Information and Communication Technology (ICT)

for Rwanda Schools

Teacher's Guide

Senior Three

CONTENTS

General Introduction

This Teacher's Guide is a compliment of ICT for S.3 Rwanda Secondary Schools Learner's Book.

ICT for S.3 also consists of four general study areas. Each area of study is broken down into units. There are 10 Units in total each having specific objectives laid down according to ICT syllabus for S.3.

Each unit is broken down into small sections in consecutive order in which they are to be taught.

The four main areas of study include:

(i)   *Introduction to ICT* containing one unit of study, that is;

- Application and Utility software installation

(ii)   *Application software* containing seven units of study, that is;

- Table of Contents and Mail merge
- Charts and advanced objects
- ArcGIS
- Charts and objects in spreadsheet
- Presentation
- Introduction to Computer Graphics
- Introduction to Multimedia.

(iii)   *Computer Network and Data Communication* with one unit, that is;

- Network Security.

(iv)   *Programming* with one unit of study, that is;

- Platform Game programming.

For each unit, the following are indicated (in the units or in the content map):

◉ Objectives

◉ Skills

◉ Learning time

- Number of periods
- Method

  Note: It is of value if you go through the Teacher's Guide before you teach a particular unit. This will help you to plan for what you are going to teach and the method to use.

As a teacher, this guide will help you to:

- Prepare your lessons adequately.
- Organise equipment or materials you need for the lesson in time.
- Appreciate the importance of the topic/unit to the learner's education.
- Have an insight about the content of the unit and what exactly you must give to learners.

All activities are designed to be learner-centered, which is the main objective of a competence based curriculum.

After completing a unit, sub-topic area or topic area, inform learners of the next unit or topic area and the learners will quickly look at the unit from the Learner's Book and get an insight of what the unit is all about. This will enable you to handle tasks faster and easier when learners are pre-informed and prepared for them.

This Teacher's Guide takes into consideration learners' experiences and background. Introduce new concepts gradually to enable time takers to take your message within the availed time. Group learners according to their abilities and speed of grasping concepts and skills.

This Teacher's Guide is prepared to help you to meet the needs of learners from both rural and urban settings.

You are tasked to assist learners to:

- Acquire knowledge and skills of using computer applications for further education and future livelihood.
- Develop useful practical and intellectual skills for living in the digital age. Learners should gain skills of observation, researching, recording and understanding.

  Note: Be ready to get more different pieces of practical work that you can give to learners to practice.

Content Map

	Unit 1	Unit 2	Unit 3	Unit 4
Unit Title	**Application and Utility Software Installation**	**Table of Contents and Mails Merge**	**Charts and Advanced Objects**	**ArcGIS**
Number of Periods	4	8	6	10
Key Unit competence	Understand the functions of operating system; install and use application and utility software.	Generate a table of contents and use one document to have multiple copies for different recipients.	Present data graphically and use different objects in a document.	Query a map using selections (attribute and location). Create a map layout and insert map elements. Use advanced symbology and labelling. Print, export and send a map.
Number of lessons	2	4	3	5
Equipment and learning and teaching materials required	Computers, projector, textbooks, storage devices, Internet access, storage of different applications and operating systems, installation video.	Computers, projector, data (formal letter and list of recipients and their individual details), Textbooks containing both table of contents; list of figures and tables and the Internet.	Computers, projector, textbooks and interactive materials.	Computers, projector, textbooks, ArcGIS and Interactive board.

	Unit 1	Unit 2	Unit 3	Unit 4
Activities/ Techniques	• Learners discuss the role of open source applications over proprietary software and vice versa. • Learners download different software setups/installer from Internet with the teacher's guidance. • Learners install and uninstall applications provided by the teacher. • Learners download and install add-ons and use them. • In groups, learners are given DVDs containing operating systems and are to follow the instructions to install on selected computers in the laboratories.	• Within a document, learners create and amend a table of contents, list of figures and tables. • Learners write a formal letter and use mail merge features to produce multiple copies to different people. • Learners adjust a document and print different orientations using the school printer, print preview and PDF writer. • Learners protect a document using a password.	• Learners insert charts and common mathematical equations in a provided document. • Learners choose and insert documents, presentations, sheets and PDF files appropriately in a document by displaying the entire file or displaying them in the document as icons. • Learners use embedded files in a document by opening them, editing and making a presentation.	• The teacher helps learners select on a map all the rivers that flow through a predetermined location using the tools they learnt. • Practical exercises on how to select by attributes/by location and on how to export selected features. • The teacher demonstrates how symbology can be given using categories. Afterwards, learners practice symbololising layers according to categories and quantities. • The teacher helps learners work with map elements and perform exercises on how to insert a legend, scale orientation and text. • Under the teacher's guidance, learners perform an exercise on printing, exporting a map as a picture (e.g. jpg) and sending a map.
List of **generic competences** practiced	• Critical thinking • Creativity and innovation • Research and problem solving • Communication • Cooperation, interpersonal relations and life skills.	• Critical thinking • Creativity and innovation • Research and problem solving • Communication • Cooperation, interpersonal relations and life skills.	• Critical thinking • Creativity and innovation • Research and problem solving • Communication • Cooperation, interpersonal relations and life skills.	• Critical thinking • Creativity and innovation • Research and problem solving • Communication • Cooperation, interpersonal relations and life skills.

	Unit 1	Unit 2	Unit 3	Unit 4
List of **cross-cutting issues** practiced	• Environment and sustainability • Inclusive education • Gender • Peace and values education.	• Inclusive education • Gender • Peace and values education.	• Environment and sustainability • Inclusive education • Financial education • Gender • Peace and values education.	• Inclusive education • Gender • Peace and values education • Environment and sustainability.
Assessment strategies of the key unit competence	Explain the functions of an operating system. Follow instructions of installation setup to respond effectively, install and uninstall correctly a given computer application.	Accurately, generate a table of contents, list of figures and tables. Correctly, write a formal letter and use mail merge to generate multiple copies for a number of recipients.	Accurately present data graphically using charts and insert a file into a document and display the whole of it or as a shortcut in the document. Correctly, use 'Mathematical Equations Editor' to write mathematical functions and equations. Use Excel to plot dynamic charts in a document.	Correctly, query a map using complex selections and produce a map layout and print a map.

	Unit 5	Unit 6	Unit 7	Unit 8
Unit Title	Charts and objects in spreadsheets.	Presentation	Introduction to Computer Graphics	Introduction to Multimedia
Number of Periods	8	6	8	8
Key Unit competence	Use charts and objects in a spreadsheet, use different techniques to organise a printable datasheet.	Prepare and make a presentation.	Create graphics using basic graphic elements and edit predefined graphics.	Explain the different uses of multimedia and interactive multimedia applications. Use multimedia software to create a video.
Number of lessons	4	3	4	4
Equipment, learning and teaching materials required	Computers, projector, textbooks and an interactive board.	Computers, projector, textbooks, and an interactive board.	Computers, projector, textbooks, graphics application (Adobe Photoshop) and an interactive board.	Computers, projector, textbooks, scanner, digital camera, phone camera, microphone, flash media files and headphones.

	Unit 5	Unit 6	Unit 7	Unit 8
Activities/ Techniques	• Learners represent and interpret data graphically using sample data provided by the teacher. • Teachers help learners to organise and print data from a sheet.	• Teacher helps learners to organise slide and choose appropriate objects for the audience. • In groups, learners are given the following topics, peace and values, gender and the impact of computers in society) and each group makes a presentation (not less than five slides) containing text, images and sounds. • Learners focus on the use of slide transition, layout design and animations.	• The teacher helps learners to define computer graphics and related items. • Learners photo shoot with a digital camera to be familiar with all operation. • Learners use scanner to capture some images from papers. • Learners are given a sample of every type of graphic, they resize them, discuss and compare the different types. • In small groups, teacher facilitates learners to create a vector and bitmap graphic using graphic elements. • Teacher demonstrates MS- paint, MS- Office Picture Manager and Adobe Photoshop to create and edit graphics images and learners do hands- on exercises in these software.	• Teacher explains the multimedia tools and applications. • In small groups, the teacher facilitates learners to create hyperlinks. • In groups, learners use media tools to capture images, video, audio or search images on the Internet to create interactive media files.
List of **generic competences** practiced	• Critical thinking • Creativity and innovation • Research and problem solving • Communication • Cooperation, interpersonal relations and life skills.	• Critical thinking • Creativity and innovation • Research and problem solving • Communication • Cooperation, interpersonal relations and life skills.	• Critical thinking • Creativity and innovation • Research and problem solving • Communication • Cooperation, interpersonal relations and life skills.	• Critical thinking • Creativity and innovation • Research and problem solving • Communication • Cooperation , interpersonal relations and life skills.

	Unit 5	Unit 6	Unit 7	Unit 8
List of **cross cutting issues** practiced	• Inclusive education • Financial education • Gender • Peace and values education • Environment and sustainability • Financial education.	• Inclusive education • Gender • Peace and values education • Environment and sustainability • Comprehensive sexuality education • Financial education.	• Inclusive education • Gender • Peace and values education.	• Inclusive education • Gender • Peace and values education.
Assessment strategies of the key unit competence	Create and format various types of charts, use tables to format the content of cells and organise a printable sheet accurately.	Prepare and make a good presentation containing images, pictures, tables, animations, slide transitions and various objects like sheets and PDF files in one presentation.	Prepare effectively a good presentation for a specific audience.	Create correctly a multimedia file using multimedia tools.

	Unit 9	Unit 10
Unit Title	**Network Security**	**Platform Game Programming**
Number of Periods	6	10
Key Unit competence	Explain network security and apply basic security measures.	To be able to use complex expressions, operators and controls to design platforms.
Number of lessons	3	5
Equipment, learning and teaching materials required	Computers, servers, routers, switches, transmission data cables, projector and textbooks.	Computers, projector, scratch editor and digital material.

	Unit 9	Unit 10
Activities/Techniques	• Teacher helps learners to understand computer security. • Teacher organises group work where learners apply network security concepts like, authentication, authorisation to access equipment and data.	• Individual work on producing platforms. • Group discussion on how to associate scratch tools/ facilities and produce a planned platform. • Practice how to use colours, copy, edit and build combo blocks. • Practice on using commands to add a level of a game.
List of **generic competences** practiced	• Critical thinking • Creativity and innovation • Research and problem solving • Communication • Cooperation, interpersonal relations and life skills.	• Critical thinking • Creativity and innovation • Research and problem solving • Communication • Cooperation, interpersonal relations and life skills.
List of **cross cutting issues** practiced	• Inclusive education • Gender • Peace and values education.	• Inclusive education • Gender • Peace and values education.
Assessment strategies of the key unit competence	Learners are able to correctly secure data travelling through the network.	Use complex expressions, operators and controls to design platforms.

Scheme of work/Unit plan

Academic year: 20XX   Term: I   School: Byimana Secondary School

Subject: ICT   Teacher's name: RUGWIRO JOSEPH

Class: S.3   Number of periods per week: 2

Dates	Unit title	Lesson title	Learning objectives + Key unit competence
From January 15 (Monday) to January 19 (Friday)	**Unit I** **Application and Utility software installation**	**Lesson title 1:** Tasks performed by the operating system and software downloads	**Knowledge and Understanding:** *Learners*: • Explain the basic functions of an operating system. **Skills**: *Learners*: • Download open source application programs from the Internet. **Attitudes and Values**: • Appreciate the role of open source application over proprietary software.
From January 22 (Monday) to January 26 (Friday)		**Lesson title 2:** Installing MS Office, Antivirus and other downloaded software (e.g. software add-ons)	**Knowledge and Understanding:** *Learners*: • Describe user privileges while installing and uninstalling a program. **Skills**: *Learners*: • Allow program access to administrative privileges during program installation. • Scan external storage devices before using them on a computer. **Attitudes and Values**: • Show concern over embedded virus infection over the Internet through downloaded application files.

	Teaching methods & techniques + Evaluation procedures	Resources & References	Observations

	• Group discussions
	• Brainstorming
	• Demonstrations
	• *Practical activities on*:
	  o Downloading, installing different software setups and software add-ons.
	  o Scanning computer with antivirus.
		• Computers
		• Projectors
		• Storage devices
		• textbooks
		• The Internet Storage of different applications and operating systems, installation video.
			• Learners can download almost everything from the Internet, so there could be risk of virus, install antivirus before.
			• Lesson successfully covered.

			• Software setups to be obtained in a lesson before installation lesson. • Learners tend to forget the type of user account that has the privilege to install or uninstall software. They should be reminded.

Dates	Unit title	Lesson title	Learning objectives + Key unit competence
		Summative Evaluation 1	**Key unit competence:** *Understand the functions of operating system, install, use application and utility software.*
From January 29 (Monday) to February 2 (Friday)	Unit 2: **Table of Contents and Mail Merge**	**Lesson title 1:** Generating a table of contents and identifying it's importance in a document. .	**Knowledge and Understanding:** *Learners*: • Identify the role of table of contents in a document. • Identify the need to write and print a letter to multiple recipients. **Skills**: *Learners*:
From February 5 (Monday) to February 9 (Friday)		**Lesson title 2:** Inserting a list of figures and list of tables.	• Generate a table of contents for a document. • Use table of contents to indicate document's content. • Apply and use mail merge to
From February 12 (Monday) to February 16 (Friday)		**Lesson title 3:** Using mail merge to produce personalised documents.	produce personalised documents. • Protect a document with a password. **Attitudes and Values**: • Appreciate the ease with which mail merge can create personalised documents to various recipients.
From February 19 (Monday) to February 23 (Friday)		**Lesson title 4:** Protecting your document with a password and PDF documents.	
		Summative Evaluation 2	**Key unit competence 2:** *Generate a table of contents and use one document to have many multiple copies for different recipients.*

	Teaching methods & techniques + Evaluation procedures	Resources & References	Observations
	Evaluation procedures • Learners can download different software setups and can scan them. • Learners are able to install or uninstall different software including software add-ons.		

	• Demonstration
	• Brainstorming
	• *Practical activities on*:
	  o Table of contents
	  o Mail merge
		• Computers
		• Projectors
		• Data (formal letter, list of recipients and their individual details),
		• textbooks containing both table of contents, list of figures and tables.
		• The Internet.
			Generating tables of contents may require some text or data already prepared. For learners, this may consume a lot of time.

			For good results, list of figures and tables usually require already prepared document with a number of tables and figures.
			Learners usually get challenges in creating and saving recipients list using required fields.
			Learners already know how to protect a document, but steps can be reviewed. To practice more on mail merge.
	Evaluation procedures: Learners are able to accurately write a formal letter and use mail merge to generate copies for many recipients.		

Competence – Based Lesson Plan

School Name: Byimana Secondary School

Teacher's name: RUGWIRO JOSEPH

Term	Date	Subject	Class	Unit No	Lesson No	Duration	Class size
1	15/01/ 2018	ICT	S.3	1	2	80 minutes	45

Type of Special Educational Needs to be catered for in this lesson and number of learners in each category	• Hearing difficulties = 1 • Gifted and talented = 1
Unit title	Application and Utility software Installation.
Key Unit Competence:	Understand the functions of operating system, install, use application and utility software.
Title of the lesson	Tasks performed by the operating system and software downloads.
Instructional objective	• Given that the computer(s) has been booted (e.g. with Windows 10 OS) and the steps for this process noted by the learners; and the computer(s) starts to work normally, the learners will be able to explain the basic functions of an operating system. • With the availability of Internet connections and antivirus security, learners will safely download and install open source applications such as Adobe Reader, Ashampoo burning software, Skype, VLC media player… within the allowable lesson time.
Plan for this Class (location: in / outside)	Inside computer laboratory.
Learning Materials (for all learners)	Computers, projector, storage devices, textbooks, the Internet, storage of different applications and operating systems.
References	• Niccola Perez, (2013) Secondary ICT, Moran Publishers Limited.

Timing for each step	Description of teaching and learning activity		Generic competences and crosscutting issues to be addressed + a short explanation
	Learners will start their computers and observe the how operating system boots and loads programs. Learners will then download application programs; being guided by the teacher and install them.		
	Teacher activities	**Learner activities**	
Introduction 10m	• Rollcall learners. • Ask learners the following questions to test knowledge they already have: *Question 1*: What is data protection? *Question 2:* What are the ways you can use to provide protection to data stored on your computer?	Learners respond and answer the questions using previous knowledge from S1 and S2. From simple demonstrations done by teacher and the time given, learners will discuss/think, and provide answers like: 1. Data protection is the process that protects data safe from corruption or errors; data should be accessed by those who have access privilege to it. 2. Ways used to provide data protection to computer data include: • Backup your data • Encrypt your data • Using cloud storage • Antimalware or antivirus protection • Install Operating system updates • Use firewall • Turn off your computer if it is not in use • Use strong passwords, etc.	• Research and problem solving will be addressed when every learner participates in finding solutions to questions before them by discussing and exchanging ideas from previous knowledge. • Critical thinking: learners will think creatively and accommodate thinking discomfort to discover correct answers to questions. This will enable learners to be creative and innovate new ways of solving a problem. • Communication is generated when learners exchange ideas and opinions amongst themselves to examine their worth in answering the asked questions using acceptable languages in Rwanda.

| **Development of the lesson** 60 min | Present to learners the following questions:
1. a) Identify basic functions performed by the operating system on computer.
b) With examples, distinguish between Application software and system software.
c)Explain what downloading means.
d) What is utility software? Identify two examples of utility software. The teacher begins his presentation and gives feedback based on learners' results.
2.What steps do you perform to download application software such as Skype, Adobe Reader or Windows Movie maker. | Learners will discuss the questions in groups and precisely start to provide answers like:
1. a) OS controls how computer hardware such as keyboard works.
• OS controls the starting and running of application software.
• OS manages the creation, storage and retrieval of files.
b) Application software is a computer program that can perform a specific task for the user e.g. Microsoft word can create letters or articles; whereas system software is a large computer program that controls how application software and computer hardware works e.g. operating system, utilities, etc.
c) Downloading is a process that copies a computer file from a remote computer to your computer.
d) Utility software is a computer program that protects, configures, monitors or maintains efficient performance of a computer. Examples include: Antivirus programs like Avast; Disk defragmenter, backup utility and so on.
• Learners will correct themselves basing on teacher's feedback.
2.Learners start their computers as they note things done by OS. Learners open web browsers and then take steps to download Skype, adobe reader, etc. with guidance of the teacher. | • Peace and values education is stressed through discussing creatively with mutual respect to each other and find answers to questions asked.
• Gender, is emphasised/ addressed when male and female learners cooperate to have equal opportunities in using computers to download programs. This helps them to cooperate positively.
• Inclusive education is emphasised when the teacher sets instructions that favour all learners. |

10 min Conclusion	Summarise the lesson by harmonising all ideas and opinions given by learners. The teacher provides to learners the questions for use to seek deeper knowledge about what operating system software does and how to download applications.	Learners note down the summary provided by teacher based on observations. Learners jot down questions for assignments.	Critical thinking will be developed when learners summarise the lesson basing on teacher's demonstrations and making their own conclusions.
Teacher self-evaluation	Lesson was successfully taught based on set objectives for the lesson. Some downloads took longer time than lesson time.		

INTRODUCTION TO ICT

ICT Fundamental

Application and Utility Software Installation

(Learner's Book pages 1–35)

Key Unit Competence

Understand the functions of operating system; install and use application and utility software.

Prerequisite for Unit 1	Learner should already be with knowledge of Data protection e.g. about viruses and antiviruses and user privileges from S2.
Cross-cutting issues to be addressed	• **Inclusive education:** Learners shall be taught how to install operating system and MS Office respectively on their computers. Ensure that all tasks and instructions to download and install software do not discriminate learners as either disabled, careless, intelligent, etc. In doing this, you will be emphasising inclusive education because tasks are designed for every learner and not some of them. • **Peace and values education:** Beginning with activity 1.1 ensure that there is harmony in class where learners can discuss creatively with respect for each other. This will also apply to the rest of activities in the unit 1. • **Gender education:** In all activities of unit 1, give equal opportunities to both male and female learners to use computers to install operating system; to download applications and add-ons; then install them on their computers. This act fosters mutual cooperation to find and give answers.

Generic competencies	• Research and problem solving is generated as learners participate in finding solutions to questions before them by discussing and exchanging ideas using previous knowledge. • Critical thinking: Learners in their group work will think creatively and accommodate thinking discomfort to find correct answers to questions. • Communication is developed when learners exchange ideas and opinions amongst themselves to test their worth in answering the asked questions using acceptable languages in Rwanda.
Vocabulary or key words or concepts	*Software terms* such as: operating system, utility software, application software; and *installation terms* e.g. install and uninstall.
Guidance to the problem statement	This is an activity at the very beginning of the unit that can make learners to be interested and know what is in the unit or what will happen at the end of the unit. Learners shall find solutions to the question(s) on their own in their groups that can be organised in 3-6 learners. You can ask learners these questions: *Identify application software and utility software you can download and install on your own and then install any two of them. Create steps that can help you install Microsoft office and to install Windows 10 on your computer.* As learners look at applications and utilities to download and install, will meet a number of learning challenges and possibilities that will lead them to discover much about this unit. Learners shall be forced to read almost the whole unit 1 in short time to find solutions.
Attention to special educational needs	Learners with hearing and vision problems should sit in front near the teacher and every small achievement done shall be praised. Talented learners should be given extended activities and additional information they might need to accomplish the activities.

List of lessons in Unit 1

Lesson number	Lesson title	Number of periods
1	Tasks performed by the operating system and software downloads.	2 periods
2	Installing MS Office, Antivirus, Browser, plus other applications including software add-ons.	2 periods
Total number of periods		**4 periods**

Lesson 1: Tasks performed by the Operating system & software downloads (Learner's Book pages 1–10)

Learning objectives	*Learners will be able to:* • Explain the basic functions of operating system. • Explain the difference between open-source and proprietary software. • Download open source application programs from Internet.
Prerequisites/Revision/ Introduction	Greet learners and ask them questions related to *Data protection*, a unit they learnt in S.2, to test learners' skills, knowledge and understanding especially on user *privileges*. Questions can be: 1. Explain the meaning of data protection. Why should you protect data? 2. What is a privilege? Introduce the new lesson with a lesson title. Explain thoroughly the meaning of the term operating system. Give learners a '5 minute' marathon reading through pages 1-3, in the Learner's Book.
Teaching aids	Computers, projector, storage devices, textbooks, the Internet, storage of different applications and operating systems, installation video. In a school with limited resources, the teacher will use one (or more) available computers; first to demonstrate how operating system works and how to download application different software setups. Learners with hearing difficulties shall sit on front computers near the teacher.
Learning activities	• Learners discuss the role of open source applications over proprietary software and vice versa. • Learners download different software setups/installer from Internet under the teacher's guidance. • Learners download and install add-ons and use them.
Synthesis	By the end of the lesson, learners will be able to explain functions of the operating systems and can download programs.

Lesson assessment	Ask learners the following questions:
	Question: When it is started, identify some tasks that the operating system (OS) does before you start using the computer.
	Answer: The OS starts (boots) the computer and it becomes ready for use. It displays the appropriate user interface for using the computer. The OS makes ready the memory to accommodate user programs like Microsoft Word; data and instructions. Prepares the hardware such as mouse and keyboard to be ready for use.
	Question 2: Why do we need to install programs?
	Answer: Because installation process makes the program to be run by the computer's operating system correctly.

Method

1.1   Operating system (Learner's Book page 1)

Step 1:   Ask learners questions related to Data protection, a unit they learnt in S.2, to test learners' skills, knowledge and understanding especially on user privileges. Introduce the new lesson with a lesson title "Tasks performed by the operating system and software downloads". You can propose another title to suite your lesson. Explain thoroughly the meaning of the term operating system.

Give learners a '5 minute' marathon reading through pages 1–2, in the Learner's Book.

Altogether this could take about 10 minutes.

1.2   Functions of operating system (Learner's Book pages 2–5)

Step 2:   Functions of operating system

Introduce the unit details in your own way. Allow learners to discuss the functions of operating system.

Enable learners to correctly explain what operating system is and the tasks it performs on computer.

1.3　　Types of license for software (Learner's Book pages 6)

Learners shall also discuss the difference between open source software and proprietary software. In this section learners shall understand better the difference between applications and operating system.

Give them time to discuss the functions of operating system, license for software and the meaning of downloading.

This could take about 10 minutes

1.4　　Download software (Learner's Book pages 7–10)

Step 3:　　Downloading software. Instruct learners to end ongoing discussion and turn on their computers. Explain to learners the meaning of the words to *download* and the *types of license for software* that they may download. Then demonstrate to them how to download software.

This could take 5 minutes.

Step 4:　　Guide learners to do Activity 1.2 in the Learner's Book page 7. Learners use the suggested web browser on their computers and then download Google chrome. In this part of the lesson, also guide learners to do Activity 1.3 on page 10 and download the required software.

This could take 40 minutes.

Note: Learners still need your guidance when downloading programs. This requires that you direct the learners to the best site from which they can download this software. The downloaded programs can remain in the downloads folder (but Google chrome automatically installs). But in case there are many computer users who make downloads every day, then let learners save their downloads in a specific folder and the location you specify e.g. create *Setups* folder in *Local Disk D.* Learners shall then install these programs in the next lesson.

Step 5:　　Let learners do Activity 1.1 in the Learner's Book page 5: Let learners do some numbers in Activity 1.1 or all numbers as assignment or exercise.

This could take 15 minutes.

Suggested answers for Activity 1.1

1. Operating system is the type of software that manages the operations of your computer such as controlling all the hardware and running application programs. The following are some of the examples of operating system software:

    ●   Microsoft –Disk Operating System (DOS) (old fashioned and not desirable by most users).
    ●   Microsoft Windows operating system.
    ●   Macintosh operating system (Mac OS).
    ●   Linux.

2. Most school computers that are new in Rwanda are installed with Microsoft Windows, version: Windows 10 but some old computers are still using Windows 7 or Windows 8. Other few computers come installed with Linux OS.

3. Functions performed by the operating system on computers include:

    ●   Manages resource allocation to various programs i.e. loads programs in memory, runs them and allots them time, hardware or instructions to use.
    ●   Manages computer memory i.e. memory can be partitioned to run different programs in different partitions.
    ●   Manages backing storage/secondary storage/auxiliary storage. OS supervises the creation, storage, updating and deletion of files to various storage devices e.g. hard disk, flash disk, etc.
    ●   Controls input/output peripherals i.e. controls reading from and writing to peripherals.
    ●   It contains utilities or utility programs that are responsible for managing, editing, re-organising storage space or making backups.
    ●   Organises user's files, etc.

4. a) Operating system that can be installed on a PDA is Android. Others are iOS, windows phone.

    b) Operating system that can be installed on Laptop computers also called desktop operating system is Windows 10. Others include Linux, Windows 8, etc.

5. a) File system is a method or technique used by the OS to name, store and retrieve files on a disk. Examples include NFS (Hierarchical File System) FAT 32 (File Allocation Table 32) and NTFS (New Technology File System).

b)   Interface is a boundary feature that enables the user to interact with computer hardware and software. Command line Interface (CLI) and Graphical User Interface (GUI) are examples.

Step 6:   Summarise the lesson

Make a summary of your lesson telling learners the title for the next lesson.

You can do this in 5 minutes.

Note: Other activities in this lesson are practical and you must see their results from learners activities on their computers.

Answers for Activity 1.2

The answers are embedded in Activity 1.2, checkout (pages 7–9).

Answers for Activity 1.3

Follow procedure for downloading a software from Activity 1.2

Lesson 2:	**Installing MS office, antivirus, browsers and software Add-ons** (Learner's Book page 10–33)

Learning objectives (Lesson)	*Learners will be able to:* • Describe and use administrative privileges to install and uninstall different software set-ups. • Show concern over embedded virus infection over Internet.
Prerequisites/ Revision/ Introduction	Ask learners questions related to *Data protection*, a unit they learnt in S.2, to test learners' skills, knowledge and understanding especially on user *privileges* (example, "*Which type of user account is suitable for installing programs? Limited account or administrator account?)*. Introduce the new lesson with a *lesson title.* This could take about 5 minutes.
Teaching aids	Computers, projector, storage devices, textbooks, the Internet, storage of different applications and operating systems and installation video. In a school with limited resources, the teacher will use one (or more) available computers; first to demonstrate how to install operating system and also how to download application different software setups. Afterwards, learners in groups will perform the same activity under teacher's guidance. Learners with hearing difficulties should be made to sit on front computers near the teacher.

Learning activities	• Learners install and uninstall applications provided by the teacher. • Learners download and install add-ons and use them • In groups, learners are given DVDs containing operating systems and are to follow the instructions to install on selected computers in the laboratories.
Synthesis	By the end of the lesson, learners will be able to use administrative privileges to install and uninstall different software setups.
Lesson assessment	**Ask learners the following question:** **Question:** Why do we need to install downloaded programs? **Answer:** Because installation process makes the program to work or to be run by the computer's operating system correctly.

Method:

1.5 Installation of software (Learner's Book page 10–27)

Step 1: Ask learners questions related to Data protection, a unit they learnt in S.2, to test learners' skills, knowledge and understanding especially on user privilege (example, Which type of user account is suitable for installing programs? Limited account or administrator account?). Introduce the new lesson with a lesson title "Installing MS Office, Antivirus, Browser, plus other applications including software add-ons".

This could take about 5 minutes.

Step 2: Explain to learners the meaning of the words to *install* and the *requirements for installing different types of software*, the meaning of software add-ons and examples.

Demonstrate to learners how to install applications software especially MS office, browser, adobe reader, skype and software add-ons.

This can take about 20 minutes of lesson time.

Step 3: Instruct learners to turn on their computers and then access the software that was downloaded during the previous lesson (possibly from the downloads folder). The software you demonstrate is what learners ought to install, one after the other, until all applications needed have been installed. Since computers are multitasking, two or more installations

can take place depending on the processing power of the computers.

Step 4:   Meanwhile as other installations on learners' computers are taking place (such as MS Office), demonstrate how to install Windows operating system. Use the most recent copies of windows e.g. Windows 10. At this time you should have dedicated some few computers earlier where learners in groups can install operating system and various applications.

Steps 3 and 4 above could take about 50 minutes.

Incase this time is not enough, use the whole lesson.

Step 5:   Guide learners to do Activity 1.4,1.5, 1.6, 1.7 and 1.8 in the Learner's Book pages 11, 18, 24, 28 and 34 respectively. This shall also include installation of Microsoft Office on page 18. The installations will take place concurrently on different computers. Ensure you organise computers that can be used for demonstrations and then installation by learners themselves in groups. This requires more than 5 machines for great success.

Answers to Activity 1.4

Refer to the Learner's Book, the answers are part of Activity 1.4 page 11.

Answers to Activity 1.5

Refer to steps of installing applications software in the Learner's Book page 22.

Answers to Activity 1.6

Refer to the Learner's Book, the answers are part of Activity 1.7 page 28.

Answers to Activities 1.7 and 1.8

Check for steps of downloading and installing add-ons in the Learner's Book, the step are part of Activity 1.7. For learners to do Activity 1.8, they will follow steps in Activity 1.7.

Summary of Unit 1

Make a summary of lesson 2 and the whole unit 1; putting emphasis on learners to master the following:

- Functions of the operating system.

- How to download and then install applications.

- Download and install add-ons.

- Download a video file using add-ons.

Give learners assignments for tasks that have not been accomplished well especially in regard to installations.

Tell learners the unit title for the next lesson.

You can do this in 5 minutes.

Additional information for the teacher

Open source and proprietary software
Open source operating system OS

This is operating system that anybody is freely licensed to use, copy, study and change e.g. Linux is a Free and Open Source Software (FOSS) and Chrome OS; this means anybody can use Linux operating system in any way he/she wants. The source code is openly shared such that people are encouraged to voluntarily improve its design.

Proprietary operating system

Proprietary means something owned by an individual or a specific company. Proprietary operating system is one that is not freely licensed. The software publisher retains intellectual property rights or copyright of the source code. Most operating systems and applications we use today are proprietary. The company designs, develops and markets the software as their own e.g. Windows OS, OS X, etc. You must buy the product from company or one of its resellers.

Proprietary applications are also developed by a specific company for specific purpose when off the shelf software can't meet their needs. Today there is a big number of proprietary application software such as ArcGIS, Adobe Photoshop and many others.

Note: Get to know the kind of computers you have in the computer lab such that you or your learners are able to install the right operating system and application programs. Determinants for using a particular operating system are given here below.

