\frac{6+1}{9}=\frac{7}{9}$
4. $\frac{1}{5}+\frac{3}{10}=\frac{2}{10}+\frac{3}{10}=\frac{2+3}{10}=\frac{5}{10}$
5. $\frac{3}{7}+\frac{1}{14}=\frac{6}{14}+\frac{1}{14}=\frac{6+1}{14}=\frac{7}{14}$
6. $\frac{1}{2}+\frac{2}{8}=\frac{4}{8}+\frac{2}{8}=\frac{4+2}{8}=\frac{6}{8}$
7. $\frac{3}{4}+\frac{1}{8}=\frac{6}{8}+\frac{1}{8}=\frac{6+1}{8}=\frac{7}{8}$
8. $\frac{1}{3}+\frac{1}{6}=\frac{2}{6}+\frac{1}{6}=\frac{2+1}{6}=\frac{3}{6}$
9. $\frac{2}{3}+\frac{3}{9}=\frac{6}{9}+\frac{3}{9}=\frac{6+3}{9}=\frac{9}{9}=1$
10. $\frac{3}{10}+\frac{1}{5}=\frac{3}{10}+\frac{2}{10}=\frac{3+2}{10}=\frac{5}{10}$

Expected answers to Practice Activity 4.11

1. Equivalent fraction of $\frac{1}{2}$ with 4 as denominator is $\frac{1\times2}{2\times2}=\frac{2}{4}$.
   Thus, $\frac{1}{2}+\frac{1}{4}=\frac{2}{4}+\frac{1}{4}=\frac{3}{4}$
2. $\frac{1\times2}{4\times2}=\frac{2}{8}, \frac{1}{4}+\frac{1}{8}=\frac{1}{4}=\frac{2}{8}+\frac{1}{8}=\frac{3}{8}$
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. $\frac{1}{6}=\frac{1}{6}\times\frac{3}{3}=\frac{3}{18}, \frac{1}{6}+\frac{1}{18}=\frac{3}{18}+\frac{1}{18}=\frac{4}{18}$

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, $\frac{5}{12}+\frac{3}{6}=\frac{5}{12}+\frac{6}{12}=\frac{11}{12}$

Lesson 7: Addition of fractions with different denominators using the LCM

a) Learning objectives (formulated)

- Explain how to add fractions with different denominators using the Lowest Common Multiple (LCM).
- Add fractions with denominators using LCM.

b) Teaching resources

Flash cards

c) Learning activities

1. Ask learners to do the revision on finding the LCM.
2. Let learners work out Activities 4.13; 4.14; 4.15 and 4.16. Distribute the flash cards to groups.
3. Guide learners' discussion about Examples 4.13; 4.14; 4.15 and 4. 16.
4. Assign learners Practice Activities 4.13; 4.14; 4.15 and 4.16 as classwork and homework for more practice. 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.

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 $6\times7=42$

$\frac{1}{7}=\frac{1}{7}\times\frac{6}{6}=\frac{6}{42}$, $\frac{1}{6}=\frac{1}{6}\times\frac{7}{7}=\frac{7}{42}$

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 $5\times4=20$

$\frac{3}{5}=\frac{3}{5}\times\frac{4}{4}=\frac{12}{20}$, $\frac{1}{4}=\frac{1}{4}\times\frac{5}{5}=\frac{5}{20}$

Thus, $\frac{3}{5}+\frac{1}{4}=\frac{12}{20}+\frac{5}{20}=\frac{17}{20}$

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, $\frac{1}{6}+\frac{1}{18}=\frac{3}{18}+\frac{1}{18}=\frac{4}{18}$

Expected answers for 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, $\frac{1}{3}+\frac{5}{12}=\frac{1(12\div 3)+5(12\div 12)}{12}$

$=\frac{4+5}{12}=\frac{9}{12}$

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, $\frac{2}{7}+\frac{1}{6}=\frac{2(42\div 7)+1(42\div)}{42}$

$=\frac{12+7}{42}=\frac{19}{42}$

Expected answers for 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, $\frac{9}{24}+\frac{5}{8}=\frac{9(24\div 24)+5(24\div 8)}{24}$

$=\frac{9+15}{24}=\frac{24}{24}=1$

Lesson 8: Addition of more fractions and mixed fractions with different denominators

a) Learning objectives

Calculate LCM and use it to add fractions with different denominators.

b) Teaching resources

Flash cards

c) Learning activities

1. Ask learners to work out Activities 4.17 and 4.18 in groups.
2. Let learners discuss Examples 4.17 and 4.18. Distribute flash cards in groups.
3. Assign learners Practice Activities 4.17 and 4.18 as classwork and homework. Check progress as they solve the questions.
4. Ask learners to give important points they have learnt.

Expected answers for Practice Activity 4.17

1. $\frac{4}{5}+\frac{4}{7}$ LCM of 5 and 7 is 35

Add $\frac{4}{5}+\frac{4}{7}=\frac{28+20}{35}=\frac{48}{35}$

$\frac{48}{35}=48\div 35=$ $35\overline{)48}$ $\begin{array}{r}1\\ -35\\ \hline 13\end{array}$

Therefore, $\frac{48}{35}=1\frac{13}{35}$

2. $\frac{7}{8}+\frac{3}{4}$ LCM of 8 and 4 is 8

Add $\frac{7}{8}+\frac{3}{4}=\frac{7+6}{8}=\frac{13}{8}$

$\frac{13}{8}=13\div 8=$ $8\overline{)13}$ $\begin{array}{r}1\\ -8\\ \hline 5\end{array}$

Therefore, $\frac{13}{8}=1\frac{5}{8}$

3. $\frac{4}{9}+\frac{9}{10}$ LCM of 9 and 10 is 90

Add $\frac{4}{9}+\frac{9}{10}=\frac{40+81}{90}=\frac{121}{90}$

$\frac{121}{90}=121\div 90=$ $90\overline{)121}$ $\begin{array}{r}1\\ -90\\ \hline 31\end{array}$

Therefore, $\frac{121}{90}=1\frac{31}{90}$

4. $\frac{5}{6}+\frac{3}{7}$ LCM of 6 and 7 is 42

Add $\frac{5}{6}+\frac{3}{7}=\frac{35+18}{42}=\frac{53}{42}$

$\frac{53}{42}=53\div 42=$ $42\overline{)53}$ $\begin{array}{r}1\\ -42\\ \hline 11\end{array}$

Therefore, $\frac{53}{42}=1\frac{11}{42}$

5. $\frac{4}{5}+\frac{2}{3}$ LCM of 5 and 3 is 15

Add $\frac{4}{5}+\frac{2}{3}=\frac{12+10}{15}=\frac{22}{15}$

$\frac{22}{15}=22\div 15=$ $15\overline{)22}$ $\begin{array}{r}1\\ -15\\ \hline 7\end{array}$

Therefore, $\frac{22}{15}=1\frac{7}{15}$

6. $\frac{2}{3}+\frac{1}{2}$ LCM of 3 and 2 is 6

Add $\frac{2}{3}+\frac{1}{2}=\frac{4+3}{6}=\frac{7}{6}$

$\frac{7}{6}=7\div 6=$ $6\overline{)7}$ $\begin{array}{r}1\\ -6\\ \hline 1\end{array}$

Therefore, $\frac{7}{6}=1\frac{1}{6}$

7. $\frac{5}{4}+\frac{4}{3}$ LCM of 4 and 3 is 12

Add $\frac{5}{4}+\frac{4}{3}=\frac{15+16}{12}=\frac{31}{12}$

$\frac{31}{12}=31\div 12=$ $12\overline{)31}$ $\begin{array}{r}2\\ -24\\ \hline 7\end{array}$

Therefore, $\frac{31}{12}=2\frac{7}{12}$

8. $\frac{8}{7}+\frac{9}{8}$ LCM of 7 and 8 is 56

Add $\frac{8}{7}+\frac{9}{8}=\frac{64+63}{56}=\frac{127}{56}$

$\frac{127}{56}=127\div 56=$ $56\overline{)127}$ $\begin{array}{r}2\\ -112\\ \hline 15\end{array}$

Therefore, $\frac{127}{56}=2\frac{15}{56}$

9. $\frac{3}{2}+\frac{4}{3}$ LCM of 2 and 3 is 6

Add $\frac{3}{2}+\frac{4}{3}=\frac{9+8}{6}=\frac{17}{6}$

$\frac{17}{6}=17\div 6=$ $6\overline{)17}$ $\begin{array}{r}2\\ -12\\ \hline 5\end{array}$

Therefore, $\frac{17}{6}=2\frac{5}{6}$

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 $\frac{33}{28} = 1\frac{5}{28}$)

   $= 6 + 1\frac{5}{28} = 7\frac{5}{28}$

Lesson 9: Word problems for addition of fractions

a) Learning objectives (formulated

- Explain how to add fractions with different denominators using the LCM.
- Calculate LCM and use it to add fractions with different denominators.

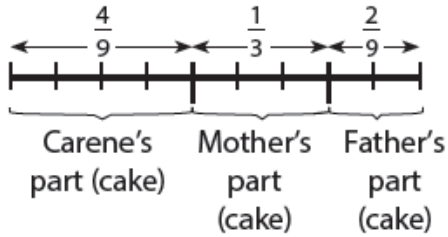
b) Teaching resources

Flash cards

c) Learning activities

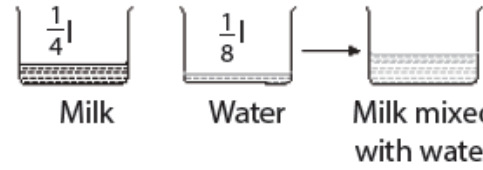
1. Ask learners to discuss Activity 4.19 in groups of five.
2. Let learners discuss Example 4.19 and 4.20. Distribute flash cards to write fraction parts to add.
3. Assign learners Practice Activity 4.19 questions 1 – 3 as classwork. Go round checking progress and give feedback.
4. Ask learners to name 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.

Expected answers to Practice Activity 4.19

1. 

$\frac{4}{9}+\frac{1}{3}$ LCM of 9 and 3 is 9.

Thus, $\frac{4}{9}+\frac{1}{3}=\frac{1\times4+3\times1}{9}=\frac{4+3}{9}=\frac{7}{9}$

2. 

$\frac{1}{4}+\frac{1}{8}$ LCM of 4 and 8 is 8.

Thus, $\left(\frac{1}{4}+\frac{1}{8}\right)l=\left(\frac{2\times1+1\times1}{8}\right)l=\frac{2+1}{8}l$

$=\frac{3}{8}l$

3. $\frac{1}{3}+\frac{1}{2}$ LCM of 3 and 2 is 6

Thus, $\left(\frac{1}{3}+\frac{1}{2}\right)l=\frac{1\times2+1\times3}{6}l=\frac{3+2}{6}l$

$=\frac{5}{6}l$

4. $\frac{4}{7}+\frac{7}{10}$ LCM of 7 and 10 is 70

Thus, $\left(\frac{4}{7}+\frac{7}{10}\right)$ acres

$=\left(\frac{10\times4+7\times7}{70}\right)$ 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, $\frac{1}{3}+\frac{1}{4}=\frac{1\times4+1\times3}{12}=\frac{4+3}{12}$

$=\frac{7}{12}$

Lesson 10: Subtraction of fractions with different denominators using equivalent fractions

a) Learning objectives

- Explain how to subtract fractions with different denominators using equivalent fractions.
- Subtract fractions with different denominators using equivalent fractions

b) Teaching resources

Flash cards

c) Learning activities

1. Ask learners to work out Activities 4.20 and 4.21
2. Let learners discuss Examples 4.21 and 4.22. Distribute flash cards so that learners solve problems written.
3. Assign learners Practice Activities 4.20 and 4.21 as classwork or homework. Go round checking progress.
4. Ask learners to identify important points they have learnt.

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. $\frac{3}{10}-\frac{1}{5}=\frac{3}{10}-\frac{2}{10}=\frac{1}{10}$ 4. $\frac{4}{7}-\frac{2}{14}=\frac{8}{14}-\frac{2}{14}=\frac{6}{14}$

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, $\frac{1}{5}-\frac{1}{15}=\frac{3}{15}-\frac{1}{15}=\frac{2}{15}$

Lesson 11: Subtraction of fractions with different denominators using the LCM

a) Learning objectives (formulated

- Explain how to subtract fractions with different denominators using the Lowest Common Multiple.
- Subtract fractions with different denominators using LCM.

b) Teaching resources

Flash cards

c) Learning activities

1. Ask learners to work out Activities 4.22; 4.23 and 4.24.
2. Let learners discuss Examples 4.23; 4.24 and 4.25. Distribute flash cards for learners to solve written problems.
3. Assign learners Practice Activities 4.22; 4.23 and 4.24 as classwork and homework. Go round assessing progress. Have learners discuss questions that are difficult.
4. Ask learners to identify important points they have learnt.

Expected answers for Practice Activity 4.22

1. $\frac{9}{10}-\frac{3}{6}$

LCM of 10 and 6 is 30.

$\frac{9}{10}=\frac{9}{10}\times\frac{3}{3}=\frac{27}{30}$

$\frac{3}{6}=\frac{3}{6}\times\frac{5}{5}=\frac{15}{30}$

Thus, $\frac{9}{10}-\frac{3}{6}=\frac{27}{30}-\frac{15}{30}=\frac{27-15}{30}=\frac{12}{30}$

2. $\frac{5}{6}-\frac{7}{9}$

LCM of 6 and 9 is 36.

$\frac{5}{6}=\frac{5}{6}\times\frac{6}{6}=\frac{30}{36}$

$\frac{7}{9}=\frac{7}{9}\times\frac{4}{4}=\frac{28}{36}$

Thus, $\frac{5}{6}-\frac{7}{9}=\frac{30}{36}-\frac{28}{36}=\frac{30-28}{36}=\frac{2}{36}$

3. $\frac{7}{8}-\frac{1}{3}$

LCM of 8 and 3 is 24.

$\frac{7}{8}=\frac{7}{8}\times\frac{3}{3}=\frac{21}{24}$

$\frac{1}{3}=\frac{1}{3}\times\frac{8}{8}=\frac{8}{24}$

Thus, $\frac{7}{8}-\frac{1}{3}=\frac{21}{24}-\frac{8}{24}=\frac{21-8}{24}=\frac{13}{24}$

4. $\frac{8}{9}-\frac{1}{5}$

LCM of 9 and 5 is 45.

$\frac{8}{9}=\frac{8}{9}\times\frac{5}{5}=\frac{40}{45}$

$\frac{1}{5}=\frac{1}{5}\times\frac{9}{9}=\frac{9}{45}$

Thus, $\frac{8}{9}-\frac{1}{5}=\frac{40}{45}-\frac{9}{45}=\frac{40-9}{45}=\frac{31}{45}$

5. $\frac{2}{3}-\frac{2}{4}$

LCM of 3 and 4 is 12.

$\frac{2}{3}=\frac{2}{3}\times\frac{4}{4}=\frac{8}{12}$

$\frac{2}{4}=\frac{2}{3}\times\frac{3}{3}=\frac{6}{12}$

Thus, $\frac{2}{3}-\frac{2}{4}=\frac{8}{12}-\frac{6}{12}=\frac{8-6}{12}=\frac{2}{12}$

6. $\frac{6}{7}-\frac{2}{5}$

LCM of 7 and 5 is 35.

$\frac{6}{7}=\frac{6}{7}\times\frac{5}{5}=\frac{30}{35}$

$\frac{2}{5}=\frac{2}{5}\times\frac{7}{7}=\frac{14}{35}$

Thus, $\frac{6}{7}-\frac{2}{5}=\frac{30}{35}-\frac{14}{35}=\frac{30-14}{35}=\frac{16}{35}$

7. $\frac{7}{8}-\frac{2}{3}$

LCM of 8 and 3 is 24.

$\frac{7}{8}=\frac{7}{8}\times\frac{3}{3}=\frac{21}{24}$

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

Thus, $\frac{7}{8}-\frac{2}{3}=\frac{21}{24}-\frac{16}{24}=\frac{21-16}{24}=\frac{5}{24}$

8. $\frac{2}{3}-\frac{4}{7}$

LCM of 3 and 7 is 21.

$\frac{2}{3}=\frac{2}{3}\times\frac{7}{7}=\frac{14}{21}$

$\frac{4}{7}=\frac{4}{7}\times\frac{3}{3}=\frac{12}{21}$

Thus, $\frac{2}{3}-\frac{4}{7}=\frac{14}{21}-\frac{12}{21}=\frac{14-12}{21}=\frac{2}{21}$

9. $\frac{2}{3}-\frac{3}{5}$

LCM of 3 and 5 is 15.

$\frac{2}{3}=\frac{2}{3}\times\frac{5}{5}=\frac{10}{15}$

$\frac{3}{5}=\frac{3}{5}\times\frac{3}{3}=\frac{9}{15}$

Thus, $\frac{2}{3}-\frac{3}{5}=\frac{10}{15}-\frac{9}{15}=\frac{10-9}{15}=\frac{1}{15}$

10. $\frac{7}{9}-\frac{1}{4}$

LCM of 9 and 4 is 36.

$\frac{7}{9}=\frac{7}{9}\times\frac{4}{4}=\frac{28}{36}$

$\frac{1}{4}=\frac{1}{4}\times\frac{9}{9}=\frac{9}{36}$

Thus, $\frac{7}{9}-\frac{1}{4}=\frac{28}{36}-\frac{9}{36}=\frac{28-9}{36}=\frac{19}{36}$

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, $\frac{3}{10}-\frac{2}{9}=\frac{27}{90}-\frac{20}{90}=\frac{27-20}{90}=\frac{7}{90}$

Expected answers for Practice Activity 4.23

A. 1. $\frac{1}{3}-\frac{1}{7}=\frac{(21\div3)\times1-(21\div7)\times1}{21}$

$=\frac{7-3}{21}=\frac{4}{21}$

2. $\frac{1}{3}-\frac{1}{9}=\frac{(27\div3)\times1-(27\div9)\times1}{27}$

$=\frac{9-3}{27}=\frac{6}{27}$

3. $\frac{1}{5}-\frac{1}{10}=\frac{(10\div5)\times1-(10\div10)\times1}{10}$

$=\frac{2-1}{10}=\frac{1}{10}$

4. $\frac{1}{2}-\frac{1}{9}=\frac{(18\div2)\times1-(18\div9)\times1}{18}$

$=\frac{9-2}{18}=\frac{7}{18}$

5. $\frac{1}{4}-\frac{1}{12}=\frac{(12\div4)\times1-(12\div12)\times1}{12}$

$=\frac{3-1}{12}=\frac{2}{12}$

6. $\frac{1}{5}-\frac{1}{6}=\frac{(30\div5)\times1-(30\div6)\times1}{30}$

$=\frac{6-5}{30}=\frac{1}{30}$

B. 1. $\frac{1}{6}-\frac{1}{7}=\frac{(42\div 6)\times 1-(42\div 7)\times 1}{42}$

$=\frac{7-6}{42}=\frac{1}{42}$

2. $\frac{1}{8}-\frac{1}{9}=\frac{(72\div 8)\times 1-(72\div 9)\times 1}{27}$

$=\frac{9-8}{72}=\frac{1}{72}$

3. $\frac{1}{9}-\frac{1}{10}=\frac{(90\div 9)\times 1-(90\div 10)\times 1}{90}$

$=\frac{10-9}{90}=\frac{1}{90}$

4. $\frac{1}{10}-\frac{1}{12}=\frac{(60\div 10)\times 1-(60\div 12)\times 1}{60}$

$=\frac{6-5}{60}=\frac{1}{60}$

5. $\frac{1}{7}-\frac{1}{9}=\frac{(63\div 7)\times 1-(63\div 9)\times 1}{63}$

$=\frac{9-7}{63}=\frac{2}{63}$

6. $\frac{1}{10}-\frac{1}{14}=\frac{(70\div 10)\times 1-(70\div 14)\times 1}{70}$

$=\frac{7-5}{70}=\frac{2}{70}$

Expected answers 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, $\frac{4}{5}-\frac{3}{4}=\frac{16}{20}-\frac{15}{20}=\frac{16-15}{20}=\frac{1}{20}$

Lesson 12: Subtraction of mixed fractions with different denominators

a) Learning objectives

- Explain how to subtract fractions with different denominators using the Least Common Multiple
- Subtract mixed fractions using LCM.

b) Teaching resources

Flash cards

c) Learning activities

1. Ask learners to work out Activities 4.25 and 4.26.
2. Let learners discuss Examples 4.26 and 4.27. Distribute flash cards for learners to solve written problems.
3. Assign learners Practice Activities 4.25 and 4.26 as classwork or homework. Go round assessing progress.
4. Ask learners to name important points they have learnt.

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. $4\frac{7}{10}-1\frac{2}{5}=(4-1)+(\frac{7}{10}-\frac{2}{5})=3+(\frac{7}{10}-\frac{4}{10})=3\frac{3}{10}$

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. $9-3\frac{3}{4}=(9-3)-\frac{3}{4}=6-\frac{3}{4}=5+(\frac{4}{4}-\frac{3}{4})=5\frac{1}{4}$

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. $4\frac{1}{6} - 1\frac{6}{9} = (4-1) + (\frac{1}{6} - \frac{6}{9}) = 3 + \frac{3-12}{18} = 2 + \frac{18+3-12}{18} = 2\frac{9}{18}$

Lesson 13: Word problems on subtraction of fractions

a) Learning objectives (formulated

- Explain how to subtract fractions with different denominators using the Least Common Multiple
- Solve problems about subtraction of fractions

b) Teaching resources

Flash cards

c) Learning activities

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.

Expected answers to Practice Activity 4.27

1. $\frac{7}{8}$ m — Jane's stick

   Michael's stick — $\frac{5}{6}$ m

   $\frac{7}{8}\text{ m} - \frac{5}{6}\text{ m}$ Common denominator = 24

   $\frac{7}{8} = \frac{7}{8} \times \frac{3}{3} = \frac{21}{24}$

   $\frac{5}{6} = \frac{5}{6} \times \frac{4}{4} = \frac{20}{24}$

   $\left(\frac{7}{8} - \frac{5}{6}\right)\text{m} = \left(\frac{21}{24} - \frac{20}{24}\right)\text{m} = \left(\frac{21-20}{24}\right)\text{m} = \frac{1}{24}\text{ m}$

2. $\frac{3}{4}$ m thread

   $\frac{1}{2}$ m for mending — Remaining thread

   $\frac{3}{4} - \frac{1}{2}$ Common denominator is 4

   Thus, $\left(\frac{3}{4} - \frac{1}{2}\right)\text{ m} = \left(\frac{3-2}{4}\right)\text{m} = \frac{1}{4}$ 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. $\left(\frac{1}{2} - \frac{2}{8}\right)\text{ kg} = \left(\frac{4-2}{8}\right)\text{kg} = \frac{2}{8}$ 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) $\frac{4}{7} - \frac{3}{7} = \frac{1}{7}$

6. $\left(\frac{3}{4} - \frac{3}{8}\right) l = \left(\frac{6-3}{8}\right) l = \frac{3}{8} l$

4.6 Additional information for the teacher

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.

4.7 End unit assessment

Expected answers for Revision Activity 4

1. $\frac{7}{10}=\frac{7}{10}\times\frac{2}{2}=\frac{14}{20}$ $\frac{4}{10}=\frac{4}{10}\times\frac{2}{2}=\frac{8}{20}$ $\frac{8}{18}=\frac{8}{18}\times\frac{2}{2}=\frac{16}{36}$

2. (a) 

   (b) 

3. (a) $\frac{3}{8}=\frac{3}{8}\times\frac{2}{2}=\frac{6}{16}$, $\frac{3}{8}=\frac{3}{8}\times\frac{3}{3}=\frac{9}{24}$

   (b) $\frac{3}{11}=\frac{3}{11}\times\frac{2}{2}=\frac{6}{22}$, $\frac{3}{11}=\frac{3}{11}\times\frac{3}{3}=\frac{9}{33}$

4. (a) $\frac{2}{3}=\frac{2}{3}\times\frac{8}{8}=\frac{16}{24}$ (b) $\frac{1}{6}=\frac{1}{6}\times\frac{4}{4}=\frac{4}{24}$

   (c) $\frac{1}{4}=\frac{1}{4}\times\frac{6}{6}=\frac{6}{24}$ (d) $\frac{3}{8}=\frac{3}{8}\times\frac{3}{3}=\frac{9}{24}$

5. (a) $\frac{2}{3}=\frac{2}{3}\times\frac{3}{3}=\frac{6}{9}$. So, $\frac{2}{3}+\frac{4}{9}=\frac{6}{9}+\frac{4}{9}=\frac{10}{9}=1\frac{1}{9}$

   (b) $\frac{5}{6}=\frac{5}{6}\times\frac{2}{2}=\frac{10}{12}$. So, $\frac{3}{12}+\frac{5}{6}=\frac{3}{12}+\frac{10}{12}=\frac{13}{12}=1\frac{1}{12}$

   (c) $\frac{3}{5}=\frac{3}{5}\times\frac{2}{2}=\frac{6}{10}$. Thus, $\frac{3}{10}+\frac{3}{5}=\frac{3}{10}+\frac{6}{10}=\frac{9}{10}$

6. (a) $\frac{1}{2}=\frac{1}{2}\times\frac{4}{4}=\frac{4}{8}$. So, $\frac{5}{8}-\frac{1}{2}=\frac{5}{8}-\frac{4}{8}=\frac{1}{8}$

(b) $\frac{3}{4}=\frac{3}{4}\times\frac{3}{3}=\frac{9}{12}$. Thus, $\frac{3}{4}-\frac{1}{12}=\frac{9}{12}-\frac{1}{12}=\frac{8}{12}$

(c) $\frac{2}{3}=\frac{2}{3}\times\frac{3}{3}=\frac{6}{9}$. Thus, $\frac{2}{3}-\frac{1}{9}=\frac{6}{9}-\frac{1}{9}=\frac{5}{9}$

7. (a) $\frac{3}{7}+\frac{5}{6}$ Common denominator is 42

$$\frac{3}{7}+\frac{5}{6}=\frac{(42\div 7)\times 3+(42\div 6)\times 5}{42}=\frac{18+35}{42}=\frac{53}{42}=1\frac{11}{42}$$

(b) $\frac{2}{9}+\frac{2}{12}$ Common denominator is 36

$$\frac{2}{9}+\frac{2}{12}=\frac{(36\div 9)\times 2+(36\div 12)\times 2}{36}=\frac{8+6}{36}=\frac{14}{36}$$

(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) $1\frac{1}{4}-\frac{2}{3}=1+(\frac{1}{4}-\frac{2}{3})=1+(\frac{3-8}{12})=\frac{12+3-8}{12}=\frac{7}{12}$

9. (a) Margarita. Now, $\left(\frac{5}{8}-\frac{1}{4}\right)\text{km}=\frac{5-2}{8}\text{ km}=\frac{3}{8}\text{ km}$.

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: $\frac{4}{12}+\frac{5}{12}=\frac{9}{12}$

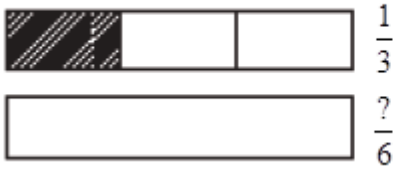
(d) Women + children: $\frac{5}{12}+\frac{3}{12}=\frac{8}{12}$

Additional activity 4

Remedial Activity:

1. Shade an equivalent fraction below.

(a)



$\frac{1}{3}$

$\frac{?}{6}$

(b)

$\frac{3}{8}$

$\frac{?}{16}$

2. Write the following equivalent fractions shaded below.

(a)

$\frac{?}{6}$

$\frac{?}{12}$

(b)

$\frac{?}{5}$

$\frac{?}{10}$

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) $\frac{2}{3}-\frac{1}{5}$ (b) $\frac{3}{4}-\frac{5}{8}$

(c) $7\frac{1}{6}-2\frac{5}{9}$ (d) $4\frac{1}{3}-2\frac{2}{5}$

Consolidation activities:

1. Write 3 equivalent fractions of:

(a) $\frac{4}{7}$ (b) $\frac{4}{11}$

2. Write equivalent fractions with 48 as the denominator.

(a) $\frac{4}{12}$ (b) $\frac{7}{16}$ (c) $\frac{5}{6}$

3. Use equivalent fractions to work out:

(a) $\frac{1}{3}+\frac{4}{9}$ (b) $\frac{2}{5}+\frac{1}{10}$

4. Use equivalent fractions to work out. Discuss your steps to calculate the answers.

(a) $\frac{3}{4}-\frac{1}{8}$ (b) $\frac{2}{3}-\frac{2}{7}$

5. Solve using the LCM. Explain the steps you followed.

   (a) $\frac{5}{8} - \frac{5}{10}$ (b) $\frac{2}{3} - \frac{2}{9}$

6. Use the LCM to add. Explain your answer.

   (a) $\frac{3}{7} + \frac{3}{5}$ (b) $\frac{2}{3} + \frac{1}{4}$

7. Find the sum of the following. Justify your answer.

   (a) $5\frac{4}{5} + 3\frac{1}{4}$ (b) $1\frac{1}{9} + 2\frac{3}{4}$

8. Solve.

   (a) $10 - 4\frac{3}{4}$ (b) $9 - 1\frac{6}{7}$

   (c) $4\frac{1}{3} - 2\frac{5}{6}$ (d) $5\frac{1}{2} - \frac{3}{4}$

9. What is seven ninths minus one half?

10. What is the sum of $2\frac{1}{4}$ and $3\frac{1}{6}$? Explain the steps to the answer.

Extended activity:

1. Write 3 equivalent fractions of the following. Justify your answers:

   (a) $\frac{3}{8}$ (b) $\frac{4}{9}$ (c) $\frac{6}{11}$

2. Write equivalent fractions with the denominator 54.

   (a) $\frac{2}{3}$ (b) $\frac{5}{6}$ (c) $\frac{2}{9}$

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)  $\frac{6}{16}$

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) $\frac{2}{7} + \frac{2}{6} = \frac{(42 \div 7) \times 2 + (42 \div 6) \times 2}{42} = \frac{12+14}{42} = \frac{26}{42}$

9. (a) $\frac{4}{5} + \frac{3}{4} = \frac{(20 \div 5) \times 4 + (20 \div 4) \times 3}{20} = \frac{16+15}{20} = \frac{31}{20} = 1\frac{11}{20}$

(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) $4\frac{1}{3}-2\frac{2}{5}=(4-2)+(\frac{1}{3}-\frac{2}{5})=2+\frac{5-6}{15}=1+\frac{15}{15}+\frac{5-6}{15}=1\frac{14}{15}$

Consolidated 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) $\frac{1}{4}+\frac{2}{12}=\frac{3+2}{12}=\frac{5}{12}$ (b) $\frac{1}{7}+\frac{1}{8}=\frac{8+7}{56}=\frac{15}{56}$

   (c) $\frac{7}{15}+\frac{3}{10}=\frac{14+9}{30}=\frac{23}{30}$

7. (a) $4\frac{3}{8}+1\frac{1}{9}=(4+1)+(\frac{27+8}{72})=5\frac{35}{72}$

   (b) $4\frac{4}{7}+3\frac{1}{3}=(4+3)+(\frac{12+7}{21})=7\frac{19}{21}$

   (c) $5\frac{3}{5}+2\frac{2}{9}=(5+2)+\left(\frac{3}{5}+\frac{2}{9}\right)=7+(\frac{27+10}{45})=7\frac{37}{45}$

8. (a) $7-2\frac{4}{9}=7-2=5-\frac{4}{9}=4\frac{9}{9}-\frac{4}{5}=4\frac{5}{9}$

   (b) $6\frac{4}{5}-2\frac{4}{6}=(6-2)+\left(\frac{4}{5}+\frac{4}{6}\right)=4+(\frac{24-20}{30})=4+\frac{4}{30}=4\frac{4}{30}$

   (c) $3\frac{3}{4}-1\frac{2}{3}=(3-1)+\left(\frac{3}{4}-\frac{2}{3}\right)=2+\frac{9-8}{12}=2\frac{1}{12}$

9. (a) $\frac{4}{5}+\frac{4}{7}=\frac{28+20}{35}=\frac{48}{35}=1\frac{13}{35}$

   (b) $\frac{1}{5}+\frac{3}{7}=\frac{7+15}{35}=\frac{22}{35}$

   (c) $\frac{4}{5}-\frac{4}{7}=\frac{28-20}{35}=\frac{8}{35}$

Unit 5: Multiplication and division of decimals

5.1 Key unit competence: Multiply, divide and compare decimal numbers up to 3 decimal places.

5.2 Prerequisite: Pupils will easily learn this unit, if they have a good background on the fractions they studied in the previous unit. In this unit learners are introduced to place values up to thousands. Also learners practice writing and giving decimal numbers in words. 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.