Factors that determine the choice of Operating System to use

- Support to the end user needs: The operating system should be able to support the applications that will be run by end users in the institution such as administrators, staff and learners. Such operating system should be secure and should function efficiently to meet user needs. Though windows OS is user friendly, most users of Linux fill secure with their data.

- The available hardware resources in relation to other required hardware i.e. the hardware available should support the operating system you want to purchase e.g. if you want to buy and install Windows 10, your computer must have more than 2GB of RAM, more than 20GB of hard disk space, greater than 2GHZ of processor power.

- These hardware requirements can help the applications you install, that require big memory such Adobe Photoshop, to run smoothly.

- Human resources i.e. technical support should be available to cater for any problem that may arise.

- Cost of buying and supporting or maintaining the operating system should be considered.

After making the right choice of the operating system, you can then install it on computers, but how?

Operating system is usually supplied with four parts/components i.e. Kernel, device drivers, user interface (shell), and system utilities. Device drivers are usually for most basic elements such as mouse, keyboard or USB. The utilities include mainly backup, scan disk, disk defragmenter and others. Some other utilities the user may need requires that he/she buys them e.g. Antivirus utility.

There two key components/parts of the OS that you need to understand:

Kernel (used to interface between hardware and applications and Shell (to provide interface between the user and the operating system).

OS Kernel

Kernel is a computer program, an essential component of the Operating system that mediates access to computer resources

such as CPU, RAM, Input/output (I/O) devices, etc. The kernel is a fundamental part of OS and allows you to talk to hardware and provides interface between hardware and applications. It acts as the translator and connector between hardware and applications. All modern OS have kernels.
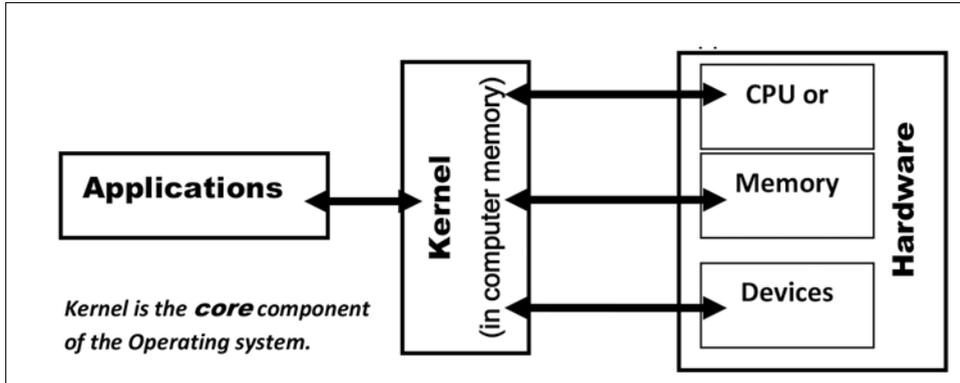
Figure 1

Kernel is the OS loaded into the computer memory to perform essential functions e.g. controlling memory, processes, input/outputs, communication functions, loading/unloading applications and allocating system resources. This means only part of the OS is loaded in memory because the OS is bigger.

The kernel of each operating system is designed to perform different tasks. The kernel code is normally loaded into a protected area of memory to prevent it from being over written by other less frequently used parts of the OS or applications. The kernel executes processes and handles all interrupts from the kernel space of memory. When a program makes requests to the kernel, it is termed as a system call.

The Shell (User interface)

Shell is a computer program that provides the interface between the computer user and the operating system, by allowing the user to pick from menus instead of entering commands.

The shell is a user interface for access to operating system's services. Operating system shell use either Command-line Interface (CLI) or Graphical User Interface (GUI). The Shell enables communication with the OS through a control language allowing the user to control the device without knowing the characteristics of hardware.

A shell is a program that provides an interface for users of OS to provide access to kernel's services.

The flow of instructions in operating system when running a software application
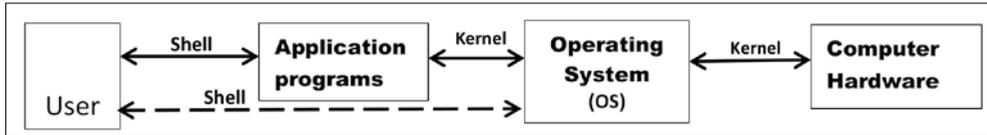
Figure 2

Note: Operating systems are classified according to number of users (Single user and multiuser operating system); according to number of tasks the OS can perform (Single task and multitask OS); according to User interface (Command-line user interface and Graphical user interface.

Almost all mobile operating systems for mobile devices are single task, single user OS e.g. Windows Phone and Android. For example, you cannot make or receive a call while you are playing music, only one task must be worked upon.

In addition, the traditional Disk operating system has been and is a single user, single task OS e.g. Microsoft Disk Operating System (MS_DOS) and PC DOS.

Other operating systems we use today on desktop computers can support many users and tasks at the same time e.g. Windows operating system, Windows Server OS, Linux.

Other classes of operating systems which are designed for sophisticated tasks include Network OS and Real-time Operating system.

Note: You may need to digest the above information for time takers to have a glimpse of the matter.

Answers to the end of unit 1 assessment (pages 34–35)

1. a) The term software installation is the process that copies program files onto hard disk in a format that allows the computer to run them as a program.

    b) Operating System (OS) is installed using the following steps:

        (i) Start the computer.

(ii)   Connect the bootable USB drive or Insert the bootable DVD in the Optical drive and then restart the computer.

(iii)   After a short period of time you will see a message on screen "Press any key to boot from DVD".

(iv)   Just press any desired key such as "ENTER" key or space bar to continue. Follow on screen information.

If the message in (iii) above does not appear, change the boot order in the computer's SETUP or just restart the computer and press F12 on keyboard to access boot order.

OR, restart the computer; and as the Power on self-test (POST) goes on, press F2 to go to the SETUP then select DVD ROM drive from the Boot order menu. Then restart the computer again, afterwards continue as per the instructions on the screen.

c)   Operating system has 3 important roles/functions that include:

● Manages computer's resources such as CPU, memory, disk drives and printers.

● Provide user interface e.g. CLI or GUI.

● Execute and provide services for application software.

2.   Options for use to install the operating system

(i)   Upgrading

Upgrading replaces the old operating system with new one e.g. replacing Windows 7 with Windows 10. The version being replaced must be older than the version you want to install, otherwise the option for upgrade may be unavailable. Upgrading however preserves system configuration settings, data and applications. But most of the applications may require reinstallation to work well.

(ii)   Multi boot

Multi boot takes place when you install more than one operating system on a computer. Each operating system must exist on its own partition. One Operating system may be on one partition C and another on another partition e.g. D. Each Operating system will have its own configuration settings and files. After installing Operating system, restart the computer.

When the computer restarts, the user is presented with a menu to select the desired Operating system. One Operating system can be run at a time to gain full control of hardware and applications.

How fresh installation works (read below)

(iii)   Fresh or clean or new installation

Fresh installation is usually done on a new computer or in cases where no upgrade path exists between current operating system and operating being installed. New installation deletes all data on the partition. A clean installation can be used if the existing operating system is damaged and can no longer work.

3.   a)   File system is a method used by Operating system to keep track of files stored on   Computer for example FAT or NTFS.

   b)   Booting is the process that starts or restarts a computer and it becomes ready for use. Booting can either be cold booting or warm booting.

   c)   Disk partitioning is the process that divides the hard disk into separate and independent sections (partitions). Since partitioning deletes all files on a disk, it is important to backup important files before partitioning takes place.

   d)   Microsoft Office is a group of application programs designed for managing common office operations. An example in the group is Microsoft Word.

4.   Learners should use Internet to research and then give the role of open source applications and proprietary software. Where there is no Internet, they can use section 1.3 in the Learner's Book pages 5–6.

5.   Follow the necessary steps given in the Learner's Book to download the given applications. Check Activity 1.2 Learner's Book pages 7–9 for steps.

6.   Follow the necessary steps for installing programs. Check in the Learner's Book section 1.5 (pages 10–24).

7.   Follow the procedures given in Learner's Book for uninstalling a program. Check in the Learner's Book pages 25–27.

Remedial and Extended activities

1. Carry out research (using Internet or Library textbooks) and find the meaning and use of the following words in relations to operating system.

    a)   Shell

    b)   Kernel

2. Distinguish between download and upload. Explain a situation when you need a software/data download and upload.

3. Explain briefly why a computer user should install software add-ons in a browser.

4. Explain the difference between command-line interface (CLI) and graphical user interface (GUI) of the Operating system.

5. Use Internet facility and find out the system requirements for installing the following programs:

    a)   Windows 10.

    b)   Adobe Photoshop.

6. Give two examples on each of the following:

    a)   Multiuser operating system.

    b)   Network operating system.

7. a)   Carry a download to obtain a recent video clip about the national football team of Rwanda.

    b)   Find and download graphics drivers for your monitor and sound card (sound blaster)

Answers for Remedial and Extended activities

1. a)   Shell is part of the operating system that provides interface between the computer user and the operating system.

    b)   Kernel is part of the operating system that is loaded in the memory to perform essential functions such as controlling memory, processes, input/output devices, loading programs and allocating resources.

2. Download is a computer process that copies software or data from a remote computer (server) to a local computer through the Internet. An Upload is a process that copies information from a local machine to a server through the Internet.

(Let learners propose answers why we download or upload information)

3. A software add-on is a piece of software that improves and adds capability to your browser.

4. Check in the Learner's Book page 2–3.

5. If Internet is available, learners will research this information for themselves.

6. a) Multiuser operating system allow more than one user to use the computer; examples include Unix, Linux, Novell Netware, and Windows Server operating system.

   b) Network operating system allows a server to manage data, users, security, applications and other networking functions.

7. Learners will use Internet facility and download the recent video about the National team and they will also download graphics drivers for monitors they are using and drivers for Sound blaster (sound card).

   Note: Inform learners about the importance of having good drivers for graphics and sound card; i.e. to have better screen display for pictures, videos, running of graphics programs like Photoshop. The sound drivers will help sound card to work or produce better sounds.

APPLICATION SOFTWARE

Word Processing

Table of Contents and Mail Merge

(Learner's Book pages 37–72)

Key Unit Competence

Generate a table of contents and use one document to have multiple copies for different recipients.

Prerequisites for Unit 2	Learners should have knowledge of word processing basics from S.1 Unit 5 and 6 plus knowledge of inserting objects in a document that they obtained from S.2 Unit 3.
Cross-cutting issues to be addressed	• **Gender education:** All activities in this unit should be done by all learners (the female and male learners). Therefore, when creating letters for mail merge, names of both male and female learners should appear. Learners should also be given equal opportunities to create table of contents and mail merge on their computers. This action will stimulate mutual cooperation among the different sexes as learners get solutions to questions. • **Peace and values education:** In this unit, learners shall type text about peace and values, and they will also type letters related to peaceful interactions e.g. invitations for meetings and parties. When they do these activities emphasise them to create or read text that depict peace and harmony.

Generic competencies	• Research and Problem solving is gained as learners participate in finding solutions to questions before them by discussing and exchanging ideas using previous knowledge. • Critical thinking: Learners will think creatively and accommodate thinking discomfort to discover correct answers to questions. • Communication skills are obtained when learners work in groups presenting answers, exchanging ideas and opinions amongst themselves to test their worth in answering the asked questions using acceptable languages in Rwanda.
Vocabulary or key words or concepts	Table of contents (TOC), list of figures and list of tables Mail Merge, Password, Data source.
Guidance to the problem statement	This activity will make learners get interest in the unit and search for more information about this unit 2. Learners will find solutions to the question (s) on their own in their groups that can be 3-6 learners. You will present to learners this question at the start: *Create a four page document with at least one table and figure and then generate a list of tables and list of figures.* *Create a mail merge for a letter inviting members in your village to village meeting. Assume the position of Defence Secretary and issues to discuss are about security.* Learners will encounter challenges to find solutions but will discover a lot that will lead them to acquire much about this unit.
Attention to special educational needs	Any learner, new or old that has a special educational need must be catered for properly, for example short learners should be given seats that enable them use the computers more comfortably, those with hearing disabilities should sit in front near the teacher and explanations have to be repeated to enable them understand. Every small achievement done should be praised and credited. Talented learners should be given extended activities and additional information they might need to accomplish their activities.

List of lessons in Unit 2

Lesson number	Lesson title	Number of periods
1	Generating table of contents and identifying its importance in a document	2 periods
2	Inserting a list of figures and a list of tables	2 periods
3	Using Mail Merge to produce personalised documents.	2 periods
4	Protecting your document with a password, and creating PDF documents.	2 periods
Total number of periods		**8 periods**

Lesson 1: Generating table of contents (Learner's Book page 37)

Learning objectives	Learners will be able to: • Identify the role of Table of Contents. • Generate Table of Contents. • Use Table of Contents to indicate document's content.
Prerequisites/ Revision/Introduction	Ask learners questions related to Word processing-objects in a document, a unit they learnt in S.2, to test learners' skills, knowledge and understanding. The question can be to identify the kind of objects one is most likely to find in a book or magazines. Answers could be tables, shapes, equation, etc. TOC becomes one of the objects you add. Introduce the lesson with a lesson title "Generating TOC".
Teaching aids	Computers, projector, data (detailed data having styled headings or text to appear in the TOC) and textbooks containing Table of Contents. In a school with limited resources, the teacher should use one (or more) available computers; first to demonstrate how to create a Table of Contents. Learners with hearing impairments should sit and use computer(s) near the teacher.
Learning activities	• Within the document, learners create and amend a Table of Contents.
Synthesis	By the end of the lesson, learners will be able to generate table of contents.

Lesson assessment	You will ask learners the following questions:
	1. What kind of information does the Table of Contents represent?
	Answer: TOC represents information that readers of a piece of literature, or book use to locate specific information they need quickly.
	2. Give three steps you would consider important for creating a TOC.
	Answer:
	• Apply heading styles for text you need in a TOC.
	• Click where you need a TOC.
	• On *References* tab, under Table of Contents, select *Automatic Table 1* style.

Method

Step 1:   Ask learners questions related to Objects in a document, a unit they learnt in S.2, to test learners' skills, knowledge and understanding.

        Guide learners to understand that table of contents and lists of figures are like objects inserted in a document, but these objects must be generated according to the contents of the document that must be formatted first in a certain style.

        Introduce the lesson with a lesson title "generating table of contents and identifying its importance in a document".

        This could take about 5 minutes.

2.1   Table of contents (TOC) (Learner's Book pages 37–46)

Step 2:   Explain to learners the meaning of Table of Contents and how it looks like by showing them various tables of contents from books picked from the school library.

        Using a previously prepared piece of text demonstrate to learners how to generate a table of contents, update it or delete it.

        If a piece of text is not readily available, prepare the text in Activity 2.1 of Unit 2, in the Learner's Book early enough for

your demonstrations. Creating TOC shall be done together with learners as per steps given in the Learner's Book.

This can take about 20 minutes of time.

Step 3: Guide learners to do Activity 2.1 (Learner's Book page 37)

Instruct learners to turn on their computers and then do Activity 2.1 on their own. Afterwards do Activity 2.2 on page 44 (as assignment).

Note: As learners type this text, they can ignore creating shapes and tables but can leave spaces for inserting those items later. Encourage faster typing.

This could take 40 minutes, incase the text is already typed.

Step 4: In case you are to use text as it appears in Activity 2.1, create this text earlier and display it on projector for all learners to see and the last items to handle with this text is how to create shapes, wrap and move them to the right place where they are. This could take them about 10 minutes.

If you find the text in Activity 2.1 longer for your demonstrations, use the text given below:

Information storage in computers

Classical computer

This computer uses bits i.e. 0 and 1, but nothing in between, to manipulate information.

Quantum computer

This computer uses Qubits which can exist in multiple states at the same time i.e. 0, 1 and something in between.

Qubits

These replace the simple ON-OFF bits of contemporary computers with on, off and something in between.

A quantum switch can be on and off at the same time. In a quantum computer, information is held in a system that can exist in two forms at the same time.

Step 5: Format the words "Information and Communication Technology" and "Computer software" by applying Heading 1 style. Apply Heading 2 style to the following text: "System software", "System software is divided into", "Application software". Apply Heading 3 style to: "Operating system",

"Utility programs", "Translator software", "Programming languages", "Word processing", "Spreadsheets software", "Presentation software"

Now create the table of contents on the first page, following the steps given in Learner's Book pages 37–44.

Add any other simple text you want about classical and quantum computers or just about computers, with headings.

Format the text according to style used above.

Demonstrate to learners how to update and to delete table of contents.

This task can take you 10 minutes.

After using this text for demonstration, give this very text to time takers to do what you have just done. Talented and fast learners shall use the text in the Learner's Book in Activity 2.2 pages 44–46.

Step 6:   Summarise the lesson.

Make a summary of the lesson by going through Activity 2.2 briefly. Introduce to learners the lesson title for the next lesson for research purposes.

You can do this in 5 minutes.

Lesson 2:   Inserting a list of tables and list of figures (Learner's Book pages 46–52)

Learning objectives	Learners will be able to: • Identify the role of list of figures and tables. • Insert Table of figures.
Prerequisites/ Revision/ Introduction	Ask learners questions on the previous lesson about creating TOC to get the attention of learners and the skills and knowledge they gained. Introduce the lesson with a lesson title "Inserting a list of tables and a list of figures".
Teaching aids	Computers, projector, data (a detailed document containing tables and figures), textbooks containing lists of tables and figures. In a school with limited resources, the teacher will use one (or more) available computers; first to demonstrate how to create a table of figures. Learners with hearing difficulties should sit and use computer(s) near the teacher.

Learning activities	• Within the document, learners create and amend a table of figures (list of tables and figures).
Synthesis	By the end of the lesson, learners will be able to generate list of tables and list of figures.

Lesson assessment	**Ask learners the following questions:**
	
	1. What is the purpose of creating a list of tables or a list of figures?
	
	   Answer: Helps in locating quickly particular table
	   of data, a specific photo, picture or an illustration
	   in a piece of literature, book or magazine.
	
	2. Give four important steps you would consider for creating a list of tables.
	
	   • Add captions to every table you need to quickly locate.
	   • Click where you want to place a list of tables.
	   • On *References* Tab in the *Captions* group, click on **Insert Table of Figures.**
	   • Under General > Caption Label select Table and click OK.

Method

Step 1: Ask learners questions related to Word processing tasks done in the previous lesson about Table of Contents.

This will help you test their knowledge, skills and understanding of the previous lesson. Have the attention of learners.

Introduce the lesson with a lesson title "Inserting a list of figures and a list of tables".

Tell learners the importance of having lists of tables and figures in books or magazines.

This could take about 5 minutes.

Step 2: Demonstrate to learners how to insert a list of tables and then a list of figures using pretyped text you have, (Activity 2.1 text).

2.2   List of tables and list of figures (Learner's Book pages 46–52)

Explain to learners the meaning of "a list of figures" and "a list of tables" and how they look like by showing learners books borrowed from school library where lists of tables and lists of

figures were used. The books from library must be brought to class prior to the lesson.

Guide learners to understand the importance of lists of figures and lists of tables in a piece of written literature, a book, magazine, etc.

Using a previously prepared piece of text, demonstrate to learners how to insert list of tables and then list of figures. Show them how you update or delete list of tables and list of figures.

If a piece of text is not readily available, use the text in Activity 2.1 that learners used for TOC and saved as My-TOC.

Demonstrate to learners how to insert tables and put caption on them; create shapes and wrap and move them where they are required and then insert caption on them. This means in this lesson add shapes and tables that you never inserted in the previous lesson and then apply captions on them. Afterwards generate a list of tables and then a list of figures.

This can take up to 15 minutes of lesson time.

Step 3: Let learners do Activity 2.3 (Learner's Book page 47)

Instruct learners to turn on their computers and then open My-TOC file they previously created for Activity 2.1.

In the text, learners shall add shapes and tables as they appear in text of Activitiy 2.1. Learners will add captions on tables and shapes/images for use to generate list of figures and tables.

In case you have another piece of literature with tables and figures, provide it to fast learners as assignment or lesson activity.

This could take 40 minutes.

Step 4: Demonstrate to learners how to update and how to delete list of figures and tables.

In our activity let learners add two computer images in the last part of the text beginning with heading "Computer Hardware". The images must be stored on learners' computers. When added, learners shall add captions on them and then update list of figures.

Learners shall also create a 2-column table containing 5 best boys in ICT and 5 best girls in ICT from their class. Now let learners update their list of tables.

This could take 10 minutes.

Step 5:   Summarise the lesson.

Make a summary of the lesson by revising how to update and delete list of figures and tables. Introduce to learners the lesson title for the next lesson. You can do this in 5 minutes as they save changes to their files and turning off their computers.

Guide them through safe steps of turning off their computers.

Lesson 3: Using mail merge (Learner's Book pages 52–63)

Learning objectives	Learners will be able to: • Identify the need to write and print a letter to multiple recipients. • Apply and use Mail merge to produce a personalised document for multiple recipients. • Appreciate the ease with which mail merge can create personalised documents to various recipients.
Prerequisites/ Revision/ Introduction	Ask learners questions on the previous lesson if any, to test learners' knowledge, skills and understanding. Introduce the lesson with a lesson title "Using mail merge".
Teaching aids	Computers, projector, data (a formal letter and list of recipients and their individual details), textbooks containing a letter or document to be sent to recipients. In a school with limited resources, the teacher should use one (or more) available computers; first to demonstrate how to create a Mail Merge and then allow learners work in manageable groups. Learners with hearing difficulties should be made to sit and use computer(s) near the teacher.
Learning activities	• Learners write formal letter and use mail merge features to produce multiple copies to different people.
Synthesis	By the end of the lesson, learners will be able to write and print a letter to multiple recipients.

Lesson assessment	Ask learners the following questions:
	a) Give a reason as to why you would use mail merge to produce the same letter for many people.
	Answer: Mail merge makes it easier and faster to generate many copies of the same letter for many people whose addresses and names are stored in a data file on computer.
	b) Create a list of five steps you would consider important for creating personalised documents.
	Answer:
	• Create a letter from which you want to generate personlaised documents.
	• On the *Mailings* Tab, select **Letters** from the ***Start Mail Merge*** menu.
	• Select T**ype a New List**, from the ***Select Recipients*** menu which is next.
	• Customise the columns, type in recipients data and save the data with a name.
	• Insert Merge fields (using Insert Merge Field button) in the correct locations and then click Finish and merge (you can finish by editing individual documents or printing them).

Method

Step 1: Greet learners and ask them questions on inserting of lists of tables and figures, to test their knowledge, skills and understanding. Introduce the lesson with a lesson title "Using Mail merge to produce personalised documents".

This could take about 5 minutes.

2.3 Mail merge (Learner's Book pages 52–63)

Step 2: Explain to learners the meaning of Mail merge and how it works.

Prepare a simple letter such as an invitation message inviting parents to the Music Dance and Drama festival at school.

You can also use a previously prepared letter. Demonstrate to learners how to use mail merge to generate personalised letters, using the Mailings tab commands. In case you do not

have any piece of information for demonstrations, use text provided in Activity 2.4.

This can take about 20 minutes.

Step 3: Guide learners to do Activity 2.4 (Learner's Book page 53)

Instruct learners to turn on their computers and then do Activity 2.4.

Move around or watch out for learners who may divert to doing uncalled for activities other than tasks they must do.

Help time takers to catch up by demonstrating again, as fast learners do the activity.

This could take 40 minutes.

Step 4: Demonstrate to learners how to update or delete names or recipients. Show learners how to print preview, to adjust documents orientation and then print it. This could take 10 minutes.

Ensure that all learners are coping up.

Entertain questions especially from time takers in case any.

Give extra activities to learners with special abilities for example instruct them to do Activity 2.5 on page 58 as assignment.

Guide learners to do Activity 2.6 on page 60 either as an assignment depending on the conditions prevailing and the time available to learners.

2.4 Organise, print and view shortcuts (Learner's Book page 63)

Take learners through a session of organising a document, printing it and viewing shortcuts. Demonstrate the steps they must follow to preview a document.

Learners do Activity 2.7 on pages 63–65.

Step 5: Summarise the lesson.

Make a summary of the lesson by going through all the 4 stages above briefly. Introduce to learners the lesson title for the next lesson. Help them to save changes to their files and turning off their computers.

Make sure that their work is saved and safe.

Help to do safe turning off of their computers.

You can do this in 5 minutes

Lesson 4:   **Protecting a document with password** (Learner's Book page 65)

Learning objectives	Learners will be able to: • Protect their documents with a password. • Organise and print a document.
Prerequisites/Revision/ Introduction	Greet learners and ask them questions on the previous lesson if any, to test learners' knowledge, skills and understanding. Introduce the lesson with a lesson title "Protecting a document with a password".
Teaching aids	Computers, projector, data files and textbooks. In a school with limited resources, the teacher should use one (or more) available computers; first to demonstrate how to protect a document with a password; and afterwards allow learners work in manageable groups. Learners with hearing difficulties should be guided to sit and use computer(s) near the teacher.
Learning activities	• Learners protect a document using a password. • Print preview a document, print the document using school printer in MS word and in PDF.
Synthesis	By the end of the lesson, learners will be able to protect their documents with passwords and to print them.

Lesson assessment	**Ask learners the following questions:**
	
	1. Explain the importance of protecting documents on a computer.
	
	  Answer: Documents are protected to safeguard them against loss, damage or alterations that may be made by other computer users or malware.
	2. Why should you make a printout of a document you create on computer?
	
	  Answer: A printed and duplicated document can be read by many people who do not have computers from anywhere. It is convenient to read hardcopy without worrying about computer failures or health effects of computers.

Method

Step 1: Greet learners and review the previous lesson of mail merge. Ask them questions to test their skills, knowledge and understanding. Introduce the lesson with a lesson title "Protecting your document with a password, and creating PDF documents".

This could take about 5 minutes.

2.5 Protect your document (Learner's Book pages 65–69)

Step 2: Remind learners about data protection and its importance. Open a previously prepared document such as mail merge (personalised letters in the previous lesson) or any another word document. Demonstrate to learners how to apply password in a document using the two methods in Learner's Book: File tab (Info and Save As dialog box as shown in the Learner's Book pages 65–68). Learners shall use the method they have understood well.

This can take about 15 minutes.

Step 3: Do a number in the end of unit assessment, then apply a password (Learner's Book pages 69–72)

Instruct learners to turn on their computers and then do number 1 of the end of unit assessment and then apply protection.

Learners shall protect the created documents with passwords. Move around or watch out for learners who may divert to doing other activities other than those they must do.

Help time takers do the right things practically.

This could take 40 minutes.

Step 4: Demonstrate to learners how to convert a document to PDF such that it is can be read from many different software platforms, without unnecessary modifications. Use the procedure:

● Click File tab.

● Click Export from the backstage view.

● Click Create PDF/XPS Document.
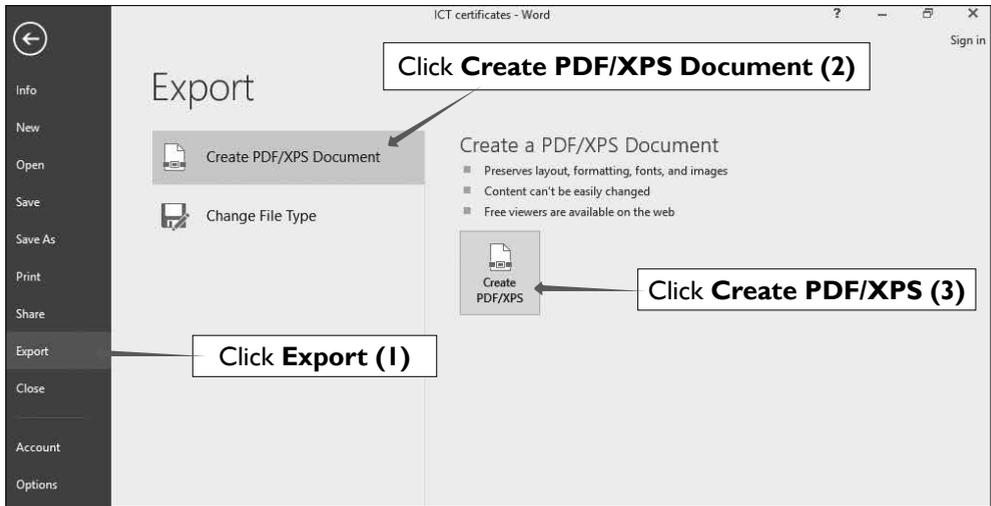
Picture 2.1: The Backstage screen for exporting a file as a PDF/XPS

- Click Create PDF/XPS.
- In the dialog box that appears, type in the name of the new PDF file, specify location and press enter key.
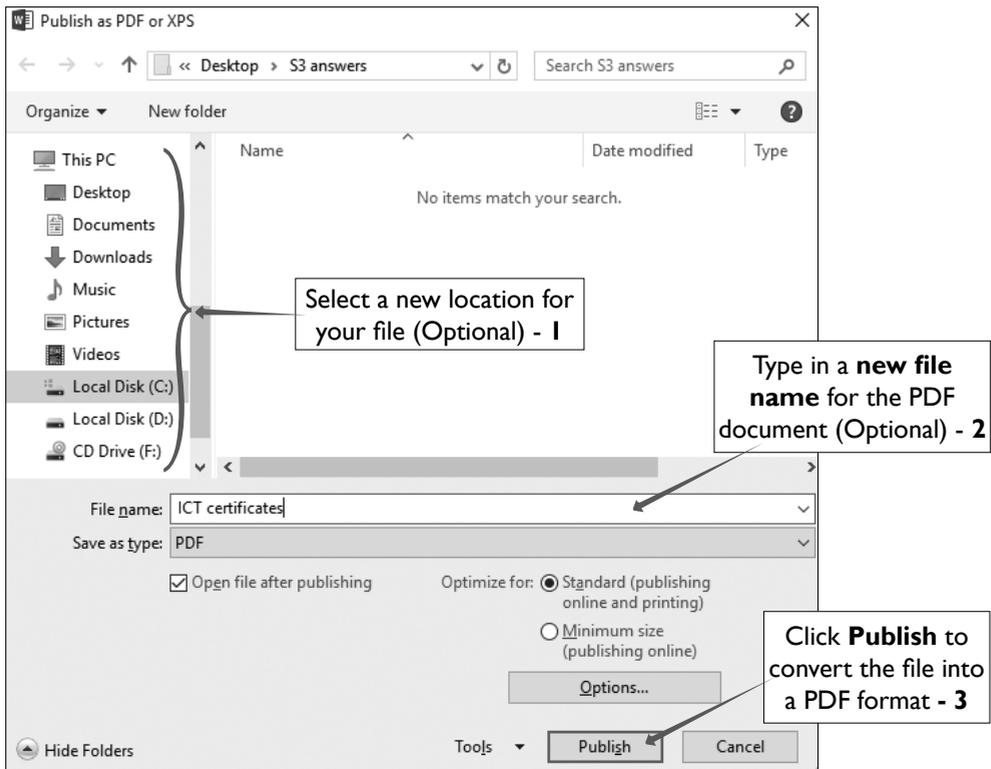
Picture 2.2: Publish as PDF or XPS dialog box

This could take 15 minutes.

Step 5: Summarise the lesson

Ask learners if there are questions you can answer and respond positively.

Make a summary of your lesson e.g. review converting documents to PDF. Tell learners the lesson title for the next lesson.

Guide learners to save changes to their files and to turn off their computers safely.

You can do this in 5 minutes.

Summary of Unit 2

Identify and tell learners the things that they must put emphasis on, to revise and practice. These include:

- Creating and generating a Table of Contents and Lists of Figures for a given document, literature, books or magazine.

- Using a Mail Merge for documents that must be distributed to many people whose names and addresses are known.

- Organising, printing a document and viewing shortcuts. Previewing and protecting a document.

You can use 5 minutes for this task.

Additional information for the teacher

Table of Figures

A List of Figures and or a List of Tables will show all of the graphics, equations, and tables in a document.   But for each of the element to be recognised, the list of figures and tables or another object must have a caption.   You display List of Tables separate from List of Figures.

Note: Any diagram, drawing, graph, chart, map, photograph or another type of illustration in a thesis or dissertation is presented as a figure. Learners can easily make their drawings and add captions for creating List of Tables and Figures. Encourage them to draw as many as they can in a document on different pages.

When captions are added to a table the number and title of a table should be suitably placed above the Table. If it is a figure, the number and title of a figure are placed below it and

this is the default setting. However, learners should know how to change this setting to suite in your objective.

Numbering will be automatic.   However, you can click on the Numbering button to choose different numbering formats in the dialog box.

Tip: In order to restart caption numbering, you will need to add a section and modify the numbering for that particular section.