5.2 Cross-cutting issues to be addressed

- **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.

5.3 Introductory activity and guidance

A. Introductory activity for unit 5

In this unit learners are introduced to decimal place values up to thousandths. Also learners practice writing and giving decimal numbers in words and or in figures. It should be noted that sometimes we quickly read decimal numbers such as 0.321 as zero point three, two, one or read as three hundred twenty one thousandths which is written in words in either way. 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. Further more, these decimal fractions can be multiplied and divided. For example,

a) Find the product of 0.105×9 and 0.17×0.3

b) What is the quotient of $0.44 \div 1.1$ and $1.792 \div 0.07$

B: Guidance on introductory activity for unit 5

This unit 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

Emphasize the learners to write a decimal number as a fraction before either multiplying or dividing and after working out either way, they need to consider the answer in decimal fraction if need be.

For example in 0.105×9, write 0.105 as a fraction to be $\frac{105}{1000}$, then multiply by 9

For 0.17×0.3 we shall have $\frac{17}{100}$ X $\frac{3}{10}$=

In $0.44 \div 1.1$ we shall have $\frac{44}{100} \div \frac{11}{10}$=

In $1.792 \div 0.07$ we shall have $\frac{1792}{1000} \div \frac{7}{100}$=

Suggested answers for introductory activity in unit 5:

a) The product of $0.105 \times 9 = 0.945$
   The product of $0.17 \times 0.3 = 0.051$
b) The quotient of $0.44 \div 1.1 = 0.4$
   The quotient of $1.792 \div 0.07 = 25.6$

5.4 List of lessons/sub-heading

#	Lesson title	Learning objectives	Number of periods 24
0.	**Introductory activity 5**	Motivate and introduce learners to concepts of decimal numbers	1
1.	Concept of decimal fractions	▪ Explain the concept of decimal numbers using place value up to 3 decimal places. ▪ Read and write decimal numbers in figures and in words.	2
2.	Place value of decimals	▪ Identify the place value of decimal numbers in figures and words. ▪ Read, write and identify place values in written decimals.	2
3.	Comparing and ordering decimal numbers using number cards	Use number cards to compare and order decimal numbers	2
4.	Comparing decimal numbers	Compare 2 or more decimal numbers using >, < or =	1
5.	Ordering decimal numbers using number cards	To order decimal numbers using number cards	2
6.	Conversion of decimals to fractions	▪ Explain how to multiply and divide decimal numbers ▪ Multiply or divide decimal numbers up to 3 decimal places and match fractions to decimals.	2

7.	Conversion of decimals to fractions	▪ Learners will be able to explain how to convert a decimal to a fraction. ▪ Convert decimal numbers to fraction form correctly.	2
8.	Matching fractions to decimals	Learners will be able to match fractions to decimals properly	2
9.	Multiplication of decimal fractions	▪ Learners will explain how to multiply decimal numbers up to 3 decimal places ▪ Multiply decimals numbers up to 3 decimals places correctly.	2
10.	Division of decimal fractions	▪ Learners will be able to explain division of decimal numbers up to 3 decimal places. ▪ Divide decimal numbers up to 3 decimal places.	2
11.	Mixed operations for multiplication and division	▪ Learners will be able to explain how to multiply and divide decimal numbers ▪ Multiply or divide decimal numbers up to 3 decimal place	2
12.	Problems involving multiplication and division of decimals	▪ Explain how to multiply and divide decimal numbers ▪ Multiply or divide decimal numbers up to 3 decimal place	1
13.	**End unit assessment**	To verify if key unit competences such as multiply, divide and compare decimal numbers up to 3 decimal places are well developed.	1

Guidance on different lessons outlined above

Lesson 1: Concept of decimal fractions

a) **Learning objectives (formulated)**

- To explain the concept of decimal numbers using place value up to 3 decimal places.
- Read and write decimal numbers in figures and in words.

b) Teaching resources

Manila cards, scissors, markers, masking tape, pencil, knife, orange, ruler

c) Learning activities

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.

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

Lesson 2: Place value of decimals

a) Learning objectives (formulated)

- To identify the place value of decimal numbers in figures and words.
- Read, write and identify place values in written decimals.

b) Teaching resources

A chart showing the place value of different decimal fractions up to 3 decimal places

c) Learning activities

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.

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

		Place value							
	Decimal number in figures	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 tenths
3. (a) (b) hundredths
   (c) thousandths tenths (d) thousandths
   (e) hundredths
4. (a) (b) thousandths
   (c) ones (d) Tens
   (e) tenths

Lesson 3: Comparing and ordering decimal numbers using number cards

Note: This is a practical activity. As teacher, refer to the Mathematics kits, practical activities and experiments user guide for P4-P6 **Practical activity 8;** page 111, 112, 113, and 114. Facilitate and engage leaners to do the practical activity on Comparing and ordering decimal numbers using number cards to achieve learning objectives.

a) Learning objectives (formulated)
To use number cards to compare decimal numbers

b) Teaching resources
Number cards

c) Learning activities

Lesson 4: Comparing decimal numbers

a) Learning objectives (formulated)

- Compare 2 or more decimal numbers using >, < or =.

b) Teaching resources

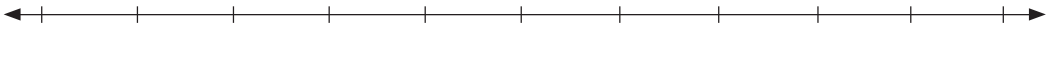
- Manila cards, scissors, markers, pencils and masking tape

c) Learning activities

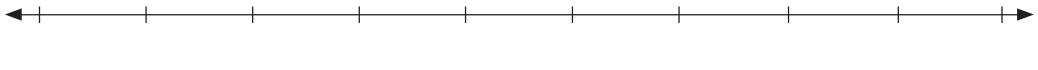
1. Introduce the lesson using Activity 5.5.
2. Let learners discuss their findings.
3. Discuss Example 5.2 a, b and c from the Pupil's Book.
4. Let learners explain their findings from the number line to wind up the lesson.
5. Have learners do questions 1 and 2 of Practice Activity 5.3.
6. Assess their progress and assist those with learning difficulties.
7. Give assignment, Practice Activity 5.3 questions 3 and 4.

Expected Answers for Practice Activity 5.3

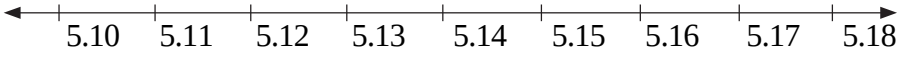
1. (a)



(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 g = 0.23 kg (b) 25 g = 0.25 kg
   (c) 0.25 kg > 0.23 kg; eggs had smaller mass
6. (a) The farmer recorded the highest amount of milk on Wednesday
   (b) 0.23 h*l*, 0.25 h*l*, 0.30 h*l*, 0.34 h*l*

Lesson 5: Ordering decimal numbers

Note: Guidance to lesson 5 in the table above is given in this lesson. As a teacher you may refer to this lesson and facilitate learners, in two lessons, to do as many activities as possible on ordering decimal numbers. With reference to SB 5.3 it is given as one lesson of comparing and ordering decimal numbers. As teacher, support and guide the students in 2 different lessons to achieve the Key unit competences.

a) **Learning objectives (formulated**
   - To order 3 or more decimal numbers in a given order using number cards

b) Teaching resources

Number cards

c) Learning activities

Lesson 6: Conversion of fractions to decimals

a) Learning objectives (formulated)
   - Learners will be able to explain how to divide decimal numbers.
   - Divide decimal numbers up to 3 decimal places and match fraction to decimals

b) Teaching resources

Manila paper with worked examples, a pair of scissors

c) Learning activities

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.

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) $\frac{3}{8} = 8\overline{)30}$ Therefore $\frac{3}{8} = 0.375$

$$\begin{array}{r} 0.375 \\ 8\overline{)30} \\ -24 \\ \hline 60 \\ -56 \\ \hline 40 \end{array}$$

3. Match the fractions to decimals.

	Fractions	Decimal
(a)	$\frac{8}{100}$	0.08
(b)	$\frac{8}{1000}$	0.008
(c)	$\frac{1}{10}$	0.1
(d)	$\frac{9}{10}$	0.9
(e)	$\frac{165}{100}$	1.65
(f)	$\frac{165}{1000}$	0.165

4. $1 \div 4 = \frac{1 \times 25}{4 \times 25} = \frac{25}{100} = 0.25$

Lesson 7: Conversion of decimals to fractions

a) Learning objectives (formulated)

- Learners will be able to explain how to convert a decimal to a fraction.
- Convert decimal numbers to fraction form correctly.

b) Teaching resources

Manila paper with worked examples or locally available materials e.g. empty cartons, pair of scissors

c) Learning activities

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.
   Give question 4 of Practice Activity 5.5, as an assignment.

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) $0.625 = \frac{\cancel{625}^{25^{5}}}{\cancel{1000}_{40_{8}}} = \frac{5}{8}$

   (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) $17.125 = 17\ \frac{\cancel{125}^{\cancel{5}^{1}}}{\cancel{1000}_{40_{8}}} = 17\frac{1}{8}$

4. (a) $\frac{3}{5}$ Or 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	$\frac{18}{1000}$

Lesson 8: Matching fractions to decimals

Note: Guidance to lesson 8 in the table above is given in this lesson. As a teacher you may refer to this lesson and facilitate learners, in two lessons, to do as many activities as possible on matching fractions to decimals numbers. As teacher, support and guide the students in this lesson to achieve the lesson objective.

a) Learning objectives (formulated)

- Learners will be able to match fractions to decimals properly.

b) Teaching resources

c) Learning activities

Lesson 9: Multiplication of decimal fractions

a) Learning objectives (formulated)

- Learners will explain how to multiply decimal numbers up to 3 decimal places
- Multiply decimals numbers up to 3 decimals places correctly.

b) Teaching resources

- Manila paper with worked examples, Knife, orange

c) Learning activities

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.

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

Lesson 10: Division of decimal fractions

a) Learning objectives

- Learners will be able to explain division of decimal numbers up to 3 decimal places.
- Divide decimal numbers up to 3 decimal places.

b) Teaching resources

Manila paper with worked examples

c) Learning activities

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

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) $\frac{6.4 \times 10}{1.6 \times 10} = \frac{64}{16} = 4$

(d) $\frac{4 \times 100}{0.02 \times 100} = \frac{400}{2} = 200$

(e) $\frac{1.792 \times 1\,000}{0.07 \times 1\,000} = \frac{1792}{70} = 25.6$

(f) $\frac{2.4 \times 100}{0.08 \times 100} = \frac{240}{8} = 30$

2. (a) $\frac{12.22 \times 100}{26 \times 100} = \frac{1222}{2600} = 0.47$

(b) $\frac{8.648 \times 1000}{0.23 \times 1000} = \frac{8648}{230} = 37.6$

(c) $\frac{0.13 \times 100}{0.05 \times 100} = \frac{13}{5} = 2.6$

3. $\frac{540 \times 10}{3.6 \times 10} = \frac{5400}{36} = 150$ dresses

4. $\frac{525 \times 100}{0.25 \times 100} = \frac{52\,500}{25} = 2\,100$ poles

5. $\frac{1}{4} \div 5 = \frac{1}{4} \times \frac{1}{5} = 0.05$

Lesson 11: Mixed operations for multiplication and division

a) Learning objectives

- Learners will be able to explain how to multiply and divide decimal numbers
- Multiply or divide decimal numbers up to 3 decimal place

b) Teaching resources

A chart showing worked examples

c) Learning activities

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.

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)

$\frac{0.2 \times 100}{0.04 \times 100}$ $\frac{2 \times 10}{4} = \frac{\overset{5}{\cancel{20}}}{\underset{1}{\cancel{4}}}$ (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) $\frac{0.4 \times 0.2}{0.8} = \frac{0.08}{0.8} = \frac{\overset{1}{\cancel{0.08}}}{\underset{1}{\cancel{0.8}}} = 0.1$ (b) $\frac{0.5 \times 0.2}{0.4} = \frac{0.1 \times 10}{0.4 \times 10} = \frac{1}{4}$ or 0.25

(c) $\frac{0.04 \times 0.2 \times 10}{0.4 \times 10} = \frac{\overset{0.02}{\cancel{0.04}} \times \overset{1}{\cancel{2}}}{\underset{1}{\cancel{2}}} = 0.02$ (d) $\frac{5 \times 1.6}{0.08 \times 10} = \frac{5 \times 16}{0.8} = \frac{80}{0.8} = 100$

(e) $\frac{29.14 \times 9.2 \times 10}{0.2 \times 10} = \frac{29.14 \times \overset{46}{\cancel{92}}}{\underset{1}{\cancel{2}}} = 1\,340.44$

2. (a) $\frac{1.2 \times 1.2 \times 10}{1.2 \times 10} = \frac{1.2 \times \overset{1}{\cancel{12}}}{\underset{1}{\cancel{12}}} = 1.2$ (b) $\frac{4 \times 0.4 \times 10}{0.16 \times 10} = \frac{4 \times 4}{1.6} = \frac{16}{1.6} = 10$

(c) $\frac{0.3 \times 0.03 \times 100}{0.009 \times 100} = \frac{0.3 \times 3}{0.9} = \frac{0.9}{0.9} = 1$

Lesson 12: Problems involving multiplication and division of decimals

Note: Guidance lesson 12 in the table above is given in this lesson. As a teacher you may refer to this lesson and facilitate learners, in 2 different lessons, to do as many problems involving multiplication and division of decimals as possible in order to achieve the lesson objectives. Some examples are given in the learning activities below.

Learning objectives

- Explain how to multiply and divide decimal numbers
- Multiply or divide decimal numbers up to 3 decimal place

a) Teaching resources

b) Learning activities

Worked examples of problems involving multiplication and division of decimals:

1. Problems involving multiplication of decimals

In the action of helping refugees each has given 0.25 of a bar of soap. How manybars of soap were served if all refuges are 1000 people?

Solution:

Ask learners to read the question and through a discussion help them to understand that, if a piece of 0.25 of soap each is given to each person. Also learners need to understand that 0.25 is just a piece from a complete bar of soap. Then they have to multiply 0.25 by 1000 people.

Therefore, 0.25 x 1000

= 250.00

= **250 bars of soap were served**

2. Problems involving division of decimals

Bigirimana is a tailor. He has a piece of cloth 16m long and he cuts it into small pieces of 0.4 m. Calculate the number of equal pieces Bigirimana will get from the cloth.

Solution:

Ask learners to read the question and through a discussion help them to understand that, if pieces of 0.4m each are cut from the length of 16m, then they have to divide 16m by 0.4m.

Hence, number of pieces will

$= 16m \div 0.4m$

$= 16m \div \frac{4}{10}$

$= 16m \times \frac{10}{4}$

$= \frac{16\ X\ 10}{4}$

$= \frac{160}{4}$

= 40 pieces of cloth

3. Problems involving division of decimals.

Chantal sold 80 kg of the sugar she had.

This was just 0.8 of the full sack of sugar. How many kg were in the full sack?

Solution

Ask learners to read the question and through a discussion help them to understand that, if 0.8 of the full sack is 80 kg, then they have to divide 80 by 0.8.

Therefore, 1 full sack = $80 \div 0.8$

$= 80 \div \frac{8}{10}$

$= 80 \times \frac{10}{8}$

$= \frac{80\ X\ 10}{8}$

$= \frac{800}{8}$

= 100 kg full

5.5 Additional information for the teacher

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.

5.6 End unit assessment

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. $\frac{3 \times 10}{0.3 \times 10} = \frac{\cancel{30}^{10}}{\cancel{3}_{1}} = 10$

3. Hundredths

4. $2\overline{)10} = 0.5$ (10 − 10 = 0)

5. $\frac{\cancel{236}}{\cancel{1000}} = \frac{\cancel{118}}{\cancel{500}} = \frac{59}{250}$

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. $2\overline{)20} = 0.2$ (20 − 20 = 0)

10. $\frac{1.44 \times 10}{1.2 \times 10} = \frac{\overset{12}{\cancel{14.4}}}{\underset{1}{\cancel{12}}} = 1.2$

11. $\frac{\cancel{2}^{1}}{\cancel{20}_{10}} = \frac{1}{10}$

12. $\frac{0.2 \times 0.5 \times 100}{0.01 \times 100} = \frac{2 \times 5}{1} = 10$

13. $\frac{5.2 \times 0.2 \times \cancel{100}}{0.05 \times \cancel{100}} = \frac{52 \times 2}{5} = \frac{104}{5} = 20.8$

14. Thousandths

15. Fifty two and sixty seven thousandths.

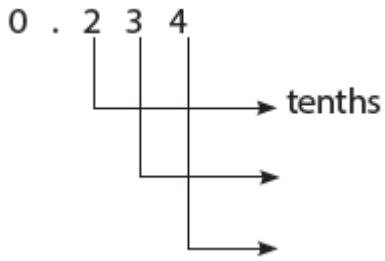
5.7 Additional activities

Remedial Activities:

1. Using the diagram below name the decimal fraction given.

$\frac{3}{10} =$ ___

2. Change 0.01 to a fraction.
3. Write the place value of the following numbers



4. Use >,< or = to fill in blank spaces. Discuss your answers.

(a) 0.002 —— 0.004

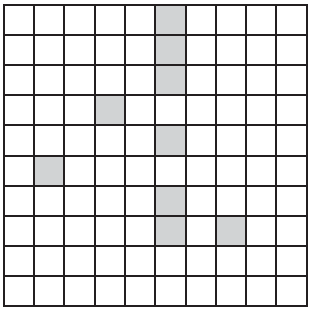
(b) 0.003 —— 0.001

5. Write in figures. Explain your steps.

Two hundred and sixty seven thousandths.

Consolidation activities:

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

Extended activities:

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 95/100 in Mathematics and 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 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)

$$\begin{array}{r} 0.95 \\ 100\overline{)950} \\ -900 \\ \hline 500 \\ -500 \\ \hline \cdots \end{array}$$

Mathematics – 0.95,

$$\begin{array}{r} 0.87 \\ 100\overline{)870} \\ -800 \\ \hline 700 \\ -700 \\ \hline \cdots \end{array}$$

English – 0.87

Place value of 5 is hundredths, 8 is tenths.

(b)

$$\begin{array}{r} 0.9 \\ 100\overline{)900} \\ -900 \\ \hline \cdots \end{array}$$

$0.90 \times 3 = 2.70$. This is 270 marks.

(c) (i) $\frac{95}{100} + \frac{87}{100} + \frac{90}{100} \times 3 = \frac{452}{100} = 4.52$ or 452 marks

(ii) $\frac{452}{100} \div 5 = \frac{4.52}{5} = 0.904$. This means 90.4 marks out of 100.

Unit 6: **Application of direct proportions**

6.1 Key unit competence: Apply direct proportions in a practical context.

6.2 Prerequisite:

Pupils will easily learn this unit, if they have a good background on the fractions, decimal fractions and simplifying fractions studied in the previous unit.

6.3 Cross-cutting issues to be addressed

- 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 Question1
- 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.

6.4 Introductory activity and guidance

A. Introductory activity for unit 6

In real life people compare or share quantities, or things proportionally based on different reasons. In Mathematics the Concept of direct proportion states that:

- ✓ As one quantity increases, the second quantity also increases; on the other hand,
- ✓ As one quantity decreases, the second quantity decreases; hence the concept of direct proportion

1. Give examples where the concept of direct proportion is used in real life.
2. On a scale drawing, 1 cm represents 5 km of road. What length of road is represented by 5 cm?

B: Guidance on introductory activity for unit 6

Emphasize the definition of direct proportion to learners and also when we get to have direct proportionality.

Suggested answers for introductory activity in unit 6:

1. Two quantities are said to be 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.
2. If on a scale drawing 1 cm represents 5km of the road, then 5cm represents 25km of the road.

6.5 List of lessons/sub-heading

#	Lesson title	Learning objectives	Number of periods 16

0.	Introductory activity 6	Prepare learners for the concepts of direct proportion	1
1.	Concept of direct proportion	▪ Explain the concept of direct proportions ▪ Apply the knowledge of direct proportions in a practical context	2
2.	Ratios and direct proportion	▪ Explain how to work out problems involving direct proportions ▪ Calculate numbers involving direct proportions	2
3.	Problems involving ratios	Solve problem involving Ratios	2
4.	Constant of proportionality and the application of direct proportion in real life	State constant of proportionality and apply direct proportion in real life	2
5.	Scale drawing and direct proportion	State scale drawing and solve mathematical problem involving direct proportions in real life	3
6.	Problems involving direct proportion	▪ Explain how to work out problems involving direct proportions ▪ Calculate numbers involving direct proportions	2
7.	**End unit assessment**	To assess and verify if competences such as application of direct proportions in a practical context are well developed.	2

Guidance on different lessons outlined above

Lesson 1: Concept of direct proportion

a) Learning objectives

- Learners will be able to explain the concept of direct proportions
- Apply the knowledge of direct proportions in a practical context.

b) Teaching resources

Counters (same size), 1 litre bottle, $\frac{1}{2}$ bottle, a cup and a bucket

c) Learning activities

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.

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. $1\,500l \times 6 = 9\,000\,l$
4. 2 minutes x 7 = 14 minutes
5. (20 x 10) years = 200 years

Lesson 2: Ratios and direct proportion

a) Learning objectives

- Learners will be able to explain how to work out problems involving direct proportions
- Calculate numbers involving direct proportions

b) Teaching resources

Counters (same size)

c) Learning activities

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.

Expected answers for Practice Activity 6.2

1. (a) $8:24 = \frac{\cancel{8}^{1}}{\cancel{24}_{3}} = 1:3$ (b) $21:24 = \frac{\cancel{21}^{1}}{\cancel{42}_{2}} = 1:2$

(c) $9:27 = \frac{\cancel{9}^{1}}{\cancel{27}_{3}} = 1:3$ (d) $16:12 = \frac{\cancel{16}^{4}}{\cancel{12}_{3}} = 4:3$

(e) $18:8 = \frac{\cancel{18}^{9}}{\cancel{8}_{4}} = 9:4$ (f) $24:16 = \frac{\cancel{24}^{3}}{\cancel{16}_{2}} = 3:2$

(g) $8:50 = \frac{\cancel{8}^{4}}{\cancel{50}_{25}} = 4:25$

2. $28:64 = \frac{\cancel{28}^{7}}{\cancel{64}_{16}} = 7:16$ 3. $420:560 = \frac{\cancel{420}^{3}}{\cancel{560}_{4}} = 3:4$

4. $120:360 = \frac{\cancel{120}^{1}}{\cancel{360}_{3}} = 1:3$ 5. $120:360 = \frac{\cancel{120}^{1}}{\cancel{360}_{3}} = 1:3$

6. $3:5 = 3 + 5 = 8$ $\text{Rice} = \frac{5}{\cancel{8}_{1}} \times \cancel{96}^{12}$ Rice = 60 kg

$\text{Maize} = \frac{3}{\cancel{8}_{1}} \times \cancel{96}^{12}$ Maize = 36 kg

7. $56 - 14 = 42$ $14:42$ $\frac{\cancel{14}^{1}}{\cancel{42}_{3}} = 1:3$ 8. $900:300$ $\frac{\cancel{900}^{3}}{\cancel{300}_{1}} = 3:1$

9. (a) and (b) – same responses (c) different responses

Lesson 3: Ratios and direct proportion

Note: This is a practical activity. As teacher, refer to the Mathematics kits, practical activities and experiments user guide for P4-P6 **Practical activity 9;** page 115, 116, 117. Facilitate and engage leaners to do the practical activity on Ratios and direct proportion to achieve learning objectives.

a) Learning objectives

Model two quantities in direct proportion using the constant of proportionality

b) Teaching resources

c) Learning activities

Lesson 4: Constant of proportionality and the application of direct proportion in real life and Lesson5: Scale drawing and Direct proportion.

Note: Guidance to lesson 4 and 5 in the table above is given in this lesson. As a teacher you may refer to the lessons and facilitate learners, in two different lessons to do as many activities as possible on Constant of proportionality and the application of direct proportion in real life and Scale drawing and direct proportion. As teacher, support and guide the students in this lesson to achieve the lesson objective.

a) Learning objectives (formulated)

- State constant of proportionality and apply direct proportion in real life and scale drawing. Solve mathematical problem involving direct proportions

b) Teaching resources

- Chart showing worked examples

c) Learning activities

Lesson 6: Problems involving direct proportion

a) Learning objectives (formulated)

- Learners will be able to state where to apply direct proportions in day to day life
- Solve mathematical problem involving direct proportions

b) Teaching resources

A chart

c) Learning activities

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.

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 $\frac{25-9}{5}g = 192$

$16\,g = 5 \times 192$ or $\frac{5 \times 192}{16} = 60$

g = 60 girls

$b = \frac{3}{5}g = \frac{3}{5} \times 60 = 36$ boys.

Expected answers for Practice Activity 6.3

1. $\frac{480\text{ g}}{8} = 60\text{ g}$
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. $\frac{\cancel{30}^{3}}{\cancel{10}_{1}} = 9$ 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 $\overset{25}{\cancel{175}} \times \frac{3}{\cancel{7}_1}$ (7 is total parts or 3 + 4) = 25 x 3 = 75 children.

Number of adults is $\overset{25}{\cancel{175}} \times \frac{4}{\cancel{7}_1}$ = 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 $\frac{3}{(2+3)} \times 100 = \frac{3}{5} \times 100 = 60$ women.

(ii) Number of men = (100 – 60)men or $\frac{2}{5} \times 100$ 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; $(170+b)\times 8=7\times(180+g)$
$1\,360+8b=1\,260+7g$ (but $b=\frac{5}{6}g$ from above).
$1\,360+8\times\frac{5}{6}g=1\,260+7g-\frac{40}{6}g=\frac{1}{3}g$.
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.

6.6 Additional information for the teacher

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.

6.7 End unit assessment

Expected Answers for Revision Activity 6

1. 60, 90, 120, 6, 210
2. $5\times 30=150$
3. $\overset{1}{\cancel{20}}:\overset{5}{\cancel{100}}=1:5$
4. $\frac{2}{\cancel{8}_{1}}\times\overset{8}{\cancel{64}}=16$
5. $10\times 5=50$ glasses
6. $40\times 2=80\times 7=560$ min $\div 60=9$ h 20 min
7. $120:240=1:2$
8. $\frac{\overset{10}{\cancel{30}}}{\cancel{90}_{3}}\times\overset{1}{\cancel{30}}=10$ km
9. $4\times 60=240$ km
10. $\frac{160\text{ min}}{40\text{ min}}=4$ compositions

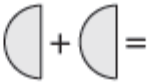
6.8 Additional activities

Remedial Activities:

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 activities:

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.

Extended activities:

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. $\cancel{9}^{1}:\cancel{27}^{3} = 1:3$ 4. 200 kg ÷ 5 = 40 kg

Extension Activity

1. $\frac{1}{4} \times 3 = \frac{3}{4}$, $\frac{1}{4} \times 4 = 1$, $\frac{1}{4} \times 5 = 1\frac{1}{4}$ and $2 \div \frac{1}{4} = 8$

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. $\frac{\overset{4}{\cancel{64}}}{\underset{1}{\cancel{16}}} \times 4 = 4 \times 4 = 16$

4. m : w = 3 : 2 (120 workers)

   (a) $\frac{\overset{24}{\cancel{120}}}{\underset{1}{\cancel{5}}} \times 2 = 48$ (b) $\frac{\overset{24}{\cancel{120}}}{\underset{1}{\cancel{5}}} \times 3 = 72$

Unit 7: **Solving problems involving measurements of length, capacity and mass**

7.1.Key unit competence: Solve problems involving measurements of length, capacity, and mass and calculating number of intervals.

7.2.Prerequisite: Pupils will easily learn this unit, if they have a good background on the standard units for measuring length, capacity and mass which they were introduced to in P4. In this unit pupils are introduced to find the concept of number of intervals between objects on open and closed lines. Develop this to allow pupils discover why we add 1 to get the number of poles, trees or flowers using examples on an open line in some cases.

7.3.Cross-cutting issues to be addressed

- 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.

7.4.Introductory activity and guidance

A. Introductory activity for unit 7

In daily life, people use different tools like metre ruler, tape measure to measure the length, width and height of a cuboid or a cube, diameter of a cylinder, length of land, house, furniture and others. They also use containers like bottles, jerry cans, buckets, cylinders etc to carry water or other liquids and also to determine the capacity of the liquid in the container. People use different types of weighing balances to measure the mass of objects. .

(a) What do you think happens when equal number of objects are placed at the same distance apart on an open line and a closed line?

(b) Did you ever try to think about the relationship between the number of objects on any given line and the interval distance?
(c) Where do you think the concept of interval distance can be applied?

B: Guidance on introductory activity for unit 7

In this unit, activities are done practically to develop the targeted skills. Therefore, emphasise the following to the learners:

I. For length, the conversion of units of length (revision). Through practical activity, define the terms like; open line, closed line, interval distance and poles/objects on a given line.
   Note: The interval distance has to be constant (same).
II. For capacity, review the conversion of units of capacity (revision). Solving problems involving capacity.
III. For mass, review the conversion of units of mass (revision). Solving problems involving mass.

Suggested answers for introductory activity in unit 7:

(a) On an open line, number of intervals will be lees by 1 from number of objects on that line. On a closed line the number of intervals is equal to the number of objects on that line.
(b) The relationship between the number of objects on any given line and the interval distance:
   I. Open line, **number of intervals= Number of objects -1**
      or **Interval distance** = $\frac{\textit{Total distance}}{\textit{Number of intervals}}$
   II. On a closed line, **number of objects = number of intervals**.
(c) i. This can be applied in Agriculture when planting plants or crops in lines in a given interval distance.
   ii. When erecting electricity poles along the road.

7.5.List of lessons/sub-heading

#	Lesson title	Learning objectives	Number of periods 8
1.	Introductory activity 7	Prepare and motivate learners about the use of concepts of length, capacity and mass	1
1.	Revision on problems on length, capacity and mass	Solve problems on length, capacity and mass.	1
2.	Number of intervals (fixed distance) between objects on an open **line**	▪ Calculate the number of intervals. ▪ Solving problems of length involving intervals	2
3.	Finding the number of intervals on a closed line	▪ Distinguish between the number of intervals in either open line or closed line given the same number of posts	2

		▪ Calculate the number of intervals. ▪ Solving problems of length involving intervals.	
4.	Interpreting decimal representations up to 3 decimal places	Interpret decimal representations up to 3 decimal places	1
5.	**End unit assessment**	To assess learners in skills of solving problems involving measurements of length, capacity, and mass and calculating number of intervals have been well developed.	1

Guidance on different lessons outlined above

Lesson1: Revision on problems on length, capacity and mass

a) **Learning objectives**

- Learners will be able to have knowledge of solving problems on length, capacity and mass
- Solve problems on length, capacity and mass.

b) **Teaching resources**

Text books.

c) **Learning activities**

2. Have learners work in groups of five. Let them discuss and solve revision problems from Revision work 7.
3. Allow different groups to present their findings as you assess and correct their responses

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*	dal	*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 dal = 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 = $\frac{200}{100}$ = 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 dl = 1 l. So, 30 dl = $\frac{30}{10}$ = 3 l

(b) 10 dl = 1 l. So, 105 dl = $\frac{105}{10}$ = 10.5 l

(c) 1 000 ml = 1 l. So, 1 050 ml = $\frac{1\,050}{1\,000}$ = 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 = $\frac{27\,000}{90}$ (300, 1) = 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.

Lesson 2: Number of intervals (fixed distance) between objects on an open line

Note: This is a practical activity. As teacher, refer to the Mathematics kits, practical activities and experiments user guide for P4-P6 **Practical activity 10;** page 118, 119, 120. Facilitate and engage leaners to do the practical activity on finding the number of intervals on an open line to achieve learning objectives. After this practical activity done satisfactorily, introduce the lesson to learners to activity 7.1 in learning activities in **(c)** below.

a) Learning objectives

- To find the number of intervals on an open line.
- Learners will be able to distinguish between the types of lines.
- Calculate the number of intervals.
- Solving problems of length involving intervals

b) Teaching resources

Meter ruler, Stick, 10 empty water bottles or poles.

c) Learning activities

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.

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. $2 \times 1\,000\text{ m} = 2\,000\text{ m}$. Number of trees $= \frac{\text{Distance}}{\text{Interval}} = \frac{2\,000}{2} = 1\,000$ trees
2. $100\text{ dm} = 1\text{ dam}$. So, $5 \times 100 = 500\text{ dm}$. Number of trees $= \frac{\text{Distance}}{\text{Interval}} + 1 = \frac{500}{5} + 1 = 101$ trees on one side. On both sides, we have $101 \times 2 = 202$ trees.
3. $16 \times 1\,000\text{ m} = 16\,000\text{ m}$.
   Number of poles $= \frac{\text{Distance}}{\text{Interval}} + 1 = \frac{16\,000}{10} + 1 = 1\,601$ poles
4. (a) $\frac{20\text{ m}}{0.5\text{ m}} - 1 = \frac{200}{5} - 1 = 39$ plants (b) $39 \times 10 = 390$ plants
5. Number of intervals $20 - 1 = 19$. Each interval is 2 m. Hence, length of terrace is $19 \times 2\text{ m} = 38\text{ m}$
6. Internal length $= \frac{\text{Distance}}{\text{Number of intervals}}$. Number of intervals $= 21 - 1 = 20$ intervals.
   Hence interval length $= \frac{30\text{ m}}{20} = 1.5\text{ m}$
7. Distance $= 3 \times 100\,000\text{ cm} = 300\,000\text{ cm}$.
   Number of flowers $= \left(\frac{\text{Distance}}{\text{Interval}} + 1\right) \times 4 = \left(\frac{300\,000}{200} + 1\right) \times 4$
   $= (1\,500 + 1) \times 4 = 6\,004$

Lesson 3: Finding the number of intervals on a closed line

Note: This is a practical activity. As teacher, refer to the Mathematics kits, practical activities and experiments user guide for P4-P6 **Practical activity 11;** page 121, 122, 123. Facilitate and engage leaners to do the practical activity on finding the number of intervals on a closed line to achieve learning objectives. After this practical activity done satisfactorily, introduce the lesson to learners to activity 7.2 in learning activities in (**c)** below.

a) Learning objectives (formulated)

- To find the number of intervals on a closed line
- Learners will be able to distinguish between the number of intervals in either open line or closed line given the same number of posts
- Calculate the number of intervals.
- Solving problems of length involving intervals.

b) Teaching resources

Meter ruler, Stick, 10 empty water bottles or poles.

c) Learning activities

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.

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 = $\frac{\text{Distance}}{\text{Number of intervals}} = \frac{\overset{0.2}{\cancel{4.2}} \times 1\,000\,\text{m}}{\cancel{210}} = 20$ m
5. Distance = Number of poles x interval length = $50 \overset{1}{\times} 2.5$ m = 125 m

   (125 ÷ 100)dam = 12.5 dam.
6. $\frac{402}{6}$ = 67 trees

Lesson 4: Interpreting decimal representations up to 3 decimal places

Note: Guidance to lesson 4 in the table above is given in this lesson. As a teacher you may refer to the lesson and facilitate learners in lesson to do as many activities as possible on selecting appropriate measures and units when solving problems and Interpreting decimal

representations up to 3 decimal places. As teacher, support and guide the students in this lesson to achieve the lesson objective.

a) Learning objectives

Interpret decimal representations up to 3 decimal places

b) Teaching resources

c) Learning activities

7.6.Additional information for the teacher

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.

7.7.End unit assessment

Expected answers for Revision Activity 7

1. (a) Closed (b) Open

   Accept reasonable explanations.

2. (i) $\frac{25}{1\,000} = 0.025$ hm (ii) $\frac{300}{100\,000} = 0.03$ dam

   (iii) 3.45 x 1 000 = 3 450 kg (iv) $\frac{30}{10} = 3\ l$

3. 1 000 cm = 1 dam. So, 80 x 1 000 = 80 000

   $\frac{80\,000}{80} + 1 = 1\,001$ strides

4. 720

5. 12 dam x 10 = 120 m. Interval length = $\frac{120\text{ m}}{40}$ = 3 metres

6. 10 m = 1 dam

   40 x 10 = 40 m

   Distance = (80 + 80 + 40 + 40)m = 240 m

   Number of posts = $\frac{240\text{ m}}{3}$ = 80 posts.

7. Distance = interval length x number of intervals = 5 m x (7 - 1) = 30 m
8. Distance = Interval length x number of intervals = 4 m x 75 = 280 m

7.8.Additional activities

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 activities:

1. Use the table below to convert the following units. Discuss your findings.

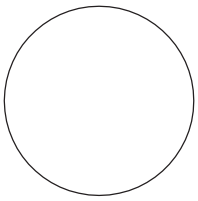
km	hm	dam	m	dm	cm	mm
1	0	0	0	0	0	0

(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

Extended activities:

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. $5 \times 100 = 500\ dm = \frac{500}{5} + 1 = 101$ 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 $= \frac{10\,000}{10} + 1 = 1\,001$ poles
4. $\frac{22}{2} = 11$ 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.

   $\text{Interval length} = \frac{\text{Distance}}{\text{Number of intervals}} = \frac{30\ m}{30} = 1\ m$
4. Perimeter = 100 m x 4 = 400 m. Number of poles $= \frac{400}{2} = 200$ poles
5. 10 m = 1 dam

   6 x 10 = 60 m

   Distance = (90 + 90 + 60 + 60)m = 300 m

   Posts $= \frac{300}{3} = 100$ posts.

Unit 8: Solving problems involving time intervals

8.1 Key unit competence: Solve real life problems that involve finding time intervals and conversion of units.

8.2 Prerequisite

Pupils will easily learn this unit, if they have a good background on the concept of hours, minutes and seconds which they studied 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

8.3 Cross-cutting issues to be addressed

- 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.

8.4 Introductory activity and guidance

A. Introductory activity for unit 8

In real life every day, we do different time of the day. For example we go to school in morning, we go back home in afternoon or evening. In class students attend lessons for a period of time. This time can be expressed in hours, minutes. How long the students stay in a class depend on the timetable. For example in the morning lessons start at 7:20 am to 9: 20 am. From 9:20 am to 9:40 am students are in break time.

(a) How many hours do the students attend lessons in the morning from 7:20 am to 9: 20 am? How many minutes are these?

(b) If students go for break time from 9:20am and go back to class at 9:40am:

(i) How many minutes do they use in break time?

(ii) How many seconds do they use in break time?

B: Guidance on introductory activity for unit 8

In this unit, guide students that in life time is very important because it is a quantity used in all ways using different units like seconds, minutes, hours, days, weeks etc

Note: (i) When changing a bigger unit to a smaller unit you multiply.

(iii) When changing a smaller unit to a bigger unit, you divide.

Suggested answers for introductory activity in unit 8.

(a) Students attend lessons from 7:20am to 9:20am for 2hours. 120minutes.

(b) i. From 9:20 am to 9:40am there are 20minutes. Students use 20minutes in break time.

ii. 20 minutes = 1200seconds. Students use 1200 seconds in break time.

8.5 List of lessons/sub-heading

#	Lesson title	Learning objectives	Number of periods 24
0.	Introductory activity on the time measurements	Prepare learners how to calculate duration, convert different units of time.	1
1.	Converting hours into minutes	▪ Explain the various units of time. ▪ State the units used in time. ▪ Convert measurements of time.	2
2.	Converting minutes into hours	▪ Explain the various units of time ▪ State the units used in time measurement ▪ Convert measurements of time.	2
3.	Converting hours into seconds	▪ State the various units of time. ▪ State the units used in time measurement. ▪ Convert the measurements of time.	2
4.	Changing days into hours	▪ Describe how to change days to hours. ▪ Convert days into hours	3
5.	Changing hours into days	▪ Describe how to solve mathematical problems. ▪ Convert hours to days.	3
6.	Finding time intervals: Using clock face, watch and calendar to find time intervals or time taken by an event	▪ Explain the meaning of time intervals ▪ Calculate the duration of a time interval.	5
7.	Real life problems that involve addition of time	▪ Describe how to solve mathematical problems involving	2

		time. ▪ Solve problems involving addition of time.	
8.	Real life problems that involve subtraction of time	▪ Describe how to solve mathematical problems involving time. ▪ Solve problems involving subtraction of time.	2
9.	**End unit assessment**	To assess if skills of solving real life problems that are related to finding time intervals and conversion of units have been developed.	2

Guidance on different lessons outlined above

Note: This unit requires practical activities at every beginning of the lesson. As teacher, refer to the Mathematics kits, practical activities and experiments user guide for P4-P6 **Practical activity 12;** page 124, 125 and 126. Facilitate and engage leaners to do the practical activity according the lesson to be taught and achieve learning objectives. After this practical activity done satisfactorily, introduce the lesson to learners based on the learning activities in different lessons below.

Lesson 1: Converting hours into minutes

a) Learning objectives

- Explain the various units of time.
- State the units used in time.
- Convert measurements of time.

b) Teaching resources

- A real wall clock or an improvised clock face

c) Learning activities

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.

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 + ($\frac{1}{2}$ × 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 = $\frac{1}{4}$ × 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 = $\frac{1}{2}$ × 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

Lesson 2: Converting minutes into hours

a) Learning objectives

- Explain the various units of time
- State the units used in time measurement
- Convert measurements of time.

b) Teaching resources

- A real clock face or an improvised clock face

c) Learning activities

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.

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 min $= \frac{425 \times 1}{60} = \frac{85}{12} = 7\frac{1}{12}$

7 h + $(\frac{1}{12} \times 60)$ = 7 h 15 min

5. 1 h = 60 min

725 min $= \frac{725 \times 1}{60} = \frac{145}{12} = 12\frac{1}{12}$

$\frac{1}{12} \times 60$ = 5 min

= 12 h 5 min

Lesson 3: Converting hours into seconds

a) Learning objectives

- State the various units of time.
- State the units used in time measurement.
- Convert the measurements of time.

b) Teaching resources

- A real wall clock or an improvised clock face

c) Learning activities

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.

Expected answers for Practice Activity 8.3

1. (a) $1\text{ h} = 60\text{ min}$

$1\text{ min} = 60\text{ s}$

- $1\text{ h} = (60 \times 60)\text{s} = 3\,600\text{ s}$

So $\frac{1}{2}\text{ h} = (\frac{1}{2} \times 3\,600)\text{s} = 1\,800\text{ s}$

Hence, $1\frac{1}{2}\text{ h} = 3\,600\text{ s} + 1\,800\text{ s}$

$= 5\,400\text{ s}$

(b) $1\text{ h} = 3\,600\text{ s}$

$5\text{ h} = 5 \times 3\,600\text{ s} = 18\,000\text{ s}$

(c) $1\text{ h} = 3\,600\text{ s}$

$10\text{ h} = 10 \times 3\,600\text{ s} = 36\,000\text{ s}$

$\frac{1}{4}\text{ h} = \frac{1}{4} \times 3\,600\text{ s} = 900\text{ s}$

Thus, $10\frac{1}{4}\text{ h} = (36\,000 + 900)\text{ s} = 36\,900\text{ s}$

2. (a) $1\text{ h} = 3\,600\text{ s}$

So, $3\text{ h} = 3 \times 3\,600\text{ s}$

$= 10\,800\text{ s}$

(b) $1\text{ h} = 3\,600\text{ s}$

So, $12\text{ h} = 12 \times 3\,600\text{ s}$

$= 43\,200\text{ s}$

(c) $1\text{ h} = 3\,600\text{ s}$

$2\frac{3}{4}\text{ h} = \_\_\_\_\text{ s}$

$2 \times 3\,600\text{ s} = 7\,200\text{ s}$

$\frac{3}{4} \times 3\,600\text{ s} = 2\,700\text{ s}$

Thus, $2\frac{3}{4}\text{ h} = (7\,200 + 2\,700)\text{ s} = 9\,900\text{ s}$

3. $1\text{ h} = 3\,600\text{ s}$

$10\text{ h} = \_\_\_\_\text{ s}$

$10 \times 3\,600\text{ s} = 36\,000\text{ s}$

Adding 30 s, we have;

$36\,000\text{ s} + 30\text{ s} = 36\,030\text{ s}$

4. $6 \times 3\,600\text{ s} = 21\,600\text{ s}$.

Adding 57 s, we have;

$21\,600\text{ s} + 57\text{ s} = 21\,657\text{ s}$

5. $1\text{ h} = 3\,600\text{ s}$

$2\text{ h} = 2 \times 3\,600 = 7\,200\text{ s}$

6. $3\frac{1}{2}\text{ h}$

$3 \times 3\,600\text{ s} = 10\,800\text{ s}$

$\frac{1}{2} \times 3\,600\text{ s} = 1\,800\text{ s}$

Thus, $3\frac{1}{2}\text{ h} = 10\,800\text{ s} + 1\,800\text{ s} = 12\,600\text{ s}$

Lesson 4: Changing days into hours

a) Learning objectives

- Learners will be able to describe how to change days to hours.
- Convert days into hours

b) Teaching resources

- A real wall clock or an improvised clock face and a calendar.

c) Learning activities

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.

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
$\frac{1}{2} \times 24 = 12$ 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
$\frac{1}{2} \times 24 = 12$ 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
$\frac{1}{2} \times 24 = 12$ 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

Lesson 5: Changing hours into days

a) Learning objectives

- Learners will be able to describe how to solve mathematical problems.

Convert hours to days.

b) Teaching resources

- A real wall clock or an improvised clock face and a calendar.

c) Learning activities

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.

Expected answers for Practice Activity 8.5

1. (a) 1 day = h

$\_\_\_\_ = 120$ h

$\frac{120}{24}$ days = 5 days

(b) 1 day = 24 h

$\_\_\_\_ = 216$ h

$\frac{216}{24}$ days = 9 days

(c) 1 day = 24 h

$\_\_\_\_ = 720$ h

$\frac{720}{24}$ days = 30 days

(d) 1 day = 24 h

$\_\_\_\_ = 432$ h

$\left(\frac{432}{24}\right)$ days = 18 days

2. (a) 1 day = 24 h

$\_\_\_\_ = 571$ h

$$\begin{array}{r} 23 \text{ days} \\ 24 \overline{)\ 571 \text{ h}} \\ -\ 48 \text{ h} \\ \hline 91 \text{ h} \\ -\ 72 \text{ h} \\ \hline 19 \text{ h} \end{array}$$

$\left(\frac{571}{24}\right)$ = 23 days 19 h

(b) 1 day = 24 h

$\_\_\_\_ = 612$

$$\begin{array}{r} 25 \text{ days} \\ 24 \overline{)\ 612 \text{ h}} \\ -\ 48 \text{ h} \\ \hline 132 \text{ h} \\ -\ 120 \text{ h} \\ \hline 12 \text{ h} \end{array}$$

$\frac{612}{24}$ = 25 days 12 h

(c) 1 day = 24 h

$\_\_\_\_ = 520$ h

$$\begin{array}{r} 21 \text{ days} \\ 24 \overline{)\ 520 \text{ h}} \\ -\ 48 \text{ h} \\ \hline 40 \text{ h} \\ -\ 24 \text{ h} \\ \hline 16 \text{ h} \end{array}$$

$\frac{520}{24}$ = 21 days 16 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

```
      8 days
24 | 242 h
   - 24 h
     2 h
```

Hence, 242 h = 10 days 2 h

3. 24 h = 1 day

So, 312 h = (312 ÷ 24) days

```
      13 days
24 | 312 h
   - 24 h
     72 h
   - 72 h
      0
```

Hence, 312 h = 13 days

4. 24 h = 1 day

So, 249 h = (249 ÷ 24) days

```
      10 days
24 | 249 h
   - 24 h
     9 h
```

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

```
      281 days
24 | 6760 h
   - 48 h
     196 h
   - 196 h
      40 h
    - 24 h
      16 h
```

Hence, 6 760 h = 281 days 16 h

Lesson 6: Finding time intervals: Using clock face, watch and calendar to find time intervals or time taken by an event

a) Learning objectives

- Learners will be able to explain the meaning of time intervals
- Calculate the duration of a time interval.

b) Teaching resources

- Clock face, watch and calendar

c) Learning activities

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.

Expected answers for Practice Activity 8.6

Lesson 6: Finding time intervals: Using clock face, watch and calendar to find time intervals or time taken by an event

a) Learning objectives

- Learners will be able to explain the meaning of time intervals
- Calculate the duration of a time interval.

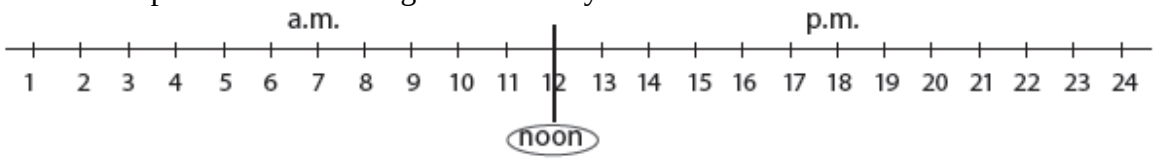
b) Teaching resources

- Clock face, watch and calendar

c) Learning activities

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.



- 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
   $1500 - 0900 = 0600 = 6$ h
   (b) $12 + 1 = 1300$ h
   1300 h $- 0400 = 0900 = 9$ h
   (c) $12 + 4 = 1600$ h
   $1600 - 0600 = 1000 = 10$ h
   (d) $12 + 6$ 1800 h
   $1800 - 0700 = 1100 = 11$ h

2. $\begin{array}{r} 10\,.\,15 \\ -\ 8\,.\,00 \\ \hline 2\,.\,00 \end{array}$ $= 2$ h

3. $\begin{array}{r} 12\,.\,45 \\ -\ 10\,.\,45 \\ \hline 2\,.\,00 \end{array}$ $= 2$ h

4. $\begin{array}{r} 3\,.\,30 \\ -\ 2\,.\,00 \\ \hline 1\,.\,30 \end{array}$ $= 1$ 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

Lesson 7: Real life problems that involve addition of time

a) Learning objectives

- Learners will be able to describe how to solve mathematical problems involving time.
- Solve problems involving addition of time.

b) Teaching resources

- A chart showing time, a wall clock, a calendar

c) Learning activities

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.

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. $11^{1}.45$ a.m
$+\ \ 1.45$
13.30
$-\ 12.00$
$01.30 = 1.30$ p.m

10. $12^{1}.45$ a.m
$+\ \ 1.15$
14.00
$-\ 12.00$
$02.00 = 2$ p.m

Lesson 8: Real life problems that involve subtraction of time

a) Learning objectives

- Learners will be able to describe how to solve mathematical problems involving time.
- Solve problems involving subtraction of time.

b) Teaching resources

- A chart showing time, a wall clock, a calendar

c) Learning activities

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.

Expected answers for Practice Activity 8.8

1. $(4 - 2)\text{ h} = 2\text{ h}$

2. $(8 - 5)\text{ h} = 3\text{ h}$

3. $(32 - 20)\text{ h} + (20 - 10)\text{ min}$
$= 12\text{ h } 10\text{ min}$

4. $(16 - 12)\text{ h} + (30 - 45)\text{ min}$
$= 3\text{ h} + (60 + 30 - 45)\text{ min}$
$= 3\text{ h } 45\text{ min}$

5. $(6 - 3)\text{ days} + (12 - 9)\text{ h}$
$= 3\text{ days } 3\text{ h}$

6. $\begin{array}{r} {}^{10}\cancel{11}^{+60}.15 \text{ a.m.} \\ -\quad 3.20 \\ \hline 7.55 \text{ a.m.} \end{array}$

7. $\begin{array}{r} {}^{6}\cancel{7}^{+60}.15 \text{ p.m.} \\ -\ 2.26 \\ \hline 4.49 \text{ p.m.} \end{array}$

8. (a) $(3 + 1)\text{ h} + 40\text{ min}$
$= 4{:}40 = 4\text{ h } 40\text{ min}$

(b) $3\text{ h} - 1\text{ h} - 40\text{ min} = 2\text{ h} - 40\text{ min}$
$= 1\text{ h } 60\text{ min} - 40\text{ min}$
$= 1\text{ h } 20\text{ min}$

9. $\begin{array}{r} 16\ 30\text{ h} \\ -\ 10\ 20\text{ h} \\ \hline 06\ 10\text{ h} \end{array} = 6.10\text{ a.m}$

10. $(18\text{ h} - 4\text{ h}) + (15\text{ min} - 38\text{ min})$
$= 14\text{ h} + (15\text{ min} - 38\text{ min})$
$= 13\text{ h} + (60 + 15 - 38)\text{ min}$
$= 13\text{ h } 37\text{ min}$

8.6 Additional information for the teacher

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.

8.7 End unit assessment

Expected answers for Revision Activity 8

1. (a) $12 + 3 = 15$
   $1500 - 0900 = 0600 = 6\text{ h}$
   (b) $12 + 1 = 13$
   $1300 - 0400 = 0900 = 9\text{ h}$
   (c) $12 + 4 = 16$
   $1600 - 1000 = 0600 = 6\text{ h}$
   (d) $12 + 3 = 15$
   $1500 - 0300 = 1200 = 12\text{ h}$
   (e) $12 + 4 = 16$
   $1600 - 0600 = 1000 = 10\text{ h}$
2. (a) $1200 - 0400 = 0800 = 8\text{ h}$ (b) $1200 - 0800 = 0400 = 4\text{ h}$
   (c) $1200 - 0600 = 0600 = 6\text{ h}$
   (d) $11 + 12 = 23$ (e) $1200 - 0700 = 0500 = 5\text{ h}$
   $2300 - 1100 = 1200 = 12\text{ h}$
3. $$\begin{array}{r} 3\text{ .}00\text{ a.m} \\ +\ 2\text{ .}00\text{ h} \\ \hline 5\text{ .}00 = \ 5.00\text{ a.m.} \end{array}$$
4. (a) $1\text{ day} = 24\text{ h}$
   $\_\_\_\_ = 168\text{ h}$
   $\frac{168}{24}\text{ days} = 7\text{ days}$
   (b) $\frac{480}{24}\text{ days} = 20\text{ days}$
   (c) $\frac{720}{24}\text{ days} = 30\text{ days}$
   (d) $\frac{285}{24}\text{ days} = 11\frac{21}{24} = 11\text{ days }21\text{ h}$

5. (a) 1 day = 24 h
5 days _____ h
5 × 24 = 120 h

(b) 12 × 24 = 288 h

(c) 1 h = 60 min
_____ = 180 min
$\frac{180}{60}$ h = 3 h

(d) 1 h = 60 min
_____ = 1 440 min
$\frac{1440}{60}$ h = 24 h

(e) 1 h = 3 600 s
_____ = 3 600 s
$\frac{3600}{3600}$ h = 1 h

(f) 1 h = 3 600 s
_____ = 7 200 s
$\frac{7200}{3600}$ h = 2 h

(g) 1 h = 60 min
_____ = 360 min
$\frac{360}{60}$ h = 6 h

(h) 1 h = 3 600 s
_____ = 25 200 s
$\frac{25200}{3600}$ h = 7 h

6. (a) 1 h = 60 min
_____ = 206 min
$\frac{206}{60}$ = 3 h 26 min

(b) 1 h = 60 min
_____ = 156 min
$\frac{156}{60}$ = 2 h 36 min

(c) 1 h = 60 min
_____ = 236 min
$\frac{236}{60}$ = 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. 9.55 a.m
8.40 a.m
1 h 15 min = 1 h 15 min

8.8 Additional activities

Remedial Activities:

1. Convert 3 hours into minutes

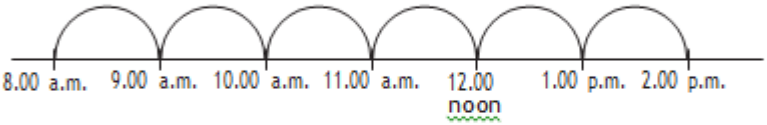
   $3 \times 60 =$

   $60 + 60 + 60 =$

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.



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 activities:

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 =

Extended activities:

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 h = 60 min

   $60 \times 4 = 240$ min
2. 1 h = 3 600 s

   $3\frac{1}{2} \times 3\,600 = 12\,600$ s
3. $12 + 4 = 16$

   1600 h - 0800 h = 08.00 = 8 h
4. (2 + 3) h + (25 + 45) min

   = 5 h + 1 h + 10 min

   = 6 h 10 min
5. (16 - 2) h + (15 - 40) min

   = 14 h + (15 - 40) min

   = 13 h + (60 + 15 - 40) min

   = 13 h 35 min

Extension Activity

1. 1 h = 3 600 s = 60 min

   (7×60) h + $(\frac{3}{4} \times 60)$ h = (420 + 45) h = 465 h

2. 1 day = 24 h

   $25\frac{1}{2} \times 24 = (25 \times 24)$ h + $(\frac{1}{2} \times 24)$ h = 600 h + 12 h = 612 h

3. (i)
   $$\begin{array}{r} {}^{3}\not{4}\,{}^{7}\not{1}5 \text{ p.m} \\ -\ 2.45 \text{ p.m} \\ \hline 1.30 = 1 \text{ h } 30 \text{ min} \end{array}$$

   (ii) 1 h = 60 min

   Thus, 1 h 30 min = (60 + 30) min

   = 90 min

   (iii) 1 min = 60 s

   90 × 60 = 5 400 s

4. (a) (15 + 9) h + (20 + 55) min = 24 h + 75 min

   = 24 h + 1 h + 15 min

   = 1 day 1 h 15 min

   (b) 25 h 15 min

5. (a) 3 p.m is 3 h + 1200 h = 1500 h

   1500 h – 1100 h = 0400 h = 4 h

   (b) 12 h + 2.05 h = 1405 h

   1405 h – 1230 h = 1 h 35 min

   (c) (4 – 1) h + (0 – 35) min

   = 3 h + (0 – 35) min

   = 2 h + (60 – 35) min

   = 2 h 25 min

They were working in the farm except during the lunch.

Unit 9: **Money and its financial application**

9.1 Key unit competence: Explain money and its financial applications.

9.2 Prerequisite

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

9.3 Cross-cutting issues to be addressed

- **Inclusive education**: During the activities, learners with special need should be inte1grated so they don't feel excluded.
- **Financial education**: Learners should be enlightened on the need to prioritise needs and wants.

9.4 Introductory activity and guidance

A. Introductory activity for unit 9

In real life, people work with aim to get money in order to become rich, to solve other financial issues like paying school fees, buying clothes, buying food etc. Some people get money through earning salary, others get money from doing business and others get money from selling their crops or domestic animals or products from domestic animals. Consider the following situation and answer the related questions:

A student has just finished university and has got a job in Rwanda Revenue Authority. This student earns 500,000Rwf per month.

(a) List down at least three ways this student would spend this first salary.

(b) Why do you think people should have money in life?

(c) Can you give different ways how your parents use money in your home?

B: Guidance on introductory activity for unit 9

In this unit, emphasise the explanation of money as **a current medium of exchange in the form of coins and banknotes.** Or money is a commodity accepted by general consent as a medium of economic exchange. Give several applications of money in daily life, its sources and uses.

Suggested answers for introductory activity in unit 9.

These are open ended questions, so guide the students and give effective feedback based on the individual response.