Mail Merge

Mail Merge is a feature designed for creating bulk mailing and emails, envelopes and labels with different information on each of the document. Load a database of recipients if you have it or manually enter the list. Then use placeholders, or "Fields", to automatically fill in each recipient's information in their own copy. This allows to create one document that can be sent to hundreds or even thousands of people.

Suggested answers to Unit activities and end of unit assessment

Unit 2 is all practical and the results of the practicals are assessed by ensuring that learners follow the right steps in using the MS Word features about inserting TOC, List of tables, List of figures and Mail merge during demonstration.

Suggested answers for Activity 2.1 Learner's Book page 37

Refer to the Learner's Book. Answers are part of Activity 2.1 page 37.

Suggested answers for Activity 2.2, 2.3, 2.4, 2.6 and 2.7

Refer to the Learner's Book. The answers are embedded in the activities.

Suggested answers for Activity 2.5 Learner's Book pages 58–60

1.   Look at the picture carefully.

2.   a)   Edit Recipient List.

        b)   Finish & Merge.

        c)   Preview Results.

d)   Insert Merge Field.

e)   Finish & Merge.

3.   The screen below displays how each of the personalised letters shall appear (suggested answers) for Activity 2.5.

End of Unit 2 Assessment (Learner's Book pages 69–72)

1. The suggested answers for question 1 is shown in the screen below.
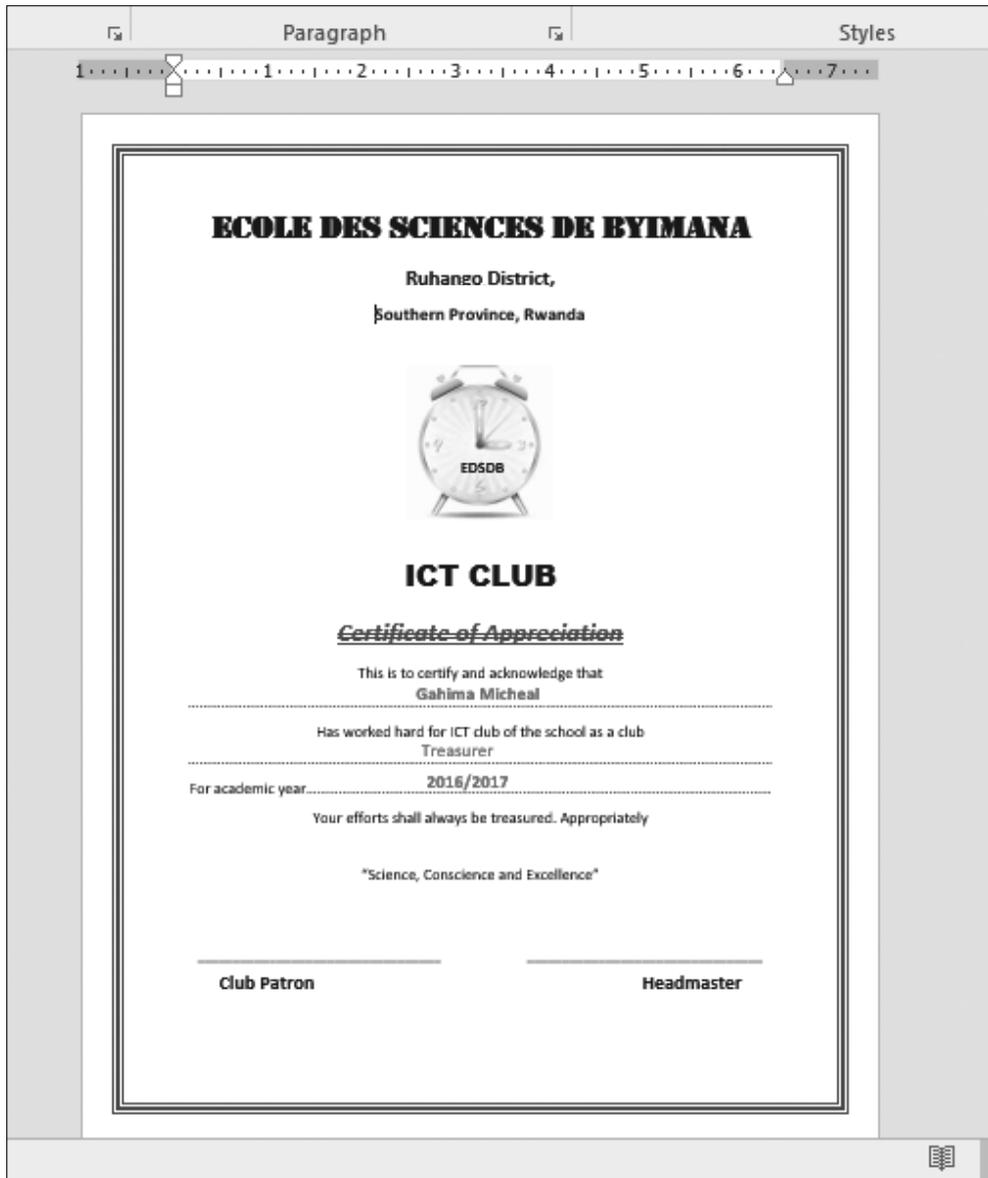
2. A formal letter is a printed letter that is sent out to a large number of people, for example a letter informing people about an activity. Formal letter is created by margining the database of names and addresses with a standard letter.

3. (i) The proposed table of contents resulting from the text is shown here below.
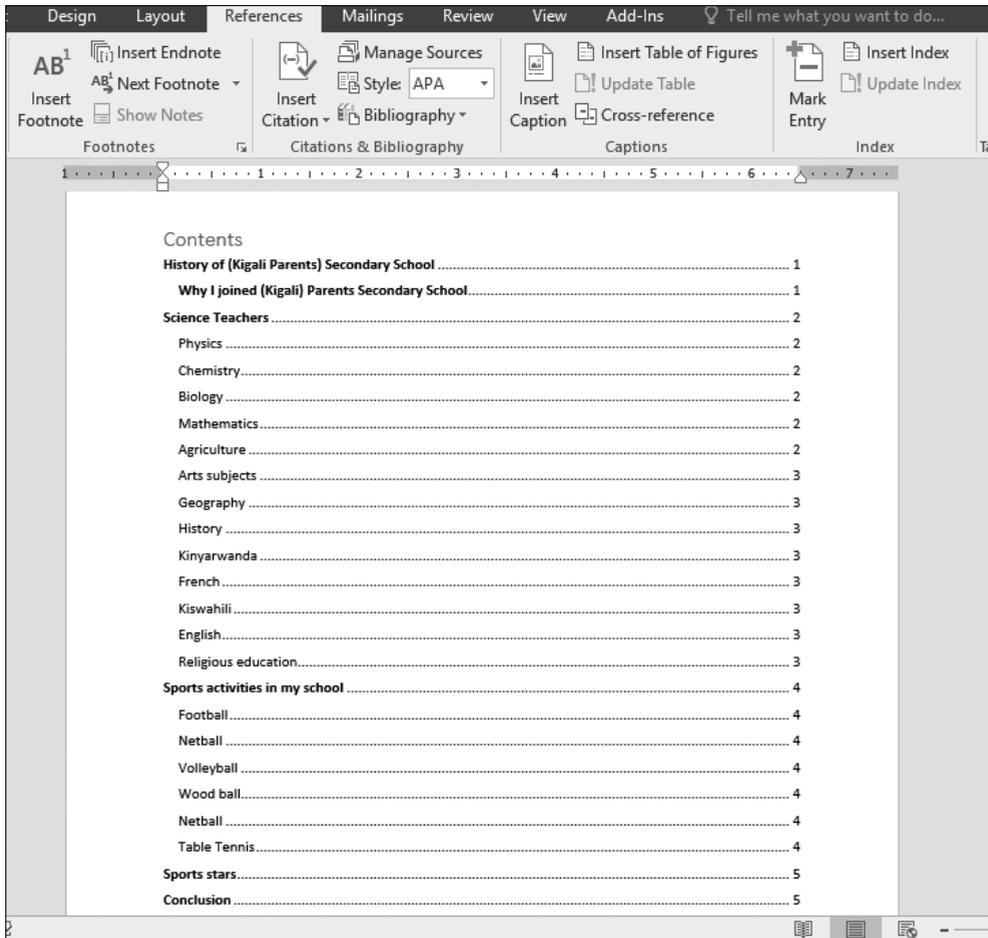
(ii) The suggested list of tables for the document is here below.
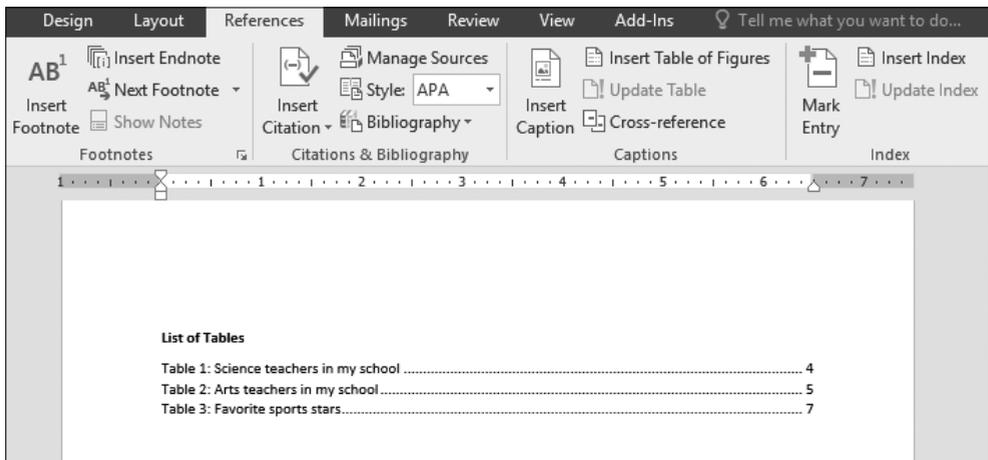
(iii)   The suggested list of figures in the document.
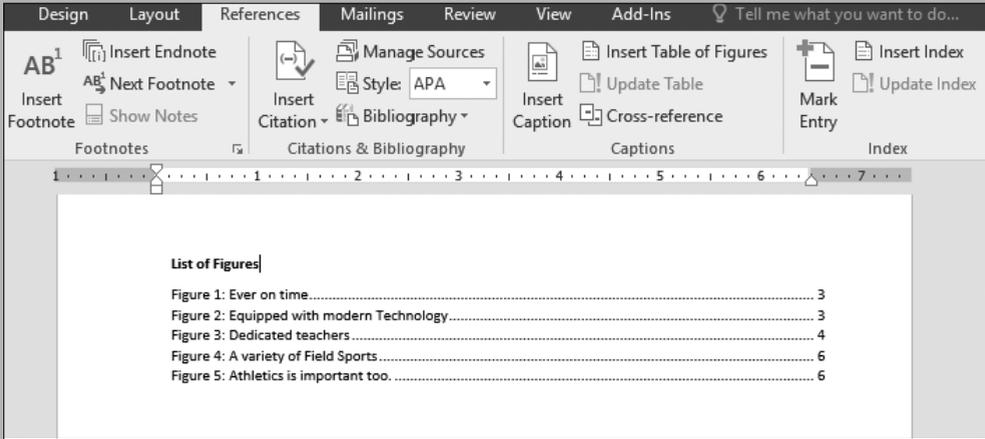
Remedial and Extended Activities

a)   Create a letter for S.3 learners to take to their parents inviting them to attend a grand celebration for the former Senior 3 class for passing highly in their examinations. The parents on their coming should be with attendance fee depending on the village of origin.

b)   Generate data of 20 learners in your class as Recipients list. Generate the data even without asking for correct information (but as imaginary data).   Use the following fields: Title,   Firstname,   Lastname,   Village   and Attendance fee.

Answers for remedial and extended activities

Refer to Activity 2.4 in the Learner's Book pages 53–58, for a proper procedure for your letter and table of recipients.

APPLICATION TO SOFTWARE

Word Processing

Charts and Advanced Objects

(Learner's Book pages 75–89)

Key Unit Competence

Present data graphically and use different objects in a document.

Prerequisites for Unit 3	Learners should have prior knowledge of working with objects such as symbols, shapes, wordart and tables which they got from Unit 3 in S.2. This unit has connections with Mathematics (Graphs, equations and functions).

Cross-cutting issues to be addressed	• **Peace and values education:** Use activity 3.1 and in the first place emphasise harmonious environment where learners can create charts and insert various objects in word processors, with creativity and respect. The harmony initiated in the first place shall be transmitted in the subsequent lessons for this unit. Noise and discomfort must be calmed immediately. Skills and knowledge and can be share peacefully.
	• **Gender education:** You will use Activity 3.3 and form manageable groups for learners to find solutions to the activity. When in groups, emphasise mutual and equal support of both male and female learners and this will promote gender understanding.
	   o In this case the learners shall create charts containing data about different sexes and will insert objects in their documents of both males and females.
	   o In addition to the above, inclusive education shall also be emphasised altogether as all learners participate fairly in inserting objects in their documents i.e. in Activity 3.3.

Generic competencies	• Communication and interpersonal management is gained when learners do group work, present answers, exchange ideas and opinions amongst themselves to test their worth in answering the asked questions using acceptable languages in Rwanda. • Research and Problem solving will be generated when every learner participates in finding solutions to questions before them by discussing and exchanging ideas using previous knowledge. • Critical thinking: Learners will think creatively and accommodate thinking discomfort to discover correct answers to questions in group work activities.
Vocabulary or key words or concepts	Chart, PDF, mathematical equations.
Guidance to the problem statement	Give an activity that will make learners get interest in the unit and search for more information about it. Learners should find solutions to the question (s) on their own in their groups that can be 3-6 learners. Present to learners this question at the start: *Create a line chart showing the number of first grades got by your school in the last 5 years.* *Insert in a document any three standard mathematical formulas you know.* Learners will encounter challenges to find solutions but will discover a lot that will lead them to acquire much about this unit. Learners can be driven to read almost the whole of unit 3 in the shortest possible time to find solutions.
Attention to special educational needs	Learners with hearing and vision difficulties should be made sit in front near the teacher to get audible sounds and to see clearly. Every small achievement they do should be praised. Talented learners should be given extended activities and additional information they might need to accomplish the activities.

List of lessons in Unit 3

Lesson number	Lesson title	Number of periods
1	Inserting common charts in a document	2 periods
2	Formatting a chart and an object	2 periods
3	Adding objects and adding objects from files	2 periods
Total number of periods		**6 periods**

Lesson 1: **Inserting common charts in a document** (Learner's Book pages 75–82)

Learning objectives	Learners will be able to: • Know how to present data graphically using charts. • Illustrate information with different charts. • Appreciate the way to present data using charts. • Insert Mathematical equations.
Prerequisites/ Revision/ Introduction	Greet learners and ask them questions on the previous lesson. This is to test learners' knowledge, skills and understanding. Introduce the lesson with a lesson title "Inserting common charts in a document".
Teaching aids	Computers, projector, textbooks and interactive materials. If a school has limited resources, the teacher will use one (or more) available computers; first to demonstrate how to insert a chart in a document; and afterwards allow learners work in manageable groups. Learners with hearing difficulties should be made to sit and use computer(s) near the teacher.
Learning activities	• Learners insert common charts e.g. column, pie and line charts in a document.
Synthesis	By the end of the lesson, learners will be able to present data graphically using charts or graphs.

Lesson assessment	**Ask learners the following questions:**
	1. Explain why someone should chart his data.
	
	   Answer: Charting organises numerical data so that it is easily interpreted than just figures.
	2. Create a list of five steps you would consider important for creating a pie chart.
	
	   Answer:
	   • Prepare numerical data that you want to appear in the chart.
	   • On Insert tab click **Chart** of the menu bar then click on the Chart icon.
	   • In the Chart box, select the type of Chart e.g. column and click **OK.**
	   • Edit the data in the data sheet and close it.
	   • Apply labels or titles such as Axis titles.

Method

Step 1:   Greet learners and review quality with them the previous unit. Ask them questions to test their knowledge, skills and understanding.

Introduce the lesson with a lesson title, and I propose "Inserting common charts in a document".

Ask learners what they know about charts.

Attend to their responses and give them an introduction.

This could take about 5 minutes.

3.1   Charts (Learner's Book page 75)

Step 2:   Charts.

Give learners to read the first 3 pages of Unit 3 i.e. from pages 75–77.

Explain to them the meaning of Charts and their purpose in documents. Discuss with learners a number of types of common charts.

3.2   To create a chart or graph (Learner's Book pages 78–82)

Use a simple piece of data on paper you earlier prepared and use it to create common charts by demonstrating to learners. If data is not available, use the data given in the Learner's Book as Activity 3.1 on pages 81–82.

This can take about 20 minutes.

Step 3:   Guide learners to do Activity 3.1 (Learner's Book page 81)

Instruct learners to turn on their computers and then do number 1 of Activity 3.1 and later the rest of the activity.

Move around or watch out for learners who may divert from doing the right things.

Help time takers to cope by demonstrating to them.

This could take 30 minutes.

Step 4:   Remind learners of the mathematical equations they learnt in S.2. Demonstrate to them how to insert mathematical equations in a provided document.

Give to learners the following equations to be inserted in the document:

Assessment

Since learners learnt about equations in S.2, give the following questions to time takers to practice by inserting them in MS word, after the chart they have created.

1. $\dfrac{x^2 y3}{\sqrt[3]{6/15xy}} y\,8\,2$

2. $10110_2 \ \Psi 1010_2$

3. $\dfrac{3/5}{5/11} \ \ni \ \dfrac{7/11}{5/13} \ X0$

4. $A/B \cap B/A$

Suggest other equations to give to learners in case you need it.

This could take 10 minutes.

Step 5:   Summarise the lesson

Make a summary of your lesson by revising with learners on the importance of using charts. Make a quick review of the steps to insert a chart.

Tell learners the lesson title for the next lesson.

Guide them to save the changes to their files and turning off their computers safely.

You can do this in 5 minutes.

Lesson 2: Formatting a chart and an object (Learner's Book pages 82–84)

Learning objectives	Learners will be able to: • Present data graphically and apply styles, adjust image and format an object.
Prerequisites/ Revision/Introduction	Greet learners and ask them questions on the previous lesson of charts and creating charts in a document. This is to test learners' knowledge, skills and understanding. Introduce the lesson with a lesson title "Formatting a chart and an object".

Teaching aids	Computers, projector, textbooks and interactive materials.
	In a school with limited resources, you can use one (or more) available computers; first to demonstrate how to format a chart; and afterwards allow learners to work in manageable groups.
	Learners with hearing difficulties should sit and use computer(s) near the teacher.
Learning activities	• Learners insert common charts and format them.
Synthesis	By the end of the lesson, learners will be able to apply styles to charts, insert and resize images.
Lesson assessment	**Ask learners the following questions:** a) Why should someone format a chart? b) Make a list of 3 steps you would consider important for creating a column chart.

Method

Step 1:   Greet learners and review with them charts and some equations. Ask them questions to test their knowledge, skills and understanding.

Introduce the lesson with a unit title, and I propose "formatting a chart and an object".

This could take about 5 minutes.

3.3   Formatting an object and chart (Learner's Book pages 82–84)

Step 2:   Explain to learners the meaning of formatting in relation to objects, charts and text.

Demonstrate to learners how to format a chart and any given object in a document, using chart tools or drawing or picture tools.

If you insert a chart you use chart tools to change its appearance, when you insert a shape or drawing, drawing tools are used, picture tools are for objects such as clipart, photograph, etc.

You can use a previously inserted object or create a new chart using data in Activity 3.2 on Learner's Book page 83.

This can take about 20 minutes.

Step 3: Learners do Activity 3.2 (Learner's Book page 83)

Instruct learners to turn on their computers and then do Activity 3.2.

Learners shall format the chart with desired colours and sizes. Move around or watch out for learners who may divert from doing the right things. Help time takers to cope.

This could take 30 minutes.

Step 4: Demonstrate to learners how to insert documents, worksheets, presentations, PDF, etc. in a document.

This could take 10 minutes.

Step 5: Summarise the lesson.

Make a summary of your lesson a quick review of the lesson from step 1 to step 4. Tell learners the lesson title for the next lesson.

You can do this in 5 minutes.

Guide them to save changes to their files and turning off their computers safely.

Lesson 3: Add objects from file (Learner's Book pages 84–86)

Learning objectives	Learners will be able to:
	• Identify procedures to add and read documents added in a document as objects.
	• Insert different objects from different programs in a document e.g. equation, excel and portable document format.
	• Insert common mathematical equations and symbols into a document.
	• Add documents to another word processing document.
	• Show confidence in writing mathematical equations in a document.
Prerequisites/ Revision/Introduction	Greet learners and ask them questions on the previous lesson i.e. formatting an object and chart, to test learners' knowledge, skills and understanding.
	Introduce the lesson with a lesson title "Add objects and objects from file".

Teaching aids	Computers, projector, textbooks and interactive materials.
	In a school with limited resources, the teacher should use one (or more) available computers; first to demonstrate to learners on how to insert objects in a document and afterwards, allow learners to work in manageable groups.
	Learners with hearing difficulties should sit and use computer(s) near the teacher.
Learning activities	• Learners choose to insert documents, presentation, sheets and PDF files appropriately in a document by displaying the entire file or displaying them in the document as icons. • Learners use embedded files in a document by opening them, editing and making presentations.
Synthesis	By the end of the lesson, learners will be able to insert documents as objects and read them.
Lesson assessment	**Ask learners the following questions:** Discuss reasons why people insert other files as icons and objects in the documents. **Answer:** To reduce the size, complexity or length of their documents.

Method

Step 1: Greet learners and review with them about formatting objects and charts. Ask them questions to test learners' knowledge, skills and understanding. Introduce the lesson with a lesson title, and I propose, "Adding objects and objects from files".

This could take about 5 minutes.

3.4 Add objects from file (Learner's Book pages 84–87)

Step 2: Earlier prepare document(s), workbook(s), presentation(s), PDF(s) with data that can be added to a document. For example, do Activity 3.3 in Excel and add or import the data in Word. Demonstrate to learners how you can add all those objects or data from different files.

Remind learners on how to insert mathematical equations.

This can take about 20 minutes.

Step 3:   Learners do Activity 3.3 on page 84 and then add previously created file as an object.

Instruct learners to turn on their computers and then do Activity 3.3. Move around or watch out for learners who may divert from doing the given activity. Time takers can be assisted by giving them more attention when doing practical sessions.

Instruct the learners to cut and paste the table into excel and in PowerPoint and then save the files.

Using the Insert tab, enable learners to insert a PowerPoint object on page and excel object on page of the same document. First demonstrate all this to learners.

This could take about 50 minutes.

Summary of Unit 3

Make a summary of your lesson and that of the unit by helping learners identify areas which they should always practice on to ensure they grasp required knowledge from the unit. Items to emphasise include:

- Creating and labelling a chart
- Formatting a chart
- Adding objects in Microsoft word.

Encourage learners to do end of unit 3 assessment and present the work for marking. Time takers can be guided to repeat Activities 3.1, 3.2 and 3.3 in the unit.

Tell learners the unit and title for the next lesson so that they can research about it.

Guide learners to save changes to their files and turn off their computers safely.

You can do this in 5 minutes.

Additional information for the teacher

Ensure that you teach the learners thoroughly about charts and graphs in Word processing. When they master charts well, Unit 5 becomes easy as it can be done in just one or two lessons.

Suggested answers for activities in Unit 3

Unit 3 is all practical and the results of the practicals are assessed by ensuring that learners follow the right steps in using the MS Word features tested on during demonstration.

Suggested answers for Activity 3.1

1. a) The table 3.2 is created as shown below in MS Word.

Sauce	Number of learners
Meat	75
Chicken	45
Fish	58
Pork	77
Beans	115
Cow Peas	65

Table 3.2: Data collected about different sauces taken by S.3 learners

    b) (i) The resulting clustered bar chart from Table 3.2 in 1 (a) is shown here below.
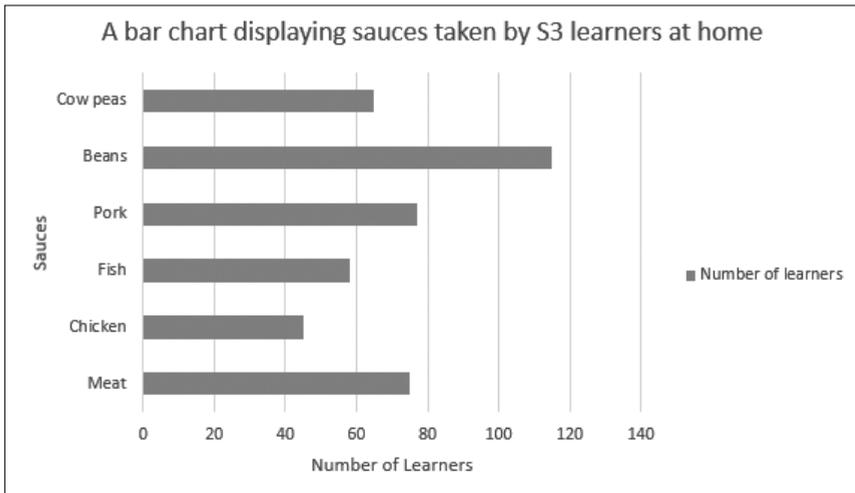
(ii) The pie chart that will appear on page 2 in learners' documents is here below.

A bar chart displaying sauces taken by S3 learners at their homes

Legend: Meat, Chicken, Fish, Pork, Beans, Cow peas

Cow peas 15%, Meat 17%, Chicken 10%, Fish 13%, Pork 18%, Beans 27%
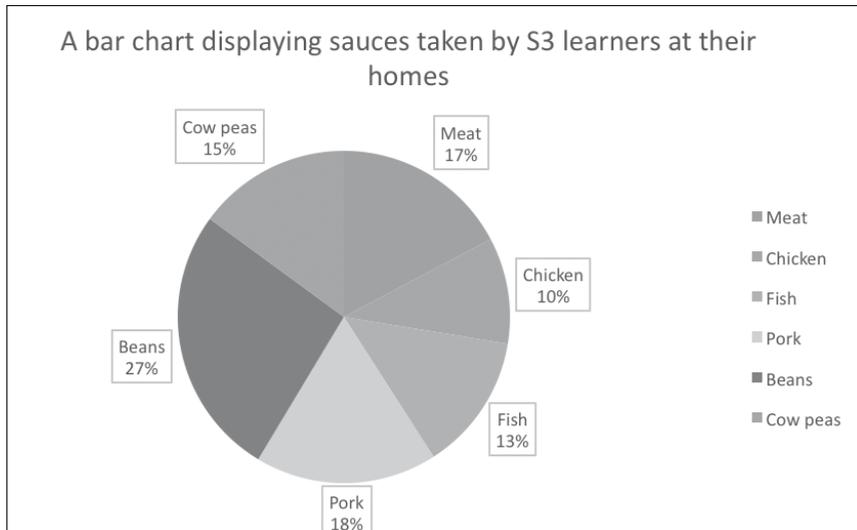
2. a) (i) Design tab is active. Some of the buttons that are displayed by design tab include; Add Chart element, Quick Layouts, Change colours and many others.

   (ii) There are two tabs displaying chart tools. The tabs are Design tab and Format tab.

   On Design tab are the following buttons:

   Add chart element: This is used to add chart features such as axis titles, legend, etc.

   Change colours: This is used to change the colours of the chart data series.

   Edit data: This is used to make changes in data used for making the chart.

   On Format tab are the following buttons:

   Shape height: This is used to change the height of the chart (or another shape).

   Shape width: This is used to change the width of the chart (or another shape).

   Format selection: This is used for formatting a selected part of the chart (or shape).

   b) (i) Change chart type.

   (ii) Add chart element.

c)   Column chart.

d)   Quick Layouts button.

3.   a)   Look closely at (observe) the picture.

b)   (i)   Shape width.

(ii)   Shape effects.

(iii)   Shape Fill.

(iv)   Format Selection.

Suggested answers for Activity 3.2

1.   a)   The table 3.3. is created as shown here below.

House	Football (%)	Volleyball (%)	Netball (%)
Gatete	88	65	56
Ngabo	78	90	70
Gaju	45	85	75

Table 3.3: *Performance results from learners house competitions in Riviera SS last year*

The 3-D column chart to represent the data in table 3.3. is here below.

b)
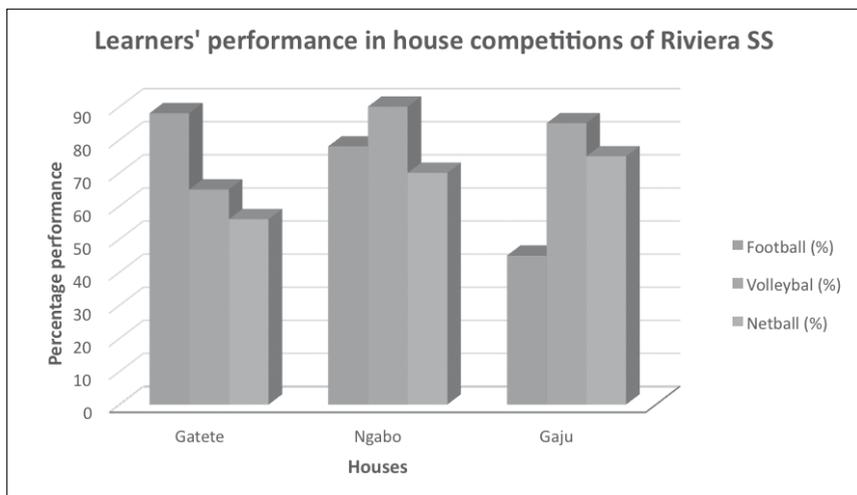
c)   When the 3-D column chart above is copied to page 2 and 3, it remains with the same appearance.

d) When the chart is changed to another type i.e. 3-D pie chart, it appears as shown below:
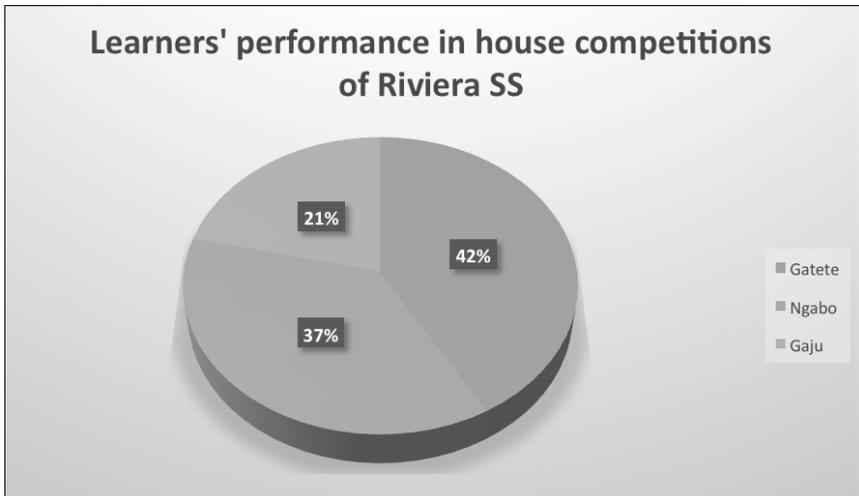
e) When the original column chart is changed to a clustered horizontal cone graph, it appears as shown below.
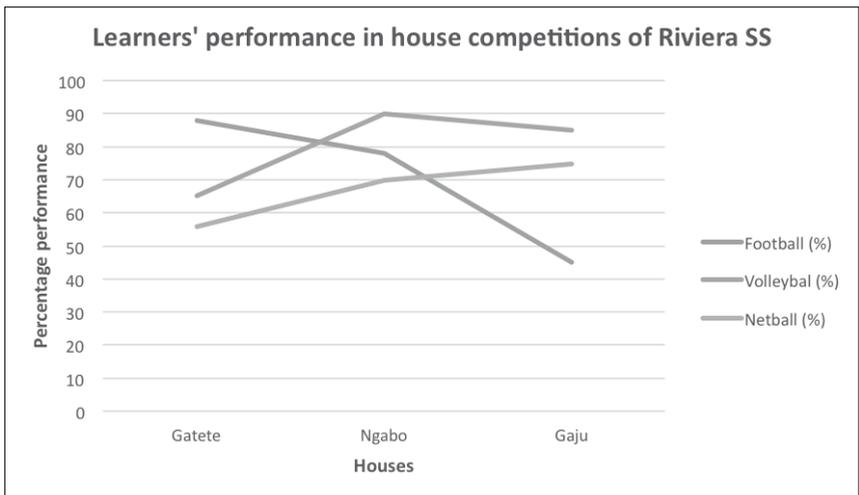
Note: The title used here may differ slightly from those the learners have used. The most important idea is to accept a title and labels that have meaning related to the data given in the table.

Suggested answers for Activity 3.3

The table created in Activity 3.3 appears as shown below in the file "Overtime"

1.   (a – e)

Teachers' Daily Overtime in GS Nyarusange

Name of teacher	Mon	Tue	Wed	Thu	Fri	Sat
Gatete Noah	40	20	80	45	65	90
Giramata Alex	30	20	15	50	30	120
Keza Tania	15	90	100	50	80	180
Kwizera Olive	120	80	10	15	30	80
Mahoro Stanslas	40	15	30	40	50	110
Mugisha Ethan	50	30	40	60	20	50
Mutesi Grace	70	90	20	20	30	90
Mutoni Carol	20	20	50	40	70	140
Ngabo Pacifique	30	20	40	30	45	100
Rukundo Micheal	100	120	20	45	20	80

Table 3.4: *Teachers' extra lessons in minutes*

f)   The 3-D stacked column chart for Mon, Tue, and Wed is shown below.
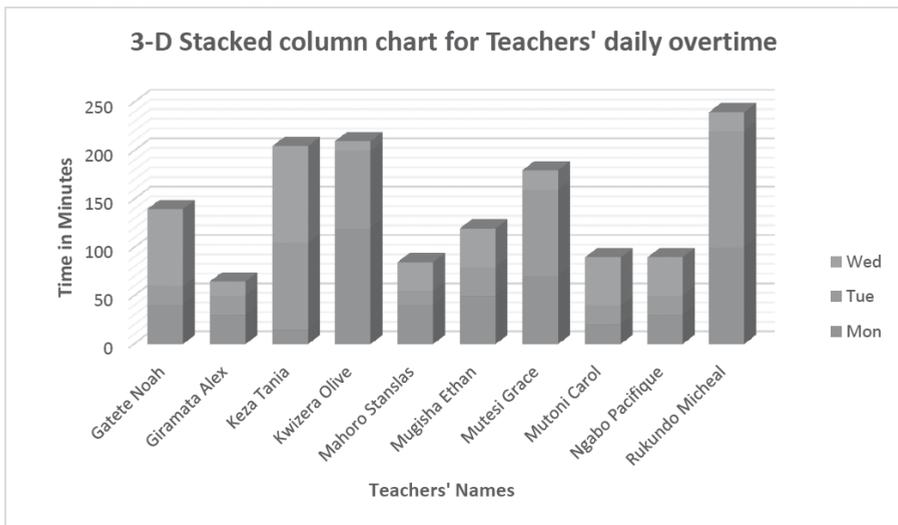
g) The line graph for the first five teachers in ascending order for Mon to Sat will appear as shown here below.

A line graph displaying Teachers Overtime from Mon to Sat
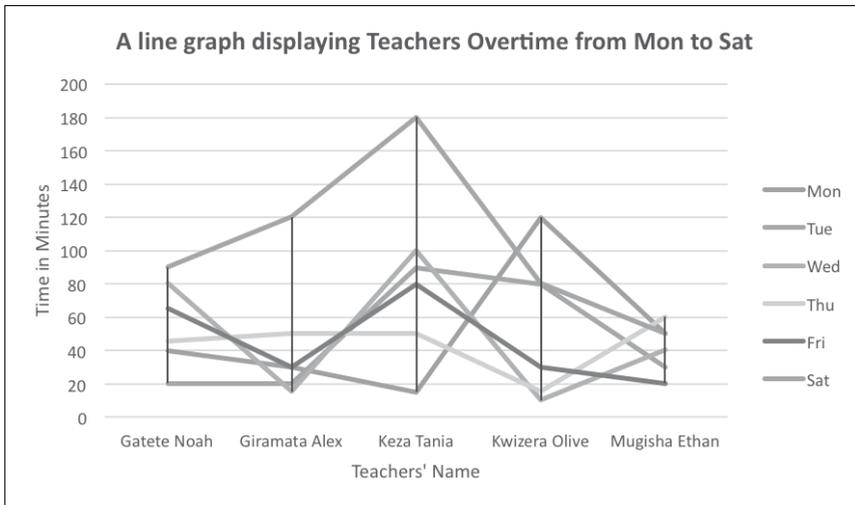
h) When created, the pie chart will appear as shown below.

Teachers Overtime for Mon and Sat
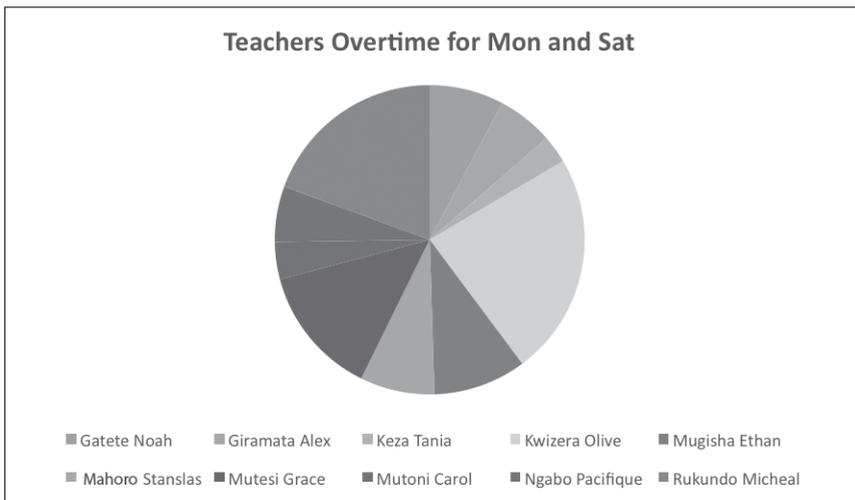
Answers for the End of Unit 3 Assessment

1. a) The expected 3-D clustered column chart for all learners is shown below.
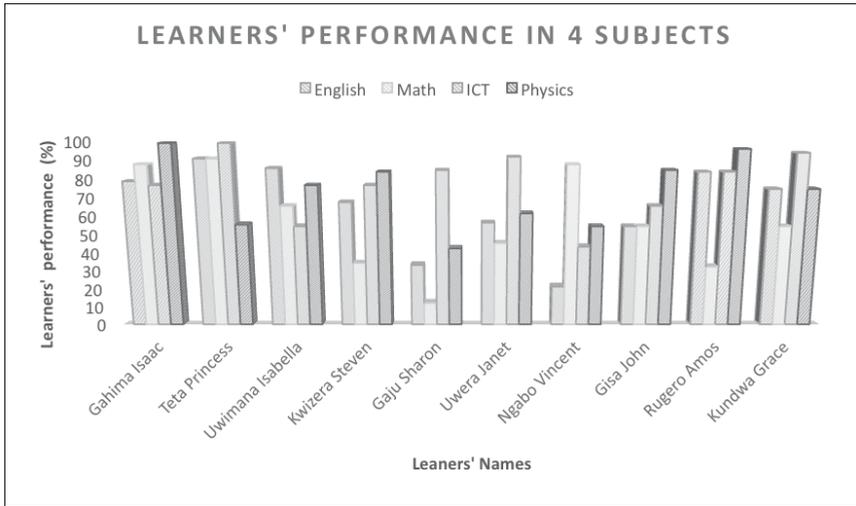
b) When line style 5 is used, the stacked line chart will appear as shown below.
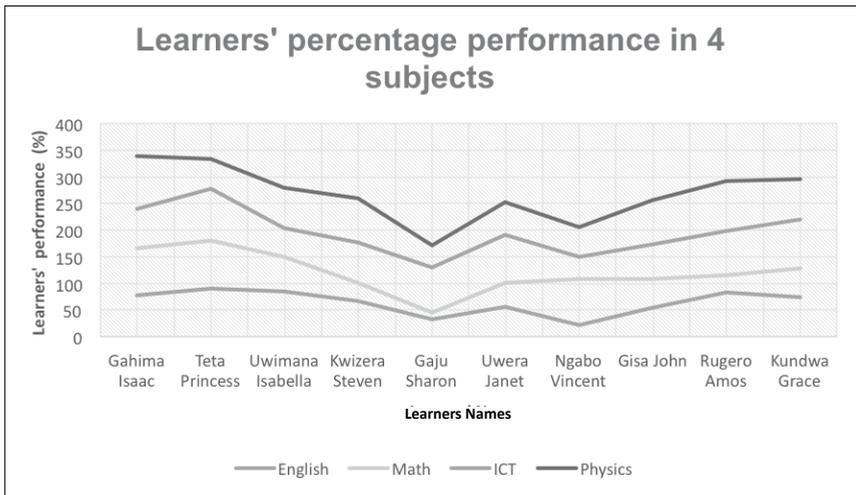
c) If chart style 10 is used, the pie chart representing the performance of all the learners in ICT is here below.
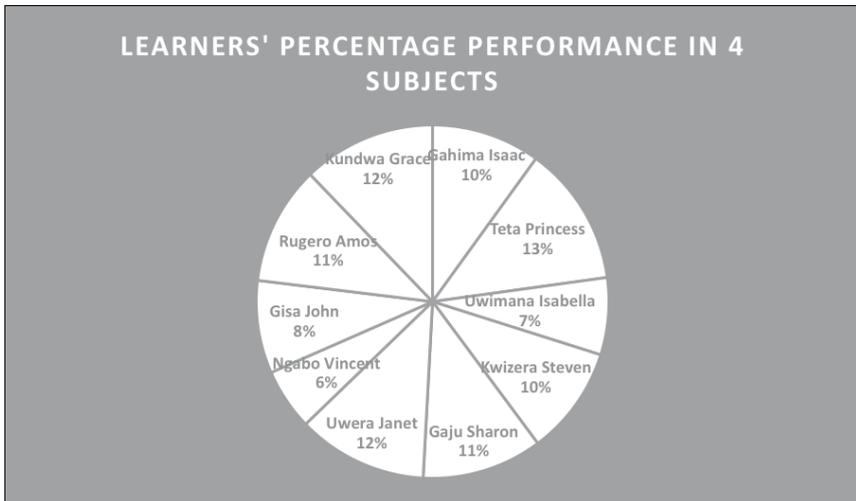
2. The proposed appearance for answers of question 2 are here below.

Remedial and Extended Activities

Create an organisational chart for your school Leadership, beginning with the Head master up to an ordinary learner in the school. Save it as special chart+ your name. Make it to appear as the one below:
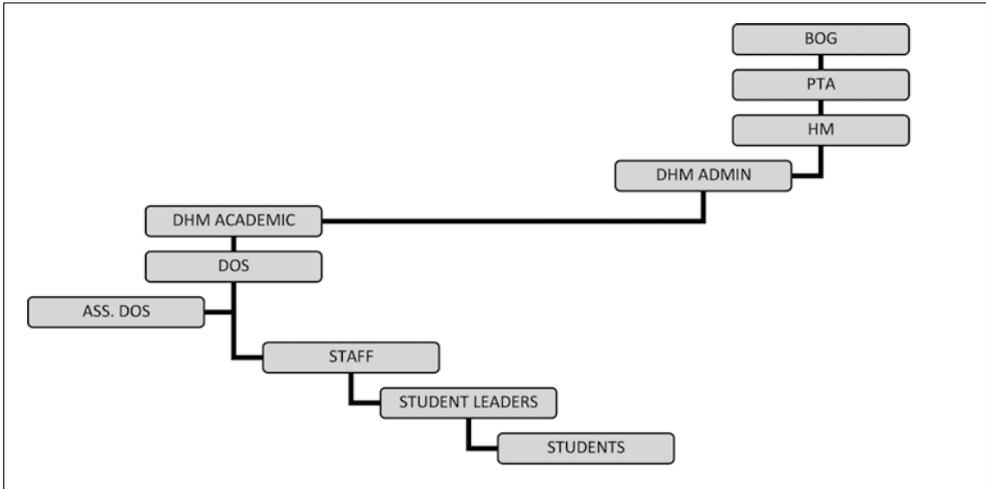
Picture 3.1: Organisational chart for most schools

To create the object above, learners shall use the following steps:

● Click where you need an organisational chart.

● On Insert tab, click Object button in the Text group.

● In the Insert object dialog box that display, scroll and select Microsoft Word 97 – 2003.
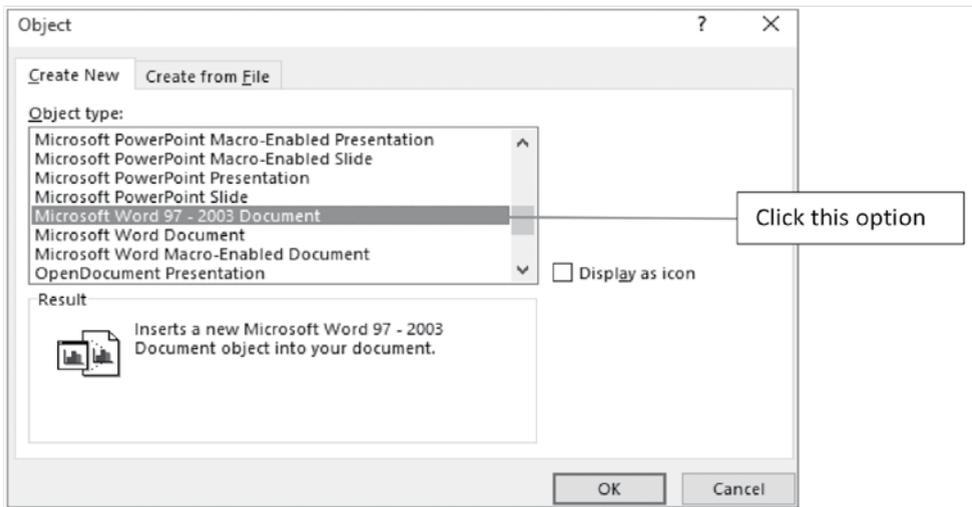
Picture 3.2: The object dialog box

- Click OK. The dialog box disappears.

- Click Insert tab (again) and select SmartArt button. The Diagram Gallery dialog box below displays.
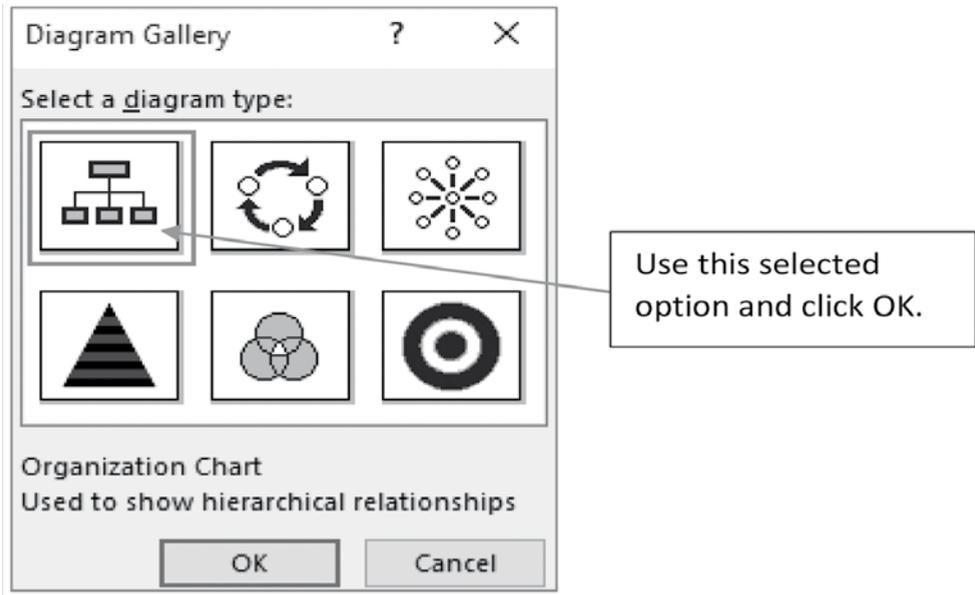
Picture 3.3: Diagram Gallery

- Start building your chart using the Format tab buttons on Ribbon.
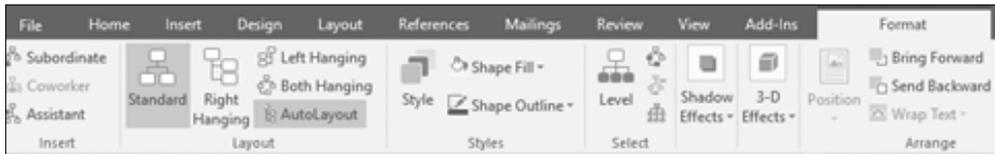
Picture 3.4: Format tab displaying tools for creating organisational chart
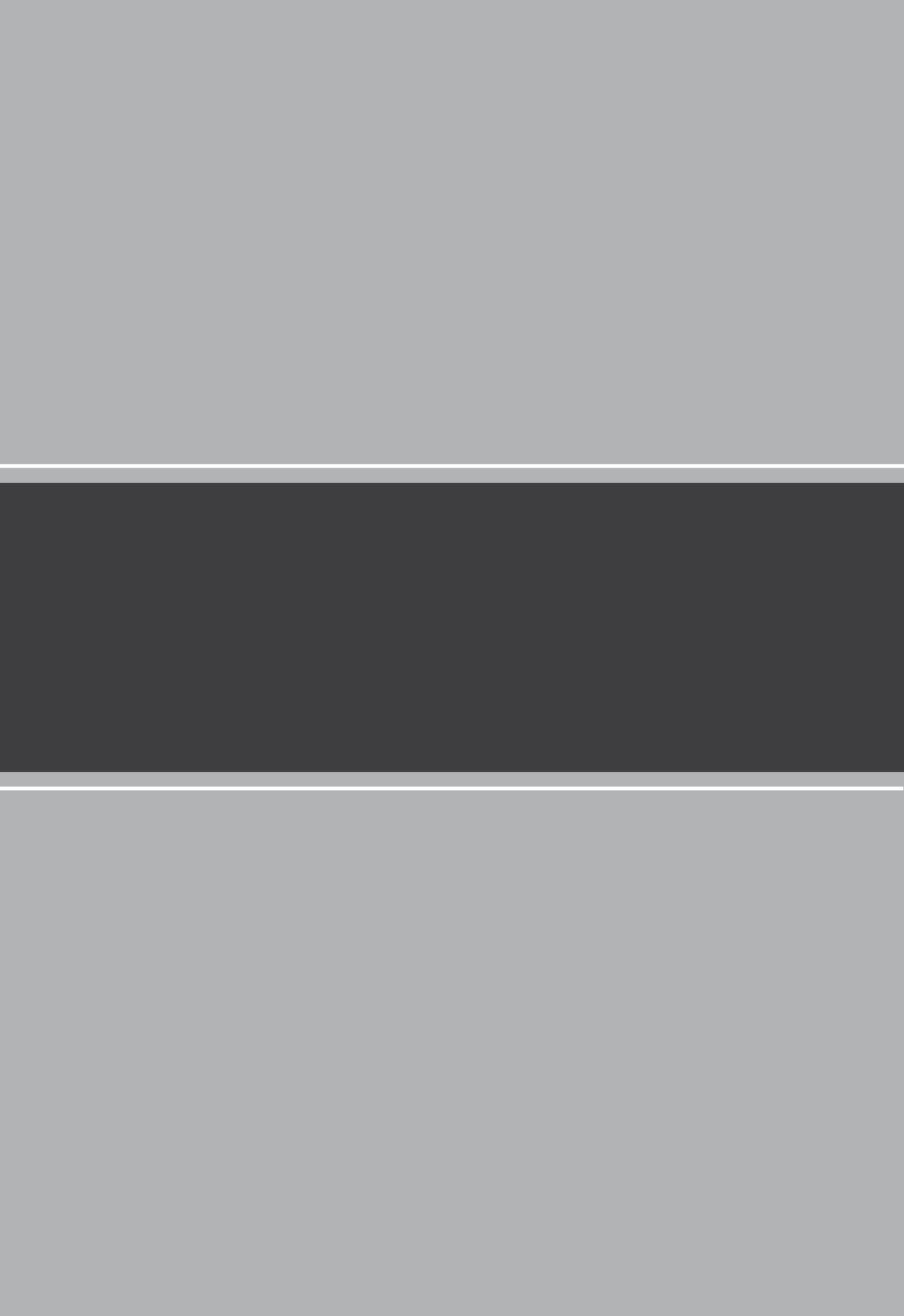
APPLICATION SOFTWARE

GIS

UNIT 4

ArcGIS

Key Unit Competence

Query a map using selections (attribute and location). Create a map layout and insert map elements. Use advanced symbology and labeling. Print, export and send a map.

Prerequisites for Unit 4	Learners already have knowledge about GIS from S.1 and S.2. By this time they have some confidence in using ArcGIS software and can work with maps. This Unit has connections with Physical Geography and Maps.
Cross-cutting issues to be addressed	• **Peace and values education:** Learners shall be taught about querying maps and how to use advanced symbology and labelling. For this to workout successfully, emphasise peaceful and a harmonious working environment where learners can perform these tasks creatively with peace respect for each other. The harmony initiated in the first place shall be transmitted in the subsequent lessons for this unit. Noise and discomfort must be calmed immediately. • **Gender education:** Form manageable groups for learners to use advanced symbology and labelling and these groups should be a combination of both male and females. Learners shall work more productively as you emphasise mutual and equal support of both male and female learners to the activities and this will promote gender understanding.

Generic competencies	• Communication and interpersonal relations is gained as learners work in groups, presenting answers, exchanging ideas and opinions amongst themselves to test their worth in answering the asked questions using acceptable languages in Rwanda. • Research and Problem solving will be achieved when every learner participates in finding solutions to questions before them by discussing and exchanging ideas using previous knowledge. • Critical thinking: Learners will think creatively and accommodate thinking discomfort to discover correct answers to questions in group work activities on working with maps.
Vocabulary or key words or concepts	Symbology, display options and map elements.
Guidance to the problem statement	Create an activity that will make learners get interest in the unit and search for more information about it. Learners find solutions to the question (s) on their own in their groups that can be 3-6 learners. You will present to learners this question at the start: *Create a map layout of Rwanda and insert map title and other important map elements. Query the map using select by attributes. Print your map.* Learners will encounter challenges to find solutions but will discover a lot that will lead them to acquire much about this unit. Learners shall be charged to read almost the whole of unit 4 in a short time to find solutions.
Attention to special educational needs	Learners with physical disabilities (e.g. hearing and vision problems) should be helped to sit where the teacher can easily attend to their needs. Every small achievement they do should be credited. Talented learners should be given extended activities and additional information they might need to accomplish their activities.

List of lessons in Unit 4

Lesson number	Lesson title	Number of periods
1	Query methods (III).	2 periods
2	Display of a layer (II).	2 periods
3	Map layout.	2 periods
4	Use page and print setup menu.	2 periods
5	Save and send a map.	2 periods
Total number of periods		**10 periods**

Lesson 1:   Query methods (iii) (Learner's Book page 91)

Learning objectives	Learners will be able to: • Query a map using complex selections. • Appreciate the ability to understand and represent geographic features.
Prerequisites/ Revision/Introduction	Greet learners and introduce the new unit in a special way you desire to attract attention and fast learning. Then introduce the lesson title "Query methods (iii)".
Teaching aids	Computers, projector, textbooks interactive board and ArcGIS. In schools with limited resources; the teacher should use one (or more) available computers; first to demonstrate how to query a map using complex selections; and afterwards allow learners to work in manageable groups. Learners with hearing difficulties should be guided to sit and use computer(s) near the teacher.
Learning activities	• The teacher helps learners to select on a map all the rivers that flow through a predetermined location using the tools they learnt. • Learners do practical exercises on how to select by attributes/ by location and on how to export selected features.
Synthesis	By the end of the lesson, learners will be able to query a map using complex selections.

Lesson assessment	Ask learners the following questions:
	1. Explain the steps for adding a map in ArcMap. **Answer**: Check in the Learner's Book Activity 4.2 (can use S.2 knowledge to recall the steps). 2. Recall the major steps for adding a layer on a map. **Answer**: Check in the Learner's Book section 4.3.2 page 102. **Note**: Learners shall recite these steps to prove orally that they can add a map and a layer on a map.

4.1   Introduction (Learner's Book page 91)

Method

Step 1:   Review with learners the previous unit i.e. charts and advanced objects. Ask them questions to test their knowledge, skills and understanding about the unit.

Introduce the lesson with a lesson title, and I propose "Query methods (III) ". Ask learners what they know about querying methods and attend to their reactions/responses.

Build from their reactions to give a ruling introduction.

This could take about 5 minutes.

4.2   Querying data (Query methods III) (Learner's Book pages 91–99)

Step 2:   Introduce to learners selecting by attributes and by location. Give learners about 10 minutes for marathon reading of the first 5 pages of Unit 4. Then explain to them the meaning of selecting by attributes, selecting by location, export selected features and their purpose in GIS. You do this as you demonstrate with ArcGIS software. Use a simple piece of data you earlier prepared and help learners to do Activity 4.1.

Use about 10 minutes for demonstrations.

Step 3:   Learners do Activity 4.1 (Learner's Book page 91)

Instruct learners to turn on their computers, open GIS software and then do Activity 4.1 using both methods (select by attributes and select by location).

Move around or watch out for learners who may divert from doing the right things. Help time takers to cope.

This could take about 50 minutes.

Step 4:   Summarise the lesson

Make a summary of your lesson i.e. go through what you have covered in the lesson. Tell learners the lesson title for the next lesson do that they can research about it.

Guide learners to save changes to their work and turn off their computers safely.

You can do this in 5 minutes.

Lesson 2: Display of a layer (II) (Learner's Book page 100)

Learning objectives	Learners will be able to produce a map layout.
Prerequisites/ Revision/Introduction	Greet learners and ask them questions on the previous lesson i.e. query methods. Introduce the lesson with a lesson title "Display of a layer".
Teaching aids	Computers, projector, textbooks interactive board and ArcGIS. In schools with limited resources; the teacher should use one (or more) available computers; first to demonstrate how to symbolise a layer and add labels of a layer and display options; and afterwards allow learners to work in manageable groups. Learners with special needs should sit and use computer(s) near the teacher.
Learning activities	• The teacher helps learners to work with map elements and perform exercises on how to insert a legend, scale, orientation and text.
Synthesis	By the end of the lesson, learners should be able to produce a map layout.
Lesson assessment	Ask learners the following questions: 1. Explain the importance of each of the chart elements on a map. **Answer**: Check in the S.3 Learner's Book Unit 4 section 4.4 pages 106–110 2. Give three steps you would consider for adding a map element. **Answer**: • Change from data view to Layout view. • Click Insert menu. • Select a map element e.g. Title, legend, etc.

Method

Step 1:   Review with learners, Activity 4.1 Learner's Book page 91. Ask them questions to test their knowledge, skills and understanding.

Introduce the lesson with a lesson title, and I propose "Display of a layer (II)".

This could take about 5 minutes.

4.3   Display of a layer (Learner's Book page 100)

Step 2:   Explain to learners the meaning of Symbolise layer in relation to map.

Demonstrate to learners how to use categories and quantities when given data.

To format a map and any given data to use, show learners how to add/remove labels of a layer (adjust label properties) into a map and finally explain to learners display options (transparency and map tips (use primary field)).

This can take about 20 minutes.

Step 3:   Learners do Activity 4.2 (Learner's Book page 98)

Instruct learners to turn on their computers and do either Activity 4.2. Learners shall use the administrative map of Rwanda and include Provinces, Districts and Lakes. Then, after labels on each layer.

Help time takers to cope by giving attention and patience.

This could take about 30 minutes.

Step 4:   Summarise the lesson.

Make a summary of your lesson. Go through Activity 4.3. After you are satisfied with the lesson teaching, tell learners the lesson title for the next lesson.

Guide learners to save changes to their files and turn off their computers safely.

You can do this in 5 minutes.

Lesson 3: Map layout (Learner's Book page 106)

Learning objectives	Learners will be able to use advanced symbology and labelling.
Prerequisites/ Revision/Introduction	Greet learners and ask them questions related to display of layer. Introduce the lesson with a lesson title i.e. "map layout".
Teaching aids	Computers, projector, textbooks interactive board and ArcGIS. In schools with limited resources; the teacher should use one (or more) available computers; first to demonstrate how to work with map elements; and afterwards allow learners to work in manageable groups. Learners with hearing impairments should sit and use computer(s) near the teacher.
Learning activities	• The teacher demonstrates how symbology can be given using categories. Afterwards, learners practice symbolising layers according categories and quantities. • Learners do practical exercise on how to select by attributes/ by location and how to export selected layers.
Synthesis	By the end of the lesson, learners will be able to use advanced symbology and labelling.
Lesson assessment	**Ask learners the following questions:** What is the importance of the following on a map? a) Legend. b) Title. Answer: a) A legend works as a key to the map. It enables you to identify colours and symbols and be able to understand their meaning in a map. b) Title is text that identifies the map e.g. its purpose or meaning.

Method

Step 1: Review with learners the previous activities e.g. display of a layer. This is to test learners' knowledge, skills and understanding. Introduce the lesson with a lesson title, and I propose "Map layout".

   This could take about 5 minutes.

Step 2: Give learners an activity on map elements after carrying out a demonstration.

4.4 Map layout (Work with map elements) (Learner's Book page 106)

Insert: legend, scale, orientation (grid or north arrow), text (title, author, date, sources, etc.).

Save and send a map:

Export map and email it (attach the exported map and send). Demonstrate to learners how to do all the above.

This can take about 20 minutes.

Step 3:   Instruct learners to turn on their computers.

Instruct them to work with map elements. First demonstrate all the necessary steps to learners.

This could take 50 minutes.

Step 4:   Guide learners to do Activity 4.4. in the Learner's Book on page 106.

Step 5:   Summarise the lesson

Make a summary of the unit. You can quickly go through all the activities done.

Guide them to save changes to their files and to turn off their computers.

You can do this in 5 minutes.

Lesson 4: Using Page and print setup menu (Learner's Book page 111)

Learning objectives	Learners will be able to: • Print, export and send a map. • Explain how to export and convert ArcGIS maps.
Prerequisites/ Revision/Introduction	Greet learners and ask them questions about map layout. Introduce the lesson with a lesson title "Using page and print setup menu".
Teaching aids	Computers, projector, textbooks interactive board and ArcGIS. In schools with limited resources; the teacher will use one (or more) available computers; first to demonstrate how to print and export a map as a picture; and afterwards allow learners to work in manageable groups. Learners with hearing impairments shall sit and use computer(s) near the teacher.

Learning activities	• Under the guidance of the teacher, learners perform an exercise on printing, exporting a map as a picture (e.g. jpg) and sending a map.
Synthesis	By the end of the lesson, learners will be able to print, export and send a map.
Lesson assessment	**Ask learners the following questions:** Give reason why you should: a) Print a map. Printed information can be used without worrying about the status of the machine where it is stored. You get details at a desired pace. b) Export a map. When a map is exported, it can be used on different platforms other than the platform where it was generated.

Method

Step 1:   Greet learners and ask them questions related to previous lessons to test learners' knowledge, skills and understanding. Introduce the lesson with a lesson title, "Use page and print setup menu".

This could take about 5 minutes.

4.5   Use page and print setup menu (Learner's Book page 111)

Step 2:   Use page setup. Using a file learners had earlier saved, demonstrate to learners how to setup the page by focusing on the margins, paper size, orientation and margins of the page.

Print setup: Secondly demonstrate to learners on how to carry out print setup before printing the map.

This can take about 20 minutes.

Step 3:   Learners do Activity 4.5 in Learner's Book page 111.

Instruct learners to turn on their computers and do Activity 4.3. This time instead of focusing on adding, should focus on page setup and print setup. Afterwards, print the map.

Move around or watch out for learners who may divert from doing the given activity. Time takers can be assisted through hands–on assistance.

This could take about 50 minutes.

Step 4:   Summarise the lesson. Review the steps in the lesson especially Activities 4.3 and 4.5.

Let learners save changes to their files and turn off their computers.

You can do this in 5 minutes.

Lesson 5:   Save and send a map (Learner's Book page 113)

Learning objectives	Learners will be to: • Save and send a map. • Review what learners have learnt and test their knowledge.
Prerequisites/ Revision/Introduction	Greet learners and ask them questions about page and print setup menu. Introduce the lesson with a lesson title "Save and print a map".
Teaching aids	Computers, projector, textbooks interactive board and ArcGIS. In schools with limited resources; the teacher will use one (or more) available computers; first to demonstrate how to create, save and send a map; and afterwards allow learners to work in manageable groups. Learners with hearing impairments should be helped to sit and use computer(s) near the teacher.
Learning activities	• Under the guidance of the teacher, learners perform an exercise on exporting a map as a picture (e.g.jpg) and sending a map.
Synthesis	By the end of the lesson, learners will be able to save and send a map.
Lesson assessment	Ask learners the following questions: Give reasons why you should save a map. Describe steps for use to save a map. **Answer:** Refer to the Learner's Book, section 4.6 (page 113–115).