9.5 List of lessons/sub-heading

#	Lesson title	Learning objectives	Number of periods 24
1.	Introductory Activity	▪ Motivate learners for the new lesson. ▪ Explain money.	1
1.	Uses and role of money in our lives	Describing the role of money in our daily life.	2
2.	Sources of money	Identify and describe different sources of money.	2
3.	Budgeting	▪ Be able to explain budgeting and how to set priorities. ▪ Explain the reasons for budgeting while using money.	2
4.	Setting priorities	▪ Explain budgeting and how to set priorities. ▪ Explain the reasons for budgeting while using money.	1
5.	Establishing a budget of what comes in and what goes out and setting priorities of a family	▪ Establish a budget of what comes in and what goes out and set priorities	2

6.	Ways of transferring money: ATM, cheques, cash, money transfer, and using a mobile phone	▪ State various ways of transferring money ▪ Describe various ways of transferring money.	3
7.	Saving (protecting) money	▪ Explain the importance of saving money. ▪ Appreciate the importance of saving money. ▪ Practicing saving and borrowing money.	3
8.	Borrowing money (borrowing is not free).	▪ Explain the importance of saving and borrowing money. ▪ Appreciate the importance of saving money. ▪ Practicing saving and borrowing money.	3
9.	Different currencies and converting currencies	▪ State different currencies and convert between them ▪ Convert currencies in a practical context	3
10.	**End unit assessment**	To verify if the explanation of money and its financial applications as skills have been developed.	2

Guidance on different lessons outlined above

Lesson1: Uses and role of money in our lives

a) Learning objectives

. Describing the role and uses of money in our daily life

b) Teaching resources

Textbooks, coins and bank notes

c) Learning activities

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.

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.

Lesson 2: Sources of money

a) Learning objectives

- Identify the sources of money.
- Describe the sources of money.

b) Teaching resources

- Manila paper
- Pictures of money
- Flash cards
- A pair of scissors.

c) Learning activities

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.

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.

Lesson 3 and 4: Budgeting and setting priorities

Note: Guidance of the lessons 3 and 4 in the table above are given in this unit. As a teacher you may refer to this lesson and facilitate learners, in 3 different lessons, to do as many as possible activities on budgeting and setting priorities as possible to achieve the objective.

a) Learning objectives

- Learners will be able to explain budgeting and how to set priorities.
- Explain the reasons for budgeting while using money.

b) Teaching resources

Flash cards

Manila papers

Pictures of a car, television, aero plane, house, clothes, water.

c) Learning activities

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.

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

Lesson 5: Establishing a budget of what comes in and what goes out and setting priorities of a family

a) Learning objectives

To establish a budget of what comes in and what goes out and set priorities

b) Teaching resources

Real money or money cards or place value counters representing money in form of coins and notes, flash cards showing items such as family food, clothes, school fees, painting house, transport for visiting friends, transport for going to the hospital, buying car, buying television and shoes.

c) Learning activities

Note: This is a practical activity. As a teacher refer to the Mathematics kits and experiments user guide for P4-P6 on **Practical Activity13** on page 127, 128, 129 and facilitate leaners to do the practical activity on establishing a budget of what comes in and what goes out and setting priorities of a family.

Lesson 6: Ways of transferring money: ATM, cheques, cash, money transfer, and using a mobile phone

a) Learning objectives

- State various ways of transferring money
- Describe various ways of transferring money.

b) Teaching resources

- A picture of an ATM booth
- A picture of a mobile phone showing money received.
- A picture of cheques/or real cheques
- A picture of a person in a banking hall.

c) Learning activities

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.

Expected answers 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

Lesson 7 and 8: Saving (protecting) and borrowing money

Note: Guidance to lesson 7 and 8 in the table above are given in this unit. As a teacher you may refer to this lesson and facilitate learners in 2 different lessons, to do as many activities as possible on saving and borrowing money.

a) Learning objectives

- Explain the importance of saving and borrowing money.
- Appreciate the importance of saving money.
- Practicing saving and borrowing money.

b) Teaching resources

- Flash cards
- Pictures of money

c) Learning activities

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).

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.

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

Lesson 9: Different currencies and converting currencies

a) Learning objectives

- State different currencies and convert between them.
- Convert currencies in a practical context

b) Teaching resources

- Flash cards
- Manila papers/charts showing currency conversion tables from a Forex shop.
- Pictures of different currencies.
- Real currencies of different countries.

c) Learning activities

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.

Expected answers to practice activity 9.6

2. i.

$$\frac{5000\ \text{Frw}}{7.25} = \text{KSh } 689.6$$

ii. (5 000 × 4.60) UGX = 23 000 UGX

iii.

$$\left(\frac{5000}{836}\right)\text{EUR} = 5.98\ \text{EUR}$$

iv.

$$\left(\frac{5000}{740}\right)\text{USD} = 6.75\ \text{USD}$$

3. (740 × 100) Frw = 74 000 Frw

4. (836 × 50) Frw = 41 800 Frw

5.

$$\left(\frac{20000}{4.60}\right)\text{Frw} = 4\,347.8\ \text{Frw}$$

6. (2 000 × 7.25) Frw = 14 500 Frw

9.6 Additional information for the teacher

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.

9.7 End unit assessment

Expected answers to Revision Activity 9

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. (5000:830) EUR = 6.02 EUR
    ii. (15000:740) USD = 20.2 USD
    iii. (15000:725) KSH =20.6 KSH
    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

9.8 Additional activities

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 if 1KSH equals to 7.25 Frw.

Expected Answers to 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. 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. 1 USD costs 740frw and 1EUR costs 830Frw.
   (a) 200 USD (b) 100 EUR

Expected Answers to 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

Extended 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 as follows:

Currency	Rate (Frw)
1 USD	740
1 EUR	830
KSh 1	7.25
4.60 UGX	1

   (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 Extended 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 × 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) $\left(\frac{31520}{830}\right)$ 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

Unit 10: Sequences that include whole numbers, fractions and decimals

10.1 Key unit competence: Write sequences of whole numbers, fractions and decimals.

10.2 Prerequisite

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.

10.3 Cross-cutting issues to be addressed

- **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.

10.4 Introductory activity and guidance

A. Introductory activity for unit 10

Students study sequences that include whole numbers, fractions and decimals sequenced according to their size in an increasing and a decreasing order. This unit will build students skills in sequencing numbers in a required order. Numbers can be arranged in increasing order by ordering/ arranging them from the smallest to the largest. Or numbers can be arranged in decreasing order by ordering/ arranging them from the largest to the smallest. This can be done in the same way to fractions and decimals.

(a) Explain how you can arrange the following in decreasing order. 43250, 42 420, 43 502, 40 352

(b)Discuss the sequence given below and the pattern used, then find the next two numbers: 10, $11\frac{1}{2}$, 13, $14\frac{1}{2}$, 16, $17\frac{1}{2}$, ___, ___. Explain the steps involved to find the next number.

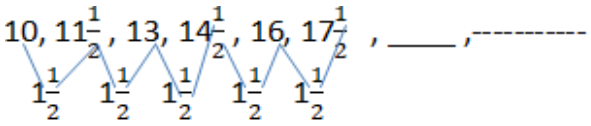
B: Guidance on introductory activity for unit 10

In Primary 4, students learnt arranging whole numbers in a given order. Build on this skill to support them to make a sequence of fractions and or decimals. Learners will be able to write sequences that include whole numbers, fractions and decimals.

Suggested answers for introductory activity in unit 10.

(a) By checking the numbers from the digit with the highest value to the lowest value. The numbers arranged in decreasing order are 43 502, 43 250, 42 420, 40 352

Find the differences in between the numbers.



Difference , $1\frac{1}{2}$, $1\frac{1}{2}$, $1\frac{1}{2}$, $1\frac{1}{2}$ (To get the next number, you add $1\frac{1}{2}$ to the previous number). The next number will be: $17\frac{1}{2} + 1\frac{1}{2} = 19$,

Then the next number is $19 + 1\frac{1}{2} = 20\frac{1}{2}$

10.5List of lessons/sub-heading

#	Lesson title	Learning objectives	Number of periods 24
0	Introductory activity	Arouse the curiosity of learners on the content of unit 10.	1
1.	Ordering whole numbers according to their size in increasing order	▪ Explain how to order whole numbers according to their size in an increasing order ▪ Order whole numbers according to given order	1
2.	Ordering whole numbers according to their size in decreasing order	▪ Explain how to order whole numbers	2

		according to their size in a decreasing order • Order whole numbers according to given order	
3.	Introduction to simple sequences	▪ Define and give examples of simple sequences and find out the pattern used ▪ Find patterns in a given sequence	1
4.	Simple sequences that include fractions	Define and give examples of sequences of fractions and solve problems involving sequences of fractions	2
5.	Forming different number patterns by using charts/flash cards, number cards or fraction cards	Practically form number patterns using number cards	1
6.	Simple sequences that include decimals	Define and give examples of sequences of decimals and solve problems involving sequences of decimals	2
7.	Sequence with constant differences	Describe how the numbers are arranged in different patterns and find out the pattern used	3
8.	Sequences with constant ratios	▪ Describe how the numbers are arranged in different patterns and find out the pattern used • Find out pattern used in constant ratios	3
9.	Sequences with regularly changing differences	Describe how whole numbers are arranged in different patterns and find out the pattern used	3

10.	Sequences where the difference is geometric	Describe how whole numbers are arranged in geometric patterns and find out the pattern used.	3
11.	**End unit assessment**	To assess how skills such as writing sequences of whole numbers, fractions and decimals numbers have been developed.	2

Guidance on different lessons outlined above

Lesson 1: Ordering whole numbers according to their size in increasing order

a) Learning objectives

- Explain how to order whole numbers according to their size in an increasing order.
- Order whole numbers according to given order

b) Teaching resources

- Flash cards
- Manila papers

c) Learning activities

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.

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.

Lesson 2 : Ordering whole numbers according to their size in decreasing order

a) Learning objectives

- Explain how to order whole numbers according to their size in a decreasing order.
- Order whole numbers according to given order

b) Teaching resources

- Flash card
- Charts
- Scissors

c) Learning activities

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.

d) 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

Lesson 3: Introduction to Simple sequences

a) Learning objectives

- Define and give examples of simple sequences and find out the pattern used
- Find patterns in a given sequence

b) Teaching resources

A chart with a worked-out example
Flash cards

c) Learning activities

Group work activities
Demonstration: show how to find missing numbers in sequences

Note: As learners have already studied to arrange the whole numbers according to their size in the previous lessons, they will learn how the numbers can be arranged following a certain pattern (sequences) in this lesson. Facilitate students using simple sequences including whole numbers. The teacher should teach it in two different lessons starting with the sequences in increasing order, then in decreasing order.

Lesson preparation: This lesson will take place inside the classroom

Teaching / learning steps

. Ask learners to observe a sequence on the chart and discuss how to find the missing number.

Example: Find the next number in the following pattern: 40; 45; 50; 55; …….

. Help them to realise that the sequence is increasing, and find the difference between the two consecutive terms.

Hence, 45 – 40 = 5, 50 – 45=5, 55 -50 = 5,

. Let the learners take 55 + 5 to get 60 as a missing number.

. Assign them more practice activities to help them understand the lesson.

Example: Find the missing numbers in the following sequences:

a. 60; 67; 74; 81; 88; …….
b. 120; 140; 160; 180; 200; ……
c. 345; 360; 375; 390; 405; …….
d. 52; 44; 36; 28; ……
e. 264; 214; 164; 114; ……
f. 80; 73; 66; 59; ……

Expected answers to practice activity

a. 95 b. 220 c. 420 d. 20 e. 64 f. 52

Lesson 4: Simple sequences that include fractions

a) Learning objectives

- Define and give examples of sequences of fractions and solve problems involving sequences of fractions

b) Teaching resources

- Flash cards
- Charts

c) Learning activities

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.

Expected answers to 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 $90 + 2\frac{1}{2} = 92\frac{1}{2}$.

Lesson 5: Forming different number patterns by using charts/flash cards, number cards or fraction cards

a) Learning objectives

Practically form number patterns using number cards

b) Teaching resources

Number cards including fraction cards

c) Learning activities

Note: This is a practical activity. As a teacher refer to the Mathematics kits, practical activities and experiments user guide for P4-P6 and facilitate leaners to do the **Practical Activity 14** on page 130, 131 and 132 about forming number patterns.

Lesson 6: Simple sequences that include decimals

a) Learning objectives

Define and give examples of sequences of decimals and solve problems involving sequences of decimals

b) Teaching resources

- Flash cards
- Manila cards
- Scissors

c) Learning activities

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 decimal
4. Assign learners Practice Activity 10.4 questions 1 – 5 as classwork and questions 6 – 10 for homework. Go round the class assessing learners' progress

d) 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.

Lesson 7: Sequences with constant differences

a) Learning objectives

- Describe how the numbers are arranged in different patterns and find out the pattern used

b) Teaching resources

- Flash cards
- Manila cards

c) Learning activities

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.

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.

Lesson 8: Sequences with constant ratios

a) Learning objectives

- Describe how the numbers are arranged in different patterns and find out the pattern used
- Find out pattern used in constant ratios

b) Teaching resources

- Manila cards
- Charts

c) Learning activities

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. Go round the class assessing learners' progress.

Expected answers to practice activity 10.6

1. Clearly, $\frac{4}{2} = \frac{8}{4} = 2$. Thus, next number is 2 × 8 = 16. This is followed by

$16 \times 2 = 32$.

2. Constant ratio is ×2. So, the next number is $64 \times 2 = 128$
3. Constant ratio is ×3. Thus, next number is $81 \times 3 = 243$
4. Constant ratio is ×4. So, the next number is $64 \times 4 = 256$
5. Constant ratio is ×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 ×4. Next number is $32 \times 4 = 128$, followed by $128 \times 4 = 512$
9. Constant ratio is ×9. Next number is $243 \times 9 = 2\,187$
10. Constant ratio is ×2. Next number is $24 \times 2 = 48$, followed by $48 \times 2 = 96$

Lesson 9: Sequences with regularly changing differences

a) Learning objectives

- Describe how whole numbers are arranged in different patterns and find out the pattern used

b) Teaching resources

- Manila cards
- Charts

c) Learning activities

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.

1. 1, 4, 10, 19

Next number is $19 + 3 \times 4 = 31$

Followed by $31 + 3 \times 5 = 46$

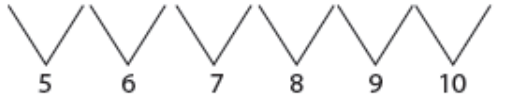
2. 12, 13, 16, 22, 32, 47, 68

3. 50, 52, 55, 59, 64, 70

4. 8, 11, 15, 20, 26, 33, 41

5. 20, 23, 27, 32, 38, 45

6. 70, 75, 81, 88, 96, 105, 115

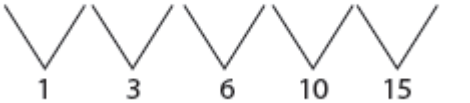


7. 31, 32, 35, 41, 51, 66

8. 44, 45, 48, 54, 64, 79

9. 62, 63, 66, 72, 82

10. 100, 101, 104, 110, 120, 135



Lesson 10: Sequences where the difference is geometric

a) Learning objectives

Describe how whole numbers are arranged in geometric patterns and find out the pattern used.

b) Teaching resources

- Manila cards
- Charts

c) Learning activities

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.

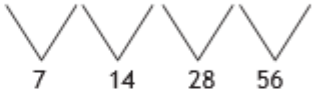
Expected answers to practice activity 10.8

1. 1, 3, 7, 15, 31, 63

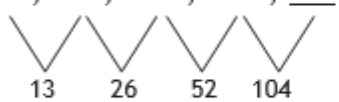
2. 2, 5, 11, 23, 47 95

3. 3 7, 15, 31, 63, 127

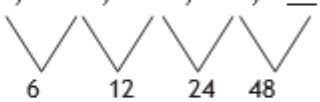
4. 6, 13, 27, 55, 111



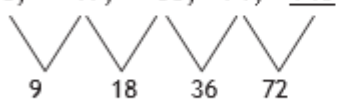
5. 12, 25, 51, 103, 207



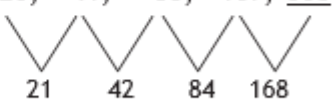
6. 5, 11, 23, 47, 95



7. 8, 17, 35, 71, 143



8. 20, 41, 83, 167, 335



9. 7, 15, 31, 63, 127

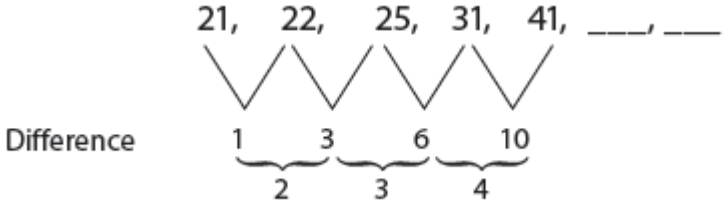
10. 4, 9, 19, 39, 79

10.6Additional information for the teacher

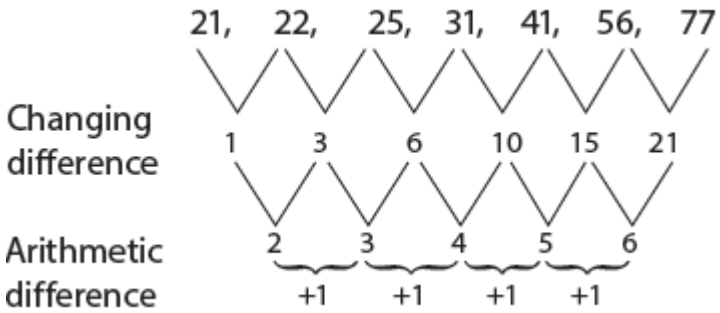
Notes to the teacher

- 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 endeavor 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:



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.



Therefore, the sequence is 21, 22, 25, 31, 41, 56, 77, ...

10.7End unit assessment

Expected answers to end unit assessment or 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, $6\frac{1}{2}$, 8, $9\frac{1}{2}$, 11 — $1\frac{1}{2}$ $1\frac{1}{2}$ $1\frac{1}{2}$ $1\frac{1}{2}$

   (b) 30, $31\frac{1}{2}$, 33, $34\frac{1}{2}$, 36, $37\frac{1}{2}$ — $1\frac{1}{2}$ $1\frac{1}{2}$ $1\frac{1}{2}$ $1\frac{1}{2}$ $1\frac{1}{2}$

   (c) 40, $41\frac{1}{2}$, 43, $44\frac{1}{2}$, 46, $47\frac{1}{2}$ — 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

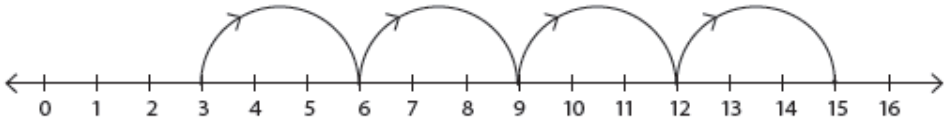
   (h) 12, 13, 16, 22, 32, 47 — 1 3 6 10 15

   (i) 11, 23, 47, 95, 191 — 12 24 48 96

   (j) 21, 43, 87, 175, 351 — 22 44 88 176

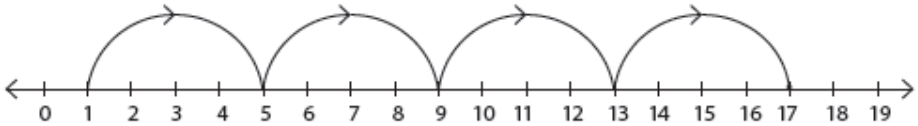
   (k) 7, 15, 31, 63, 127 — 8 16 32 64

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

10.8Additional activities

Remedial Activities:

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
3. Find the next number in the sequences below.

   $5, 6\frac{1}{2}, 8, 9\frac{1}{2},$ _____

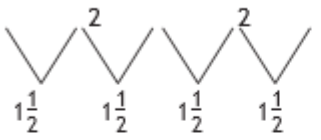
   $20, 21\frac{1}{2}, 23, 24\frac{1}{2},$ _____
4. Explain the steps involved in finding the next number in the sequences below:
   a) 10, 10.5, 11, 11.5, _____
   b) 12, 14, 16, 18, _____
   c) 25, 27, 29, 31, _____, _____
   d) 30, 35, 40, 45, _____, _____
   e) 1, 3, 9, 27, _____
   f) 11, 12, 14, 18, _____

Answers to Remedial activity

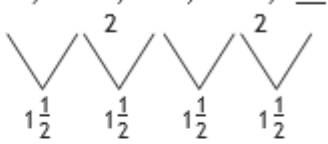
1. 400 m, 500 m, 900 m

2. 3 502, 3 250, 3 052, 2 420

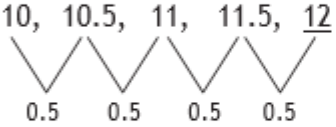
3. 5, $6\frac{1}{2}$, 8, $9\frac{1}{2}$, 11



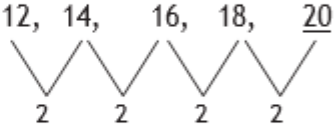
4. 20, $21\frac{1}{2}$, 23, $24\frac{1}{2}$, 26



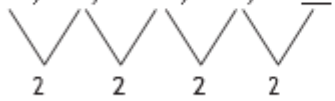
5. 10, 10.5, 11, 11.5, 12



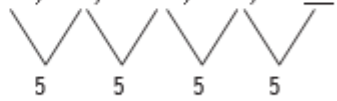
6. 12, 14, 16, 18, 20



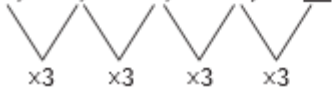
7. 25, 27, 29, 31, 33



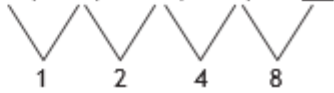
8. 30, 35, 40, 45, 50



9. 1, 3, 9, 27, 81



10. 11, 12, 14, 18, 26



Consolidation activities:

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.

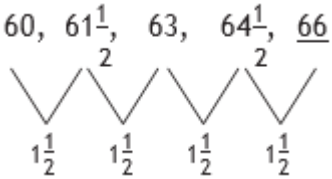
3. 50 502, 50 520, 50 052
4. 22 020, 20 202, 20 002

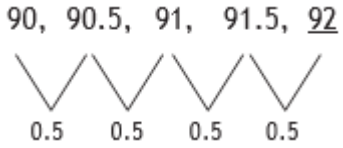
Explain the steps involved in finding the next number in the sequence:

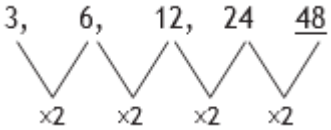
5. 60, $61\frac{1}{2}$, 63, $64\frac{1}{2}$, _____
6. 90, 90.5, 91, 91.5, _____
7. 3, 6, 21, 24, _____
8. 4, 5, 8, 14, _____
9. 60, 62, 65, 69, _____
10. 21, 43, 76, _____

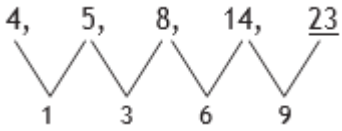
Answers to consolidation activity

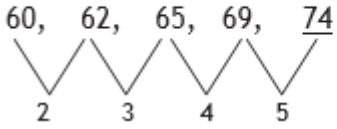
1. 81 389, 81 839, 81 983
2. 10 350, 13 500, 15 300
3. 50 052, 50 502, 50 520
4. 22 020, 20 202, 20 002
5. 60, $61\frac{1}{2}$, 63, $64\frac{1}{2}$, 66

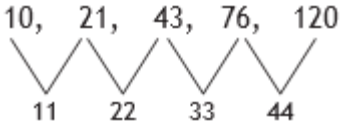


6. 

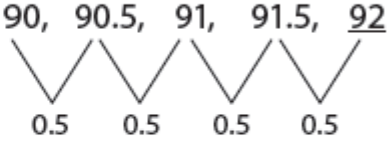
7. 

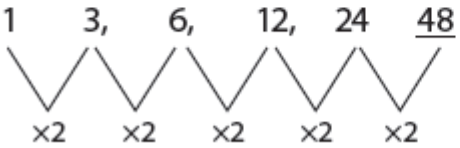
8. 

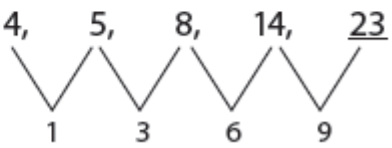
9. 

10. 

Answers to consolidation activity

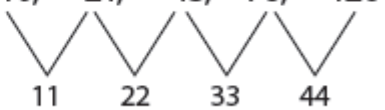
1. 81 389, 81 839, 81 983
2. 10 350, 13 500, 15 300
3. 50 052, 50 502, 50 520
4. 22 020, 20 202, 20 002
5. 60, $60\frac{1}{2}$, 63, $64\frac{1}{2}$, 66
   $1\frac{1}{2}$ $1\frac{1}{2}$ $1\frac{1}{2}$ $1\frac{1}{2}$
6. 

7. 

8. 

9. 60, 62, 65, 69, 74

10. 10, 21, 43, 76, 120



Extended activities:

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.

6. 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.

Answers to 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, $\underline{23\frac{1}{2}}$

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

(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.

Unit 11: **Drawing and construction of angles**

11.1 Key unit competence: Draw and construct different angles

11.2 Prerequisite

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.

11.3 Cross-cutting issues to be addressed

- **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.

11.4 Introductory activity and guidance

A. Introductory activity for unit 11

In real life, geometrical construction/drawing skills is very much used. Carpenters, Architecture and designers use such skills. Many shapes have plane shapes with many sides, angles and vertices. Some have same size of sides and angles while others don't. The concept of drawing and

constructing angles is used in making different objects and these objects are used in our daily life.

1. Look around your classroom and identify plane shaped objects and try to name them basing on the number of sides and angles.
2. (a) Is there any object of 3 sides and 3 angles in your class?
   (b) Is there any object of 4 sides and 4 angles?

(c) How are the sides of the observed objects?
(d) Find out if they have all equal sides, and equal angles.
3. What do you use when constructing angles?

B: Guidance on introductory activity for unit 11

In this unit, emphasise the following to students;

i. When drawing any shape, sharp pencil is used.
ii. In construction, sharp pencil, a ruler and a compass are used
iii. Thin and clear lines should be drawn for accuracy in measurements of angles and sides

Suggested answers for introductory activity in unit 11.

NOTE:

- ✓ During this lesson make sure there are samples of geometrical tools/shapes.
- ✓ Motivate and support students to look around the classroom to describe the shapes of classroom walls; what happens when two walls meet, which lines of walls are parallel, which lines are meeting and how they are they meeting?
- ✓ Support the students to draw whatever is their findings.

1. Support students with their findings by asking them to show what is called a plane, angle and sides.
2. (a) If the answer is yes, ask the students to present it and tell its name. If answer is no, ask them to give an example.
   (b) If the answer is yes, ask the students to present it and tell its name. If answer is no, ask them to give examples.
   (c) Support the students basing on the object named; for example, if it is a rectangle, opposite sides are equal. The sides meet at 90^0
   If it is triangular, describe the sides and angles.
3. When constructing angles we use a sharp pencil, compass and a ruler.

11.5List of lessons/sub-heading

#	Lesson title	Learning objectives	Number of periods 24
	Introductory activity 11	Arouse curiosity of learners on unit 11	1

	Construction of different angles with a protractor	Describe the process of drawing angles • with a protractor. • Measure different angles using a protractor.	1
	Bisection of angles (Using folding)	• Describe the process of bisecting an angle by folding. • Carry out the process of bisection of an angle by folding.	1
	Bisecting angles using a pair of compasses and a ruler	• Describe the process of bisecting angles using a pair of compasses and a ruler. • Carry out and explain the process of bisecting an angle using a pair of compasses and a ruler.	1
	Constructing 90°, 45° and 22.5° angles	• Describe the process of constructing 90°, 45° and 22.5° angles using a pair of compasses and a ruler. • Construct angles using a ruler and a pair of compasses.	1
	Constructing 60°, 30° and 15° angles	• Describe the process of constructing 60°, 30° and 15° angles using a ruler and a pair of compasses. • Construct angles using a ruler and a pair of compasses.	1
	Constructing angles 120° and 150° angles	• Describe the process of constructing 120°, 150° angles using a ruler and a pair of compasses. • Construct angles using a ruler and a pair of compasses.	2
	Identify different lines and angles formed on real objects	Observe and identify different lines and angles formed using real objects.	2
	Perpendicular lines	• Explain the concept of perpendicular lines. • Draw and measure angles formed by perpendicular lines.	1
	Parallel lines, intersecting lines and transversals	• Explain the concept of parallel lines,	2

		transversal lines and intersecting lines.	
	Properties related to angles formed by intersecting lines	• Explain the concept of angles formed by intersecting lines. • Measure angles related to angles formed by intersecting lines.	2
	Angle properties of parallel lines: Corresponding angles,	• Explain the concept of corresponding angles. • Measuring corresponding angles.	2
	Angle properties of parallel lines: Alternate angles	• Explain the concept of parallel lines and transversal lines and how they form alternate angles. • Measure angles using a protractor.	2
	Angle properties of parallel lines: Co-interior angles,	• Explain the concept of a parallel line and a transversal and how they form co- interior angles. • Measuring angles using a protractor.	2
	Angle sum of a triangle	• Solve problems involving angles. • Apply the knowledge of constructing angles to solve mathematical problems in daily life.	2
	End unit assessment	To assess if the skills required in this unit such as: draw and construct different angles have been developed	1

Guidance on different lessons outlined above

Note: This unit is done practically . As a teacher refer to the Mathematics kits, practical activities and experiments user guide for P4-P6 **Practical activity 15** page 133, 134, and **Practical activity 16** page 135, 136, 137, and 138 to facilitate leaners to do the practical activity on **Identifying different lines and angles formed by lines and angles formed by two parallel lines and transversal lines** to achieve learning objectives.

Lesson 1: Introductory on the construction of different angles with a protractor

a) Learning objectives

- Describe the process of drawing angles with a protractor.
- Measure different angles using a protractor.

b) Teaching resources

- Protractor
- Manila paper
- Geometry set
- Ruler

c) Learning activities

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.

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.

Lesson 2: Bisection of angles (Using folding)

(a) Learning objectives

- Describe the process of bisecting an angle by folding.
- Carry out the process of bisection of an angle by folding.

(b) Teaching resources

- Protractor
- Manila paper
- A pair of scissors
- Ruler

(c) Learning activities

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.

Expected answers to Practice Activity

- Check on pairs and assist where necessary. Accept an error of ±1°.
- The learners' answers may vary depending on construction accuracy.

Lesson3 : Bisecting angles using a pair of compasses and a ruler

(a) Learning objectives

- Describe the process of bisecting angles using a pair of compasses and a ruler.
- Carry out and explain the process of bisecting an angle using a pair of compasses and a ruler.

(b) Teaching resources

- Protractor
- A pair of compasses
- Manila paper

(c) Learning activities

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.

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).

Lesson4: Constructing 90°, 45° and 22.5° angles

(a) **Learning objectives**

- Describe the process of constructing 90°, 45° and 22.5° angles using a pair of compasses and a ruler.
- Construct angles using a ruler and a pair of compasses.

(b) **Teaching resources**

- Ruler
- A pair of compasses
- Manila paper

(c) Learning activities

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.

- Assign learners Practice Activity 11.10 questions 1 – 3 for classwork.

(d) Expected answers to Practice Activity 11.10

- Check the constructions in learners' exercise books.
- Insist on accuracy.

Lesson5: Constructing 60°, 30° and 15° angles

a) Learning objectives

- Describe the process of constructing 60°, 30° and 15° angles using a ruler and a pair of compasses.
- Construct angles using a ruler and a pair of compasses.

b) Teaching resources

- Ruler
- Geometry set
- Manila paper

c) Learning activities

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.

d) Expected answers to Practice Activity 11.11

Check the learners construction for accuracy.

Lesson6: Constructing angles 120° and 150° angles

a) Learning objectives

- Describe the process of constructing 120°, 150° angles using a ruler and a pair of compasses.
- Construct angles using a ruler and a pair of compasses.

b) Teaching resources

- Ruler
- A pair of compasses
- Manila paper

c) Learning activities

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.

Expected answers to Practice Activity 11.12

Check learners' work and insist on accuracy

Lesson7: Identify different lines and angles formed on real objects

a) Learning objectives

Observe and identify different lines and angles formed using real objects.

b) Teaching resources

- Exercise book.
- Boxes
- Chairs
- Walls
- Windows, desks, ……

c) Learning activities

1. Let learners move around the classroom and observe different objects such as walls, boxes, chairs, windows to identify different lines and angles formed.
2. Ask them to identify straight lines, lines that meet and lines that do not meet on the real objects.
3. Ask them to identify also different angles formed on those objects (materials).
4. Give them more practice activities involving identifying straight lines, parallel lines, intersecting lines and transversals on real objects.

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.

Lesson8: Perpendicular lines

a) Learning objectives

- Explain the concept of perpendicular lines.
- Measure angles formed by perpendicular lines

b) Teaching resources

- Walls of a classroom.

- Window frames.
- Tables

c) Learning activities

- Learners will observe the corners of the walls and window frames of the classroom in Activity 11.2.
- Learners will discuss their observations.
- Learners will follow the demonstration in Example 11.2.
- In pairs learners will discuss Practice Activity 11.2 questions 1 – 2 for classwork.
- Go round the class assessing learners' progress.

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.

Lesson9: Parallel lines, intersecting lines and transversals

a) Learning objectives

- Explain the concept of parallel lines, transversal lines and intersecting lines.

b) Teaching resources

- Geometry set.
- Exercise book.
- Boxes
- Chairs
- Walls
- Windows

c) Learning activities

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.

d) 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

(c) Line PQ intersects QR (d)

Line MO intersects ON

Lesson10: Properties related to angles formed by intersecting lines

a) Learning objectives

- Explain the concept of angles formed by intersecting lines.
- Measure angles related to angles formed by intersecting lines.

b) Teaching resources

- Ruler
- Protractor
- Chalkboard geometrical instruments.

c) Learning activities

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.

d) Expected answers to Practice Activity 11.3

1. (a) a = 120° (b) 60° (c) 60° (d) 120°

(b) 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°

Lesson11: Angle properties of parallel lines: Corresponding angles,

a) Learning objectives

- Explain the concept of corresponding angles.
- Measuring corresponding angles.

b) Teaching resources

- Chalkboard geometry set
- Geometry set
- 1 metre ruler
- Protractor

c) Learning activities

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.

d) 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

Lesson12: Angle properties of parallel lines: Alternate angles

a) Learning objectives

- Explain the concept of parallel lines and transversal lines and how they form alternate angles.
- Measure angles using a protractor.

b) Teaching resources

- Geometry set
- 1 metre ruler
- Manila paper

c) Learning activities

- Have learners measure the angles marked with letters.
- Have learners discuss the angles marked with letters in Activity 11.5
- Let learners discuss the Example 11.5.
- Assign learners Practice Activity 11.5 questions 1 to 7 for classwork.

- Go round the class assessing learners' progress.

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

Lesson13: Angle properties of parallel lines: Co-interior angles

a) Learning objectives

- Explain the concept of a parallel line and a transversal and how they form co- interior angles.
- Measuring angles using a protractor.

b) Teaching resources

- Metre ruler
- Protractor
- Manila paper

c) Learning activities

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.

Expected answers to Practice Activity 11.6

1. 180° – 115° = 65°
   b = 65°
   a = 65°
2. 180° – 60° = 120°
   c = 120°
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

Lesson14: Sum of Angles of a triangle

a) Learning objectives

- Solve problems involving angles.
- Apply the knowledge of constructing angles to solve mathematical problems in daily life.

b) Teaching resources

- Ruler

- Protractor
- Pair of compasses
- Manila paper

c) Learning activities

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.

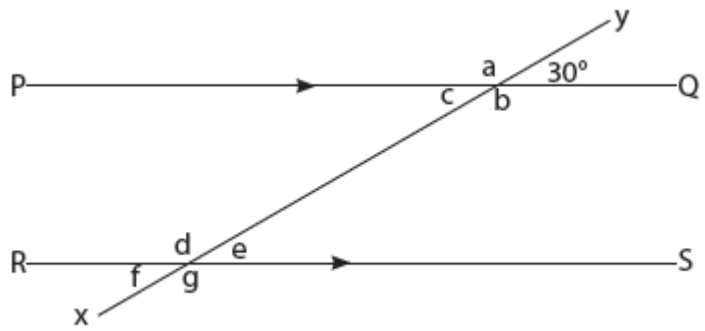
d) Expected answers to Practice Activity 11.13

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, $a = \frac{120°}{2} = 60°$

11.6. Additional information for the teacher

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;

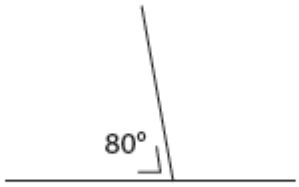
- Remedial Activity: For slow learners to help them catch up with the rest of the learners.
- Consolidation Activity – For average learners.
- Extension Activity – This is given to fast learners. The questions here should be challenging to help them develop creative thinking.

11.7.End unit assessment

Expected answers to Revision Activity 11

1. – Classroom walls
   – Chairs, tables
2. (a) Line PQ and RS, line PR and QS.
   (a) 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.



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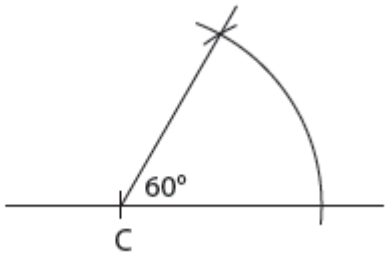

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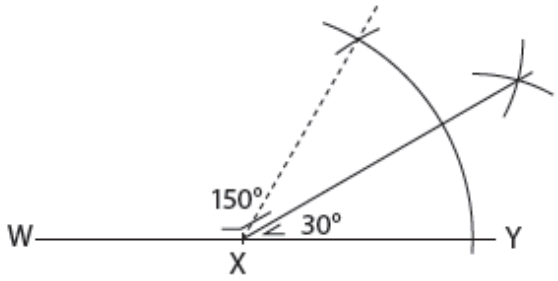
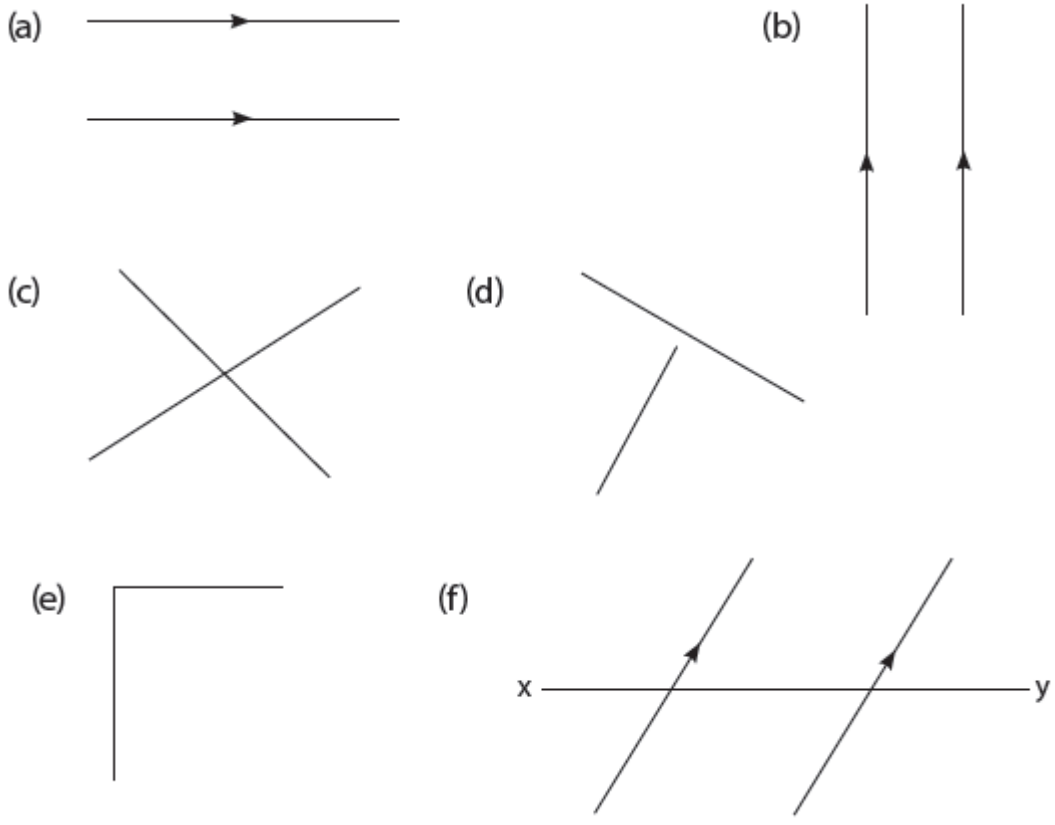


11.8.**Additional activities**

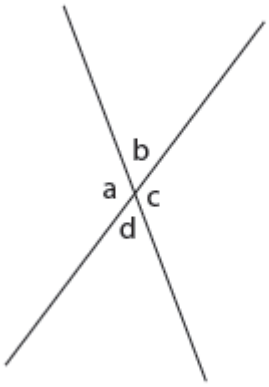
Remedial Activities:

1. Identify the following from the lines given below;
   (i) parallel lines
   (ii) intersecting lines
   (iii) transversal lines



2. Measure the angles in the diagram below.

I



a =
b =
c =
d =

I Find;

(i) a + b (iii) c + d

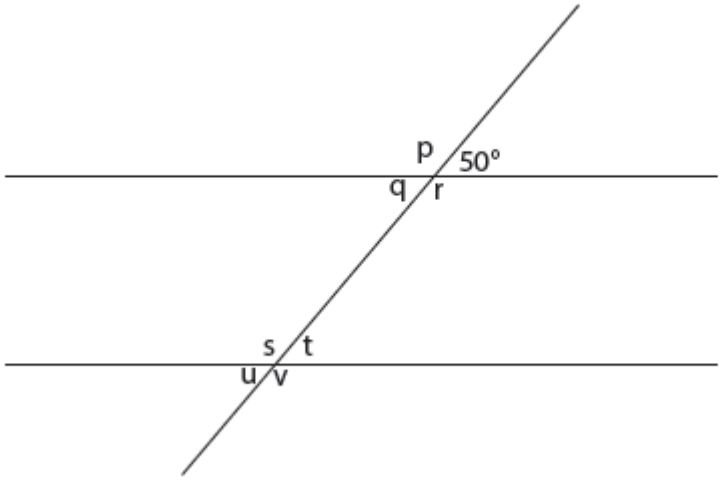
(ii) b + a (iv) d + b

What do you notice?

II 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.



Explain the steps involved in finding the following angles.

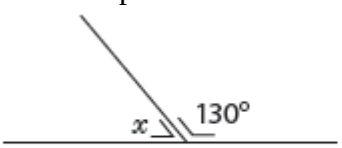
(i) p (ii) q (iii) r (iv) s

(v) t (vi) u (vii) v

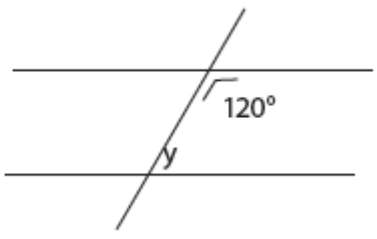
4. Construct angle 90°.

5. Discuss the steps involved in finding the angles marked with letters.

(a)



(b)

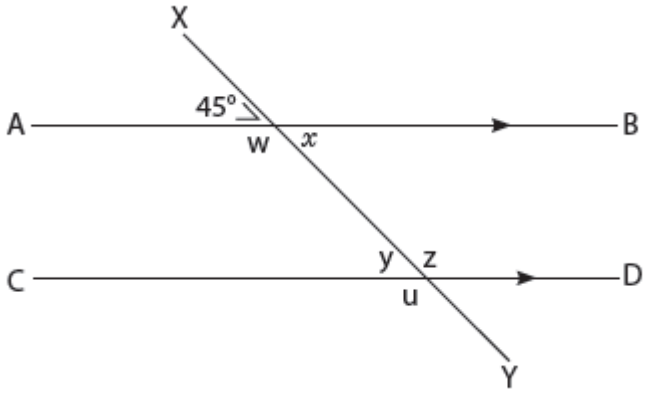


Consolidation activities:

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.



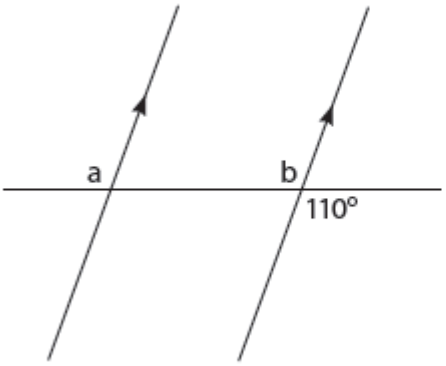
Find the value of angles below.

(i) u ___ (ii) w ___ (iii) x ___

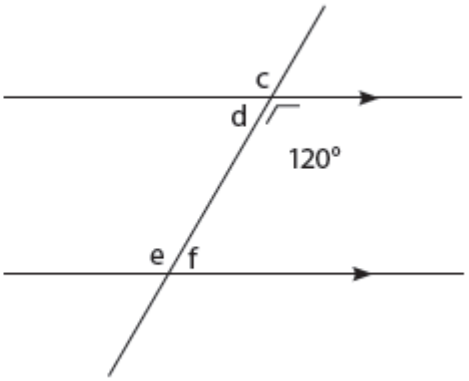
(iv) y ___ (v) z ___ (vi) Angle x + z = ___

3. Explain the steps involved in finding the angles marked.

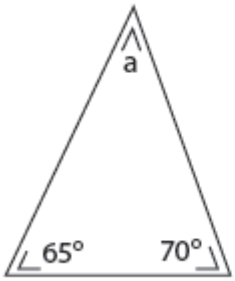
(i)

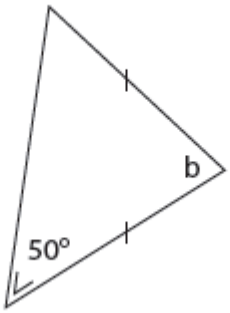


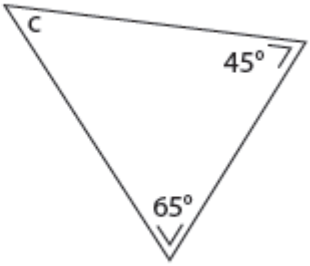
(ii)



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.

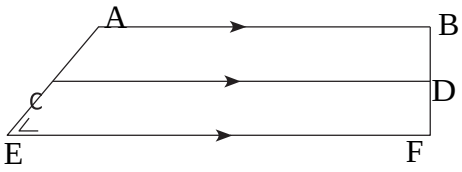






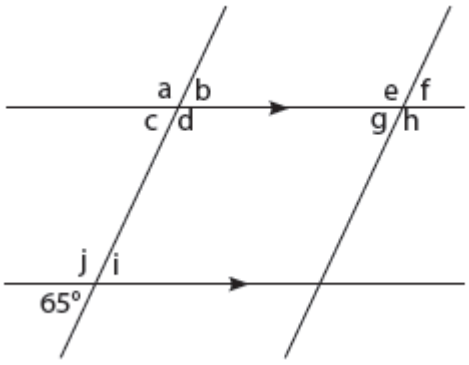
Extended activities:

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.

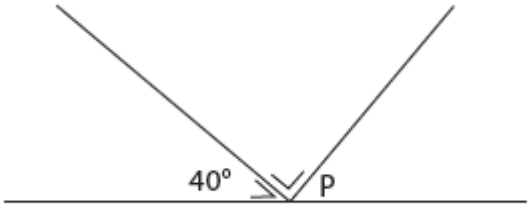


a = ___ b = ___ c = ___ d = ___ e = ___
f = ___ g = ___ h = ___ i = ___ j = ___
Find d + i

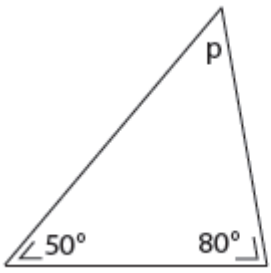
3. Discuss the process of constructing 30° at point A.
4. Explain the steps involved in constructing angle 45° at point B.
5. Discuss and justify the value of the angle marked y.

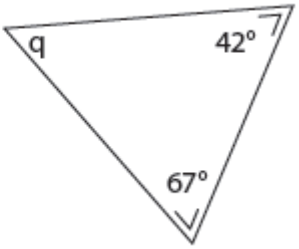
6. Using a ruler and a pair of compass, construct angle 120° at point X. Discuss your steps.

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 Activities 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
   120° + 60° = 180°
   (ii) b + a
   60° + 120° = 180°
   (iii) c + d
   120° + 60° = 180°
   (iv) d + b
   60° + 120° = 180°

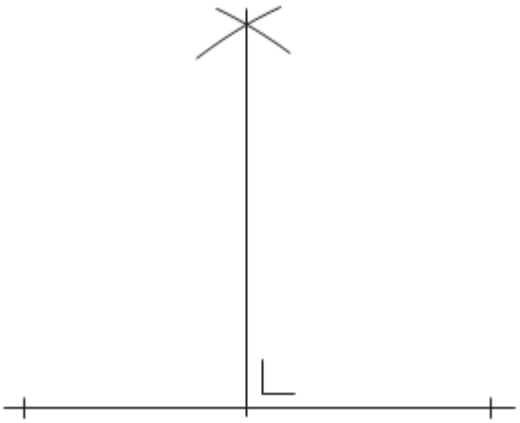
The sum of the two angles is 180° (they are co-interior angles).

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°
   r = 180° – 50° = 130°
   s = 180° – 50 = 130°
   (ii) q = 180° – 130° = 50° (iii)
   (iv) q + s = 180°
   (v) t = alternate with q = 50°
   (vi) u is vertically opposite. Thus, u = 50°.
   (vii) v is vertically opposite s. Hence v = 130°.

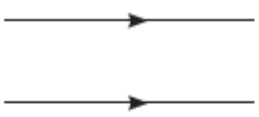
4. (i)



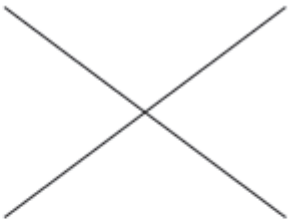
5. (a) $x = 180° - 130° = 50°$ (b) $y = 180° - 120° = 60°$ co-interior angles

Consolidation Activity

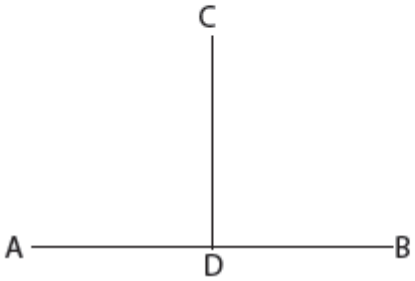
1. (i)



(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

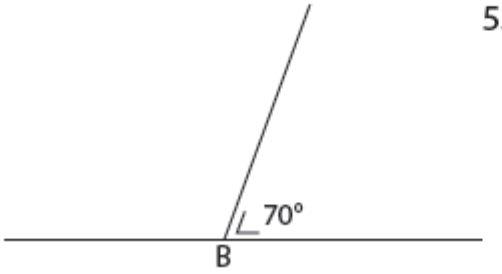
(ii) c = 120° vertically opposite

d = 180° – 120° = 60° supplement of c

e = 180° – 60° = 120° co-interior with d

f = 180° – 120° = 60° or alternate to d.

4.



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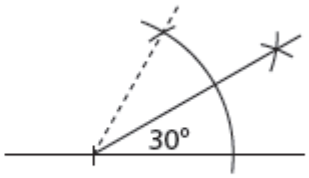
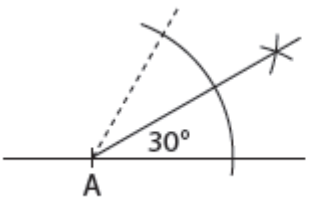


6. a = 180° – (65° + 70°) = 45°
   b = 180° – 100° = 45°
   c = 180° – (65° + 45°) = 70°

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.



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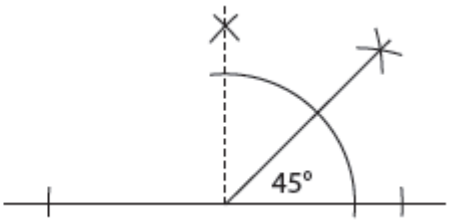
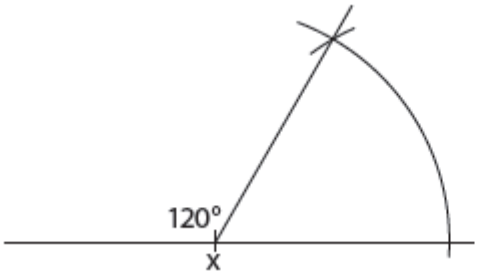


Consider the explanation given by the learners under each of the questions discussed.

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. $p = 180° - (50° + 80°) = 50°$
   $q = 180° - (67° + 42°) = 71°$

Unit 12: Interpreting and constructing scale drawings.

12.1 Key unit competence: **I**nterpret and construct scale drawings

12.2 Prerequisite

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 at building on the knowledge and skills that were acquired earlier in the geometry related units.

12.3 Cross-cutting issues to be addressed

- **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.

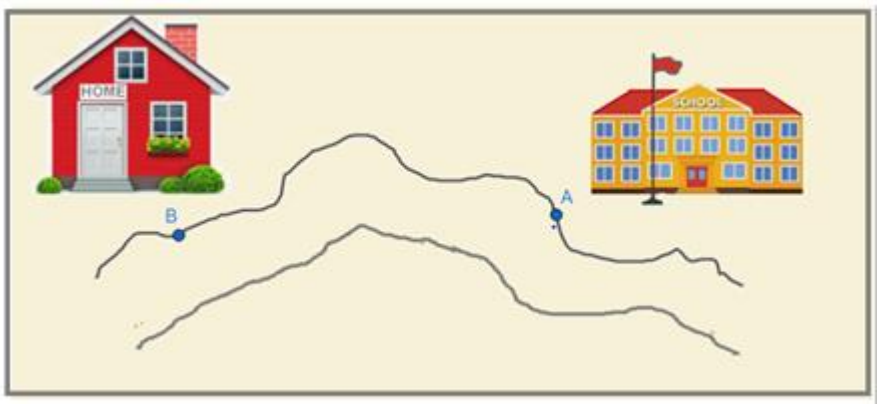
- **Inclusive education**

  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

12.4 Introductory activity and guidance

A. Introductory activity for unit 12

Consider the following image and try to answer the related questions.



1. Estimate the distance from your school (in point A) to your home (in point B) and write it.
2. To write the real distance from school to your home, are you using big or small length unit?

3. On a piece of paper, can you represent a distance of 2 km? How can you proceed to represent such distance? Explain your idea.

B. Guidance on introductory activity for unit 12

This unit provides information on scale drawing. Through the introductory activity, let students share ideas on how to proceed to present big sizes on a piece of paper and clarify the concept of scale drawing by building on students' ideas. Supplement what the students have not given by focusing on the following:

- Actual distances may not be possible to fit on a piece of paper while drawing them. We draw them to the size of the paper using shorter distances.
- Drawing actual distances to the size of a paper is called scale drawing and a scale is usually expressed in using small units where for example 1 cm can represent 1 km on drawings or it can be expressed using ratio / fraction without mentioning units, for example the ratio of 1: 100 000 can be used.

12.5List of lessons/sub-heading

#	Lesson title	Learning objectives	Number of periods 8
	Introductory activity	Arouse curiosity of the learners on unit 12.	1
	Concept of scale drawing through examples of actual distances/sizes and the distance/size on a map	• Explain the concept of scale drawing through examples of actual distances/sizes and the distance/size on a map. • Compare the actual distances/sizes/lengths with the drawing distances/sizes/lengths.	1
	Finding scale: Establishing the scale of a real object to be drawn on a sheet of paper	• Explain how to find the scale of drawings and maps. • Convert between measurements of length in order to get the same units when finding scale.	1

	Construction of scale drawings	Explain how to make scale drawings • . Draw diagrams/lines to represent the distances/lengths.	1
	Finding actual distance	• Explain how to find the actual distance on the ground. • Calculating the actual distance on the ground.	1
	Finding the drawing length	• Explain how to find the drawing length. • Calculating the drawing length.	1
	Real life problems involving scale drawings	Be able to solve real life problems involving scale drawings.	1
	End unit assessment	To assess if the skills like Interpreting and constructing scale drawings are well developed	1

Guidance on different lessons outlined above

Note: This unit is done practically . As a teacher refer to the Mathematics kits, practical activities and experiments user guide for P4-P6 **Practical activity 17** page 139, 140 and 141 to facilitate leaners to do the practical activity on **Establishing scale of a real object to be drawn on a sheet of paper** to achieve learning objectives.

Lesson 1: Concept of scale drawing through examples of actual distances/sizes and the distance/size on a map

a) Learning objectives

5. Explain the concept of scale drawing through examples of actual distances/sizes and the distance/size on a map.
6. Compare the actual distances/sizes/lengths with the drawing distances/sizes/lengths.

b) Teaching resources

- 1 metre ruler
- Tape measure
- Maps
- Real objects available

c) Learning activities

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.

d) 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.

Lesson 2: Finding scale: Establishing the scale of a real object to be drawn on a sheet of paper

a) Learning objectives

- Explain how to find the scale of drawings and maps.
- Convert between measurements of length in order to get the same units when finding scale.

b) Teaching resources

- Ruler
- Charts
- Desk
- Classroom
- Sheets of paper

c) Learning activities

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.

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 = $\frac{\text{Drawing Length}}{\text{Actual Length}}$
4. Write scale in ratio form as Drawing length: Actual length

Expected Answers to Practice Activity 12.2

1. (a) 1:100 (b) $\frac{5\text{ cm}}{1.5\text{ m}} = \frac{\overset{1}{\cancel{5}}\text{ cm}}{\underset{30}{\cancel{150}}\text{ cm}} = \frac{1}{30} = 1:30$

(c) $\frac{\overset{1}{\cancel{10}}\text{ cm}}{\underset{3}{\cancel{30}}\text{ cm}} = \frac{1}{3} = 1:3$ (d) $\frac{3.5\text{ cm}}{7\text{ cm}} = \frac{\overset{1}{\cancel{35}}\text{ cm}}{\underset{2}{\cancel{70}}\text{ cm}} = \frac{1}{2} = 1:2$

(e) $\frac{10\text{ cm}}{40\text{ km}} = \frac{10\text{ cm}}{400000} = 1:40\,000$

(f) $\frac{30\text{ cm}}{6\text{ dam}} = \frac{\overset{1}{\cancel{30}}\text{ cm}}{\underset{2}{\cancel{6}} \times 1000\text{ cm}} = \frac{1}{200} = 1:200$

2. $\frac{5\text{ cm}}{25\text{ km}} = \frac{\overset{1}{\cancel{5}}\text{ cm}}{\underset{5}{\cancel{25}} \times 100000\text{ cm}} = \frac{1}{500000} = 1:500\,000$

3. $\frac{5\text{ cm}}{10\text{ m}} = \frac{\overset{1}{\cancel{5}}\text{ cm}}{\underset{200}{\cancel{1000}}\text{ cm}} = \frac{1}{200} = 1:200$

4. $\frac{30\text{ cm}}{300\text{ km}} = \frac{\overset{1}{\cancel{30}}\text{ cm}}{\underset{10}{\cancel{300}} \times 100000} = \frac{1}{1000000} = 1:1\,000\,000$

5. (a) Length = 6 cm Width: 4 cm

(b) Perimeter = 2(4 + 6) = 20 cm

(c) $\frac{4\text{ cm}}{20\text{ m}} = \frac{\overset{1}{\cancel{4}}\text{ cm}}{\underset{5}{\cancel{20}} \times 100\text{ cm}} = \frac{1}{500} = 1:500$

Check the explanation for each of the questions where the learners have been asked to explain or discuss.

Lesson3: Construction of scale drawings

a) Learning objectives

- Explain how to make scale drawings.
- . Draw diagrams/lines to represent the distances/lengths.

b) Teaching resources

- Classroom Tape measure
- Office
- Ruler

c) Learning activities

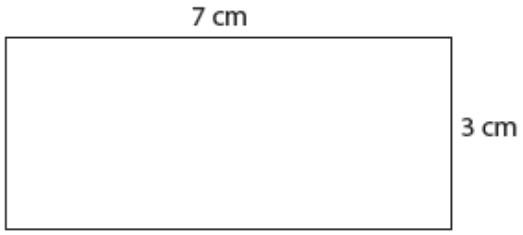
1. Ask learners to perform Activity 12.4 in small groups.
2. Ask learners to discuss the process involved in making the scale drawing by using Example 12.2 and 12.3.
3. Ask learners to discuss Practice Activity 12.3 in pairs (questions 1 – 2 for classwork and questions 3 – 5 for homework).
4. Go round the classroom to assess learners' progress.

Guidance to the teacher

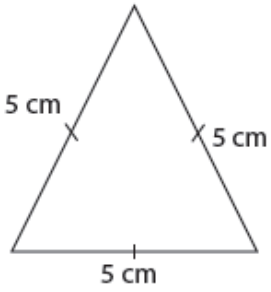
- Allow learners to discuss the activities in groups.
- Explain to learners the process involved in making scale drawings as follows:
  (i) Interpret the scale to find what actual measurement will be represented by drawing a length of 1 cm.
  (ii) Use the interpretation of the scale to find the drawing measurements of the length and the width.
  (iii) Use the drawing measurements to make the drawings.