Summary of unit 4

It is very important that learners build knowledge of using Arcmap from S.1 and S.2. By S.3, they can manipulate any map using tools in the ArcGIS software.

Encourage learners to practice working with maps.

Some of the maps can be generated around your school, community or district.

Additional information for the teacher

Below is a map of the world displayed by ArcGIS Online

Note: In case you get challenges in accessing ArcMap for use to teach learners, feel free to use the online platform as long as you can access Internet. The difference is the procedures used in each platform, but all in all you can achieve the same result destination. The advantage with online platform is that you do not need to install any software on the computer, but you need to register as a user. You can let learners register and use ArcMap.
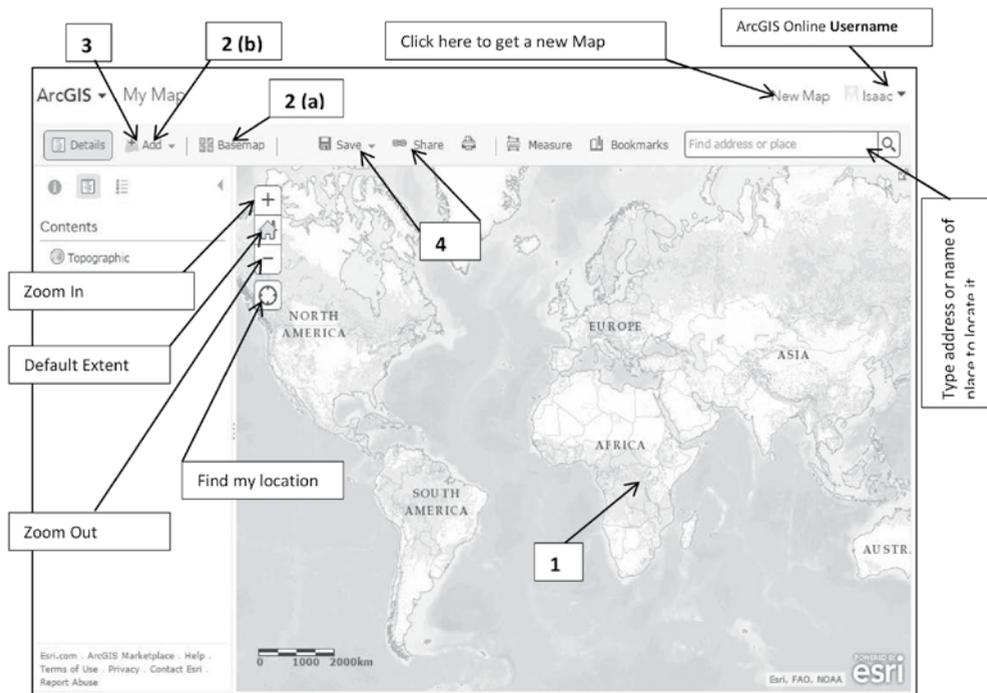
Picture 4.1: ArcGIS Online

Procedure for making/creating a Map

1. Choose an area e.g. "Kigali". Pan and zoom the map to an area or search by its name or address.

2. Decide what to show.

   a) Choose a Basemap

   b) then Add layers on top of it.

3. Add more to your map.

    Add map notes to draw features on the map. Display descriptive text, images, and charts for map features in a pop-up.

4. Save and share your map.

   Give your map a name and description then share it with other people.

Suggested answers to activities in unit 4

Unit 4 is all practical and the results of the practicals are assessed by ensuring that learners follow the right steps in using the ArcGIS features during demonstrations.

Check for answer guidelines from respective Activities 4.1, 4.2, 4.3, 4.4, 4.5 in the Learner's Book.

Remedial and Extended activities

- Open ArcGIS Online and add a map of your district. Add layers such as roads, rivers and lakes.

- Query a map using selections (attribute and location).

- Create a map layout and insert map elements.

- Save your map

Suggested answers for remedial and extended activities

Access AcrGIS online and learn to use it as per guidelines given online. You will add a map and any feature needed in it.

Suggested answers for End of unit assessment

1.   Follow steps for adding a new map from Learner's Book pages 98–
      99 and then add provinces, districts, section, rivers and national
      parks.

      ●   Add a label to each layer.
      ●   Insert a legend, scale and orientation.
      ●   Insert a map title, author and date.
      ●   Send to the given email.

2.   Follow steps for adding a map from Learner's Book pages 98–99.

      ●   Follow steps for adding layers in the Learner's Book pages
            102–105.
      ●   Follow steps for adding map elements from pages 106–110
            in the Learner's Book.

APPLICATION SOFTWARE

Spreadsheets

Charts and Objects in Spreadsheets

(Learner's Book pages 119–144)

Key Unit Competence

Use charts and objects in a spreadsheet, use different techniques to organise a printable datasheet.

Prerequisites for Unit 5	Learners should have prerequisite knowledge about spreadsheet basics and Worksheet, data presentation, obtained from S.2. Learners already have the knowledge of charts and advanced objects of Unit 3 in S.3 for the success of this unit. This unit has connections with Mathematics: (Equations and functions and graphs).
Cross-cutting issues to be addressed	• **Peace and values education:** Learners will perform practical activities in generating different graphs and this calls for sharing knowledge and skills amongst themselves. This will promote peace and cooperation; and learners will value their education. • **Gender education:** In this unit, learners will generate different charts containing data about different sexes. This will enable them to be gender conscious and have respect and value for themselves in relation to their gender. The issue of inclusive education shall also be emphasised when generating charts. • **Financial education:** Learners shall be given different pieces of numerical data, some of which may be monetary figures, to turn such data into charts. Doing this will help them to know how financial figures are easily summarised by graphs.

Generic competencies	• Communication and interpersonal relations is gained as learners do group work, present answers, exchange ideas and opinions amongst themselves to examine their abilities in answering questions using acceptable languages in Rwanda. • Research and Problem solving is generated as every learner participates in finding solutions to questions by discussing and exchanging ideas using previous knowledge. • Critical thinking: Learners try to think creatively and accommodate thinking discomfort to discover correct answers to questions in group work activities.
Vocabulary or key words or concepts	Chart elements i.e. x- axis and y-axis, chart title and legend; and objects.
Guidance to the problem statement	Pose a question that will make learners get concern for the unit and search for more information about this Unit 5. Learners shall find solutions to the question (s) on their own in their groups that can be 3-6 learners. You will present to learners this question at the start: *Create a 3-D column chart showing the number of learners per class or stream in your school. Format your chart appropriately and print it.* Learners might find it challenging to find answers but will discover a lot that will lead them to acquire much about this unit.
Attention to special educational needs	Any learner, new or old who requires a special educational need must be catered for properly, for instance short learners should be given seats that enable them use the computers more comfortably. Those with hearing problems should sit in front near the teacher and explanations have to be repeated to enable them understand. Every small achievement done should be praised and credited. Talented learners should be given extended activities and additional information they might need to accomplish their activities.

List of lessons in Unit 5

Lesson number	Lesson title	Number of periods
1	Inserting common charts in a document.	2 periods
2	Formatting excel chart.	2 periods
3	Formatting cell data as table and setting print area.	2 periods
4	Unit Summary.	2 periods
Total number of periods		**8 periods**

Lesson 1: Inserting common charts in a document (Learner's Book page 119)

Learning objectives	Learners will be able to: • Identify different ways of presenting data. • Use charts and graphs to present data graphically.
Prerequisites/ Revision/Introduction	Greet learners and ask them questions related to Unit 3 – charts and advanced objects to test their knowledge and skills about charts. Introduce the new unit in ways that draws learners attention. Introduce the lesson "inserting common charts in a document".
Teaching aids	Computers, projector, textbooks and interactive board. In schools with few computers; you can use one (or more) available computers; first to demonstrate how to create a chart e.g. column chart; and afterwards allow learners to work in manageable groups. Learners with learning disabilities should use computer(s) near the teacher.
Learning activities	• Represent and interpret data graphically.
Synthesis	By the end of the lesson, learners will be able to identify different ways of presenting data and will be able to use charts to present data graphically with spreadsheet software.

Lesson assessment	**Ask learners the questions below:**
	Question 1: Explain the meaning of the term "*Chart*".
	Answer: A chart is an illustration used to represent numerical data in a way that is easier to understand.
	Question 2: Explain the purpose of creating charts.
	Answer: Charts are created purposely to do the following:
	• To represent numerical data in a summarised form. • To detect trend overtime and make forecasts • To view relationships between two or more variables e.g. price against volume.
	Question 3: Identify and explain charts commonly used to represent numerical data today.
	• *Column chart*. This is used to represent data in form of vertical bars or objects. • *Bar chart* represents data in horizontal bars or objects. • *Line chart* represents data using a series of lines. • *Pie chart* represents data as slices within a circular object.

Method

Step 1:   Have a quick review of the previous unit i.e. query methods (III), display of layer (II), etc. All the questions asked should test knowledge, skills and understanding. Also ask learners about charts they learnt in Unit 3.

Introduce the lesson with a lesson title, "Inserting common charts in a document".

This could take about 5 minutes.

5.1   Charts (graphs) (Learner's Book page 119)

Step 2:   Demonstrate to learners by using a simple piece of data on paper you earlier prepared and use it to create common charts (column, bar, pie, line and scatter graphs). If you don't have this data, use number 1 of Activity 5.1 (Learner's Book page 120).

This can take about 15 minutes.

5.2 Steps to create common charts in excel and formatting cell data (Learner's Book page 123)

Step 3: Review the steps for creating charts, step by step to enable time takers cope.

Also demonstrate to learners how to format cell data e.g. applying borders, font colour and font size, cell alignment, etc.

Step 4: Learners do Activity 5.1 (Learner's Book page 120).

Instruct learners to turn on their computers and then do Activity 5.1 and first create any chart of their own choice. You can allow fast learners to do one number in Activity 5.2 Learner's Book page 127. Monitor the learners as they are doing their work. Time takers can do the same activity later after mastering Activity 5.1.

Help time takers with multi-ability practicals.

This could take about 50 minutes.

Step 5: Summarise the lesson

Make a summary of the lesson. You can go through the previous activities i.e. the steps of creating charts in Excel. Guide them to save changes to their files and to turn off their computers safely.

You can do this in 5 minutes.

Lesson 2: Formatting excel charts (Learner's Book page 133)

Learning objectives	Learners will be able to format a range of data cells to improve readability.
Prerequisites/ Revision/Introduction	Greet learners and ask them questions related to inserting common charts. Introduce the new lesson in ways that draws learners attention. Introduce the lesson with a lesson title "formatting Excel charts".
Teaching aids	Computers, projector, textbooks and interactive board. In schools with few computers; you can use one (or more) available computers; first to demonstrate how to format an excel chart e.g. pie chart; and afterwards allow learners to work in manageable groups. Learners with learning disabilities can sit and use computer(s) near the teacher.

Learning activities	• The teacher helps learners to format a chart.
Synthesis	By the end of the lesson, learners will be able to format a range of cells in spreadsheets and to format charts and objects.
Lesson assessment	**Ask learners the questions below:** **Question 1:** Why are charts formatted? **Answer:** To make the data more readable and attractive to use. **Question 2:** What does it mean to format chart? **Answer**: To format a chart is to change its appearance in terms of colour, size, etc.

Method

Step 1:   Review the previous lesson with learners. Ask them questions about creating charts in Excel to test learners' knowledge, skills and understanding.

Introduce the lesson with a lesson title, "formatting excel chart".

This could take about 5 minutes.

5.3   Formatting chart (Learner's Book page 133)

Step 2:   Demonstrate to learners how to format a chart in excel, by selecting a specific element and changing its appearance.

You can use a previously inserted chart or create a new chart using data in Activity 5.1 (page 120).

This can take about 20 minutes.

Step 3:   Let learners do Activity 5.3 (Learner's Book page 133)

Instruct learners to turn on their computers and then do Activity 5.3.

Learners shall format chart with desired colours and sizes they want.

Monitor learners as they do work.

Give credit to learners who are excelling and also encourage time takers.

This could take about 30 minutes.

Step 4: Demonstrate to learners how to print excel sheet or chart. Learners can now organise the data on sheets and print it using laboratory printer.

This could take about 10 minutes.

Step 5: Summarise the lesson.

Make a summary of your lesson using Activity 5.2. Tell learners the lesson title for the next lesson so that they can prepare for it.

Guide learners to save changes to their files and to turn off their computers safely.

You can do this in about 5 minutes.

Lesson 3: Formatting cell data as a table and setting print area
(Learner's Book page 135)

Learning objectives	Learners will be able to: • Format a range of cells as a table to improve readability. • Identify different techniques used to organise, set and print content from many sheets. • Apply basic data manipulation techniques to organise content in many sheets.
Prerequisites/ Revision/ Introduction	Greet learners and ask them questions on formatting cell data and creating charts. Introduce the lesson with a lesson title "formatting cell data as table and setting print area".
Teaching aids	Computers, projector, textbooks and interactive board. In schools with few computers; the teacher should use one (or more) available computers; first to demonstrate how to format a range of cells as a table; and afterwards allow learners to work in manageable groups.
Learning activities	• Create and format data as a table.
Synthesis	By the end of the lesson, learners will be able to format a range of cells as a table and will be able to set and print content from many sheets.

Lesson assessment	**Ask learners the questions below:**
	Question 1: In two steps explain how you would format cell data as a table.
	Answer: Select the cell data you want to format.
	On **Home** tab, in **Styles** group, click **Format as Table** drop down list, and then select desired Table style you want.
	Question 2: Explain the purpose of printing worksheet data or chart.
	Answer: To produce hardcopy information that can be used in case of absence of softcopy or for use by a person who finds it uncomfortable using a screen. Hardcopy can also provide convenience to read at any time you need.
	Question 3: When you are preparing to print, you need to insert header and footer information. What is a header?
	Answer: Header is a piece of information inserted at the top margin of every page and this could be company names or names of the presenter, titles, dates and times, etc.

Method

Step 1:   Review with learners the previous lesson on formatting charts. Ask them questions on formatting cells, to test learners' knowledge, skills and understanding.

Introduce the lesson with a lesson title, "Formatting cell data as table and setting print area".

This could take about 5 minutes.

5.4   Format cell data as a table (Learner's Book pages 135–136)

Step 2:   Demonstrate to learners how to format cell data as a table. You can use a previously inserted data. If not available, use or enter data in Activity 5.1 for demonstration.

This can take about 5-10 minutes.

5.5   Printable datasheet (Learner's Book page 136)

Step 3:   Demonstrate to learners how to set a print area or sheets and to print the whole sheet(s). In this part of the lesson, teach

learners how to change margins, change orientation, paper size, etc.

This can take 10 minutes.

Step 4: Learners do number 1 of the end of unit 5 assessment (Learner's Book page 142).

Instruct learners to turn on their computers and then do the activity. Learners shall format the chart with desired colours and sizes they want. Help time takers to catch up.

This could take 45 minutes.

Step 5: Review with learners more on how to insert on a sheet; headers and footers, set margins, set page numbers and print preview printable sheet.

This could take about 5 minutes.

Step 6: Summarise the lesson.

Make a summary of the lesson by going through number 1 of end of unit assessment. Tell learners the unit title for the next unit for research purposes.

Guide learners to save changes to their files and turning off their computers safely.

You can do this in about 5 minutes.

Lesson 4: Unit summary

Learning objectives	Learners will be able to appreciate the importance of organised content in many sheets.
Prerequisites/ Revision/Introduction	Greet learners and ask them questions about printable datasheet, formatting cell data, creating common charts etc. and consider their responses.
Teaching aids	Computers, projector, textbooks and interactive board. The teacher will demonstrate a particular feature which was not well mastered and then give activity to learners; afterwards learners will work in manageable groups.
Learning activities	• Create and format data, then print the data.
Synthesis	By the end of the lesson, learners will be able to appreciate the importance of organised content in many sheets.

Lesson assessment	Ask learners the questions below:
	Question 1: Identify important steps you would take to quickly format a chart.
	Answer: *Step 1;* create or open an existing chart.
	Step 2; right-click any part of the chart e.g. chart area, legend, title, or data series.
	Step 3; click Format Chart Area (if you have right-clicked chart area and vice versa on any other part).
	Step 4; Format Option for formatting a selected area displays, select one or more formatting option you need and the chart area or any other part will change appearance.
	Question 2: Identify items you would consider to look at before printing a chart or a datasheet in spreadsheets.
	Answer: I would consider most importantly looking at and setting page margins, inserting headers and or footers.
	Question 3: How do you set a print area?
	Answer: After creating generating worksheet data or chart, select the cells you want to define as print area. On **Page Layout** tab, in the **Page Setup** group, click **Print Area**, and then click **Set Print Area**.

Method

Step 1: Review with learners lesson 3 i.e. formatting cell data and setting print area. Use their response to gauge the learners' knowledge, skill and understanding.

Introduce the lesson as "Unit Summary".

This could take about 5 minutes.

Step 2: Summarising the unit

Go through most or all the tasks you have demonstrated to learners for this unit. Help time takers to understand better. The items you can revisit include;

- Selecting the right data for charting.
- Selecting the right chart element.
- Formatting a chart.
- Applying headers & footers.

- Setting margins.

- Inserting page number, etc.

This can take about 20 minutes.

Step 3: Instruct learners to turn on their computers and do (number 2 and 3) of end of unit assessment on pages 142–144. Learners should format the chart with desired colours and sizes they want. Help time takers to become better.

This could take 30 minutes.

Step 4: Wind up in your own way depending on how you see the level of understanding of your learners.

Tell learners the unit title for the next lesson.

Guide learners to save changes to their files and to turn off their computers safely.

You can do this in 5 minutes.

Additional information for the teacher

Spreadsheet programs enable users, you can create charts, which are also called graphs. Charts show data in ways that are visually more interesting than tables.

A column chart uses vertical bars to show changes over time emphasising fixed points in time. For example:

- Compare the number of learners in a school in five different years.

- Compare the number of people in a country in five different years.

A bar chart uses horizontal bars to show different amounts of the same item, for example:

- Compare how many learners there are in each grade in a school.

- Compare the number of people in five different countries.

A line chart uses lines to show changes over time on an ongoing basis, for example;

- Display the number of learners in a grade each year.

- Display the growth in a country's population every month for the past 10 years.

A pie chart uses segments of a circle to show different parts in relation to the whole, for example;

- Show what percentage of all learners are in each grade.

- Show the percentage of a country's population in different age groups.

Selecting the most effective chart can allow you to present data clearer, stronger and more informative.

As a teacher, enable learners to explore by using all the available forms of charts, though the syllabus specifies to use 5 only i.e. line, bar, column, pie and scatter charts.

Suggested answers for Activity 5.2

1. When given data is organised in spreadsheet software and a 3-D line chart used to represent it, it may appear as shown below.
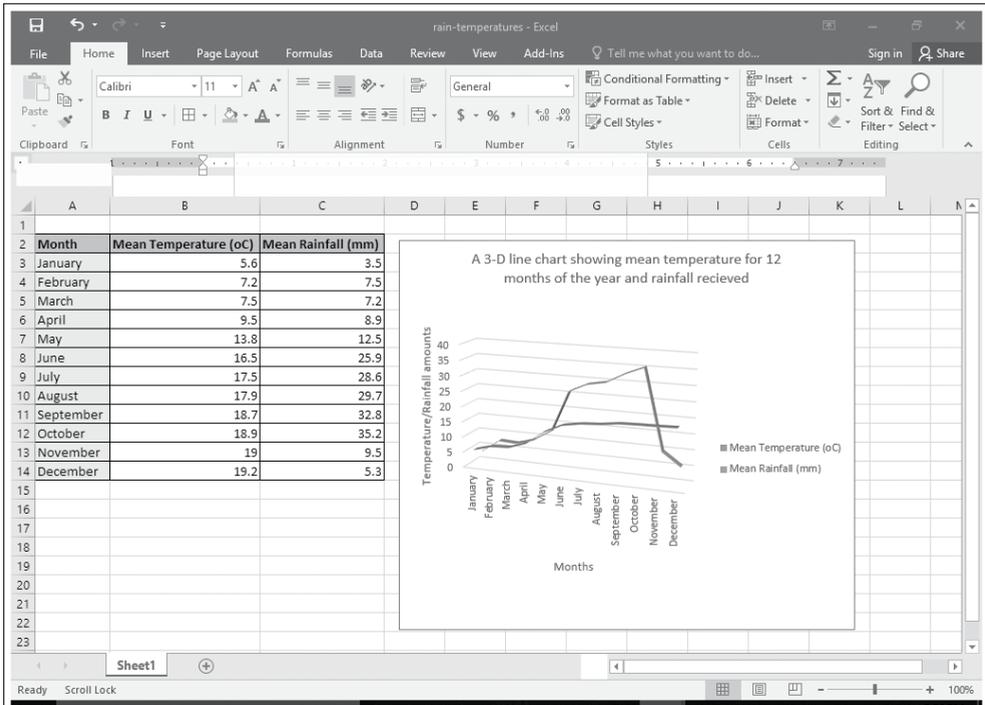
2. When the animal data is entered in the spreadsheet, copied to sheet 2 and formatted, it appears as shown below when calculations are done. This covers parts (a) – (c).

|	A	B	C	D	E	F
		Font			Alignment	
1	Year	Sheep	Cattle	Goats	Pigs	
2	YR 1991	29,505.0	48,575.0	85,950.0	121,056.0	
3	YR 1992	35,850.0	55,679.0	98,750.0	132,980.0	
4	YR 1993	48,599.0	67,692.0	105,670.0	157,091.0	
5	YR 1994	1,345.0	5,431.0	9,257.0	4,690.0	
6	YR 1995	2,984.0	9,429.0	15,790.0	6,900.0	
7	YR 1996	3,695.0	10,764.0	21,052.0	10,950.0	
8	YR 1997	4,675.0	13,075.0	32,109.0	15,070.0	
9	YR 1998	5,250.0	15,872.0	39,027.0	25,900.0	
10	YR 1999	5,664.0	18,546.0	45,830.0	35,092.0	
11	YR 2000	6,679.0	23,005.0	56,049.0	38,950.0	
12	Lowest number	1,345.0	5,431.0	9,257.0	4,690.0	
13	Highest number	48,599.0	67,692.0	105,670.0	157,091.0	
14	Average number	14,424.6	26,806.8	50,948.4	54,867.9	
15						
16						

d) If the data for the year 1991 is selected with the labels, the resulting pie chart appears as shown below, after chart style 3 is applied.

Animal data for YR 1991

10%
17%
43%
30%

Sheep
Cattle
Goats
Pigs
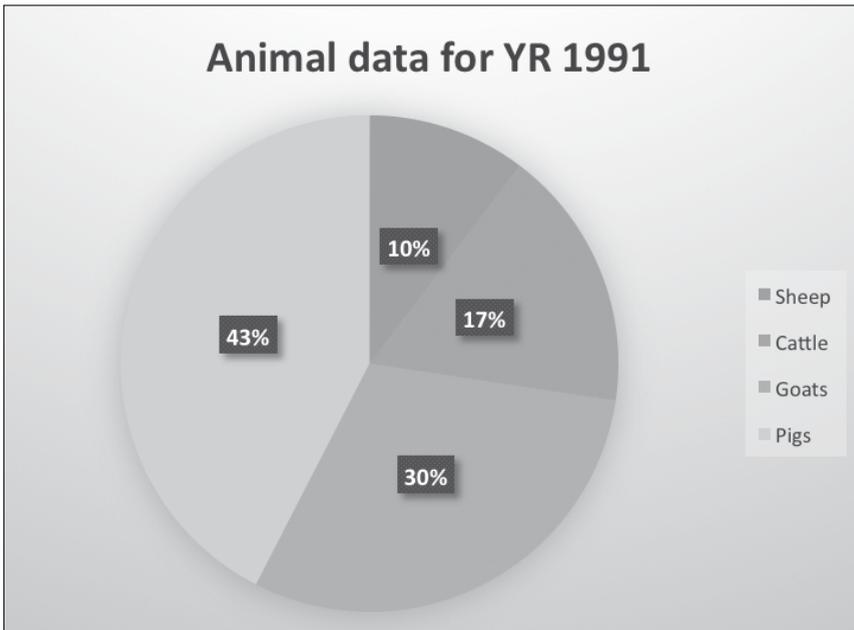
e) When animal data for the years 1991 to 1996 and 2000 are used to create a column chart, the suggested chart is shown here below.
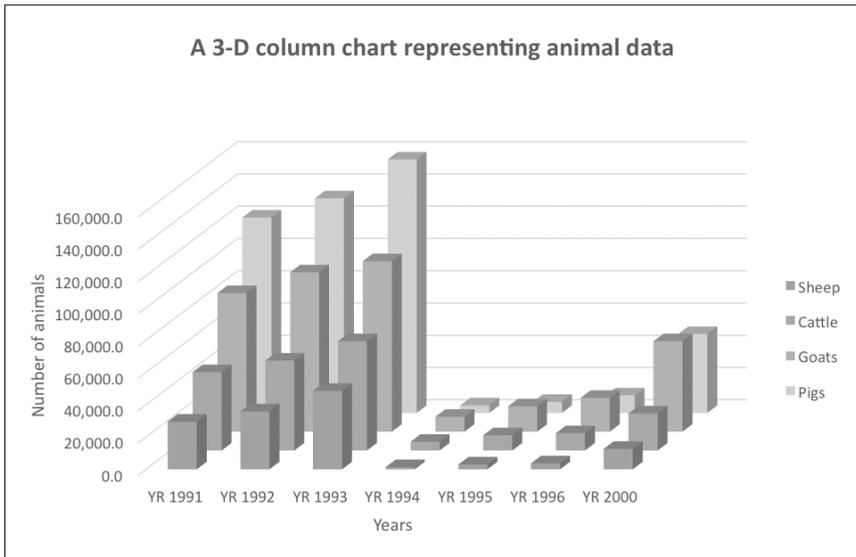
Suggested answers for Activity 5.3

a) When data is entered in Microsoft Excel and one decimal place is applied to all the figures, the resulting data is shown below.

	A	B	C
1	Ordinary Level Examinations Results for 2016		
2	Subject	Boys	Girls
3	Biology	36.6	30.5
4	Physics	29.8	22.3
5	Chemistry	32.5	23.4
6	ICT	36.0	38.9
7	Geography	19.0	29.2
8	Mathematics	28.8	25.6
9	Kiswahili	38.0	38.3
10	Kinyarwanda	27.7	28.0
11	Business Studies	26.0	26.0
12	English	33.0	38.0
13			
14			

For (b) – (e), results are displayed in the picture below.

A column chart showing Examinination results for 2016 at credit level
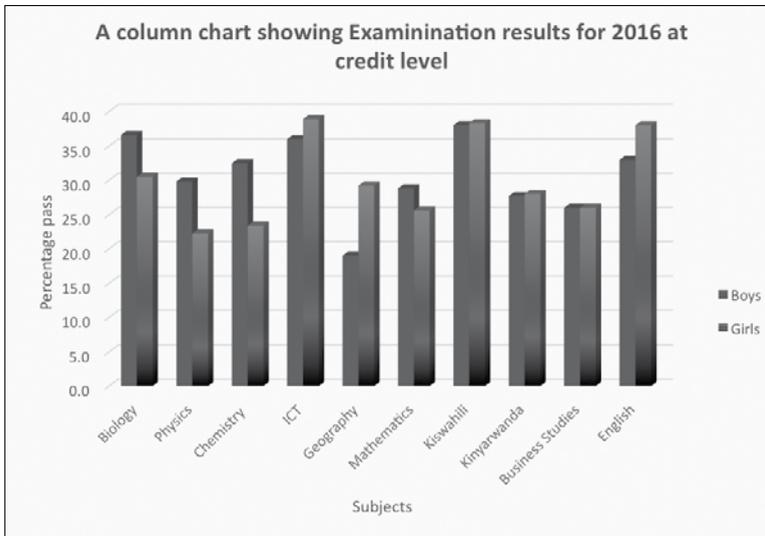
Suggested answers to end of unit assessment

Unit 5 is all practical, the skills and the results of the practicals are assessed by ensuring that learners follow the right steps given during demonstration to use MS Excel features tested on correctly.

Suggested answers for end of unit 5 assessment

1. If data given is entered in a spreadsheet, and scatterplot (with smooth lines and markers) used, the scatter graph will appear as shown below when chart style 11 is applied.

A scatter chart showing amount spent on adverts and appointments booked
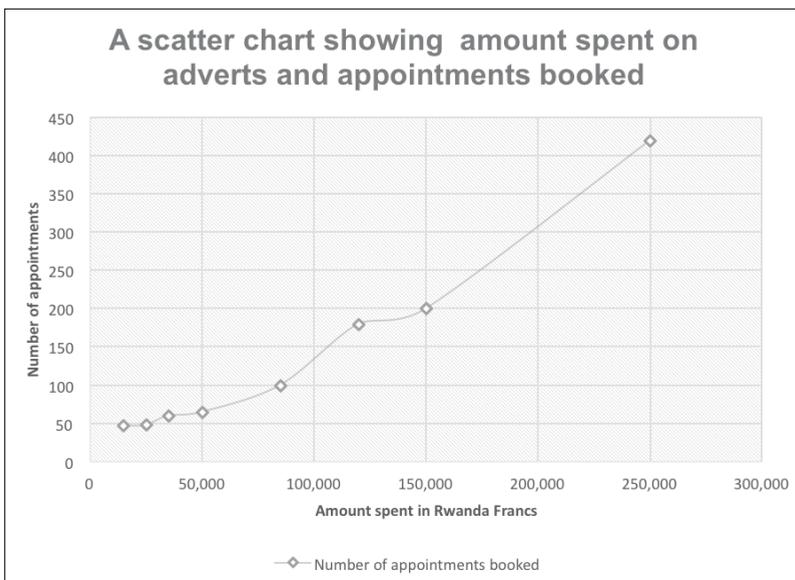
Note: If a quick Layout is used to apply labels you would get a scatterplot with linear number of appointments booked. That is also accepted if done by learners.

2. a) When data is entered correctly to create a 2-D column chart for learners' performance in science and social studies, the chart appears as shown below.
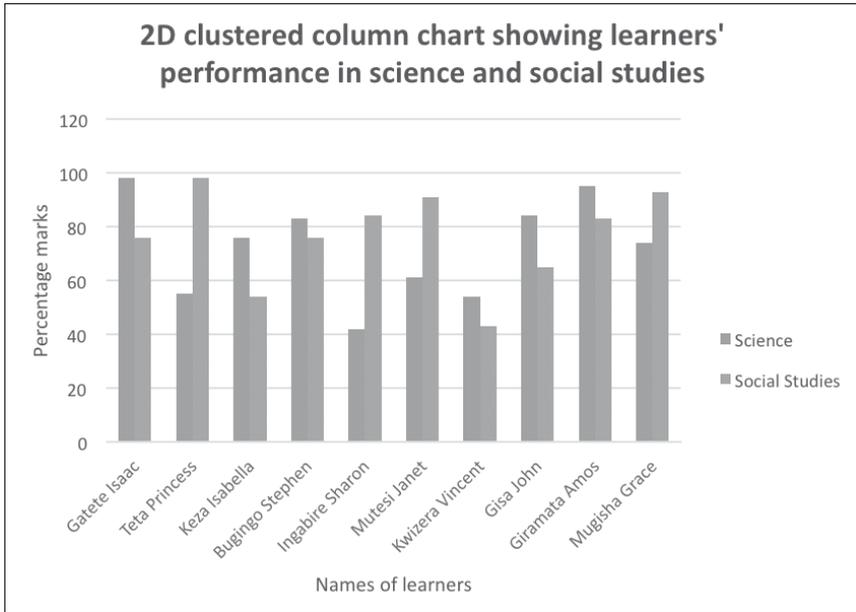
b) If all the data is selected to create a 3-D clustered column chart, it appears as shown below.
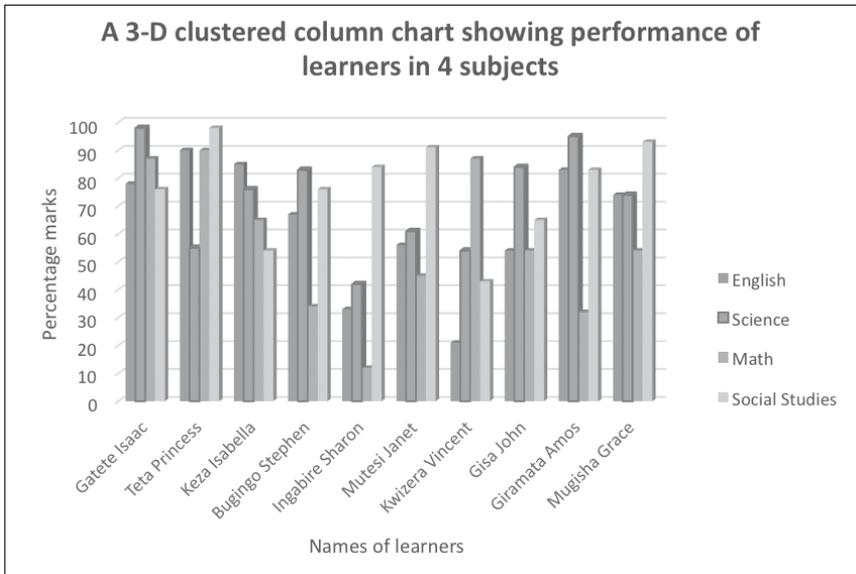
c) If average and total marks are selected correctly with corresponding names, the stacked line chart would appear as shown below.