Expected Answers to Practice Activity 12.3

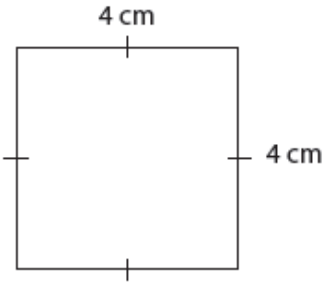
1. (a) 7 m by 3 m

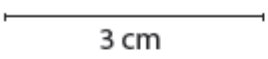


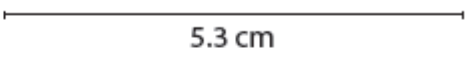
(b)

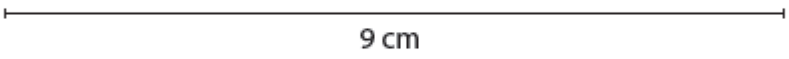


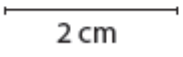
(c)



2. (a) 

(b) 

(c) 

(d) 

2. Assess length of drawn lines. They are:

(a) $\frac{7200\text{ cm}}{1000\text{ cm}} = 7.2\text{ cm}$ (b) $\frac{8000\text{ cm}}{1000\text{ cm}} = 8\text{ cm}$ (c) $\frac{6800\text{ cm}}{1000\text{ cm}} = 6.8\text{ cm}$

3. Accept relevant answers in practical context.

5. (a) A to B = 10 m
Scale = 1:400
$\frac{10\text{ m}}{400\text{ cm}} = \frac{10 \times 100}{400} = 2.5\text{ cm}$

(b) A to E = 40 m
Scale = 1:400
$\frac{40\text{ m}}{400\text{ cm}} = \frac{\overset{10}{\cancel{40}} \times 100}{\underset{1}{\cancel{400}}} = 10\text{ cm}$

Check the explanation given against each question.

Lesson4: Finding the actual distance

a) Learning objectives

- Explain how to find the actual distance on the ground.
- Calculating the actual distance on the ground.

b) Teaching resources

- Ruler
- Tape measure
- Maps

c) Learning activities

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)

d) Expected Answers to Practice Activity12.4

1. Scale 1:2500

   Drawn length = 10 cm

   $\frac{2500\ \text{cm}}{10\ \text{cm}} = 250\ \text{m}$

2. (a) Actual distance

   $4.5\ \text{cm} \times 100\,000 = \frac{450000\ \text{cm}}{100000} = 4.5\ \text{km}$

   (b) $\frac{800000\ \text{cm}}{100000} = 8\ \text{km}$ (c) $\frac{600000\ \text{cm}}{100000} = 6\ \text{km}$

   (d) $\frac{1850000\ \text{cm}}{100000} = 18.5\ \text{km}$

3. (a) $200\,000 \times 5 = \frac{1000000\ \text{cm}}{100000} = 10\ \text{km}$

   (b) $200\,000 \times 2.5 = \frac{500000\ \text{cm}}{100000} = 5\ \text{km}$

   (c) $3.2\ \text{cm} \times 200\,000 = \frac{640000\ \text{cm}}{100000} = 6.4\ \text{km}$

   (d) $8\ \text{cm} \times 200\,000 = \frac{1600000\ \text{cm}}{100000} = 16\ \text{km}$

4. (i) $AB = 4\ \text{cm} \times 40\,000 = \frac{160000\ \text{cm}}{100} = 1\,600\ \text{m}$

   (ii) $BC = 5\ \text{cm} \times 40\,000 = \frac{200000\ \text{cm}}{100} = 2\,000\ \text{m}$

   (iii) $CD = \frac{5\ \text{cm} \times 40000\ \text{cm}}{100} = 2\,000\ \text{m}$ (iv) $DE = \frac{4\ \text{cm} \times 40000\ \text{cm}}{100} = 1\,600\ \text{m}$

   (v) $AH = \frac{4\ \text{cm} \times 40000\ \text{cm}}{100} = 1\,600\ \text{m}$ (vi) $FE = \frac{5\ \text{cm} \times 40000\ \text{cm}}{100} = 2\,000\ \text{m}$

   (vii) $AD = \frac{14\ \text{cm} \times 40000\ \text{cm}}{100} = 5\,600\ \text{m}$ (viii) $GE = \frac{10\ \text{cm} \times 40000\ \text{cm}}{100} = 4\,000\ \text{m}$

Check the explanation given where it is required in the activities.

Lesson5: Finding the drawing length

a) Learning objectives

- Explain how to find the drawing length.
- Calculating the drawing length.

b) Teaching resources

- Geometry set
- Ruler

- Maps
- Charts

c) Learning activities

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) $\frac{350\text{ m} \times 100}{10000} = 3.5\text{ cm}$ (b) $\frac{820\text{ m} \times 100}{10000} = 8.2\text{ cm}$

   (c) $\frac{225\text{ m} \times 100}{10000} = 2.25\text{ cm}$

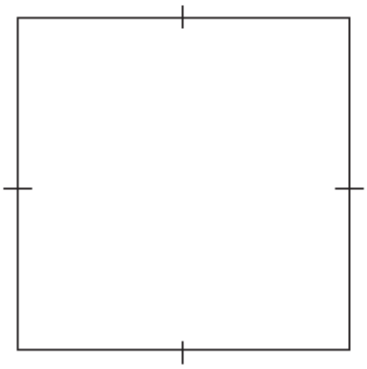
2. (a) $\frac{60\text{ km} \times 100000}{100000} = 60\text{ cm}$ (b) $\frac{225\text{ km} \times 100000}{100000} = 225\text{ cm}$

   (c) $\frac{200\text{ km} \times 100000}{100000} = 200\text{ cm}$

3. $\frac{\overset{40}{\cancel{120}}\text{ km} \times 100000}{\underset{1}{\cancel{300000}}} = 40\text{ cm}$

4. (a) 

(b)

5. (a) 

(b)

6. $\frac{56\text{ km} \times 100000}{1000000} = 5.6\text{ cm}$

Check the explanations given against each question.

Lesson6: Real life problems involving scale drawings

a) Learning objectives

Solve real life problems involving scale drawings.

b) Teaching resources

- A chart with a worked-out example
- Pieces of paper
- Ruler

c) Learning activities

This lesson will help learners to solve step by step real life problems involving scale drawings. As a teacher, help them to be familiar with solving different problems involving scale drawing in our daily life.

Examples of problems involving scale drawings:

Example 1: The actual distance between two towns is 30km. Alice drew this distance on a sheet of paper using a line of 6cm. Explain the scale used by Alice.

Solution

Drawing length/distance =6cm

Actual length = 30km

Scale = $\frac{\text{Drawing length}}{\text{Actual length}} = \frac{6\text{cm}}{30\text{km}} = \frac{6\text{cm}}{3000000\text{cm}}$

Scale used by Alice = 1: 500 000

Example 2: Using a scale of 1: 500 000, draw a line to represent the actual distance of 50km.

Solution

Interpret the scale: 1cm represents 500 000cm or 5km

Therefore: 5km are represented by a line of 1cm

50km are represented by a line of $\frac{50}{5}$ cm = 10cm

Drawing length = 10cm (guide learners to draw a line 10cm long using their ruler)

Example 3: The drawing length of a section of a river is 4cm. Explain how you can find its actual length using a scale of 1: 200 000

Solution

Interpret the scale: 1cm represents 200 000cm

Realize that: 4cm represent 200 000cm × 4 = 800 000cm = 8km

Therefore, the actual length of the river is 8km.

Assign more practice activities about real life problems involving scale drawings for better understanding.

12.6Additional information for the teacher

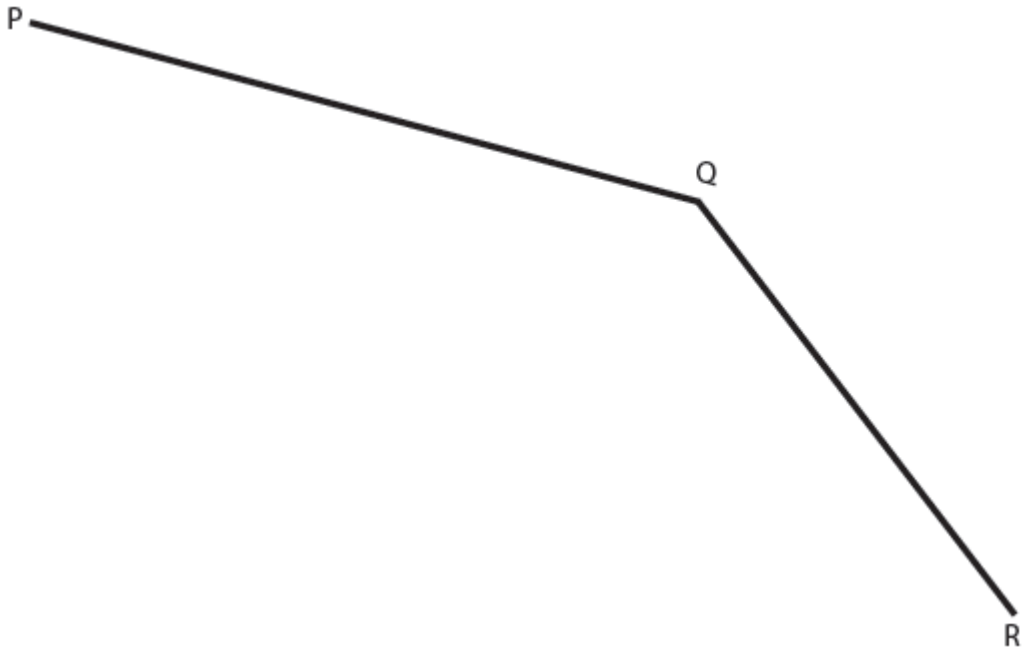
Notes to the teacher

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

Support for 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

12.7End unit assessment

1. $\frac{17.2\text{ cm} \times 10}{1720\text{ m} \times 1000} = \frac{\overset{1}{\cancel{172}}}{\cancel{172}0000_{10000}} = \frac{1}{10000} = 1{:}10\,000$

2. 1 cm rep 1 m or 1: 100

$\frac{24\text{ m}}{100\text{ cm}} = \frac{24\cancel{00}}{\cancel{100}} = 24\text{ cm}$

Scale 1:100

$\frac{10\text{ m}}{100\text{ cm}} = \frac{\cancel{1000}}{\cancel{100}} = 10\text{ cm}$

Scale 1:100

3. (a) $\frac{820\text{ cm}}{100\text{ cm}} = 8.2\text{ cm} = 1{:}100$ (b) $\frac{\cancel{6000}\text{ cm}}{\cancel{1000}\text{ cm}} = 6\text{ cm} = 1{:}1\,000$

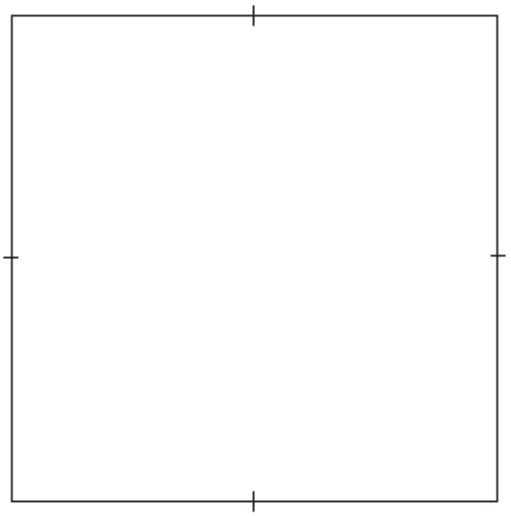
(c) $\frac{\overset{20}{\cancel{4000000}}\text{ cm}}{\cancel{200000}_{1}\text{ cm}} = 20\text{ cm} = 1{:}200\,000$

4. (a) $\frac{\overset{1}{\cancel{12}}\text{ cm}}{\cancel{6000}_{500}\text{ cm}} = 1{:}500$ (b) $\frac{\overset{1}{\cancel{8}\text{ cm}}}{\cancel{40} \times 100_{5}} = 1{:}500$ 5. $\frac{\overset{4.2}{\cancel{840} \times \cancel{100}}}{\cancel{20000}_{1}} = 4.2\text{ cm}$

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) $\frac{\overset{7}{\cancel{21}} \times \cancel{100000}}{\underset{1}{\cancel{300000}}} = 7$ cm

(b) $\frac{\overset{9}{\cancel{27}} \times \cancel{100000}}{\underset{1}{\cancel{300000}}} = 9$ cm

(c) $\frac{\overset{12}{\cancel{36}} \times \cancel{100000}}{\underset{1}{\cancel{300000}}} = 12$ cm

(d) $\frac{\overset{5}{\cancel{15}} \times \cancel{100000}}{\underset{1}{\cancel{300000}}} = 5$ cm

See the explanation given under each question.

12.8Additional activities

Remedial Activities:

1. Draw a diagram to represent the Primary 5 Math Pupil's Book.
2. Measure the actual length of the Primary 5 math Pupil's Book.
3. Measure the actual width of the Primary 5 math Pupil's Book.

Fill the following table

	Item	Actual length	Drawing length	Scale used
	Primary 5 Math Pupil's Book	20 cm	4 cm	$\frac{4}{20} = \frac{1}{5} = 1:5$
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 path 25 m long will be as follows:

$$25 \times 100 = 2\,500$$

$$= \frac{\cancel{2500}}{\cancel{100}} = 25 \text{ cm}$$

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 activities:

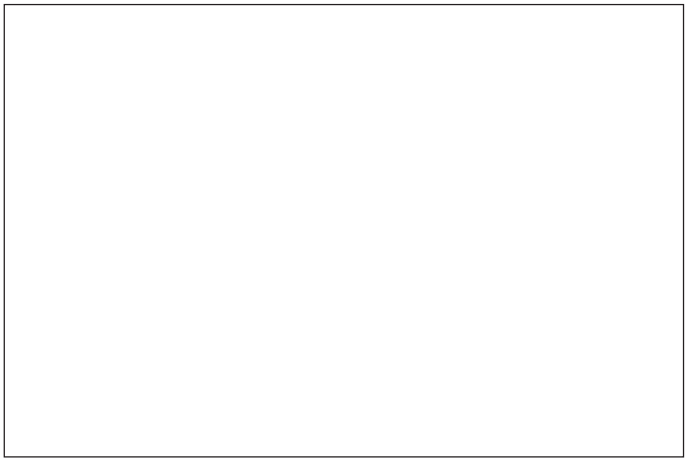
Fill in the table below.

	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.

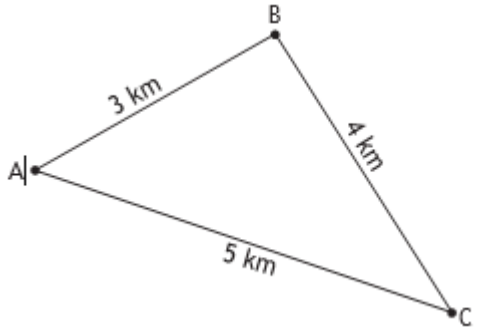


(a) Discuss how to find the actual length in metres.

(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.

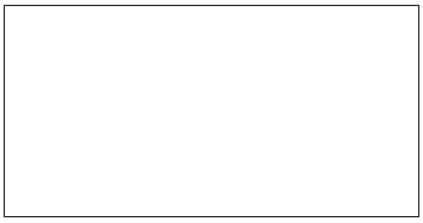
(a) What is the drawing measurement between schools A and B?

(b) What is the drawing measurement between schools B and C?

(c) What is the drawing measurement between schools A to C?

Extended activities:

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.

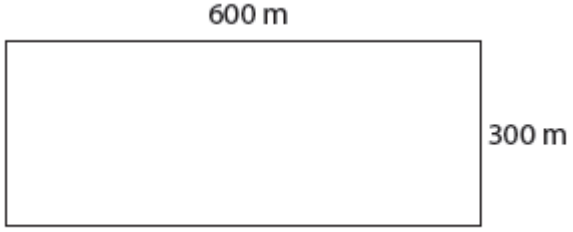
If the scale used to draw the farm is 1:50 000,

(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.



(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 kilometers?

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. $\frac{5\text{ cm}}{5\text{ m} \times 100} = \frac{\cancel{5}^{1}}{\cancel{500}_{1}} = \frac{1}{100} = 1{:}100$

5. $\frac{\cancel{10}\text{ cm}}{\cancel{10} \times 100000} = \frac{1}{100000} = 1{:}100\,000$

6. $7 \times 100 = \frac{7\cancel{00}}{1\cancel{00}} = 7\text{ cm}$

7. (a) $7 \times 200 = \frac{14\cancel{00}}{1\cancel{00}} = 14\text{ m}$

(b) $4 \times 200 = \frac{8\cancel{00}}{1\cancel{00}} = 8\text{ m}$

(c) $2 \times (14 + 8) = 44\text{ m}$

Consolidation Activity

1. $\frac{6\text{ cm}}{6\text{ m}} = \frac{\cancel{6}^{1}}{\cancel{600}_{100}} = \frac{1}{100} = 1{:}100$

2. $\frac{2\text{ cm}}{2\text{ m}} = \frac{\cancel{2}^{1}}{\cancel{200}_{100}} = \frac{1}{100} = 1{:}100$

3. $\frac{3\text{ cm}}{3\text{ m}} = \frac{\cancel{3}^{1}}{\cancel{300}_{100}} = \frac{1}{100} = 1{:}100$

4. $\frac{20\text{ cm}}{8\text{ km}} = \frac{{}^{1}\cancel{20}\text{ cm}}{\cancel{800000}_{40000}} = \frac{1}{40000} = 1{:}40\,000$

5. $\text{Length} = \frac{8\cancel{00}\text{ m} \times 1\cancel{00}}{1\cancel{0000}} = 8\text{ cm.}$ $\text{Width} = \frac{5\cancel{00}\text{ m} \times 1\cancel{00}}{1\cancel{0000}} = 5\text{ cm.}$

6. $15 \times 10\,000 = \frac{150\cancel{000}}{1\cancel{00000}} = 1.5\text{ km}$

7. (a) $9\text{ cm} \times 5\,000 = \frac{4500\cancel{0}\text{ cm}}{1\cancel{00}} = 450\text{ m}$

(b) $6\text{ cm} \times 5\,000 = \frac{3000\cancel{0}\text{ cm}}{1\cancel{00}} = 300\text{ m.}$

8. (a) $3 \times 100\,000 = \frac{300000 \text{ cm}}{100000} = 3 \text{ cm}$

(b) $4 \times 100 = \frac{400000 \text{ cm}}{100000} = 4 \text{ cm}$

(c) $5 \times 100\,000 = \frac{500000 \text{ cm}}{100000} = 5 \text{ cm}$

Extension Activity

1. $\frac{7 \text{ cm}}{7 \text{ m}} = \frac{7^{1}}{\underset{100}{700}} = \frac{1}{100} = 1{:}100$

2. $\frac{5 \text{ cm}}{5 \text{ km}} = \frac{5^{1}}{\underset{100000}{500000}} = \frac{1}{100000} = 1{:}100\,000$

3. $\frac{10 \text{ cm}}{30 \text{ km}} = \frac{10^{1} \text{ cm}}{\underset{300000}{3000000}} = \frac{1}{300000} = 1{:}300\,000$

4. (a) $6 \text{ cm} \times 50\,000 = \frac{300000 \text{ cm}}{100} = 3\,000 \text{ m}$

(b) $3 \text{ cm} \times 50\,000 = \frac{150000 \text{ cm}}{100} = 1\,500 \text{ m}$

(c) $2(3\,000 + 1\,500) \text{ m} = 9\,000 \text{ m}$

5. (a) Scale 1:5000 = 1 cm rep 50 m

$\frac{\overset{12}{600} \text{ m}}{\underset{1}{50} \text{ m}} = 12 \text{ cm}$

(b) $\frac{5000}{100} = 1 \text{ cm rep } 50 \text{ m}$

$\frac{\overset{6}{300}}{\underset{1}{50}} = 6 \text{ cm}$

6. (a)

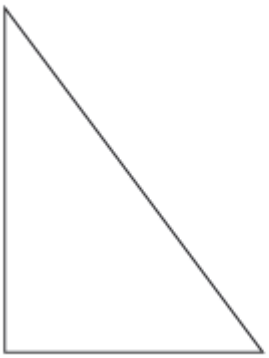
(b)

(c)

(d)

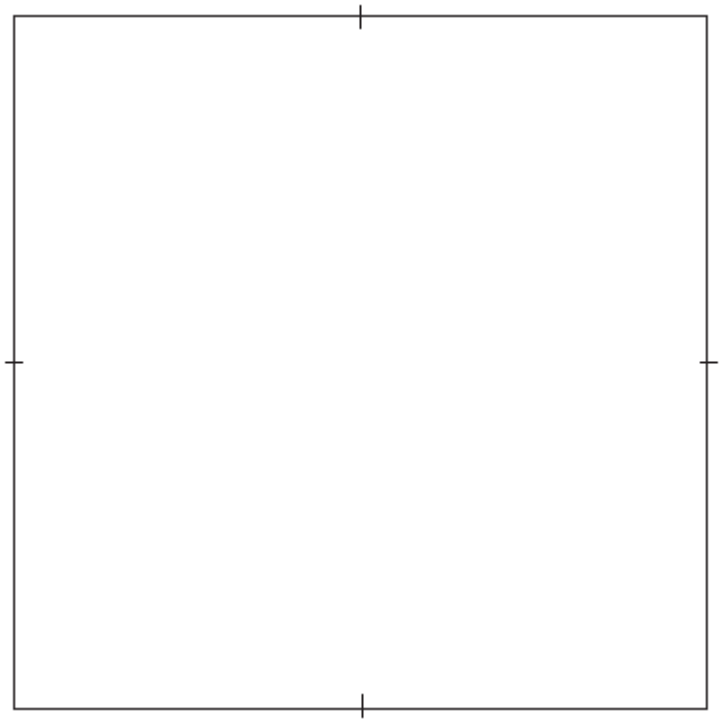
7. $200\text{ cm} \times 20\,000 = \frac{\cancel{400000}\text{ cm}}{\cancel{100000}} = 4\text{ km}$

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

Unit 13: Calculating circumference of a circle and volume of cuboids and cubes.

13.1 Key unit competence: **C**alculate circumference of a circle and volume of cuboids and cubes.

13.2 Prerequisite

Learners will perform well in this unit if they have a good background on how to calculate the circumference 2-Dimension quadrilaterals.

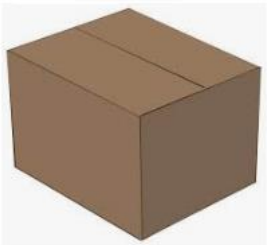
13.3 Cross-cutting issues to be addressed

- 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.

13.4 Introductory activity and guidance

A. Introductory activity for unit 13

In Mathematics, it is known that a circle is rounded geometric figure, a cube is a solid made by squares while a cuboid is a solid made by rectangles. In nature, there are objects that are in circular, cube and cuboids shapes. Refer to the images below and answer the related questions

Image 1	Image 2	Image 3	Image 4
			

1. Identify objects with circular shapes in the above images.
2. Why do you think these objects have circular shapes? Discuss.
3. You have made a cake and want to decorate it with a ribbon. The diameter of the cake is 15 cm. You have a length of ribbon that is 0.5 m long. Will you have enough ribbon to go around the outside of the cake? Explain your answer.
4. Take the box in turns. Count its faces, vertices and edges. Record the counted numbers in a table and discuss your results.

A box	Number of faces	Number of Vertices	Number of edges

5. In your own words, how can you describe the volume of a box?

B. Guidance on introductory activity for unit 13

This unit provides information on circular shapes and their circumference, cube, cuboids and their nets and volume. Through the provided introductory activity and real life examples, let students find out different objects in nature that have circular shapes and give them time to discuss on different common features of circular shapes highlighting that they are characterized by a **circumference**.

Also, in group discussion, let students read through and work out the task on the needed ribbon to go around the outside of the cake to compare the circumference of the cake (22/7 x 15cm) with the circumference of the ribbon is (22/7 x 50 cm) and find out that they have enough ribbon to go around the outside of the cake.
In addition, let them find out that a box has 6 faces, 12 edges, 12 vertices and that its volume is determined by its width, length and height.

13.5List of lessons/sub-heading

#	Lesson title	Learning objectives	Number of periods 16
0	Introductory activity	Arouse the curiosity of learners on the content of unit 13.	1
1.	Circumference of a circle	Practically measure the circumference of a circle and explain the concept of circumference	1
2.	Finding the number pi (π) and calculating the circumference of a circle	Explain the value of pi by measuring the circumference of a circle.	2
3.	Cubes and cuboids and their properties	Establish the relationship between cubes and cuboids basing on their properties	2
4.	Nets of cubes and cuboids	Distinguish cuboids and cubes basing on their nets and dimension.	2
5.	Calculating the volume of cubes and cuboids	Solve mathematical problems related to finding the volume of cuboids and cubes.	2
6.	Finding one dimension of a cuboid	Solve mathematical problems related to finding the one dimension of a cuboid	1
7.	Find the height of a cuboid given	Solve mathematical problems related to	2

	its volume and base area	finding the height of cubes and cuboids given its volume and base area.	
8.	Finding the area of a face of a cuboid	Solve mathematical problems related to finding the area of a face of a cuboid.	2
9.	End unit assessment	**C**alculate circumference of a circle and volume of cuboids and cubes	1

Guidance on lessons outlined above

Note: This unit is done practically . As a teacher refer to the Mathematics kits, practical activities and experiments user guide for P4-P6 **Practical activity 18 page 142, 143 and 144; and practical activity 19 page 145 and 146; Practical activity 20 page 147, 148 and 149** to facilitate leaners to do the practical activity on **Discovering and explaining the concept of Diameter and the number Pi** to achieve learning objectives.

Lesson 1: Circumference of a circle

a) Learning objectives

Practically measure the circumference of a circle and explain the concept of circumference

b) Teaching resources

- Car tyre, Bottle tops, Cups, Plates,
- Roundabout or circle in football pitch
- Tape measure, strings and rulers

c) Learning activities

- 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.

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

Lesson 2: Finding pi(π) and calculating the circumference of a circle

a) Learning objectives

- Explain the concept of circumference
- Explain the value of pi by measuring the circumference of a circle.

b) Teaching resources

Ruler, ropes, markers, tape measure, various circular objects e.g. bottle tops, tins, plates, cups, drum, water containers

c) Learning activities

1. Group work activities – perform activities in groups.
2. Practical approaches – measuring the circumference and the diameter.
3. 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.

Guidance to the teacher

(d) 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 = π d and d = $\frac{C}{\pi}$.

Expected answers to Practice Activity 13.2

A.1) $\frac{22}{7}$ x 77cm = 242 cm 2) $\frac{22}{7}$ x 56 cm = 176 cm

3) $\frac{22}{7}$ x 14cm = 44 cm 4) $\frac{22}{7}$ x 21 cm = 66 cm

B.1) 13.14 x 44cm = 131.88 cm 2) 13.14 x 28 cm = 87.92 cm

3) 13.14 x 35cm = 109.9 cm

C.1) $\frac{22}{7}$ x 21cm = 66 cm 2) $\frac{22}{7}$ x 98 cm = 308 cm

3) (a) $\frac{22}{7}$ x 9.8 m = 30.8 m (b) 30.8 x 3 m =92.4 m

Expected answers to Practice Activity 13.3

1. (a) $2\pi r$ (b) $2\pi r$

$2x\frac{22}{7}$ x 21cm = 132 cm $2 x\frac{22}{7}$ x 63 cm = 396 cm

(c) $2\pi r$

$2 x\frac{22}{7}$ x 14cm = 88 cm

2. (a) $2\pi r$ (3) $2\pi r$

$2x\frac{22}{7}$ x 15cm = 94.3 cm $2 x\frac{22}{7}$ x 45 cm = 282.9cm

(4) $2\pi r$

2 x 3.14x 3.5 cm = 21.98 cm

Expected answers to Practice Activity 13.4

1) $D = C \div \pi$

$D=154m \div \frac{22}{7}$ = 49 m

$R= D \div 2$

R= 49 m ÷ 2 = 24.5m

2) $D = C \div \pi$

$D=77cm \div \frac{22}{7}$ = 24.5 cm

$R= D \div 2$

R= 24.5 cm ÷ 2 = 12.25 cm

3) $D=44cm \div \frac{22}{7} = 14$ cm

4) $D=110cm \div \frac{22}{7} = 35$ cm

$R= D \div 2$

$R= 14 cm \div 2 = 7$ cm

5) $D=30.8m \div \frac{22}{7} = 9.8$ m

6) $D= \frac{439.6cm \times 10}{3.14 \times 10} = 140$ cm

$R= 9.8 m \div 2 = 4.9m$

7) $D= \frac{628m \times 100}{3.14 \times 100} = 200$ m

8) $D=88cm \div \frac{22}{7} = 28$ cm

$R= 200 m \div 2 = 100$ m

Consider the explanation given for each of the questions.

Lesson 3: Cubes and cuboids and their properties

a) Learning objectives

- Establish the relationship between cubes and cuboids basing on their properties.

b) Teaching resources

Cubes, Cuboids, Ruler

c) Learning activities

(e) Practical approaches – measuring dimensions of cubes and cuboids.

(f) Discussion – discuss examples and the findings of activities.

(g) 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.

Guidance to the teacher

(h) Allow learners to discuss the activities.

(i) Through Activity 13.5 guide learners to identify cubes and cuboids.

(j) Use Activity 13.6 to guide learners to discover properties of cuboids and cubes.

(k) 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.

Lesson 4: Nets of cubes and cuboids

a) Learning objectives

Distinguish cuboids and cubes basing on their nets and dimension.

b) Teaching resources

Ruler, Paper squares, Boxes, Charts

c) Learning activities

1. Group work activities – working out activities.
2. Practical approaches – making nets of cubes and cuboids.
3. 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.

Guidance to the teacher

(l) Allow the learners to discuss the activities in groups.

(m) 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).

Lesson 5: Calculating the volume of cubes and cuboids

a) Learning objectives

- Explain how to find the volume of cubes and cuboids
- Solve mathematical problems related to finding the volume of cuboids and cubes.

b) Teaching resources

Manila paper, Square cards, Cubes, Cuboids

c) Learning activities

(n) Group work activities – perform activities in small groups.

(o) Practical approaches – count the cubes

(p) 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.

Guidance to the teacher

(q) Allow learners to discuss and explain the activities.

(r) 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.

(s) For cube and cuboid, Volume = cubes along the length × cubes along the width × cubes along the height.