A stacked line chart showing average and total marks for learners
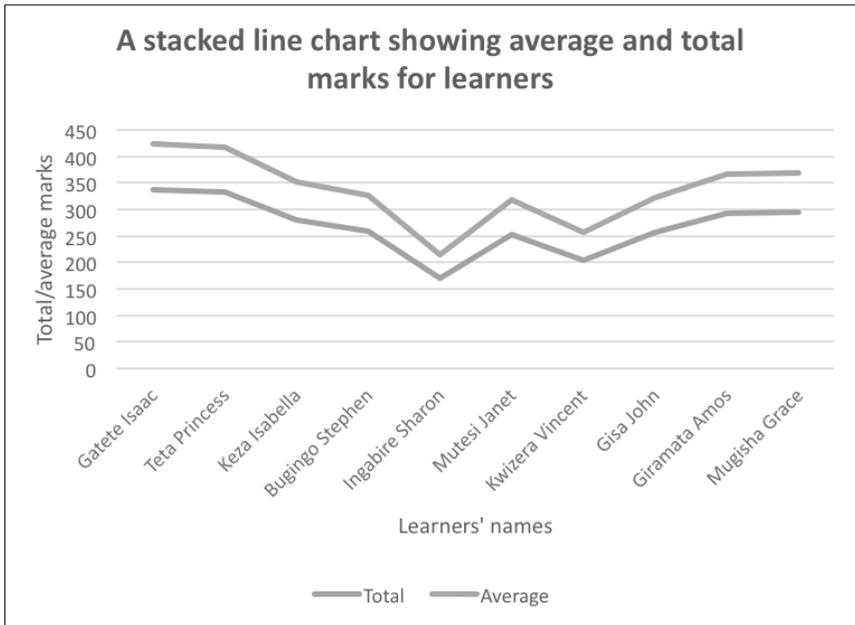
d) If learners' marks for math are presented on a pie chart as an object on sheet3, it appears as shown below.

Performance of learners in Math
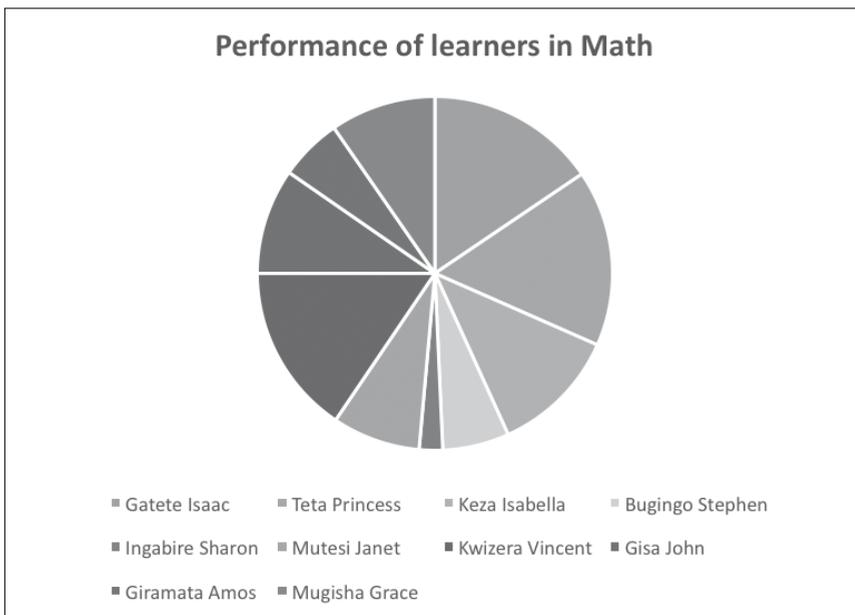
3. a) If the data given is organised in spreadsheet it will appear as shown below in MS Excel.

Mineral water vs Temperature	
Temperature °C	**Mineral water (Rwanda Francs)**
15.2	1200
17.4	3250
14.9	1850
16.2	3200
19.5	4000
25.1	5250
22.4	4150

b) The combination chart showing Mrs Gaju sales of mineral water and temperatures of a given day.
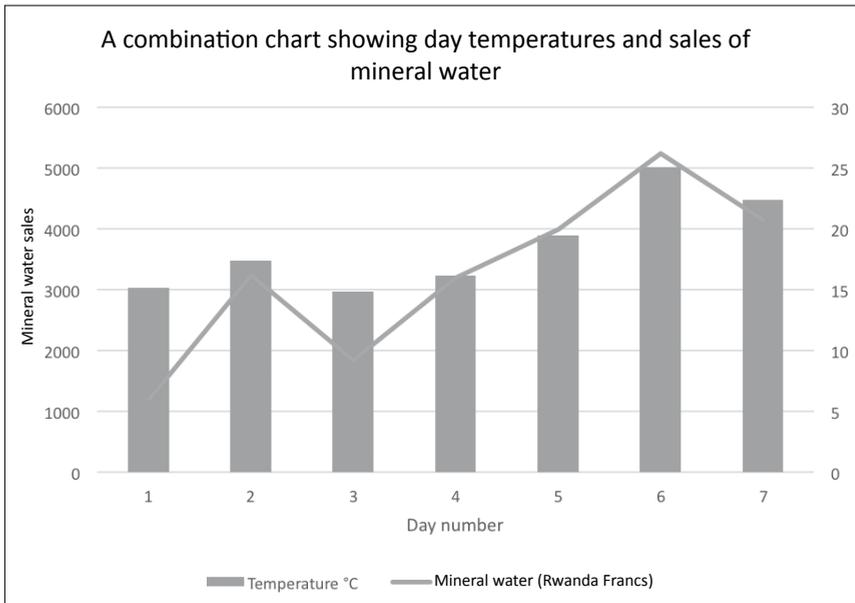
Remedial and Extended activities

1. Explain the meaning of the following charts and give situations when you can suitably use them.

    a) Scatter graph.

    b) Bar chart.

    c) Column.

2. Draw a chart that can suitably represent the data in the table below. Provide a suitable chart title and axis titles

Year	Number of students graduating
YR2000	2000
YR2005	5000
YR2010	25000
YR2018	60000

Table 5.1: Number of learners graduating in a particular University

Suggested answers for Remedial and Extended activities

1. Refer to the Learner's Book Unit 5, section 5.1.2.

2. Check and follow steps for creating a chart in the Learner's Book on page 123. Select a chart of your choice that you think brings out the results better. You can select and use any common chart such as Pie chart, column, scatter, bar and line charts. The chart i propose is a line chart.

APPLICATION SOFTWARE

Presentation

Presentation

Key Unit Competence

Prepare and make a presentation.

Prerequisite for Unit 6	Learners have knowledge and skills of typing text and formatting it and inserting objects in it. They have gradually got this knowledge from S.1 and S.2 and also from the first 5 units of S.3. Learners will be able to organise information in Powerpoint and run a presentation to the intended audience.
Cross-cutting issues to be addressed	• Gender education is emphasised as you are teaching this unit. This will help male and female learners to equally support each other as a team regardless of their differences. Give learners equal opportunities in using computers to work with *PowerPoint presentation to insert different objects and then to make complete presentation.* • Peace and values education is emphasised by guiding elarners to discuss with respect and harmony and to participate in finding answers to both simple and complex questions asked. Noise and any form of discomfort must be sorted out immediately so as to ensure a peaceful environment. • Inclusive education is emphasised when tasks or instructions presented to learners do not discriminate any of them. • Financial education is emphasised when teaching learners to use charts/graphs to summarise numerical data and make a presentation to audience. • Environment and sustainability is emphasised when teaching learners to use presentation software to present information on screen without necessarily printing on paper that wastes stationary and subsequently damaging the environment.

Generic competencies	• Communication and interpersonal relations is generated as learners work in groups and present answers, exchange ideas and opinions amongst themselves to test their worth in answering the asked questions using acceptable languages in Rwanda. • Research and Problem solving is a competence developed as a learner participates in finding solutions to questions and tasks by discussing and exchanging ideas using previous knowledge. • Critical thinking: Learners will think creatively and accommodate thinking discomfort to discover correct answers to questions in group work activities.
Vocabulary or key words or concepts	• Components of a presentation environment. • Presentation views. • Slide transition and slide animation.
Guidance to the problem statement	Generate question (s) that will make learners get engaged in the unit and search for more information about it. Learners will find solutions to the question (s) on their own in their groups that can be 3-6 learners. You will present to learners the following question: *Generate a presentation about your school with 7 slides. Include the following information; Name and geographical location of your school plus name of presenter (YOUR NAME); name and address of your head teacher; 5 names of both male and female teachers; number of subjects offered in the school, administrative hierarchy of leadership in your school (from students to head teacher); table of 10 best performers in your class and a graph showing their performance. Apply necessary animations and transitions and save your file as* **My school***.* Learners might meet difficulties to get solutions but will find a lot that will lead them to acquire more knowledge of using many basic features presentation software.

Attention to special educational needs	Learners who have special educational need must be helped to learn properly, for example learners with hearing impairments and those who are physically impaired must sit in places where the teacher can attend to them in a special way. These learners can always work in small groups. Teacher explanations have to be repeated to enable them understand.
	Every small achievement done should be praised and credited. Talented learners should be given extended activities and additional information they might need to accomplish their activities.

List of lessons in Unit 6

Lesson number	Lesson title	Number of periods
1	Working with PowerPoint presentations.	2 periods
2	Inserting objects in PowerPoint.	2 periods
3	Making a complete presentation.	2 periods
Total number of periods		**6 periods**

Lesson 1: Working with PowerPoint presentations (Learner's Book page 148)

Learning objectives	Learners will be able to: • Identify and explain the role of presentation applications. • Arrange and format presentation slides.
Prerequisites/ Revision/Introduction	Greet learners and introduce the new unit in a way that draws learner's attention. Introduce the lesson with a lesson title "working with PowerPoint presentations".
Teaching aids	Computers, projector, textbooks and interactive board
	In schools with few computers; the teacher will use one (or more) available computers; first to demonstrate how to open, create, edit and format a presentation; and afterwards allow learners to work in manageable groups.
Learning activities	• Teacher helps learners organise slides. • In groups learners are given the following topics: (Environmental protection, peace and values, gender and the impact of computers in society) and each group selects and makes a presentation. The presentation should not be less than five slides.

Synthesis	By the end of the lesson, learners will be able to arrange and format a presentation with MS PowerPoint.
Lesson assessment	**Ask learners the questions below:** **Question 1:** Explain the meaning of the term *presentation*. Identify programs that you can use to generate attractive presentations. **Answer:** A presentation is an organised message prepared for use to deliver information to a particular audience using a computer program. Programs you can use to generate presentation include: Microsoft PowerPoint, Open Office Impress, Kingsoft Presentations, etc. **Question 2:** Explain the role of creating a presentation. **Answer:** The purpose of creating a presentation is to give information, create awareness, present strategies or to sell a product. **Question 3:** What is a slide in presentation development? **Answer:** A slide is a page of information usually landscape orientation (can be changed) created using presentation software.

Method

Step 1: Ask learners questions about the previous lessons to test their knowledge, skills and understanding.

Introduce the lesson with a title, "Working with PowerPoint presentations".

This could take about 5 minutes.

6.1 Presentation (Learner's Book page 147)

Step 2: Explain to the learners the meaning of Presentation, giving examples of presentation software.

This can take about 3 – 5 minutes.

6.1.1 Role of presentation (Learner's Book page 147)

Step 3: Discuss with learners the use or role of presentation software in delivering or conveying information to people of different categories.

This can take about 5 minutes.

Step 4:   Demonstrate to learners how to work with PowerPoint; showing them the steps for launching PowerPoint, saving a new presentation and opening existing presentation.

This takes about 5 – 8 minutes.

6.2   Components of presentation environment (Learner's Book page 156)

Step 5:   Guide learners into the components of presentation environment main features of PowerPoint window on a projector, and the main features of PowerPoint window on a projector.

Learners should be shown the locations of the following parts of PowerPoint window:

- The title bar,
- Ribbon tabs,
- Tool bar
- Menu bar and its tabs
- Groups on the ribbon
- Notes pane,
- Slide pane,
- Navigation pane,
- Status bar,
- Zoom and quick access toolbar.

Learners should be shown the locations and importance of the following important features for a good presentation:

- Slide layout,
- Design,
- Transitions,
- Animations and
- Slide master.

Help learners to quickly identify how the above mentioned features work.

This can take up to 10 minutes.

6.3   Slides (Learner's Book page 157)

Step 6:   Demonstrate to learners how to insert text or object on slide using placeholders and other content holders.

Show them how to insert, cut, copy and paste slides.

This may take about 5 minutes

Step 7: Instruct learners to switch on their computers and then do Activity 6.1. The presentation can be of one slide but containing any piece of information they like e.g. pictures, name of the school and motto formatted well, etc. Learners should also do Activities 6.2 and 6.3. Encourage speed learning. Move around or watch out for learners who may divert from doing the right things. Help time takers to cope through extended demonstration.

This could take about 60 minutes.

Step 8: Summarise the lesson.

Make a summary of what you taught about slides. Tell learners the lesson title for the next lesson.

Guide them to save the changes to their files and to turn off their computers safely.

You can do this in 5 minutes.

Lesson 2: Inserting objects in PowerPoint (Learner's Book page 162)

Learning objectives	Learners will be able to insert objects into slides.
Prerequisites/ Revision/Introduction	Greet learners and review with them the previous lessons. Introduce the lesson with a lesson title "inserting objects in PowerPoint".
Teaching aids	Computers, projector, textbooks and interactive board. Incase there are a few computers; you can use one (or more) available computers; first to demonstrate how to open, create, edit and format a presentation; and afterwards allow learners to work in manageable groups.
Learning activities	• Teacher helps learners to organise slides and choose appropriate objects for the audience.
Synthesis	By the end of the lesson, learners will be able to insert suitable objects into slides.

Lesson assessment	**Ask learners the questions below:**
	Question 1: Give the difference between an object and a textbox.
	Answer: An object is any information that can be inserted in office file and can not be typed using the keyboard.
	Question 2: There are several objects you can insert in a presentation, identify some of them.
	Answer: Objects that can be inserted include; textbox, pictures or images, tables, charts, media clips, etc.
	Question 3: What items could you consider when formatting a presentation?
	Answer: Formatting can be done on almost everything in a presentation so as to make it look nice. It can be done on text, table, picture, chart, slide background, etc.

Method:

Step 1: Guide learners to review lesson 1. Ask them questions to test their knowledge, skills and understanding.

Introduce the lesson with a lesson title, "Inserting objects in PowerPoint".

This could take about 5 minutes.

6.4 Objects (Learner's Book page 162)

Step 2: Demonstrate to learners how to insert objects such as tables, clip art, word art, smart art, charts, shapes and media clips. Learners should also be guided to format these objects in PowerPoint. You can use a previously created file or create a new file in which you demonstrate to insert these objects.

This can take about 20 minutes.

6.5 Formatting a slide (Learner's Book page 183)

Step 3: Guide learners to do Activities 6.4, 6.5, 6,6 and 6.7 (Learner's Book pages 162–170)

Instruct learners to turn on their computers and then do Activities 6.4–6.7. Help time takers to cope fast by demonstrating further. In this question, guide learners to perform the following;

Assessment

1. Inserting the table below in your presentation showing the performance (in percentage) of 3 major houses in 3 sports activities.

Sport	Bugingo house	Ngabo house	Gatete house
Football	78	84	81
Volleyball	76	92	66
Netball	69	72	86

2. To insert another slide with a column chart representing sports results in the table shown above (in 3 sports activities).

This could take 50 minutes.

Step 4: Show learners how to format a slide presentation using font, theme fonts and background, slide design and layout. Make use of the Home tab, Design tab and Transitions tab.

Step 5: Summarise the lesson.

Make a summary of the lesson by going through Activity 6.5. Tell learners the lesson title for the next lesson. This helps active learners to read further or do research before the lesson. Guide learners to save changes to their files and turn off their computers safely.

You can do this in 5 minutes.

Lesson 3: Making a complete presentation (Learner's Book page 185)

Learning objectives	Learners will be able to:
	• State how to distinguish between different presentation views.
	• Use animations and transitions to format slides and use various slide presentation modes to display the presentation.

Prerequisites/ Revision/ Introduction	Greet learners and introduce the lesson by asking learners questions about inserting objects. Introduce the lesson with a lesson title "Making a complete presentation". Define presentation.
Teaching aids	Computers, projector, textbooks and interactive board. In schools with few computers; you can use one (or more) available computers; first to demonstrate how to open, create, edit and format a presentation; and afterwards allow learners to work in manageable groups.
Learning activities	• Learners focus on use of slide transition, layout design and animations. • Learners in groups make a presentation (of not less than five slides) containing text, images and sounds.
Synthesis	By the end of the lesson, learners will be able to use animations and transitions and to format slides for particular audiences. Learners will be able to use different presentation modes to display presentation.
Lesson assessment	**You ask the learners the questions below:** **Question 1:** Distinguish between animation and transition effects. **Answer**: Animation effect is a presentation feature used to give motion to text or objects in the slide show whereas the transition effect is a presentation feature used to determine how one slide replaces another slide during a slideshow presentation. **Question 2:** There are a number of views used to display presentation information. Identify them. **Answer**: Normal view, Outline view, Slide Sorter view, Reading view, and Notes Page view. **Question 3:** Explain what happens to information you place on the slide master? **Answer**: Every piece of information placed on a slide master reproduces itself on all the *slide layouts and all the slides* in the presentation. Any item you want to appear on all the slides in a particular location is placed in the slide master.

Method

Step 1: Guide learners to review lesson 2 (inserting objects in PowerPoint).

Guide their knowledge, skills and understanding by their responses.

Introduce the lesson with a lesson title "making a complete presentation". Demonstrate to learners how to use WordArt, SmartArt, Shapes, chart, media clips using a previously created file "Nature-protect".

This could take about 25 minutes.

6.6 Animation of a presentation (Learner's Book page 185)

Step 2: Use a previously created presentation or create a new presentation in which you apply animation schemes. Tell learners to avoid overuse of animations, because though exciting, can kill the exact purpose of the presentation. Demonstrate how to apply animations by selecting and clicking on the animations features on the Animations tab.

This can take about 10 minutes.

6.7 Presentation views (Learner's Book page 187)

Show learners the various presentation views i.e. normal view, slide sorter view, slide show, etc. and how they are used. Demonstrate to learners how to run a slide show presentation.

This can take about 10 minutes to demonstrate.

Step 3: Learners do Activity 6.8 (Learner's Book page 185)

Instruct learners to turn on their computers and then do Activity 6.8. Learners can first do number 1 and afterwards do number 2 as assignment. Monitor learners as they do work. Help time takers to do good work.

This could take 30 minutes.

Step 4: Summarise the lesson.

Make a summary of your lesson by guiding learners to go through Activities 6.3-6.7. Guide learners to save changes to their files and to turn off their computers.

You can do this in 5 minutes.

Step 5:   Encourage learners to do end of unit 6 assessment on pages 193–196.

Unit Summary

You must understand that Presentation is one of the most exciting units that learners like, guide learners to suitably apply slide transition and determine the transition speed; applying animations to text and graphics and applying sounds if any. It is because, the above features make presentation a unique software.

Learners should also learn to organise information in form of brief points on the slides. With this, you can give them a big text and instruct them to organise the information on slide. With such activity, they learn how to summarise information.

When printing, learners must consider printing handouts because they do not consume time to print especially when your lab has one printer, secondly they consume paper especially when they are hard to get from people responsible. Printing slide takes alot of paper.

Additional information

As an instructor you should understand well various tips about presentation.

When you write to deliver a speech, it means you are informing a specific audience about your opinion/idea and to convince them to agree with your point of view. A good speech is well researched and presents a carefully structured argument.

The key steps of speech writing include:

- Prewriting: This involves researching on a topic, gathering and organising the right information. You don't just research, but should have something serious to say.

- Writing: Structure your argument and support it with important points, reasons or evidence.

- Foresee and answer doubts.

- Revising: This is done by checking your reasoning. Make sure your reasoning will appeal to your audience.

- Editing: Check your draft speech for impact and accuracy and turn it into notes. Refer to these notes when you deliver your speech.

Encourage learners to build professional presentations they can easily deliver to particular audiences by giving them these professional tips:

- Introduce yourself and your subject.

- Speak clearly.

- Ensure to connect with your audience (accept questions and be ready to answer them).

- Answers questions.

- Watch your time.

Don't forget speakers, notes for yourself and audience (otherwise you may bore them)

Suggested answers to Unit 6 Activities

Unit 6 is all practical, the skills and the results of the practicals are assessed by ensuring that learners follow the right steps given during demonstrations to use MS PowerPoint features tested on correctly.

Suggested answers for Activity 6.1

The answers are part of the activity in the Learner's Book page 150.

Suggested answers for Activity 6.2

The answers are part of the activity in the Learner's Book page 152.

Suggested answers for Activity 6.3

The answers are part of the activity in the Learner's Book page 157.

Suggested answers for Activity 6.4

The answers are part of the activity in the Learner's Book page 162.

Suggested answers for Activity 6.5

The answers are part of the activity in the Learner's Book page 163.

Suggested answers for Activity 6.6

The answers are part of the activity in the Learner's Book page 165.

Suggested answers for Activity 6.7

The answers are part of the activity in the Learner's Book page 170.

Suggested answers for Activity 6.8

The answers are part of the activity in the Learner's Book page 185.

Suggested answers for End of Unit 6 Assessment

1. Since learners are expected to print a handout, the handout should look similar to the one shown below.

Damage done by Virus in computer

- Viruses delete important data on the hard disk
- Damages programs by interrupting normal processes of OS
- Can cause hardware failure
- Cause hard disk to crash

How Viruses spread to computers

- Using infected software e.g. infected operating system
- Using infected hardware e.g. using infected flash disk
- Using freeware and shareware from Internet without scanning them.
- Through updating programs such Antivirus or OS.

Mahoro Juliet

2. The handout information containing the answers will appear similar to the one shown below.

Disadvantages of computers to Rwandans

- Information loss or damage.
- Slow network processes bring frustration
- Over-staying on computers cause adverse health effects such as eyestrain, back pain, etc.
- Data entry errors may lead to loss of data integrity
- Computerization employs few skilled people leaving others unemployed

Uses of computers by Rwandans

- Used as teaching and learning aid in educational institutions
- Carrying out research by government bodies
- Provide entertainment e.g. for playing games, video and audio
- Creation of documents for business and office use.
- Keeping records in businesses, education and everyday life activities.

Mugisa Noah   2

List of hardware and software in school

Computer Hardware	Computer Software
Mice	Operating systems
Keyboards	Microsoft Office
Projector	Adobe Photoshop
Monitors	Skype
System Units	Antiviruses

How school computers are used

3D column chart showing number of computers used by different classes

Mugisa Noah 3
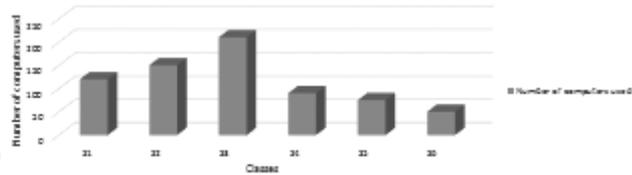
3. The handout for the presentation shall appear similar to the one shown below.

Disadvantages of Deforestation in Rwanda

- Global warming effects
- Destruction of natural habitats for animals
- Gives way to soil erosion and accompanying effects

Areas most affected by deforestation

- Kigali City
- Southern province
- Northern province

Rukundo Micheal - S3 Stream B   12/16/2017

Level of Deforestation

Year	Developing Countries	Developed Countries
1950	Very low	Very high
1970	Low	High
1990	High	Low
2010	Very high	Very low

Methods used to reduce deforestation

* Reforestation
* Afforestation
* Good Government policies
* Provision of alternative source of energy e.g. gas

APPLICATION SOFTWARE

Graphics and Multimedia

Introduction to Computer Graphics

Key Unit Competence

Create graphics using basic graphic elements and edit predefined graphics.

Prerequisite for Unit 7	Learners have knowledge about pictures or snaps taken from phone camera and those generated by scanner or just photocopied. Learners will use this knowledge to learn more about computer graphics with MS Paint, MS Paint 3D and Adobe Photoshop. This unit has links with Fine Art and Crafts (drawing, painting and colouring).
Cross-cutting issues to be addressed	• While teaching this unit, emphasise peace and values education through learners discussing with respect and harmony. Encourage learners to participate in finding answers to questions both complex and simple without making noise or any form of discomfort in the learning environment. • As you teach this unit of computer graphics, emphasise gender education. Guide male and female learners to equally support each other as a team. The learners will cooperate and share the opportunity of using computers to *create, edit and format computer graphics or images*. This helps them to positively work and cooperate with each other regardless of gender differences. • Inclusive education is emphasised by giving tasks or instructions to learners without discrimination.

Generic competencies	• Research and Problem solving skills or competences are gained when learners participate in finding solutions to questions before them by discussing and exchanging ideas using previous knowledge. • Communication and interpersonal relations is gained when learners either individually or in group, present their answers, exchange ideas and opinions amongst themselves to test their worth in answering the questions using acceptable languages in Rwanda. • Critical thinking: Learners will think creatively and accommodate thinking discomfort to discover correct answers to questions either individually or in group work activities.
Vocabulary or key words or concepts	Graphics related terms such as: vector and raster, graphics elements and graphic software.
Guidance on problem statement	Pose a question that will move learners to search for more information about this unit. Learners will find solutions to the question (s) on their own in their groups. Present to learners this question at the start: 1. *Use a digital camera and take photos of each other in your group. Introduce the photos on your computer and resize and change their appearances using* 　*(i)　Paint* 　*(ii)　Adobe Photoshop.* 2. *Use a scanner and capture an image from a school magazine or newspaper and save it on your computer. Crop the image (s), apply desired colour and save changes.* Learners will be insighted to read and research harder to find answers and will discover a lot that will lead them to acquire knowledge about this unit.
Attention to special educational needs	A learner with hearing or vision difficulties shall work in small groups where he/she can comfortably communicate and learn. Such learners must sit where the teacher can watch them to ensure they have learnt something. Every small achievement done should be praised. Talented learners should be given extended activities and additional information they might need to accomplish the activities.

List of lessons in Unit 7

Lesson number	Lesson title	Number of periods
1	Concepts of computer graphics	2 periods
2	Graphics software	2 periods
3	Graphics features and formatting	2 periods
4	Edit image and the changes to a file	2 periods
Total number of periods		**8 periods**

Lesson 1: Concepts of computer graphics (Learner's Book pages 199–203)

Learning objectives	Learners will be able to: • State the value of graphics like logos and explain computer graphics related terms. • Demonstrate the difference between vector graphics and bitmap graphics.
Prerequisites/ Revision/Introduction	Greet learners and ask them questions about digital camera and drawing fine art drawings. Introduce the new unit in a way that draws attention of all learners. Introduce the lesson with a lesson title "concepts of computer graphics".
Teaching aids	Computers, projector, textbooks, interactive board, MS Paint, Paint 3D, Adobe Photoshop and adobe Illustrator. In case of schools with few computers; the teacher will use one (or more) available computers; first to explain and demonstrate how vector graphics and bitmap graphics look like using a computer; and afterwards allow learners to interact with the available software in manageable groups. Learners with hearing difficulties should be guided to sit and use computer(s) near the teacher.
Learning activities	• The teacher helps learners to define computer graphics and the related items. • Learners do photoshoot with a digital camera to be familiar with all operations (they should know the kind of graphics digital camera generate).
Synthesis	By the end of the lesson, learners will be able to state and explain computer graphics related terms.

Lesson assessment	**Ask learners the questions below:**
	Question 1: Distinguish between Bitmap graphic and vector graphic.
	Answer: *A bitmap or raster graphic* is a digital image composed of matrix dots or tiny parts called pixels e.g. scanned images from a magazine or photos taken by a digital camera. A *vector graphic* is usually a 2D illustration made up of points, lines and curves related to one another using mathematical formulas. Outlines, colours and other blends can be added using the computer program such as Adobe Illustrator. All Engineering drawings such as a new car model are examples of vector graphics.
	Question 2: Distinguish between a pixel and a resolution.
	Answer: A pixel is the smallest part of an image displayed on computer screen whereas *resolution* is the average number of pixels per unit of area. The more the pixels, the better and sharper the image is.
	Question 3: Identify some of the graphic file formats in use today.
	Answer: • BMP used for bitmap files • GIF for internet graphics • JPEG for internet graphics, photos, etc. • TIFF for bitmap images • PNG for Network graphics. **Question 4:** Identify specific areas that require a lot of graphics to communicate information efficiently.
	Answer: Entertainment, advertisements, book publishing, magazine publications, teaching and learning (education), etc.

Method

Step 1: Introduce the lesson with a lesson title "Concepts of Computer graphics."

7.1   Introduction (Learner's Book page 199)

Introduce the unit about computer graphics and guide learners to outline the drawback of sketching something on paper and why it is more efficient to draw a picture on a computer screen. Refer to Learner's Book "introduction" page 199.

This could take about 5 minutes.

7.2   Definitions (Learner's Book pages 200–202)

Step 2:   Group learners in groups of 4, provide Learner's Books or computers connected to the Internet, and then ask them to discover what computer graphics is and to differentiate ways of drawing digital images on a computer screen.

Helps learners to define and understand other computer graphics related terms such as vector, raster, pixel, resolution, 2D and 3D.

This could take about 15 minutes.

Step 3:   Activities:

1.   Provide a digital camera and help learners to do photo shoot with it, to be familiar with all operation. Guide learners on how to use a scanner to capture some images from papers.

Note: Most images scanned with a scanner or taken with a digital camera are bitmaps.

2.   Provide vector and bitmap pictures to learners and then ask them to look at them closely and discuss and compare the different types.

This could take about 25 minutes.

7.3   Graphic file format (Learner's Book page 202)

Step 4:   In pairs, ask learners to identify different types of image format.

Additional note:

Most images scanned with a scanner or taken with a digital camera are bitmaps. Most bitmaps have been stored in some common image file format, such as:

- jpeg
- tiff
- bmp
- png
- gif

Before starting to process images, you should be aware of safe and unsafe routines in storing images. Some image file formats allow you to store an image losslessly but others are lossy. Lossless data comprising is the one in which unnecessary information is discarded.

To store lossless images use file formats like PNG, TIFF and BMP.

You can store lossy images with e.g. the JPEG file format. Please observe, though, that some programs will allow lossless storage with JPEG.

If you store images in a lossy way, you will save storage capacity, but do not trust the image shown by the image–processing program when you store the image. Always open the stored image with another program to make sure the quality is good enough. If an image is compressed too much when it is stored, it may include unwanted 'packaging traces'.

Keep your original image files safely stored and preferably in a lossless format! Do not forget backup copying; never modify your original images, but always create a copy of the original for modifying purposes.

> *This could take about 10 minutes.*

7.4   Areas of graphics use (Learner's Book page 202)

Step 5:   Discuss with learners the area of computer graphics and especially focus on the following:

- Advertisement.
- Decoration services.
- Logos.
- Book illustrations.
- Magazines.
- Product packaging.
- Entertainment.

Refer to the Internet and Learner's Book.

This could take about 10 minutes.

Step 6: Summarise the lesson.

Make a summary of the lesson by reviewing with learners all the concepts of computer graphics, and the types of computer graphics. Tell learners the title for the next lesson for research purposes.

You can do this in 5 minutes.