(t) 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. $20\text{ cm} \times 20\text{ cm} \times 20\text{ cm} = 8\,000\text{ cm}^3$
2. $4\text{ m} \times 3\text{ m} \times 2\text{ m} = 24\text{ m}^3$
3. $20\text{ cm} \times 15\text{ cm} \times 8\text{ cm} = 2\,400\text{ cm}^3$

4. $35\text{ cm} \times 22\text{ cm} \times 12\text{ cm} = 9\,240\text{ cm}^3$
5. $8\text{ m} \times 6\text{ m} \times 10\text{ m} = 480\text{ m}^3$

Lesson 6: Finding one dimension of a cuboid

a) Learning objectives

- Solve mathematical problems related to finding the one dimension of a cuboid

b) Teaching resources

Cubes and cuboids like cartons, boxes, etc., Manila paper, Charts

c) Learning activities

1. Group work activities – working out activities in groups.
2. Practical approaches – measuring one side of cubes/cuboids once volume and other dimensions are known.
3. 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.

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 x Wx H

(ii) Height = $\frac{\text{Volume}}{\text{Length x width}}$

(iii)Width = $\frac{\text{Volume}}{\text{Length x Height}}$

(iv) Length = $\frac{\text{Volume}}{\text{Width x Height}}$

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. $36\text{ cm} \times 72\text{ cm} = 2\,592\text{ cm}^2$
6. $144\text{ cm} \times 36\text{ cm} = 5184\text{ cm}^2$

$142\,540\ cm^3 \div 2\,592\ cm^2 = 55\ cm$

7. $35\ cm \times 30\ cm = 1\,050\ cm^2$

   $25\,200\ cm^3 \div 1\,050\ cm^2 = 24\ cm$

9. $8m \times 5\ m = 40\ m^2$

   $160\ m^3 \div 40m^2 = 4\ m$

$414\,720\ cm^3 \div 5\,184\ cm^2 = 80\ cm$

8. $40\ cm \times 18\ cm = 720\ cm^2$

   $21\,600\ cm^3 \div 720\ cm^2 = 30\ cm$

10. $3.8\ m \times 2.5\ m = 9.5\ m^2$

    $38\ m^3 \div 9.5\ m^2 = 4\ m$

Lesson 7: Finding the height of a cuboid given its volume and base area

a) Learning objectives

- Solve mathematical problems related to finding the height of cubes and cuboids given its volume and base area.

b) Teaching resources

Cube and cuboid objects, Manila charts

c) Learning activities

1. Problem solving – learners solve problem about volume.
2. Group work activities – discuss activities in group.
3. 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.

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. $3150\ cm^3 \div 315\ cm^2 = 10\ cm$
2. $576\ cm^3 \div 144\ cm^2 = 4\ cm$
3. $250\ m^3 \div 50\ m^2 = 5\ m$
4. (a) $30\ cm \times 30\ cm = 900\ cm^2$ (b) $18\,000\ cm^3 \div 900\ cm^2 = 20\ cm$
5. $90\ cm \times 50\ cm = 4\,500\ cm^2$

   $10\,000\ cm^3 \div 4\,500\ cm^3 = 2.2\ cm$

6. $8\,000\,cm^3 \div 160\,cm^2 = 50\,cm$
7. $8\,m \times 7\,m = 56\,m^2$

   $168\,m^3 \div 56\,m^2 = 3\,m$

8. $34\,m \times 22\,cm = 748\,cm^2$

   $11\,220\,cm^3 \div 748\,cm^2 = 15\,cm$
9. $84\,m^3 \div 28\,m^2 = 3\,m$

Lesson 8: Finding the area of a face of a cuboid

a) Learning objectives

- Solve mathematical problems related to finding the area of a face of a cuboid.

b) Teaching resources

Cubes, Cuboids, Manila charts illustrating the concept.

c) Learning activities

1. Group work activities – working activities in group.
2. Discussion – discussing activities.
3. 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.

Guidance to the teacher

1. Allow learners to discuss the activities.
2. Guide learners to find the area of the shaded faces.
3. Guide learners to calculate the area of the shaded faces as below.

   Area of shaded face of cuboid is given by $\frac{\text{Volume of cuboid}}{\text{Given dimension}}$. The dimension can be length, width or height of the cuboid.

   Area of shaded face of cube is given by $\frac{\text{Volume of cube}}{\text{Length of cube}}$

Expected answers to Practice Activity 13.11

1. (a) $3\,120\,cm^3 \div 15\,cm = 208\,cm^2$ (b) $1\,428\,cm^3 \div 7\,cm = 204\,cm^2$

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) $8\,151\text{ cm}^3 \div 429\text{ cm}^2 = 19\text{ cm}$

(b) (i) $3\text{ cm} \times 5\text{ cm} = 15\text{ cm}^2$

$90 \div 15 = 6\text{ cm}$

$6\text{ cm} \times 3\text{ cm} = 18\text{ cm}^2$

(ii) $90\text{ cm} \div 15\text{ cm} = 6\text{ cm}$ (c)

(i) $3.6\text{ m} \times 3.6\text{ m} = 12.96\text{ m}^2$

$41.472\text{ cm}^3 \div 12.96\text{ m}^2 = 3.2\text{ cm}$

$3.2\text{ m} \times 3.6\text{ m} = 11.52\text{ m}^2$

(ii) $41.472\text{ m}^3 \div 12.96\text{ m}^2 = 3.2\text{ m}$

3. (a) $1.5\text{ m} \times 0.8\text{ m} = 1.2\text{ m}^2$

$1.44\text{ m}^3 \div 1.2\text{ m}2 = 1.2$

$1.5\text{ m} \times 1.2\text{ m} = 1.8\text{ m}^2$

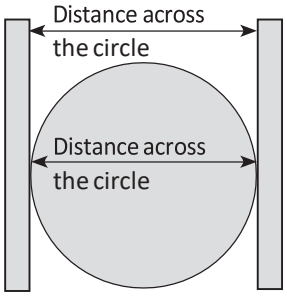
(b) $1.44\text{ m}^3 \div 1.2\text{ m}^2 = 1.2\text{ m}$

13.6Additional information for the teacher

Learners should calculate the circumference of a circle and the volume of cuboids and cubes.

Notes to the teacher

4. Ensure this unit is handled with a lot of practical activities. Learning/teaching materials must be prepared in advance.
5. Organise for activities and specify where they are to be carried out.
6. 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	$\frac{44}{14} = \frac{22}{7} or \quad 3\frac{1}{7}$
Mug	22 cm	7 cm	$\frac{22}{7} or \quad 3\frac{1}{7}$
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 $\frac{22}{7} or \quad 3\frac{1}{7}$ or 3.14.

The constant of $\frac{C}{D}$ is called pi. The symbol for pi is π.

$$pi(\pi) = \frac{\text{Circumference (C)}}{\text{Diameter (D)}}, \quad \pi = \frac{C}{D}$$

13.7End unit assessment

Expected Answers to Revision activity13

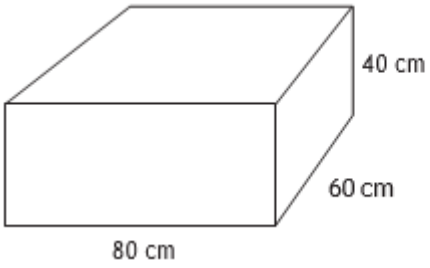
1. (a) 154 cm (b) 49 cm
2. (a) $\frac{22}{7} \times 28cm = 88cm$
3. $\frac{22}{7} \times 15.4\text{cm} = 48.4\text{cm}$
4. 5 faces
5. $8 \times 12 = 96$
6. (a) Cuboid

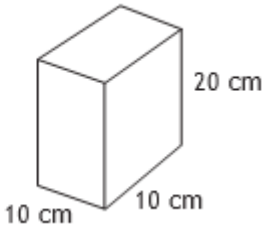
(b) None (c) Cube (d) Cube (e) None

7. $D = 88 \div \frac{22}{7}$

$= \cancel{88}^{4} \times \frac{7}{\cancel{22}_{1}} = 28 \text{ m}$

8.





Volume of the carton = 80cm x 60cm x 40cm = 192 000cm^3

Volume of a small packet = 10cm x 10cm x 20cm = 2 000cm^3

Number of bottles = $\frac{192\ 000cm3}{2\ 000cm3}$ $96\ bottles$

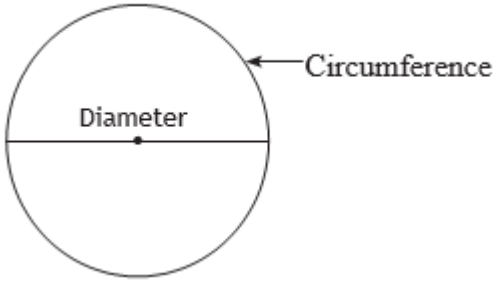
4. 7.2 m × 5.5 m × 2 m = 79.2 m^3
5. 18 cm × 18 cm × 18 cm = 5 832 cm^3
6. 7 m × 3 m × 4.2 m = 88.2 m^3
7. 4 cm × 4 cm × 4 cm = 64 cm^3
8. $\frac{405\ m3}{15m \times 9m} = 3m$
9. $\frac{4530m3}{5m}$ =906m^2
10. $\frac{87360cm2}{48cm \times 35cm} = 52cm$
11. $\frac{32cm3}{8cm2} = 4cm$
12. $\frac{19285cm3}{35cm} = 551cm^2$

See the explanations given under each question.

13.8 Additional activities

Remedial Activities:

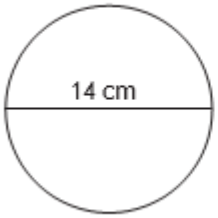
1. Study the diagram below.

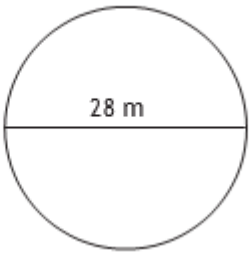


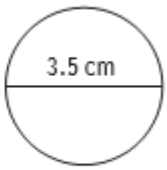
How many times does a diameter fit on the circumference? _____.

2. The radius is half of the _____.

   The circumference of a circle =_____× d
3. Find the circumference of circles with the following diameters.

(a) 

(b) 

(c) 

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.

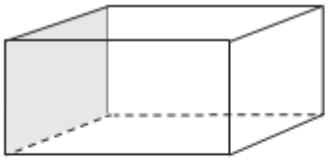
Consolidation activities:

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 cm^3. It has a length of 30 m and 20 cm wide. What is the height of the cuboid?
7. Fill the table below.

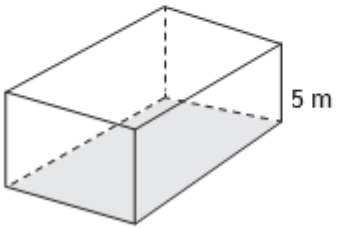
	Length	Width	Height	Volume
(a)	—	50 cm	36 cm	25 200 cm^3
(b)	4 m	3 m	12 m	—
(c)	5 m	—	12 m	240 m^3

8. The volume of a cuboid is 720 000 cm^3. Its base area is 2 400 cm^2. 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 cm^3

10. 

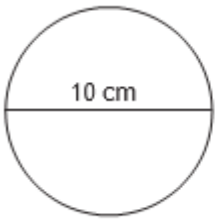
Volume = 60 m^3

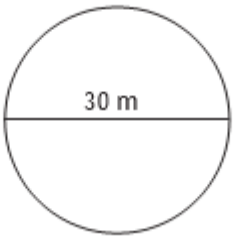
Extended activities:

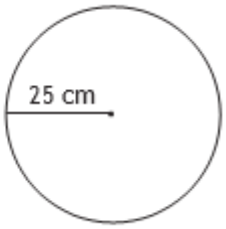
1. Fill in the table below.

	Circumference	Diameter	Radius
(a)	—	1.4 m	—
(b)	—	—	49
(c)	154	—	—

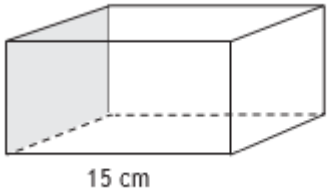
2. The circumference of a circle is 308 cm find the radius of the circle.
3. Find the circumference of the following circles

(a) 

(b) 

(c) 

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 cm^3. 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 cm^3. Find its width in Decameter. Discuss your steps.
8. The volume of a cuboid is 3 150 cm^3. Its base area is 315 cm^2. Calculate its height in Decameter. Justify your answer.
9. Find the area of the shaded face in the diagram below given its volume is 3 120 cm^3.



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) $\frac{22}{7}$ x 14cm = 44 cm (b) $\frac{22}{7}$ x 28cm = 88 cm

(c) $\frac{22}{7}$ x 3.5cm = 11 cm

4) $\frac{22}{7}$ x 5.6cm x 2 = 35.2 cm

5) (a) 7cm x 2 = 14 cm

$\frac{22}{7}$ x 14cm = 44 cm

(b) 70cm ÷ 2 = 35 cm

$\frac{22}{7}$ x 70cm = 220 cm

(c) D = 154m ÷ $\frac{22}{7}$ =49 m

R = $\frac{49}{2}$ m = 24.5m

6) 6 7) 8

Consolidation activity

1) (a) $\frac{22}{7}$ x 35cm = 110 cm (b) $\frac{22}{7}$ x 11.2cm x 2 = 70.4 cm

3) D = 44cm ÷ $\frac{22}{7}$ = 14 cm 4) 18

5) 8m x 6m x 4m = 192 m^3

6) 30m x 20cm = 600 cm^2

90 000 cm^3 ÷ 600 cm^2 = 150 cm

7) (a) $\frac{25\,200\ cm^3}{50\ cm\ x\ 36\ cm}$ = 14 cm (b) 4m x 3m x 12m = 144 m^3

(c) $\frac{240\ m^3}{5\ m\ x\ 12\ m}$ = 4 m

8) $\frac{720\,000\ cm^3}{2\,400\ cm^2}$ = 300 cm (9) $\frac{26.8\ cm^3}{17\ cm}$ = 154 cm^2 (10) $\frac{60\ m^3}{5\ m}$ = 12 m^2

Extension Activity

1) (a) Radius $= \frac{1.4\text{ m}}{2} = 0.7$ m , $C = \frac{22}{7}$ x 1.4 m = 4.4 m

(b) D=49 x 2 = 98 cm $C = \frac{22}{7}$ x 98 cm = 308 cm

(c) D=154cm $\div \frac{22}{7} = 49$ cm , $R = \frac{49\text{cm}}{2} = 24.5$ cm

2) D=308cm $\div \frac{22}{7} = 98$ cm , $R = \frac{98\text{cm}}{2} = 49$ cm

3) (a) 3.14 x 10 cm = 31.4 cm (b) 3.14 x 30 cm = 94.2 cm (c) 3.14 x 50 cm = 157 cm

4) 6 x 8 = 48 5) 6 + 12 = 18

6) $\frac{11970\text{ cm}^3}{38\text{ cm x }21\text{ cm}} = 15$ cm 7) $\frac{9\,000\text{ m}^3}{30\text{ m x }15\text{ m}} = 20$cm. Now 20 cm = $\frac{20}{1000}$dam = 0.02dam

8) $3150\text{ cm}^3 \div 315\text{cm}^2 = 10$ cm . Hence, 10cm = $\frac{10}{1000}$dam = 0.01dam

9) $3120\text{ cm}^3 \div 15\text{cm} = 208\text{ cm}^2$ 10) 3.5 x 2m x 1.5 m =10.5 m^3

Unit 14: Statistics.

14.1 Key unit competence: Collect data, represent and interpret it in order to answer a question or explore a hypothesis.

14.2 Prerequisite

Learners will perform well in this unit if they have a good background on Data collection using tables, Quantitative and qualitative data, Interpreting and extracting information from tables and bar graphs, representing information using tables and bar graphs seen in Primary 4.

14.3 Cross-cutting issues to be addressed

- **Gender education:** Learners will have an equal opportunity to attain desired behavior and attitude irrespective of whether they are male or female. In class, organise learners in groups of mixed gender so as to learn together.

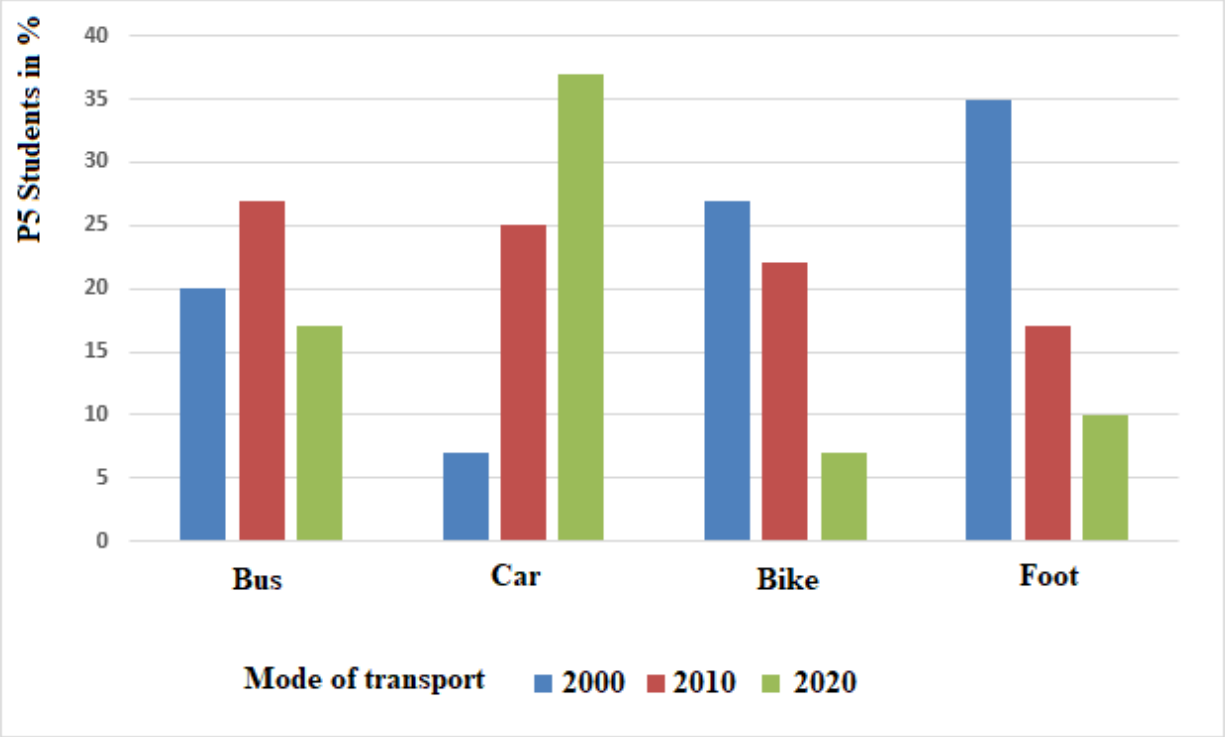
  This gender harmony will facilitate learners to achieve the desired competence.
- **Standardisation culture:** Learners are expected to give accurate answers to questions and problems. Develop a standard culture in learners to investigate or do research to solve problems objectively.
- **Inclusive education:** 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.

14.4 Introductory activity and guidance

A. Introductory activity for unit 14

Data are helpful in knowing how things are taking place. They are also helpful in good planning. With records, one is able to remember what took place in the past. People are able to know things that happened due to stored data or information.

For example, the P5 students at a certain school were surveyed to find out how they usually get to school and return home in three different years 2000, 2010 and 2020. The diagram provided illustrates the results of the survey.



Refer to the diagram and answer the questions.

(a) Does the diagram very helpful to quickly recognize different mode of transport for P5 students in different 3 years 2000, 2010 and 2020?

(b) Which mode of transport is used by a big number of P5 students in 2000, 2010 or in 2020? Which means of transport is used by a small number of P5 students 2000, 2010 or in 2020?

(c) How do you think representing data on a diagram can help you to interpret different mode of transport for P5 students each year?

(d) Do you think collecting and presentation of data is important to you? Give 2 reasons.

B. Guidance on introductory activity for unit 14

This unit provides the essence of data collection, presentation and interpretation. Students need to be guided on what they will gain from this unit. Let them be challenged through the provided introductory activity and help them to have the general idea of the unit content.

Let them find out that the presented diagram / pie chart can make easy the comparison of groups of the data by highlighting the following:

- The diagram/ bar chart stands for the whole amount of data being dealt with (number of students, different mode of transport). For example, the diagram presents and compare the number of P5 students who usually get to school and return home by bus, car, bike or foot in three years 2000, 2010 and 2020.
- Each bar (in different colour) stands for a named part of the data according to the given year (2000, 2010 or 2020). The size of each bar shows the size of that part of the data. For example, the overall information given by the whole diagram is that the car gained its popularity and the number of people who used to walk gradually decreased.
- In 2000, almost 20 percent of P5 students used buses to and from the school and this percentage grew to almost 28% after 10 years. In 2020, bus users fell to less than 20%. On the contrary, in the case of private cars, the users were only about 7% in 2000, which was the lowest among the 4 categories, and this increased sharply in 2010 amounting 25%, and in 2020, more than 38%, making it the most used form of the transportation system.
- Besides, more than 27% P5 students used bikes in 2000 and in 2010 the number decreased by 5% but in 2020 it dramatically fell to somewhat 7%. Finally, 35% of P5 students used to walk to go to school and to return from there. But this foot-walkers' number declined significantly in the 2010 and in 2020. To summarise, more P5 students used to walk to travel to and from school in 2000 but with the popularity of private cars, this ratio declined.
- Collecting and presenting data in different forms (tables, bar chart, …) is important because it make easier the comparison and interpretation of groups of data.
- Let students find out that data is knowledge and good data help to make Informed decisions.
- Bar graphs are easy to understand, widely used, and can show changes over time.

14.5List of lessons/sub-heading

#	Lesson title	Learning objectives	Number of periods 24
0	Introductory activity	Arouse the curiosity of learners on the content of unit 14.	2
1.	Definition and examples of quantitative data	Define and give examples of quantitative data.	3
2.	Definition and examples of Discrete data	Define and give examples of discrete data.	2

3.	Definition and examples of Continuous data	Define and give examples of continuous data.	2
4.	Collecting and Recording data using tally and table	Collect and Record data in a tally table	3
5.	Representing data using bar charts	Represent data in a bar chart	3
6.	Interpreting bar charts to draw a conclusion	Interpret bar charts and draw appropriate conclusions.	1
7.	Representing data using line graphs	Represent data in a line graph	3
8.	Interpreting line graphs to draw a conclusion	Interpret line graphs and draw appropriate conclusions.	3
9.	End unit assessment	To assess if such skills as collecting, representing and interpreting data have been developed in order to answer questions or explore hypothesis.	2

Guidance on lessons outlined above

Note: This unit is done practically. As a teacher refer to the Mathematics kits, practical activities and experiments user guide for P4-P6 **Practical activity 21 page 150, 151 and 152;** to facilitate leaners to do the practical activity on **Collecting, Representing and Interpreting data** to achieve learning objectives.

Lesson 1: Definition and examples of quantitative data

a) Learning objectives

Define and give examples of quantitative data.

b) Teaching resources

A chart showing example of quantitative data

c) Learning activities

- Through examples, explain learners that quantitative data answer questions such as "How many?", "How often?", "How much?".
- By using the following examples "Height in feet, age in years, and weight in kilograms", Help learners to finds out that quantitative data is **data that can be counted or measured in numerical values**.
- Teacher uses the listed below to provide more examples of data that can help deeply understanding of the concept "quantitative data".

1. A teacher records scores on a 20-point in Mathematics quiz for the 30 students in his/ her class as follow: 19 20 18 18 17 18 19 17 20 18 20 16 20 15 17 12 18 19 18 19 17 20 18 16 15 18 20 5 0 0. These scores are numerical values; hence they are quantitative data.
2. **83 people** downloaded the latest mobile Mathematics application.
3. **150 respondents** were of the opinion that the new product feature will not be successful.
4. There will be **30% increase** in revenue with the inclusion of a new product.
5. **500 people** attended the seminar.
6. **54% people** prefer shopping online instead of going to the mall.
7. Product X costs **1000 Frw**.

Note: Teacher can prepare and adapt the information given for this lesson basing on the class he or she is teaching, the school materials and environment.

Lessons 2 & 3: Continuous and discrete quantitative data

Note: Guidance of the lessons 2 and 3 in the table above are given in this lesson. As a teacher you may refer to this lesson and facilitate learners, in 2 different lessons, to do as many as possible activities on continuous and discrete data quantitative data. Let learners give examples of quantitative discrete data and examples of continuous quantitative data and basing on those examples guide them to distinguish the two types of quantitative data.

a) Learning objectives

- Define and give examples of discrete or continuous data.
- Distinguish between continuous and discrete data.

b) Teaching resources

Tape measure, ruler, stopwatches, string.

c) Learning activities

- 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.

Organize 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 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.

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.

Lesson 4: Collecting and Recording data using tally and table

a) Learning objectives

Collect and Record data in a tally table

b) Teaching resources

Rule, a chart showing recorded data in a table

c) Learning activities

- A teacher asks students to collect all copies of students and record scores on a 20-point in Mathematics quiz for the 30 students as follows: 19 20 18 18 17 18 19 17 20 18 20 16 20 15 17 12 18 19 18 19 17 20 18 16 15 18 20 5 0 0
- Ask learners to work in small groups, by using pens or pencil identify the number of students with the same score and organize data in a tally table below.

Marks on 20 point	**Tally**	**Number of students with the same score**
20		
19		
……		

2		
1		
0		
Total number of students		

A full completed table

Marks on 20 point	**Tally**	**Number of students with the same score**
20	𝍸	6
19	𝍷	4
18	𝍸	8
17	𝍷	4
16	𝍵	2
15	𝍵	2
14		0
13		0
12	𝍶	1
11		0
10		0
9		0
8		0
7		0
6		0
5	𝍶	1
4		0
3		0
2		0
1		0
0	𝍵	2
Total number of students		30

Note: Teacher can prepare and adapt the information given for this lesson basing on the class he or she is teaching, the school materials and environment.

Lesson 5: Representing data on bar charts

a) Learning objectives

Represent data in a bar chart

b) Teaching resources

Rule, Graph or grid papers, a chart showing solution to problem in Activity 14.3

c) Learning activities

- 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

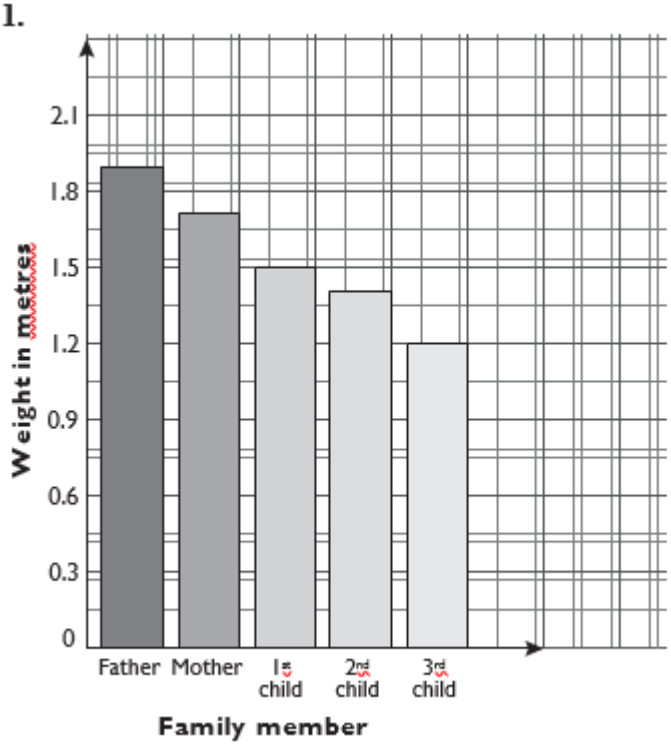
1. Ask learners to carry out Activity 14.3. Let learners present data in a bar chart.
2. Let learners discuss Example 14.2 to understand the steps of drawing a bar chart.
3. Assign learners to draw bar charts in Practice Activity 14.2 questions 1 and 2 as classwork. Go round checking progress.
4. Have learners give important points they have learnt.
5. Assign learners question 3 of Practice Activity 14.2 as homework.

Guidance to the teacher

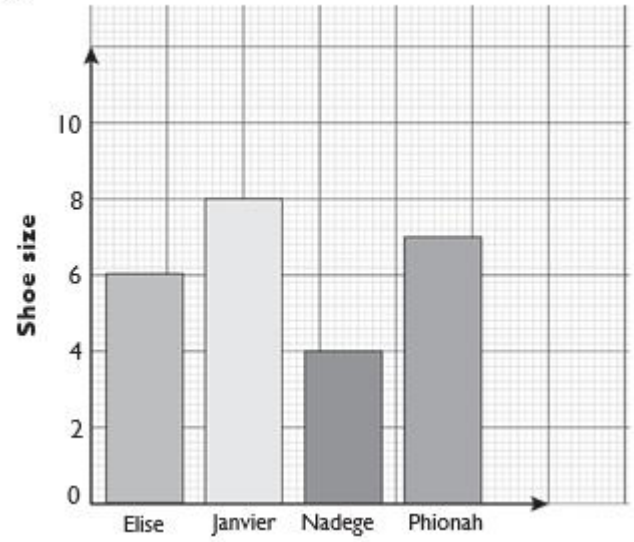
- On a bar chart the vertical axis represents the number of items.
- The horizontal axis represents the items represented.
- The scale on the vertical axis should allow for representation of all data. Intervals on the horizontal axis are consistent for easy reading.

Expected Answers for Practice 14.2

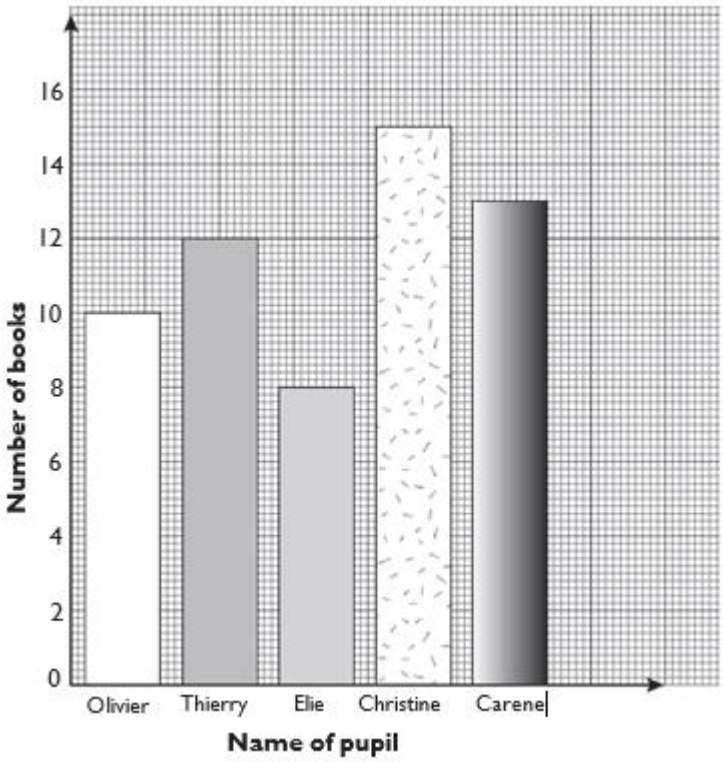
1.