Lesson 2: Graphics software (Learner's Book page 203)

Learning objectives	Learners will be able to: • Create vector graphics and bitmap graphics using graphic elements.
Prerequisites/ Revision/ Introduction	Greet learners and ask them questions on graphics use, types and concepts, 'concepts of computer graphics'.Introduce the lesson with a lesson title "graphics software".
Teaching aids	Computers, projector, textbooks, interactive board, MS Paint, MS Paint 3D and application (Adobe Photoshop). Incase there are few computers; the teacher should use one (or more) available computers; first to explain and demonstrate how graphics software works with MS Paint, MS Paint 3D and with Photoshop. Afterwards, allow learners to interact with Paint software and Photoshop in manageable groups.
Learning activities	• Learners use scanner to capture some images from papers. • The teacher demonstrates MS Paint to create and edit graphics images and learners do hands on exercises. • Learners are given a sample of every type of graphics and they resize them and discuss and compare the different types.
Synthesis	By the end of the lesson, learners will be able to distinguish and create vector and bitmap graphics.
Lesson assessment	**Ask learners the questions below:** **Question 1:** Identify commonly used Raster graphics software in schools today. **Answer:** Microsoft Paint, Adobe Photoshop, **Question 2:** Name some of the graphics elements available in Microsoft Paint. **Answer**: Eraser, pencil, brush options, fill options, magnify, etc.

Method

Step 1: Ask learners questions about concepts of computer graphics to test knowledge, skills and understanding.

7.5 Graphics software (Learner's Book page 203)

Introduce the lesson with a lesson title "Graphics software" Learner's Book page 203. Discuss with learners various categories of software i.e. Bitmap software e.g. MS Paint and Photoshop plus vector graphics software.

This could take about 5 minutes.

Step 2: Ask learners if they have created/drawn the images on computer, and which software they have used.

Explain that there are different software used to create graphics, some are used to create bitmap graphics, others vector graphics but some can convert graphics to another type.

Inform learners that in this course you will create and manipulate graphics using Microsoft Windows 10-Paint which is bitmap graphics. Software comes with windows and its default file format type is bmp.

This could take about 5 minutes.

Step 3: Go through section 7.6 on pages 205–210 and then guide learners to do Activity 7.1: Launch Paint. (Learner's Book page 204)

7.6 Basic graphic elements (with MS Paint) (Learner's Book page 205)

Instruct learners to turn on their computers, guide them to open MS-Paint in Windows 10 and discuss its environment.

This could take about 15 minutes.

Step 4: Guide learners on how to create images using various tools in Paint.

Do Activity 7.2 on page 207 in the Learner's Book.

Instruct learners to follow steps in Learner's Book to create different images using various tools i.e. lines and curve tools, paintbrush tools, pencil tool, spray can, shapes, fill tools and ellipse tool (Learner's Book pages 205–210).

Guide learners to do Activity 7.2 (Learner's Book page 207–210).

This could take about 40 minutes.

Step 5:   Summarise the lesson.

Revise with learners the graphics software especially Activity 7.1.

Instruct learners to save their work. Guide them to turn off their computers safely.

Tell learners the lesson title for the next lesson for research purposes and for further reading.

You can do this in 5 minutes.

Lesson 3:   Graphic features and formatting (Learner's Book pages 211–222)

Learning objectives	Learners will be able to:
	• State different graphic formats.
	• Use basic vector graphic features to create a graphic and format it.
Prerequisites/ Revision/Introduction	Greet learners and introduce the new unit in a way that draws attention of all learners. Introduce the lesson with a lesson title "Graphic features and formatting".
Teaching aids	Computers, projector, textbooks, MS Paint 3D interactive board and Adobe Photoshop.
	In schools with few computers; the teacher should use one (or more) available computers; first to explain and demonstrate how vector graphics and bitmap graphics look like using a computer; and afterwards allow learners to interact with the available software in manageable groups.
	Learners with hearing impairments can sit and use computer(s) near the teacher.
Learning activities	• In small groups, teacher facilitates learners to create a vector and bitmap graphic elements.
	• The teacher performs a demonstration with MS Paint work with features to create objects and format them. Learners do hands-on exercises.

Synthesis	By the end of the lesson, learners will be able to use basic vector and raster graphic features to create a graphic and format it.
Lesson assessment	**Ask learners the questions below:** **Question 1:** Identify paint tools used for selecting objects. **Answer**: *Regular selection* using a dotted outline of a rectangle. *Freeform selection* using a dotted outline of oval shape. **Question 2:** Draw a face of a human being. Fill colour and erase the part you don't want using an eraser. Copy the image and paste it. Move the paste in a new location and save your file.

Method

Step 1: Introduce the lesson with a lesson title "Graphics features and formatting."

Use about 5 minutes to greet and introduce the unit title.

7.7 Graphic features (Learner's Book page 211)

Explain to learners that graphic software have different graphic features used to modifying images e.g. cut/copy, resize, flip, rotate, trim, selection tools, etc. Guide learners on how to select parts of an image, copy and paste images, resize, rotate and flip using steps on pages 211–217. Demonstrate to learners how to edit vector graphics. Ensure to make preparation in time.

This could take about 5 minutes.

Step 2: Do Activity 7.3 (a) which requires the learners to use Graphic features such as: Selection tools, copy and paste, duplicate, move and arrange (for align and order), resize, flip (reflexion), skew (shear, slant), rotate, group, combine, cut out, trim, weld, intersect, add text and to erase image using Eraser tool.

This could take about 20 minutes.

Step 3: Guide learners to do Activity 7.3 (b) to edit vector graphics i.e. lines, circles, ovals, etc.

Guide learners to follow steps in Learner's Book pages 220–229. Refer to pictures 7.12 (b) – 7.12 (q).

Later, guide learners also to manipulate nodes and control points as indicated on page 230 in the Learner's Book referring to picture 7.12 (r).

This could take about 30 minutes.

7.8 Graphics formatting (Learner's Book page 230)

Step 3: Quickly explain and demonstrate what formatting a graphic means, by using paint tools and Activity 7.4 on page 230 in the Learner's Book.

This takes 10 minutes.

7.9 Edit image (Learner's Book page 232)

Explain and demonstrate how to edit image in paint using Activity 7.5. Use the steps given.

Go through Activity 7.6 and 7.7 which require learners to use Graphics formatting such as colours for the outlines and fill of objects, create shading and fill objects with patterns and textures, fonts as part of the graphic design and fit text to path and envelope effect etc.

Guide learners to follow steps in Learner's Book pages 232– 255.

Refer learners to Activity 7.4 on page 230.

This could take about 20 minutes.

Step 4: Summarise the lesson.

Quickly look at features that enable users of MS Paint to create, edit and format an image, referring to steps on pages 248–255. Encourage fast learners to do Activity 7.8 (a) on page 251 in the Learner's Book.

Then go through quickly the steps to generate and edit vector graphics and guide learners to do Activity 7.8 (b) on page 255 in the Learner's Book.

Tell learners the lesson title for the next lesson for research purposes.

Remember to guide learners to save their work and turn off their computers safely.

You can do this in 10 minutes.

Lesson 4: Edit image and save changes to a file (Learner's Book page 232)

Learning objectives	Learners will be able to: • Manipulate bitmap images. • Appreciate use of graphics to improve data presentations. • Enjoy the way graphics are used to improve the appearance of household items.
Prerequisites/ Revision/Introduction	Greet learners and introduce the new lesson in a way that draws attention of all learners. Introduce the lesson with a lesson title: "Edit image and save changes to a file".
Teaching aids	Computers, projector, textbooks, interactive board and application (Adobe Photoshop) and MS Paint 3D. In schools with few computers; the teacher should use one (or more) available computers; first to explain and demonstrate how vector graphics and bitmap graphics look like using a computer; and afterwards, allow learners to interact with the available software in manageable groups.
Learning activities	• Teacher demonstrates using Adobe Photoshop to create and edit graphics images and learners do hands-on exercises. • Learners are given graphics and they resize them and discuss and compare the different types of graphics. • Learners photoshoot with a digital camera and use pictures for their activities.
Synthesis	By the end of the lesson, learners will be able to manipulate bitmap images.
Lesson assessment	**Ask learners the questions below:** **Question 1:** What do you know about Adobe Photoshop? **Answer**: Adobe Photoshop is a raster graphics software used to edit photos, videos and design objects. **Question 2:** Use a digital camera to introduce an image in Photoshop (or just use an existing image on computer). Edit the image in Photoshop by resizing, adding text and removing sports in it. **Answer**: use your computer and launch Photoshop, begin doing the activity using an image you insert from camera or computer. (This might require teacher's guidance).

Method

Step 1:   Introduce the lesson with a lesson title "Edit image and save changes."

Use 5 minutes.

Explain to learners that with graphics, it is possible to create and edit image with MS Paint and Adobe Photoshop.

This could take about 5 minutes.

7.10   Using Photoshop (Learner's Book pages 255–260)

Step 2:   Guide learners to follow steps provided in the Learner's Book for editing image (with MS Paint, MS Paint 3D and Photoshop) such as:

- Crop an image.
- Resize, and magnify an area of a picture.
- Change colour.
- Colour picker.
- Brightness and contrast.
- Flip.
- Rotate.
- Stretch.
- Changing pixels.
- Brushing tools.
- Work with layers.

First work with MS Paint 3D to generate and edit 3D models.

Now put emphasis on using Adobe Photoshop to edit an image.

This could take about 20 minutes.

Step 3:   Guide learners to   do Activity 7.9: Editing image (Learner's Book page 256)

Instruct learners to follow steps in the Learner's Book to answer Activity 7.9.

This could take about 20 minutes.

You can connect to Activity 7.6 Learner's Book page 238 so that learners exercise more on editing images. Select an activity that meets your objectives.

Step 4: Guide learners to understand how to work with layers (follow steps on pages 246–248 in Learner's Book) and creating a 3D image on pages 248–255.

This could take about 15 minutes.

Step 5: Guide learners to go through "Using Photoshop" on pages 255–260. Instruct them to do Activity 7.9 on page 256 in the Learner's Book.

This can take 10 minutes or if time is not enough for all these activities, provide more time for learners to use Photoshop instead of Paint 3D and Paint. You can then leave learners with assignment to work with Paint 3D and make presentations.

Step 6: Summarise the lesson

Instruct learners to save their work,

Make a summary of your lesson.

This can cover all the steps 1–5. Guide learners to turn off their computers safely.

You can do this in 5 minutes.

Unit summary

Guide learners to do End of Unit 7 assessment on pages 261–265.

This unit requires a lot of practice in learning how to manipulate images. Allow learners to develop skills early by creating extra periods for them to practice.

Encourage learners to practice more image manipulation with Photoshop.

Suggested answers to Unit 7 activities

Much of Unit 7 is practical, the skills and the results of the practical sessions are assessed by ensuring that learners follow the right steps given to them during demonstrations in using MS Paint features and Adobe Photoshop features.

The answers to unit activities are embedded within the activities.

Suggested answers for End of Unit 7 Assessment

Multiple choice questions

1. A	2. C	3. B	4. B	5. A

6. D   7. C   8. A

Guide learners to do practical work i.e. numbers 1–8 pages 246–250.

Answers for the practical assessment are embedded in the steps.

Endeavour to generate images.

Additional information

All images created by using a computer are termed as Computer graphics. They help us to use computers in a much easier way. Today we have Graphical user interfaces (GUIs) which enable computer users to interact with their computers by selecting small images called icons to execute instructions, rather than typing text commands.

Computer graphics are used in a variety of fields such as education, business, entertainment, industry, medicine and science.

Today, almost all the things built and used in the world were originally designed and tested with computer graphics e.g. cars, space crafts, engines, etc.

Remedial and Extended activities

1. Give five specific fields where computer graphics are used and the specific products they make.

    You may need to explain to learners the expected answers.
   They could be in form of;

    Manufacturing sector for example cars, ships, televisions, radios, etc.

    Entertainment sector e.g. video capture and editing, film making, etc.

2. a) Use MS Paint and design your school badge.

    b) Open Photoshop and add the school badge for manipulations and save it.

c) In Photoshop, edit the badge by changing the colour of some specific parts and use other tools to modify it into your preferred badge.

d) Save the badge as 'my-new-badge'.

3. a) Create the following vector graphics shapes as they appear below using:

   (i) Adobe Illustrator. Save the file as 'modern shapes'.

   (ii) Paint 3D software. Save the file as 'Modern paint'.

   b) Edit or reshape the graphics using different effects in Illustrator program.
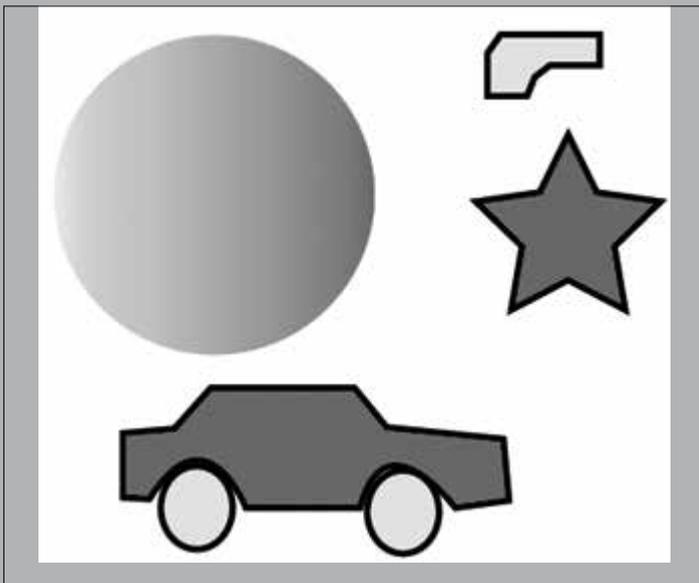
Suggested solutions to number 3

Follow steps given in the learners' book for creating and editing graphics with Adobe Illustrator and with Microsoft Paint 3D.

Answers for Remedial and Extended activities

All the above questions are purely practical and the results are examined from learner's screen and how the features demonstrated are used.

Ensure that learners understand all the necessary steps for editing images in Photoshop.

APPLICATION SOFTWARE

Graphics and Multimedia

Introduction to Multimedia

(Learner's Book pages 267–307)

Key Unit Competence

Explain the different uses of multimedia and interactive multimedia applications. Use multimedia software to create a video.

Prerequisite for Unit 8	In order to meet learning objectives, learners must know how to use Presentation software such a Microsoft PowerPoint. This knowledge they already have from Unit 6. Unit 8 has connections with Video making.
Cross-cutting issues to be addressed	• **Gender education:** In this unit learners shall be taught how to capture images, videos, audios on internet to create interactive multimedia. The images, videos and audios shall be gender sensitive and not one sided. This will help learners to respect themselves in relation to their gender. • **Peace and values education:** Learners will be taught how to create hyperlinks in multimedia. This knowledge and skills will enable them understand that in life all human beings are linked to each other in one way or the other, the same way objects and text in multimedia are linked to each other and others in many different ways. Peace and values education shall be emphasised when learners use this knowledge of interconnections to have value and peace with each other, as each of them is related to each other in the same or different classes, religions, etc.

Generic competencies	• Research and Problem solving skills are generated when every learner participates in finding solutions to questions before them, by discussing and exchanging ideas using previous knowledge. • Communication and interpersonal management competence is achieved when learners either individually or in group, present their answers, exchange ideas and opinions amongst themselves to test their worth in answering the questions using acceptable languages in Rwanda. • Critical thinking: Learners will think creatively and accommodate thinking discomfort to discover correct answers to questions either individually or in group work activities.
Vocabulary or key words or concepts	• Media terms such as video, audio, hyperlink • Media applications. • Action buttons.
Guidance to the problem statement	This is an activity that will make learners get interest in the unit and search for more information about it. Learners will find solutions to the question(s) on their own and in their groups. Present to learners the following question: *Use Microsoft PowerPoint file (Nature-protect) you created in unit 6 and create hyperlinks to images you created and saved in unit 7. In the file, insert an audio file and a video file from your computer or Internet.* As learners are trying to find solutions, they will discover a lot that will lead them to acquire much about this unit.
Attention to special educational needs	Learners with hearing and vision difficulties must be given an open opportunity to freely ask, interact and communicate smoothly with the teacher and other learners. Such learners sit in a place where the teacher can monitor their learning performance. Every small achievement done should be praised. Talented learners should be given extended activities and additional information they might need to accomplish their activities.

List of lessons in Unit 8

Lesson number	Lesson title	Number of periods
1	Defining multimedia and related terms.	2 periods
2	Multimedia hardware and software. Creating an interactive multimedia with MS PowerPoint.	2 periods
3	Creating hyperlinks.	2 periods
4	Creating and using action buttons. Create digital images and audio-video files.	2 periods
Total number of periods		**8 periods**

Lesson 1: Defining multimedia and related terms (Learner's Book pages 267–269)

Learning objectives	Learners will be able to: • Explain multimedia terms. • Explain different multimedia tools and applications. • Appreciate the effectiveness of multimedia tools and applications.
Prerequisites/ Revision/Introduction	Greet learners and ask them questions related to the graphics they learnt in Unit 7. Introduce the new unit in a way that draws all learners' attention. Introduce the lesson with a lesson title "Multimedia and related terms".
Teaching aids	Computers, projector, textbooks, scanner, digital camera, phone camera, microphone, flash media files, headphones and multimedia application tools like MS PowerPoint, Windows Movie maker, Adobe Premier, etc. An interactive board can also be available for demonstrations. In schools with few computers; the teacher will use one (or more) available computers; first to explain to learners how multimedia works and areas of use. You can also demonstrate how to open, create, edit and format a multimedia presentation; and afterwards allow learners to interact with computers in manageable groups. Learners with learning impairments shall sit and use computer(s) near the teacher.

Learning activities	• The teacher helps learners to define multimedia terms and explain categories of multimedia. Learners explain the multimedia tools and applications.
Synthesis	By the end of the lesson, learners will be able to explain different multimedia tools, applications, terms and categories. They will also explain areas that use multimedia.
Lesson assessment	**Ask learners the questions below:** **Question:** Identify areas where application of multimedia technology is critically needed to function excellently. **Answer**: Commercial advertisement, entertainment, education, industry, etc.

Method

8.1   Introduction (Learner's Book page 267)

8.2   Definition (Learner's Book page 267)

Step 1:   Introduce multimedia. Give the definition of multimedia. Guide learners to read through the Learner's Book pages 267–269.

8.3   Categories of multimedia (Learner's Book page 268)

Guide learners to read in the Learner's Book the text about categories of multimedia. Let them do No. 2 of Activity 8.1.

8.4   Features of multimedia (Learner's Book page 268)

Guide learners to read through the text in the Learner's Book about the features of multimedia. Let them do No. 3 of Activity 8.1.

8.5   Types of multimedia (Learner's Book pages 268–269)

Discuss the types of multimedia, let learners read the text on types of multimedia.

Step 2: Guide learners to review Activity 8.1 Learner's Book page 269.

Activity 8.1 (Learner's Book page 269)

1. Define the term multimedia.

   Answers for Activity 8.1

   a) Multimedia is the media that uses multiple forms of information content and information processing (e.g. text, audio, graphics, animation, and video) to inform or entertain the user.

   b) Multimedia also refers to the use of electronic media to store and experience multimedia content. Multimedia is similar to traditional mixed media in fine art, but with a broader scope.

2. What are the types of multimedia?

   There are different multimedia used within a school such as:

   ● Text: This is a basic element for all multimedia applications. It directly informs the user about the information that it wishes to convey.

   ● Graphics: These are pictures as visuals in digital form used in multimedia presentations.

   ● Animation: This is the process of adding movements to static images through various methods.

   ● Audio: Sound in digital form used in multimedia presentations.

   ● Video: Video in digital form in multimedia presentations.

3. What are features of multimedia?

   ● Multimedia presentations may be viewed in person on stage, projected, transmitted, or played locally with a media player.

   ● A broadcast may be a live or recorded multimedia presentation.

   ● Broadcasts and recordings can be either analog or digital electronic media technology.

   ● Digital online multimedia may be downloaded or streamed.

- Streaming multimedia may be live or on-demand.
- Multimedia games and simulations may be used in a physical environment with special effects, with multiple users in an online network, or locally with an offline computer, game system, or simulator.

4. Using examples, describe categories of multimedia.

Multimedia may be broadly divided into linear and non-linear categories.

- Linear active content progresses without any navigation control for the viewer/user.

  Examples: Movies, video clips and song.

- Non- linear content offers the ability to control the content interactivity with the user/viewer.

  Example: Computer games, assimilation software used in self computer based trainings.

Lesson 2: Multimedia hardware and software (Learner's Book pages 270–272)

Learning objectives	Learners will be able to explain the different multimedia tools and applications.
Prerequisites/ Revision/Introduction	Greet learners and introduce the new lesson by asking questions about multimedia terms, tools and use. Introduce the lesson with a lesson title "multimedia hardware and software".
Teaching aids	Computers, projector, textbooks, scanner, digital camera, phone camera, microphone, flash media files, headphones and multimedia application tools like MS PowerPoint, Windows Movie maker, Adobe Premier, etc. An interactive board can also be available for demonstrations.
	Incase there are few computers; the teacher should use one (or more) available computers; first to explain to learners how multimedia works and areas of use. You can also demonstrate different types of software and hardware. Afterwards, allow learners to interact with computers in manageable groups. Learners with learning impairments should sit and use computer(s) near the teacher.
Learning activities	• In groups, learners use media tools to capture images, video, audio or search images on the Internet to create interactive media files.

Synthesis	By the end of the lesson, learners will be able to describe and identify both multimedia hardware and software.
Lesson assessment	**Ask learners the questions below:**
	Question: Create a list of multimedia devices you may need at school for academic purposes.
	Answer: Digital camera, microphone, scanner, computer, headphone, speakers, interactive whiteboard, etc.

8.6 Applications of multimedia (Learner's Book pages 269–270)

Step 1: After giving a lesson title, Introduce learners to Applications of multimedia (page 269).

Step 2: Guide learners to do Activity 8.2 (Learner's Book page 270).

Answers to Activity 8.2

1. Using your school Internet facilities, search more on multimedia applications and compare your results.

   a) Commercial

      Most of the electronic media used in commercial advertisement fall in multimedia. In most Rwandan cities, there is exciting presentations that are used to take and keep attention of people with the interest of advertising.

   b) Entertainment

      Multimedia is heavily used in the entertainment industry. It is especially used to develop special effects in movies and video games.

   c) Education

      In Education, multimedia is used to produce computer-based training courses and reference books like encyclopedia and almanacs.

   d) Industry

      In the Industrial sector, multimedia is used as a way to help present information to shareholders, superiors and co-workers. Multimedia is also helpful for providing employee training, advertising

and selling products all over the world via virtually unlimited web-based technologies.

e)   Medicine

In Medicine, doctors can be trained to do human surgery and they can simulate how the human body is affected by diseases, viruses and how bacteria spread, using multimedia tools and then develop techniques to prevent it.

f)   Multimedia in public places

In hotels, airports, shopping malls, museums, and grocery stores multimedia tools are available to help people/tourist to give the information they need.

Example: At the airport, there is no need to ask plane information to the personnel of the airport; notice board is there to inform passengers.

2.   In groups, discuss the application of multimedia in your local community.

3.   Compare what is happening in other communities and what is found in your community.

8.7   Multimedia hardware and software (Learner's Book pages 270–272)

Step 3:   Discuss with the learners as you read text on pages 270–272 in the Learner's Book.

Step 4:   In pairs, guide learners to do Activity 8.3 (Learner's Book page 272).

Expected answers for Activity 8.3

1.   Discuss other multimedia hardware and software which are not discussed in here. Use the facilities available within your school.

Multimedia hardware
Below are some of the hardware that can be used in multimedia:

●   Computer.

- Digital camera.
- Microphone.
- Scanner.
- Speaker /headphone.
- Digital camera.

Multimedia software
- Adobe Acrobat Pro.
- Adobe   Creative Suite.
- Master Collection.
- Facetime.
- Final Cut Studio Pro.
- HandBrake.
- iCal.
- Image Capture.
- iTunes.
- Microsoft Office Suite.
- PhotoBooth.

2. Identify multimedia hardware which are used in your school.

- Computer.
- Digital camera.
- Microphone.
- Scanner.
- Speaker /headphone.
- Digital camera.

3. List multimedia software that are installed in school computer lab.

- Adobe Acrobat Pro.
- Adobe Creative Suite.
- Windows media player.
- iTunes.
- Microsoft Office Suite.

Lesson 3: Interactive Multimedia (Learner's Book pages 273–278)

Learning objectives	Learners will be able to create and use hyperlinked presentations.
Prerequisites/ Revision/Introduction	Greet learners and introduce the lesson by asking learners questions about multimedia software and hardware. Introduce the lesson with a lesson title "creating hyperlinks".
Teaching aids	Computers, projector, textbooks, scanner, digital camera, phone camera, microphone, flash media files, headphones and multimedia application tools like MS PowerPoint, Windows Movie maker, etc. An interactive board can also be available for demonstrations. In schools where there are few computers; the teacher should use one (or more) available computers; to first explain to learners how multimedia works and areas of use. You can also demonstrate how to create a PowerPoint presentation, how to link slides and how to create hyperlinks. Afterwards, allow learners to interact with computers in manageable groups. Learners with learning impairments should sit and use computer(s) near the teacher.
Learning activities	• In small groups, the teacher facilitates learners to create hyperlinks.
Synthesis	By the end of the lesson, learners will be able to create and use hyperlinks in presentations.
Lesson assessment	**Ask learners the questions below:** **Question:** where are hyperlinks placed in a presentation? **Answer:** Hyperlink is text or object placed in any desired location for the user to click on and jump to another location in the same presentation or another presentation or document on the same or different computer on a network.

Method

8.8   Interactive multimedia (Learner's Book page 273)

Discuss and demonstrate as you create hyperlinks in MS Paint.

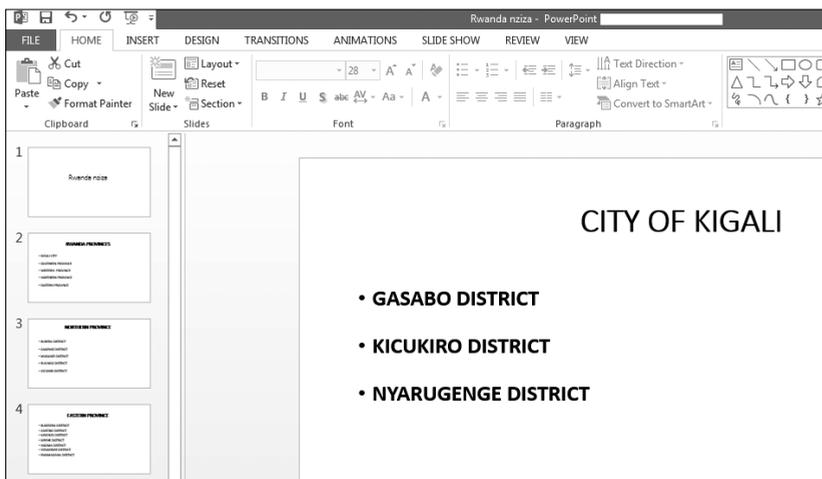Step 1:   Guide learners to read text on pages 273–278.

Step 2: Guide learners to do Activity 8.4 (Learner's Book page 274).

Create a PowerPoint presentation "Rwanda Nziza". This presentation has the following slides:

- Slide 1: Province.
- Slide 2: Northern Province.
- Slide 3: Eastern Province.
- Slide 4: Southern Province.
- Slide 5: Western Province.
- Slide 6: City of Kigali.

Step 3: Link slide 1 to other remaining slides in a way that you can jump from slide1 to any other of these slides. Follow the guidelines below:

(i) Create Rwanda Nziza presentation

(ii)   Link slide 1 to slide 2.

Step 1: Go to **Insert tab**

Step 2: Select the word, you want to use as the Link

Step 3: Go to **Choose Hyperlink**

Step 4: Choose **page in this document**

Step 5: **Select slide**

Click to finish

Hyperlinks

Step 4:   Guide learners to go through steps of creating hyperlinks to a slide in a different presentation.

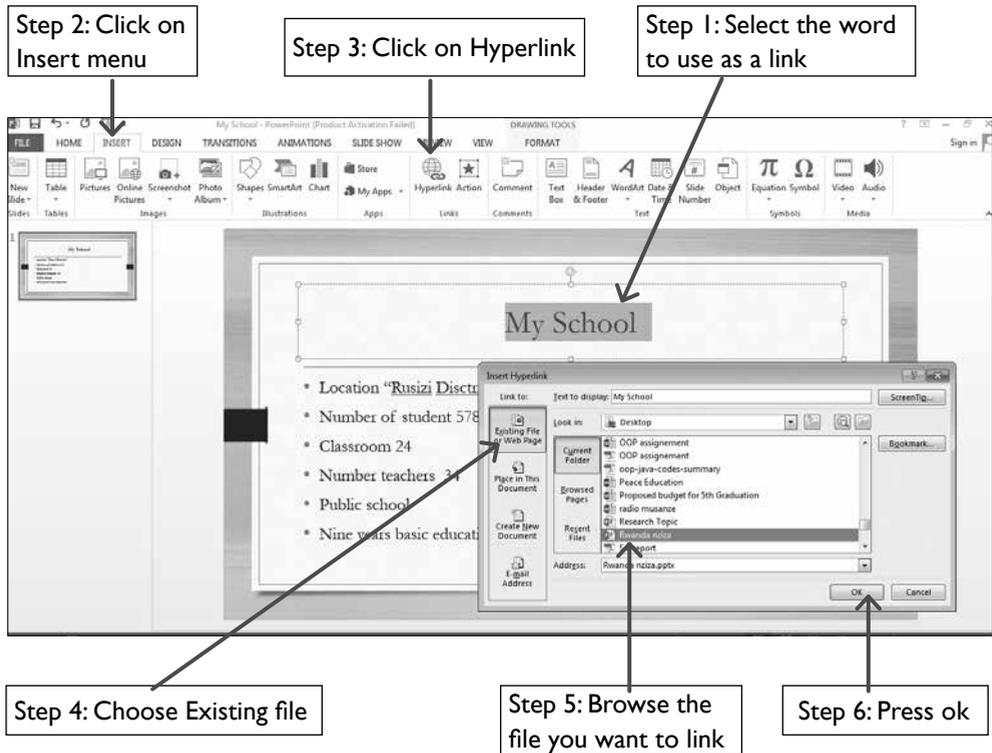Guide learners to do Activity 8.5 (Learner's Book page 275).

Create a PowerPoint presentation, "My school" and connect it to the previous presentation, "Rwanda Nziza".

(i)   Create My school presentation.

(ii)   Link my school presentation to Rwanda Nziza
        presentation.