2.



3.



4. Discrete data

Lesson 6: Interpreting bar charts

a) Learning objectives

Interpret bar charts and draw appropriate conclusions.

b) Teaching resources

A chart showing solutions to Activity 14.4.

c) Learning activities

- 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.
5. **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

Lesson 7: Representing data using line graphs

a) Learning objectives

Represent data in a line graph

b) Teaching resources

Metre ruler or tape measure, graph/grid papers

c) Learning activities

- 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.

Guidance to the teacher

Emphasise that when drawing a line graph, it is important to follow these steps:

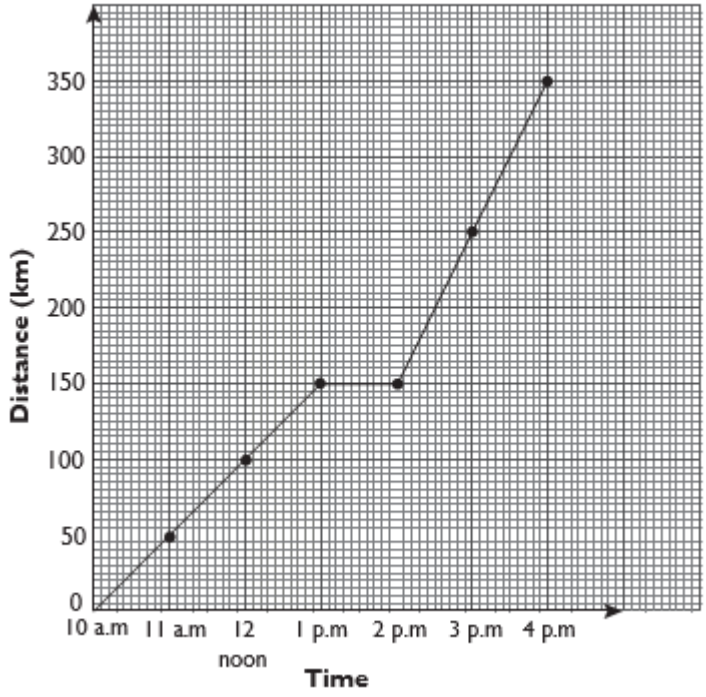
(a) Choose a good scale. Length of axes should allow you to have all data values.

(b) Draw the axes and label.

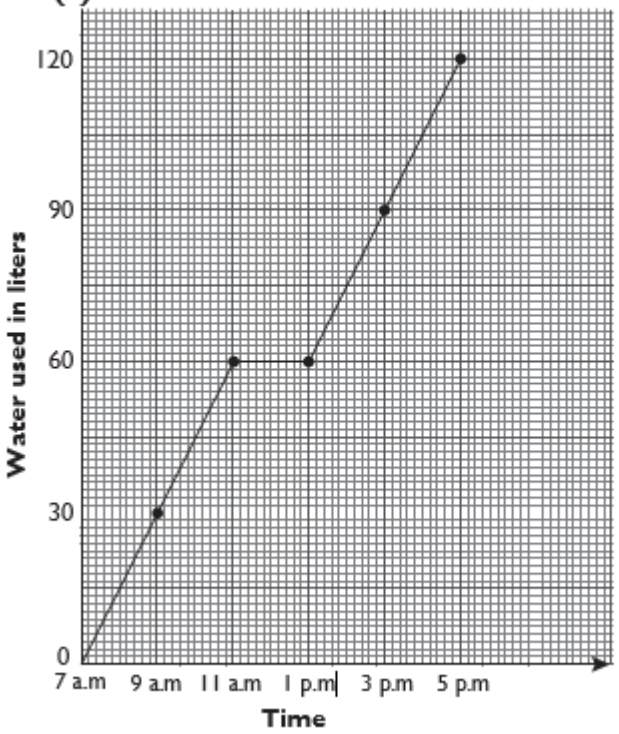
(c) Plot points on the graph then join the points using a straight line.

Expected answers for Practice Activity 14.4

1.

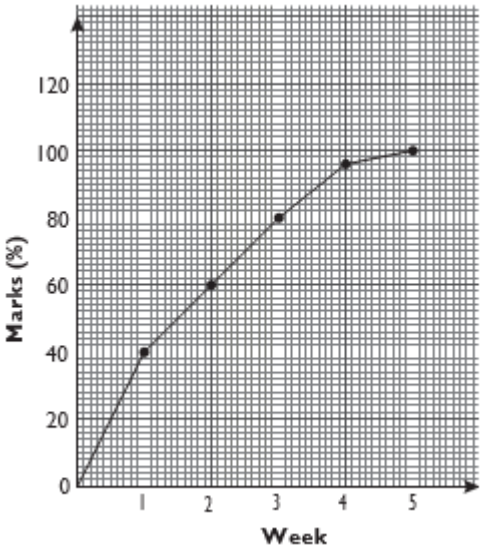


2. (a)



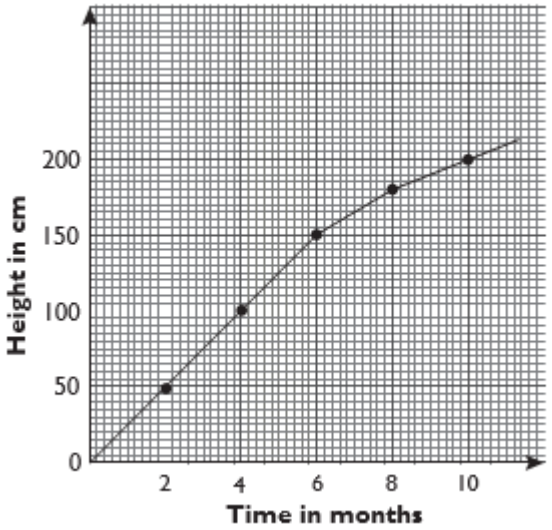
(b) Water was not being used.

3. Yes, marks was improving every week.



4.

- Plot the height of the crop.
- Join the dots.



Lesson 8: Interpreting line graphs

a) Learning objectives

Interpret line graphs and draw appropriate conclusions.

b) Teaching resources

- Illustrated chart
- Grid or graph papers

c) Learning activities

- 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.

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) $1\frac{1}{2}\ hr$ or 1 h 30 min.

14.6Additional information for the teacher

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).

14.7End unit assessment

- 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

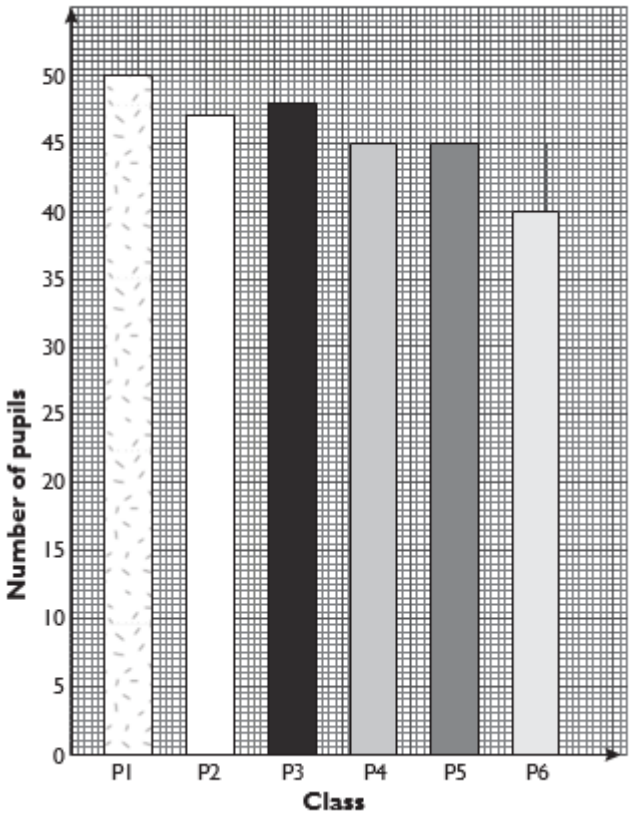
more time to complete the task motivate all learners with different abilities to have positive attitude and achieve expected competence.

- 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)



(c) (i) **P1**

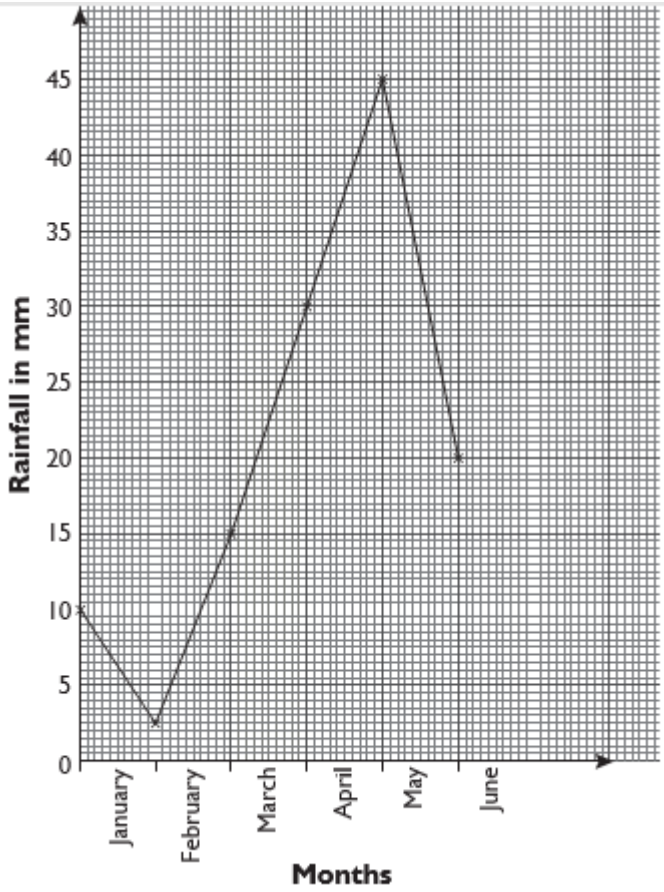
(ii) P4 and P5

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.

14.8Additional activities

7. **Remedial Activities**:

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.

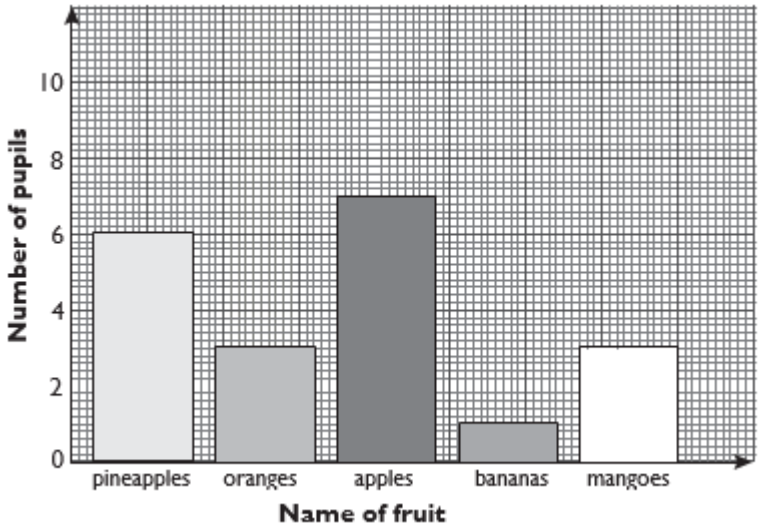
(d) Distance round the school compound.

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' favorite 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 kilometers 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**

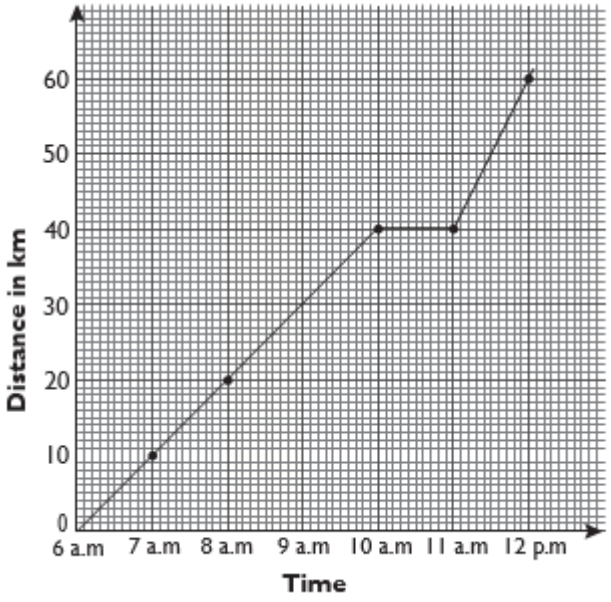
(b) Apples

(c) Oranges and mangoes

(d) 20 pupils

(e) Pupils' favorite fruits.

3. **(a)**



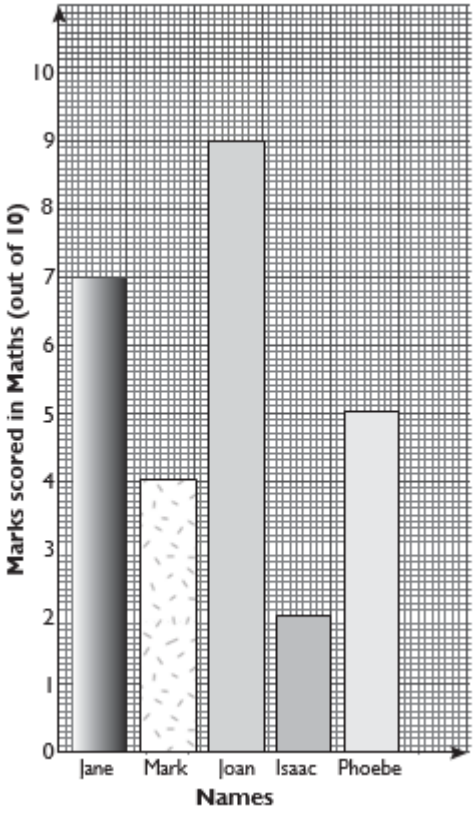
(b) 10 a.m. **(c)** 30 km

Consolidation activities:

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.

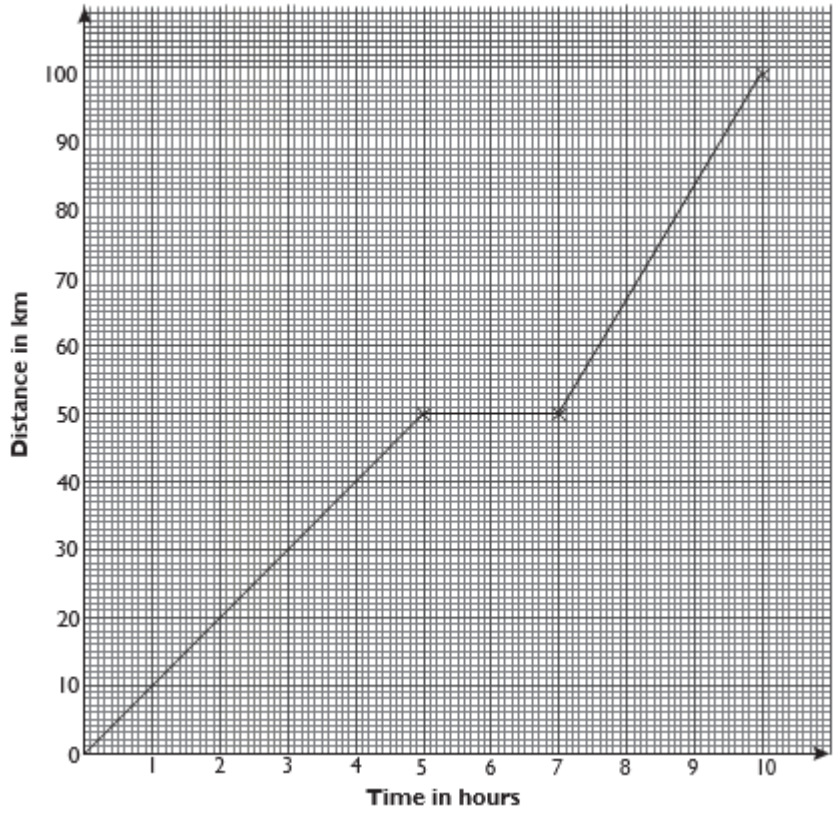
It shows distance travelled by a motorist.

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.

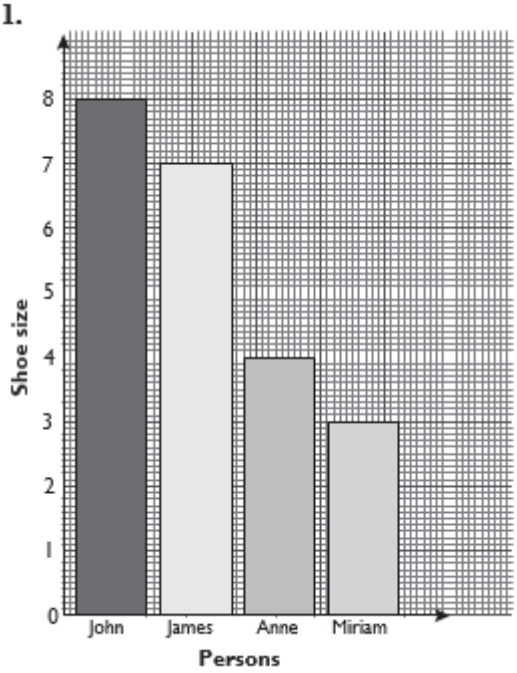


(a) What distance did the motorist cover from the 5^{th} hour to the 7^{th} hour?

(b) What distance had the motorist covered in 10 hours? Explain.

Expected Answers

1.

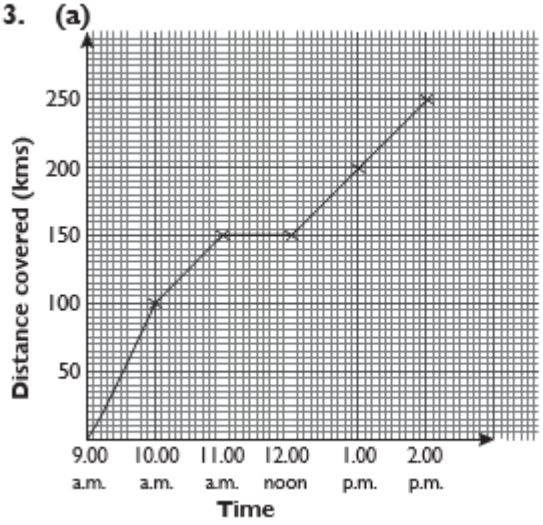


2. **(a)** Joan, 9 marks out of 10

(b) Isaac

(c) Jane, Joan, Phoebe

3. (a)



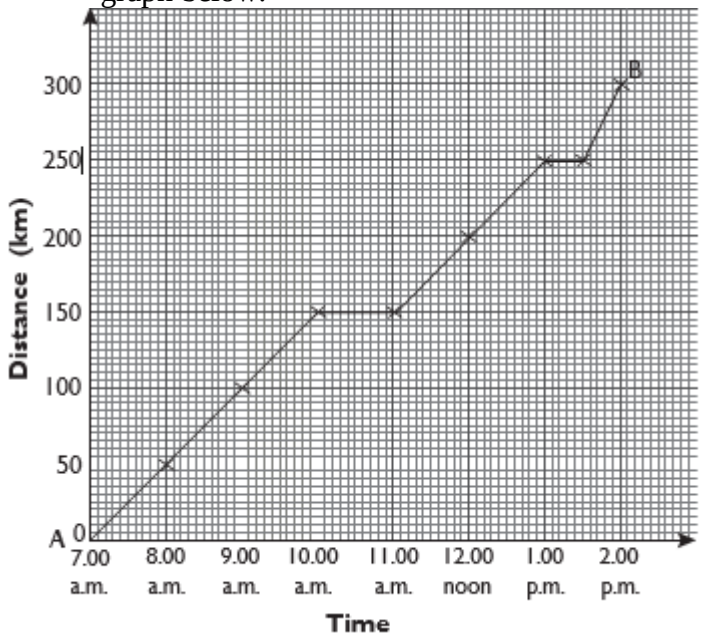
(b) Between 11:00 a.m. and 12:00 p.m. the motorist was resting.

4. (a) 0 km.

(b) 100 km.

Extended activities:

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 favorite 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.

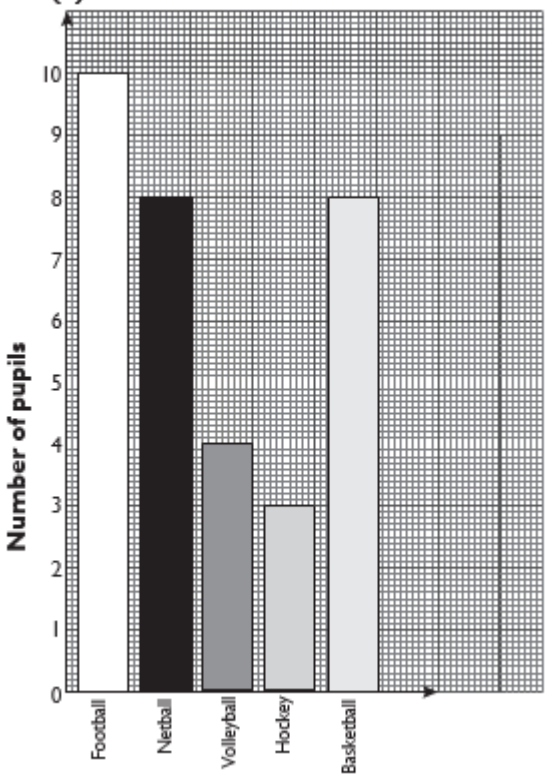
10.00 a.m. to 11.00 a.m. = 1 h

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.

Unit 15: **Probability.**

15.1 Key unit competence: Conduct experiments to decide how likely something is to happen.

15.2 Prerequisite

Learners will perform well in this unit if they have a good background on the following chance vocabulary: fair or not fair game, tossing a coin and recording outcomes seen in Primary 4.

15.3 Cross-cutting issues to be addressed

- 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

15.4 Introductory activity and guidance

A. Introductory activity for unit 15

Things in nature always happen and there is no fixed low to follow. Some things occur by chance while others must happen; some have equal chance of happening, while others are practically impossible. For example, before any Football match starts, the spectators are not sure who will win. The chance of winning the game is equal at the begging. At the end of the game, different possible outcomes or results may occur.
Normally a referee tosses a coin before the football match starts in order to help 2 teams to know the part of the playground they are going to use in the first half time.

(a) Do you think that one team to start the game using a certain part of the playground in a football match is certain to happen? likely to happen? or impossible to happen? Justify your answer.
(b) Do you think that to have the same score in a football match is likely to happen? Or impossible? With support of examples justify your answer.

B. Guidance on introductory activity for unit 15

In this unit, the students will Conduct simple experiments of tossing a coin or a die to decide how likely something is to happen. So, let them go through the introductory activity in order to be oriented about the unit content where they are going to explore the vocabulary of chance: impossible, certain, equally likely, even chance, unlikely, likely etc.

Let students find out that when the referee tosses a coin before the start of a football match, a certain team to use to a certain part of the playground in a football match is certain to happen because both team have equal chance to use any part of the playground.

With concrete examples in Rwanda football teams (First division), let the students realized that to have the same score in a football match is likely to happen, because sometimes 2 teams have the same results in a football match. Also, let the students realized that to have the same score in a football match is impossible because some teams are wining in a football match.

15.5List of lessons/sub-heading

#	Lesson title	Learning objectives	Number of periods 8
0	**Introductory activity**	Arouse the curiosity of learners on the content of unit 15.	**1**
1.	**Representing the outcomes of a die tossed many times**	Conduct experiments and record outcomes systematically	**1**
2.	Vocabulary of chance: experiment,	Use the vocabulary of	1

	outcomes, equal chance, certain, impossible, equally likely, less likely, likely, more likely.	likelihood to compare events.	
3.	**Event and related concepts: certain event, impossible event, uncertain event**	Define and give examples of different events: certain event, impossible event, uncertain event	**2**
4.	Conducting experiments, predict the outcomes and decide how likely something is to happen (use less likely or more likely).	Conduct experiments and record the outcomes systematically and use the vocabulary of likelihood to compare events	2
5.	**End unit assessment**	Conduct experiments to decide how likely something is to happen	1

Guidance on lessons outlined above

Lesson1: Representing the outcomes of a die tossed many times

a) Learning objectives

Conduct experiments and record outcomes systematically

b) Teaching resources

Dice

c) Learning activities

Notes:

4. This is a practical activity. As a teacher refer to the Mathematics kits, practical activities and experiments user guide for P4-P6 and facilitate leaners to do the practical activity 22 in P5 on tossing a dice many times, see Pages 153 -156.
5. Help leaners to understand that when you roll a single die, you can get six possible outcomes: 1, 2, 3, 4, 5, or 6.

Steps to perform this practical activity

Step1: Toss a die and observe the side that is facing up. Then ask the following questions for helping learners to develop critical thinking

If a die is rolled once,

i) What is the probability of getting a 5?

ii) What is the probability of getting an even number?

Step 2: Toss the die many times (5 times at least) and record in the following table the number of times the side shows up.

Face of a die						
Outcomes = Number						

of times a face showed up (number of counters)						

Lesson 2: **Vocabulary of chance**

a) Learning objectives

- Use the vocabulary of likelihood to compare events.

b) Teaching resources

Bottle tops, coins, dice (improvise by using wooden cubes and label the sides as required)

c) Learning activities

1. Group work – in small groups work out Activity 15.1 and Activity 15.2.
2. Practical activity – in small groups toss a coin and record.
3. Discussion – in small groups discuss their finding and the meaning of the vocabulary of chance.
4. Supervised practice – learners do activities and you assess their progress.
5. Problem solving – solving problems from examples and practice activity.

Teaching/Learning preparations

6. Provide enough coins for the lesson.
7. Organise pupils in small groups of mixed abilities and gender.
8. 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

9. 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.
10. Provide visually impaired learners with large print materials.
11. Hearing impaired learners may use finger spelling sign language and oral methods.
12. Learners with problems of tossing coins can observe and record the data.

Expected answers for Practice Activity 15.1

1. Likely 2. Likely 3. Impossible

4. Likely 5. Unlikely

Lesson3: Event and related concepts: certain event, impossible event, uncertain event

a) Learning objectives

Define and give examples of different events: certain event, impossible event, uncertain event

Lesson4: Conducting experiments, predict the outcomes and decide how likely something is to happen

a) Learning objectives

- Conduct experiments and record the outcomes systematically and use the vocabulary of likelihood to compare events.

b) Teaching resources

Bottle tops, coins, dice (improvise by using wooden cubes and label the sides as required)

c) Learning activities

- 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

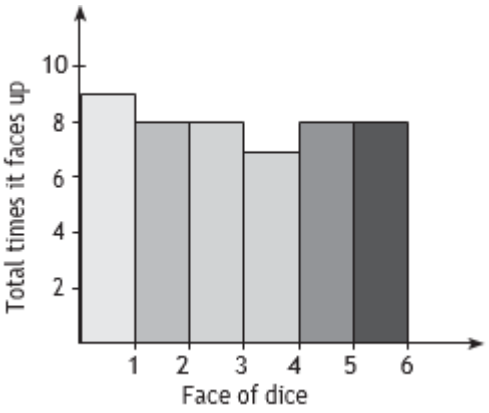
1. Introduce the concept of experiments and chances using Activity 15.2
2. In small groups let the learners do Activity 15.3 and Activity 15.4
3. Have learners discuss the tips for experiments and chance.
4. Let learners explain their findings and do Activity 15.5.
5. In pairs, let the learners do Practice 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.
8. Supervise their progress and assist those with learning difficulties.
9. Assign questions 3 and 4 of Practice Activity 15.2 as homework.

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. $\frac{1}{2}$
3. i.



(ii) 1, $\frac{9}{48} = \frac{3}{16}$ (iii) 4, $\frac{7}{48}$ (iv) $\frac{8}{48} = \frac{1}{6}$

4(i) 10 (ii) 2 (iii) 8

(iv) No - The results show us the outcome is favoring facing up almost all the time

15.6Additional information for the teacher

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.

$$\text{Probability of H} = \frac{\text{Possible outcomes}}{\text{Total outcomes}} = \frac{6}{10} = 0.6$$

However, from theoretical probability, for a fair coin toss.

$\text{Probability of H} = \frac{\text{Possible outcomes}}{\text{Total outcomes}} = \frac{1}{2} = 0.5$. 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.

15.7End unit assessment or Revision Activity 15

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. Organize 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 to Revision Activity 15

i. (i) certain (ii) impossible (iii) likely

(iv) Equally likely (v) unlikely

ii. (i) 6 (ii) 4 (iii) 10

(vi) $\frac{3}{5}$ (v) $\frac{2}{5}$

(v) No, impossible

15.8Additional activities

Remedial Activities:

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.

Expected Answers for Remedial Activity

1. (i) impossible (ii) likely

2. (i) 24 (ii) $\frac{1}{24}$

3. (i) 11 (ii) $\frac{9}{20}$

Consolidation activities:

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?

3. 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.

Expected Answers for Consolidation Activity

1. (i) unlikely (ii) impossible
2. (i) 9 (ii) $\frac{5}{24}$
3. (i) 10 (ii) $\frac{10}{20} = \frac{1}{2}$

Extended activities:

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. (LSikely, 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

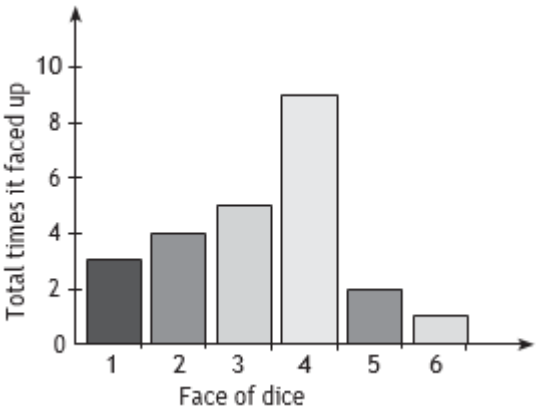
   (i) Represent the data in a bar graph.
   (ii) Which face had the highest chance of facing up? What was its chance?
   (iii) Find the chance of getting face 2.
3. A group of learners conducted an experiment. They tossed a coin twenty times. They recorded their results below. Discuss their findings.

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				
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 Extended Activity

1. i. Impossible ii. Unlikely iii. 20
2. i.



ii.face 4, its chance is $\frac{9}{24}$

iii.$\frac{4}{24} = \frac{1}{6}$

3. (i) 20 (ii) 8 (iii) No

(iv)$\frac{8}{20} = \frac{2}{5}$ (v) $\frac{12}{20} = \frac{3}{5}$