Step 2: Click on
Insert menu

Step 3: Click on Hyperlink

Step 1: Select the word
to use as a link

Step 4: Choose Existing file

Step 5: Browse the
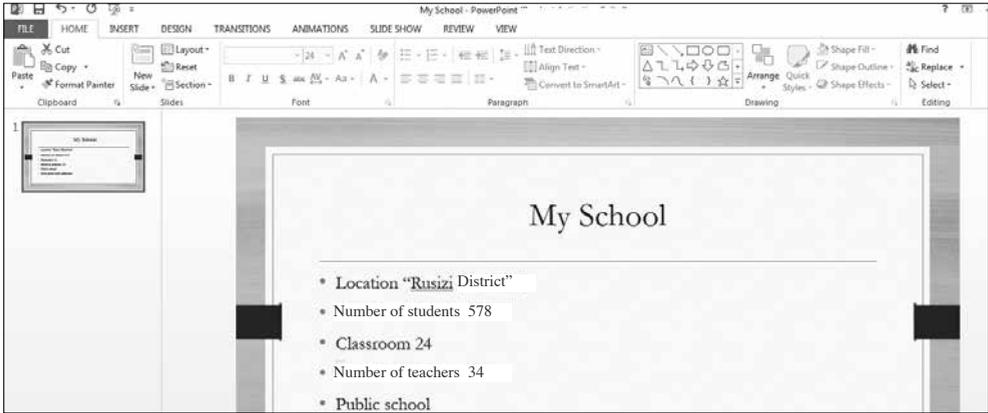file you want to link

Step 6: Press ok

You can give fast learners an extended activity for them not to
be bored or to disrupt other learners.
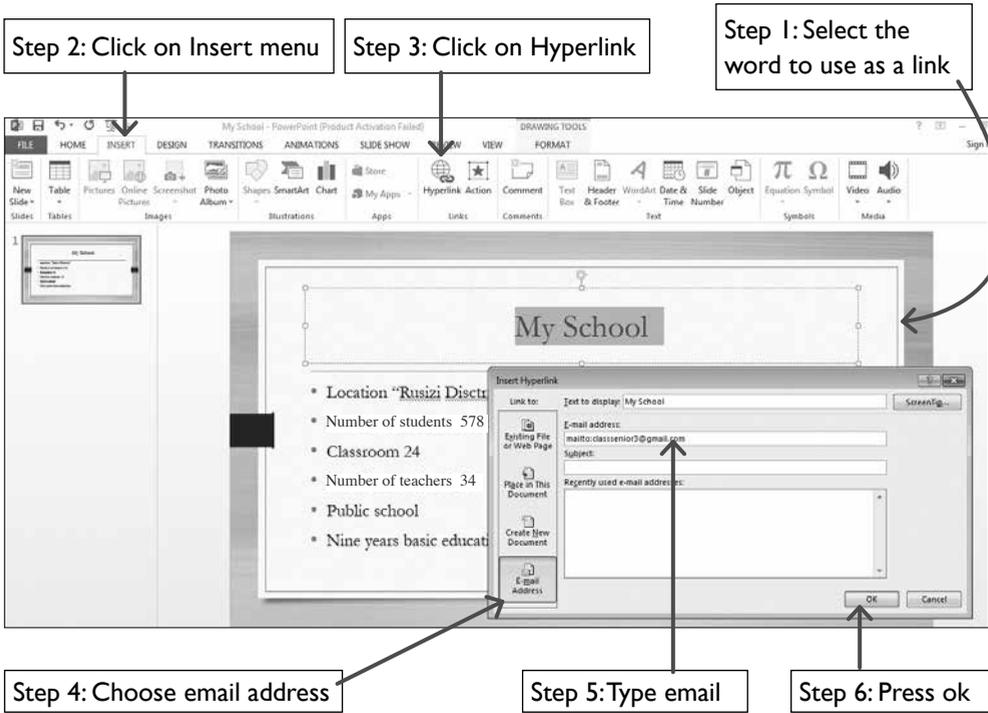
Step 5:   Allow learners to do Activity 8.6 on page 276

●   Guide learners to go through text on page 277.

●   Guide learners to do Activity 8.6 (Learner's Book page 276).

●   Create a PowerPoint presentation, "My school" and
     connect it to the class email, "classsenior3@gmail.com".

(i)   Create My school presentation

(ii)   Link "My school presentation" to the class email:"classsenior3@gmail.com".

Step 2: Click on Insert menu

Step 3: Click on Hyperlink

Step 1: Select the word to use as a link

Step 4: Choose email address

Step 5: Type email

Step 6: Press ok

Step 6:   Guide learners to go through the text on pages 273–278 and to do Activities 8.5, 8.6 and 8.7.

Lesson 4: Creating and using Action buttons. Create digital images and audio-video files (Learner's Book pages 278–306)

Learning objectives	Learners will be able to create and use action buttons, digital images and audio-video files.
Prerequisites/ Revision/Introduction	Introduce the new lesson in a way that draws all learners' attention. Introduce the lesson with a lesson title "creating and using action buttons, digital images and video files".
Teaching aids	Computers, projector, textbooks, scanner, digital camera, phone camera, microphone, flash media files and headphones. An interactive board can also be available for demonstrations.
	In schools where computers are few; the teacher should use one (or more) available computers; first to explain and demonstrate to learners how to create action buttons, digital images, audio-video files and how to use them. Afterwards, allow learners to interact with computers in manageable groups.
	Learners with learning impairments should sit and use computer(s) near the teacher.
Learning activities	• In small groups, the teacher facilitates learners to create action buttons as hyperlinks. • In groups, learners use media tools to capture images, video, audio or search images on the Internet to create interactive media files.
Synthesis	By the end of the lesson, learners will be able to create and use action buttons, digital images and audio-video files.
Lesson assessment	**Ask learners the questions below:** **Question:** What is the difference between a video and an audio? **Answer**: A video is a recording, reproduction or broadcasting of moving visual images. Videos have audio component in them that correspond to pictures being shown on screen. Audio is sound produced by a system, object and can be added to the computer. Audio is the most important multimedia element that generates meaningful speech in any languages.

8.9 Create action buttons (Learner's Book page 278)

Method

Step 1: Introduce learners to the concept of adding commands to presentations using action buttons. These include video files, MP3 audios, CD audios and many others.

Step 2: Demonstrate, discuss and guide learners to quickly read through the text in the Learner's Book pages 278–287.

Guide them to do Activities 8.8, 8.9, 8.10 and 8.11 (Learner's Book pages 278–287).

Use a previously prepared presentation; if it doesn't exist, generate a new presentation to demonstrate all activities.

This may take 30 minutes.

8.10 Create digital images and audio-video files (Learner's Book pages 287–306)

Discuss with learners about digital images and audio plus video files. Demonstrate to them how to use GIMP software (download from Internet). Follow guidelines on pages 287–299 in the Learner's Book.

Step 1: Guide learners to do Activity 8.12 on pages 287–288.

Step 2: Guide learners to do Activity 8.13 on pages 288–292.

Step 3: Guide learners to do Activity 8.14 on pages 292 – 298.

Step 4: Guide learners to do Activity 8.15 on pages 298–306 in the Learner's Book.

Step 5: Guide learners to Activity 8.16 in the Learner's Book page 306.

Step 6: Guide learners to manipulate images i.e. saving image, creating new image, editing image and rotating image.

Ensure whatever demonstration you perform is also done by learners.

Create time of 5–10 minutes to see what learners are doing on their computers and make a summary.

This may take 30 minutes.

Unit Summary

By the end of the unit inform and encourage learners not waste time with animations, video and audio files but should target completing their assignments, exercises or examinations as required.

Additional information for the teacher

Multimedia is an area of science that presents information by combining text, sound, pictures, animation, and video. Games and learning software use a lot multimedia. Most multimedia applications are designed with hyperlinks, that enable users to switch between media elements and topics.

There is a variety of multimedia applications on the Internet and others are supplied on disks.

Multimedia applications usually require more computer memory and processing power than the same information represented by text only. This means a computer running multimedia applications must have:

● Fast processor for timely computations.

● Big or extra memory to support the CPU to make faster computations.

● Good screen for display.

● A high capacity hard disk for storage and retrieval of multimedia information.

Other requirements may include (depending on the user and the type of computer):

● Optical disk or flash disk.

● Keyboard and a pointing device such as mouse or touch pad.

Multimedia impact on education

● In secondary schools, learners use powerful multimedia authoring tools to create multimedia presentations that enhance reports and essays and speeches.

● Medical schools use multimedia-simulated operations that enable soon-to-be surgeons to perform operations on a computer-generated virtual' patient.

- Students in engineering schools use interactive multimedia presentations of circuit design to learn the basics of electronics and to immediately implement, test, and manipulate the circuits they design on the computer.

- Also it has great impact on business, entertainment and job creation.

- Architects use multimedia presentations to give their clients tours of houses that are yet to be built.

- Mail-order businesses provide multimedia collections that allow potential buyers to browse virtual showrooms and possibly take orders.

Suggested answers to activities and end of unit assessment

Unit 8 is mainly practical, the skills and the results of the practical are assessed by ensuring that learners follow the right steps given to them during demonstration to use MS PowerPoint features tested on in manipulating multimedia correctly.

Remedial and Extended activities

1. Explain how hyperlinks work in multimedia programs.

2. Use Internet facility and find out five multimedia programs and brief data on how they work in multimedia.

3. Create an interactive multimedia file to link all files that you have created in a computer in this unit.

   Note: This may require that learners use their folders where they store all their personal files for future use.

Expected answers to the above activities

1. The work of hyperlinks is to enable the user jump or move from one location or page or document to another quickly without closing the open ones. A hyperlink can be text or object.

2. The answer shall be produced or generated by learners after making their research using the Internet.

   Some of these programs include:

   - Windows Media Player used on Windows OS to play audio, videos, etc.

- QuickTime works on Mac OS.
- iTunes plays and edit video and audio files
- Microsoft Office Suite that includes MS PowerPoint that can edit audio and video.

3. Let learners do this for themselves using the files they have created in this unit. They should follow the steps of creating hyperlinks to link the files in section 8.8 Learner's Book pages 273–278.

Answers for End of Unit 8 Assessment

1. Multimedia tools used in my community include:

   - Adobe Photoshop for editing photos and graphic design.
   - Dreamweaver for creating websites.
   - Microsoft PowerPoint
   - Microsoft Office (Word and Excel)
   - Adobe Illustrator

2. Number 2–8 shall be answered by the learners' presentations. Answers may vary from learner to another. The answers shall be analysed by the teacher.

COMPUTER NETWORK AND DATA COMMUNICATION

Network Security

Key Unit Competence

Explain network security and apply basic security measures.

Prerequisites for Unit 9	To successfully achieve the intended learning objectives, learners should have knowledge about Network and Internet fundamentals learnt in S.1; Network components and social media applications plus data protections. All these were learnt in S.2. This unit has connections with security systems against threats.
Cross-cutting issues to be addressed	• **Gender education:** When taught about different security procedures practically, all the learners, irrespective of their gender should participate and do them for their life benefit. This will help learners to value themselves regardless of their gender. Inclusive education is emphasised when teaching network security because it is the knowledge that benefits all. • **Peace and values education:** In this unit, learners will be taught about security threats and security procedures on their computers and computer network. By acquiring this knowledge, emphasise to learners to be aware and guard against negative thoughts that may disrupt the peace and harmony that is amongst them, their environment as they connect to their learning goals.

Generic competencies	• Research and Problem solving competences are generated when learners participate in finding solutions to questions, by discussing and exchanging ideas using previous knowledge. • Communication, and interpersonal relations is gained when learners either individually or in group, present their answers, exchange ideas and opinions amongst themselves in answering the questions and doing activities using acceptable languages in Rwanda. • Critical thinking: Learners will think creatively, research and enquire to discover correct answers to questions either individually or in group work activities.
Vocabulary or key words or concepts	• Network security terms such as threat, security, firewall, authentication, encryption and decryption. • Security threats such as virus, worms spyware and social engineers.
Guidance to the problem statement	Generate question (s) to make learners get interest in the unit and search for more information about it. Learners find solutions to the question (s) on their own in their groups. Present to learners the following task: *Find out whether your computer is secure using the following guideline and make a report presentation as a group:* • Antivirus (if antivirus is not update, update it now) • Your network function. Is your network performing efficiently, is it on or off. Try to check connections i.e. cables, connectors, network switch (es), router, etc. Issues beyond your knowledge, report back to tender. • Physical security (does your laboratory have metallic doors and windows, burglar alarms or security guards). If all these are missing, advise the administration of your school through your leadership hierarchy. • Your hard disk capacity and RAM. If your hard disk is almost full, inform the system administrator or concerned teacher. If your computer is constantly showing "Low virtual memory" find out information about your computer's RAM and processor speed. Learners will try to find the information and will discover a lot that will lead them to acquire much about this unit.

Attention to special education needs	Learners with hearing and vision difficulties must be given an open opportunity to freely ask, interact and communicate swiftly with the teacher and other learners. Such a learner sits in a place where the teacher can monitor their learning performance. Every small achievement done should be praised. Talented learners should be given extended activities and additional information they might need to accomplish their activities .

List of lessons in Unit 9

Lesson number	Lesson title	Number of periods
1	Definitions of network security terms	2 periods
2	Definitions of security terms	2 periods
3	Applying security concepts	2 periods
Total number of periods		**6 periods**

Lesson 1: Definitions of network security terms (Learner's Book pages 309–312)

Learning objectives	Learners will be able to: • Explain or describe why security is important. • Identify and describe security threats.
Prerequisites/ Revision/Introduction	Greet learners and ask them questions related to network concepts and network components. Using the knowledge acquired in S.1 and S.2, they will be able to answer them. Introduce the new unit in a way that draws all learners' attention. Ask learners to define security and network security. Respond to their responses by giving the title of the lesson "Network security terms".
Teaching aids	Computers, projector, textbooks, routers, switches and transmission data cables. An interactive board can be availed for visual explanation. Learners with hearing difficulties should sit and use computer(s) near the teacher.

Learning activities	The teacher will first explain to learners the network security terms and network threats (either verbally or with visual aids); and afterwards allow learners to discuss in manageable groups. • Teacher helps learners to discuss and understand computer security (terms and threats).
Synthesis	By the end of the lesson, learners will be able to explain or describe the importance of security and to identify network security threats.
Lesson assessment	**Ask learners the questions below:** **Question 1:** Explain the meaning of the term computer network. What type of network does your school run? **Answer:** A computer network is a collection of computers connected such that they can communicate and exchange messages shared by users. In our school the network available with us is a Local area network. The school also connects to a wide area network, specifically Internet for purposes of research, and education and communication to distant places. **Question 2:** Identify things you normally do with the school network. **Answer**: Communication of messages with email, Facebook, twitter and so on, research for educative information, etc.

Method

Step 1: Introduce the lesson by asking learners the implications of network and social media they learnt in S.2 ICT unit 8. Test learners' knowledge, skills and understanding about network security.

Introduce the lesson with a lesson title, "definitions of network security terms".

This could take about 5 minutes.

9.1 Introduction to Network security (Learner's Book page 309)

Step 2: Explain in details to learners the meaning of the term Network Security in relation to computers. This should include the term security and threat.

Also guide learners on definitions of various network security terms e.g threat, encryption, etc.

This can take about 15 minutes.

Step 3:   Guide learners to do Activity 9.1 (Learner's Book page 310)

Learners can now attempt this activity as partly a revision activity because it includes questions similar to those that learners did in their S.2 ICT. You can mark books within the lesson or once the exercise is fully done, then books are collected for marking.

The practical activity can be done if learners are in the computer lab, so decide whether you get the lesson from class or lab. I advise you can be in the laboratory.

This activity can take up to 50 minutes.

Step 4:   Summarise the lesson.

Make a summary of the lesson go through with learners' answers for Activity 9.1. Tell learners the lesson title for the next lesson for research purposes or for further reading.

You can do this in 5 minutes.

Proposed answers to Activity 9.1

1.   Network security refers to policies and technologies designed to protect the usability and integrity of computer network and information. Network security can be used to prevent unauthorised access, misuse, or denial of service attacks to safeguard information and information systems.

2.   Security means a sense of feeling protected from attack, harm or loss whereas a threat is a possible danger that can exploit the vulnerability to break security in place.

3.   Threats that are common with computer networks today include:
     ●   Computer viruses.
     ●   Hackers.
     ●   Phishing emails.
     ●   Rootkit viruses.
     ●   Spyware.
     ●   Technical failures.
     ●   Physical damage.
     ●   Denial of services.
     ●   Sabotage by employees, etc.

4. Solutions that can be used to safeguard a computer network include:

- Limit access rights. Unauthorised access must be stopped immediately.
- Turn off network if it not in use.
- Disable remote administration.
- Protect physical equipment against fire and burglary by putting in place fire extinguishers, use of metallic doors and windows with strong padlocks.
- Install updated antivirus software and scan your computer regularly.
- Update your operating system regularly using the latest security patches, service packs and hot fixes.
- Make backups of your important data and emails.
- Set a very strong password at your computer.
- Install and configure a software or hardware firewall.
- Don't download anything from the insecure websites.
- Don't open email attachments from unknown sources. Attachment with suspicious lines, file names or messages are dangerous.
- Increase your browser's security level.
- Encrypt all important files.

5. Computer viruses are self-reproducing computer programs that interfere with normal working of other computer programs and causing malfunctions in computer hardware.

The risks involved when viruses attack your computer system include among others the following:

- Viruses corrupt or delete computer data on hard disk and on other removable magnetic disks and solid drives.
- Delete most important system files leading the operating system to malfunction and unable to run user' applications.
- Can slow down computer processes, eventually leading the system to crash.
- Can allow hackers to run programs on your computer or allow intruders open access to your important files.
- Causes hardware malfunctions and suddenly the computer may break down and fail to work.
- The Hard disk may crash and become unusable.

6. You can get to know that the computer is having virus using the following indicators:

- The computer takes long to boot or start for use.
- It also takes long to open programs, often locks up or freezes.
- The computer produces uncommon sounds played by images that pops up on the screen.
- Unusual error messages appear as you use various computer programs.
- Some files or programs may disappear mysteriously; trying to open them, the location could not be established.
- The memory on your hard disk reduces continuously even when you do not install new programs.
- Your computer screen starts to flicker or flashes unsteadily.
- Unusual graphics may start appearing on your screen and usually annoys the user, though may be non-destructive etc.

7. You can protect your computer from viruses by doing the following:

- Using Antivirus utility: Download antivirus from Internet or buy it from vendors and install the software on your PC. Obtain one of the following antivirus: Avast, Norton, Symantec, AVG, MacAfee, etc. and always ensure it is updated periodically usually every month.

  Antivirus software is a program designed to detect and remove or prevent computer viruses, Trojan horses, spyware, adware and worms from your computer.

  When connecting to the Internet it is possible that this program can be compromised. This means that antivirus is not the best solution for data security on the computer but can help in detecting malicious acts of viruses or Internet hackers.

Other methods you can use include:

- Limit or control how you use freeware/shareware i.e. don't just copy any free material from Internet and think it is good on your computer.
- Control how you share disks e.g. flash disks or optical disks, etc. Share with trusted people.

8. Follow procedures/steps used for scanning viruses using installed antivirus (Here, the teacher guides learners taking them through the process practically). Learners can also recall the steps for scanning a computer with an Antivirus.

Lesson 2: Definitions of security terms (Learner's Book pages 310–320)

Learning objectives	Learners will be able to identify and define security terms and be able to apply them in explaining a network status or solution.
Prerequisites/ Revision/Introduction	Greet learners and revise with them Activity 9.1. Introduce the new lesson in a way that draws all learners' attention. Introduce the lesson with a lesson title "Security terms".
Teaching aids	Computers, projector, textbooks, routers, switches and transmission data cables. An interactive board can be availed for visual explanation. Learners with hearing difficulties should sit and use computer(s) near the teacher.
Learning activities	The teacher should first explain to learners the network security terms and network threats (either verbally of with visual aids); and afterwards allow learners to discuss in manageable groups. • Teacher organises group work where learners apply network security concepts like, authentication, authorisation to access equipment and data.
Synthesis	By the end of the lesson, learners will be able to define security terms and apply them either in groups or individually.
Lesson assessment	**Ask learners the questions below:** **Question:** How secure is the school local network in terms of unauthorised physical access and online access? **Answer:** The school network is guarded physically and monitored by both security officer and a system administrator, supported by ICT teachers. Online access protection is made by strong antivirus which is frequently updated. Computers are scanned regularly for online threats so that school's important data is made secure all the time. Fire extinguishers, power backups and power stabilisers are in full use at the school.

Method

Step 1: Review with learners the previous lesson (1). Ask questions to test learners' knowledge, skills and understanding.

Introduce the lesson with a lesson title and I propose "definitions of security terms".

This could take about 5 minutes.

9.2 Definition of terms (Network security terms) (Learner's Book pages 310–312)

Step 2: Explain more to learners the meaning of each of the following security words: authentication, authorisation, encryption, decryption and firewall.

9.3 Importance of computer security (Learner's Book page 313)

Describe the importance of computer security to learners in details by allowing a simple discussion among learners.

This can take about 20 minutes.

9.4 Security threats (Learner's Book pages 299–313–320)

Step 3: Help learners to discuss and understand security threats that include; computer viruses, hackers, natural hazards, technical failures, etc. In this explanation, learners should understand the security precautions used to safeguard networks.

This can take 20 minutes.

9.5 Security procedures (Learner's Book pages 320–323)

In addition to security threats, guide learners to explain most of the security procedures and precautions used today on networks. Include Data backups. (Learner's Book page 321)

This can take about 10 minutes.

Step 4: Guide learners to do Activity 9.2 (Learner's Book pages 315–316)

Let learners do Activity 9.2 in their books as an exercise for marking. Keep moving around to maintain order as learners are doing work.

This could take about 20 minutes.

Suggested answers to Activity 9.2

1. A spyware is software that reveals the identity of the user whereas a spam is an electronic junk mail (or unsolicited commercial message transmitted through Internet as a mass mailing).

    The risk involved when a computer is having a spyware include:

    *   One's personal information can be collected and sent to bad people without your knowledge.
    *   One's computer settings may change to allow in viruses and other threats.
    *   If one's computer is using Windows OS, the windows registry files are likely to get corrupted.
    *   Internet connection speeds could slow down.
    *   One's privacy could be broken into.
    *   Spyware can make a computer to crash.

2. Social engineering is a method used by hackers to gain access to computer systems by exploiting human behaviour.

    Social engineering is a collection of methods used to trick internal computer users to carry out specific actions or revealing confidential information thus breaking normal security procedures.

3. 'Identity theft' occurs when personal information is obtained by unauthorised individuals who then use information to commit a crime such as fraud or theft.

    *   People have to spend a lot of money to clean up their personal and financial records.
    *   People may be arrested for crimes they didn't commit.

4. Check in the Learner's Book page 312 for answer.

5. Check in the Learner's Book pages 311–312.

Additional information for the teacher

Software Patch is a piece of software code availed to correct an error in a software application or to add a new feature.

The risk of not using software patches updates is that your computer becomes a playground for any form of computer viruses and Internet hackers and therefore you risk losing important data.

The solution is configuring your computer to download operating system updates and patches on regular basis and install them on your computer.

Phishing is the act of tricking somebody into providing you his/her bank or credit card information by sending a fraudulent email purporting to be from the bank.

Social engineering is the act of using fraudulent methods to access computer systems protected by passwords and user IDs.

Step 5: Summarise the lesson revising Activity 9.2. Tell learners the lesson title for the next lesson for research and further reading. You can do this in 5 minutes.

Lesson 3: Applying security concepts (Learner's Book pages 316–320)

Learning objectives	Learners will be able to: • Feel secure when using the network. • Be aware of data flow through the network. • Apply network security concepts to prevent unauthorised intruders from intercepting data travelling through the network or to initiate commands disrupting the network's normal operation.
Prerequisites/ Revision/Introduction	Greet learners and review the previous lesson, then introduce the new lesson in a way that draws all learners' attention. Introduce the lesson with a lesson title "applying security concepts".
Teaching aids	Computers, projector, textbooks, routers, switches and transmission data cables. An interactive board can be availed for visual explanation. Learners with hearing difficulties should sit and use computer(s) near the teacher.
Learning activities	• Teacher organises group work where learners apply network security concepts like, authentication, authorisation to access equipment and data.
Synthesis	By the end of the lesson, learners will be able to feel secure when using network. They should also be aware of data flow through the network and apply security concepts.

Lesson assessment	Ask learners the questions below:
	Question 1: Define the terms: Antivirus, authorisation, encryption and decryption in relation to computer network.
	Answer: Antivirus is a computer program used to detect and remove viruses and other malware from the computer or network.
	Authorisation is a permission to carry out an activity on a computer or network.
	• *Encryption* is the process that encodes messages between two or more devices on the network such that other devices outside the network or specified points cannot intercept and read it. • Decryption is the process that decodes messages such that it is made available to only authorised parties in right form.
	Question 2: Have you ever scanned a computer for virus attacks? If so which antivirus did you use? Perform a virus scan of your computer and then backup files that are important to you on a removable storage media.

Method

Step 1: Introduce the lesson with a lesson title "Applying Security Concepts".

 This could take about 5 minutes.

Step 2: Applying authentication (applying passwords)

 Demonstrate on screen how authentication works using a projector. This shall be performed when learners review the steps for creating a password on Windows 10 and on a file. This shall mean that the system will require the user to type either his name and or password to start Windows or open a file or user account.

 Organise learners into groups and let them perform authentication procedures on the available school network.

 This can take about 20 minutes.

Step 3: Applying Authorisation

 Demonstrate on screen how authorisation works on projector.

Let learners perform authorisation procedures using the school network.

By using a limited account, install a given application on a computer and where the computer demands for administrator password, first type a different one to show learners you have not been authorised, then do it the second time to get authorised to install the program.

This could take 30 minutes.

9.6 Basic security precautions (Learner's Book page 323)

Discuss with learners the security procedures available to protect network and all resources available on a computer.

Step 4: Discuss with learners how you backup data on an optical disk, external hard drive or flash drive. Discuss the importance of backing up data. Refer to page 321 in the Learner's Book.

This can take about 20 minutes.

Step 5: Wireless network/ the security solutions to wireless networks. (Learner's Book page 323).

- Discuss with learners about wireless networks and then allow them to read the text on page 323.

- Encourage them to ask questions where they don't understand.

- Guide learners to do Activity 9.3 (Learner's Book pages 322–323)

Step 6: Summarise the lesson.

Revise with learners Activity 9.3.

Tell learners about the next unit for research purposes and further reading.

Suggested answers to Activity 9.3

1. Some of the security risks to computers in our school include:

- Abrupt fire outbreak.
- Theft of computer equipment such as mouse keyboard, external drives or even whole computer systems.
- Theft of important files.
- Computer viruses and other malware, which could lead to loss of data or damage to important programs frequently used.
- Dust, this affects internal computer components so much that the computer may start freezing or malfunctioning.

To ensure security to computers at school and other organisations, the following ought to be done:

- Buying and putting in place fire extinguishers. Learners should know how to use them correctly.
- By backing up all important computer files to a safe place.
- By not allowing bags by learners as they could easily hide small devices such as mouse, hard disks, etc.
- Use of strong metallic doors and windows with strong padlocks to limit burglary.
- Use of security cameras and burglar alarms.
- Employing laboratory attendant to ensure that he/she maintains records (inventory) of lab equipment and to regulate how the lab is used.
- Employing security personnel e.g. night guard to keep the laboratory secure.
- Limiting the use of external disks in the laboratory as they often introduce in new and deadly viruses.
- Buy and install antivirus software and keep it updated so that it can detect newer viruses and other malware.

2. Check Learner's Book page 321.

3. Check Learner's Book page 320.

Practical numbers from 4–8 can generate the results. You can see from learners' screen or their presentations in groups.

Additional information for the teacher

Much of this topic is theory work unless you have access to all the network security resources to demonstrate all network

security procedures used while networking. However, engage the learners in a discussion because this is one of the topics that learners like and already have an idea about. Be ready to answer any question from them that relate to computer network security Local Network. The available hardware for the provision of security on network can be brought to class, shown to learners.

In case you have the means, organise an outing for learners to visit a nearby busy company and ask and learn how their network is kept secure from unauthorised users and other threats. Capture and store a video of this exercise using a digital camera and later the learners can watch this video. The information below is also useful in explaining security solutions to a network.

Types of network security

Access control

Do not allow every user to access a school/organisation network. Make sure that each device is recognised before using the network. By having security policies, you can block devices that do not comply to the standard you set or give limited access. This implementation is called Network access control (NAC).

Antivirus and antimalware software

Malware includes viruses, worms, Trojans, and spyware. These can infect the system and remain dormant for some time either to be triggered by a certain condition or just date. Ensure to have antimalware that can scan malware upon entry, track files, fix damage and remove malware.

Application security

Programs used by the organisation such as schools or businesses need protection. The bad thing that there will always be loopholes used by the attacker to infiltrate your network. Application security should target closure of these holes using special hardware, software, and processes.

Behavioural analytics

There must be a mechanist set to detect abnormal behaviour in a network. You must know the difference between normal and abnormal behaviour of a network. In an organisation there must be a security team that can better identify indicators of compromise that pose a potential problem and quickly provide a solution to threats.

Data loss prevention

Organisations must make sure that their staff does not send sensitive information outside the network. Data loss prevention, or DLP, technologies can stop people from uploading, forwarding, or even printing critical information in an unsafe manner.

Email security

Email gateways are the number one threat vector for a security breach. An email security application blocks incoming attacks and controls outbound messages to prevent the loss of sensitive data.

Firewalls

Firewalls put up a barrier between your trusted internal network and untrusted outside networks, such as the Internet.

Intrusion prevention systems

An intrusion prevention system (IPS) scans network traffic to actively block attacks.

Mobile device security

Cybercriminals are increasingly targeting mobile devices and apps. Most IT organisations today are advocates for corporate applications on personal mobile devices.

Web security

A web security solution will control your staff's web use, block web-based threats, and deny access to malicious websites. It will protect your web gateway on site or in the cloud. Web security refers to the steps you take to protect your own website such as a school website or personal website.

Wireless security

Wireless networks are not as secure as wired ones. Without stringent security measures, installing a wireless LAN can be like putting Ethernet ports everywhere, including the parking lot. To prevent an exploit from taking hold, you need products specifically designed to protect a wireless network.

Remedial and Extended activity

1.   Discuss the various types of network security procedures that can be implemented in your school.

2.   Start your computer and turn on Windows Firewall (if it is off) or Turn off Windows firewall (if it is on).

     Note: Put in mind the importance of firewall on a computer/ network.

Follow steps below to turn on firewall

Step 1:   Open Control Panel window

Step 2:   Double click on Windows Firewall icon. See picture below.
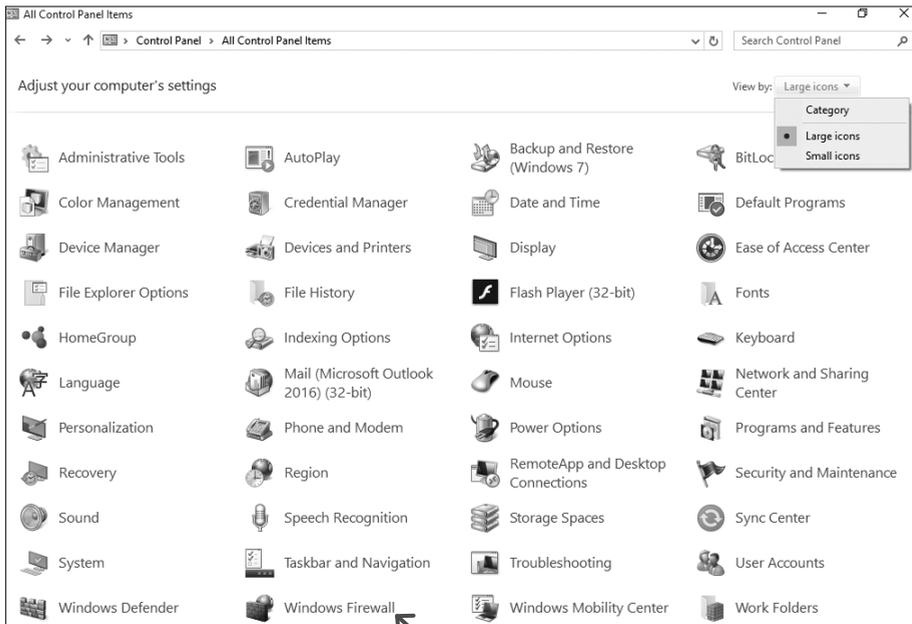
Double-click **Windows Firewall**

Picture 9.1: Control Panel Window

The Windows firewall screen displays as shown below.
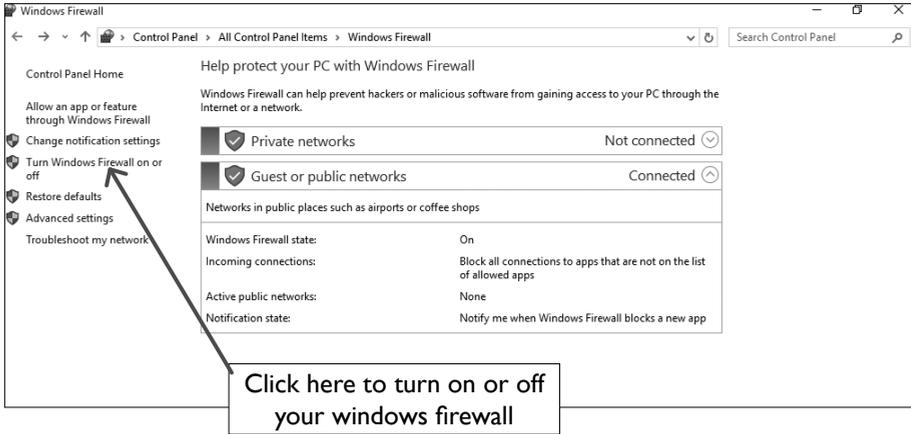
Picture 9.2: Windows Firewall window

Step 3:   From the Windows Firewall screen, from the left pane, select "Turn Windows Firewall on or off".

Step 4:   In the Customise Settings screen that displays, use Private Network Settings if your network is private or use Public Network Settings if your network is public (Internet). Click on "Turn on Windows Firewall" if it was off or "Turn off Windows Firewall" if it was on. See picture below.
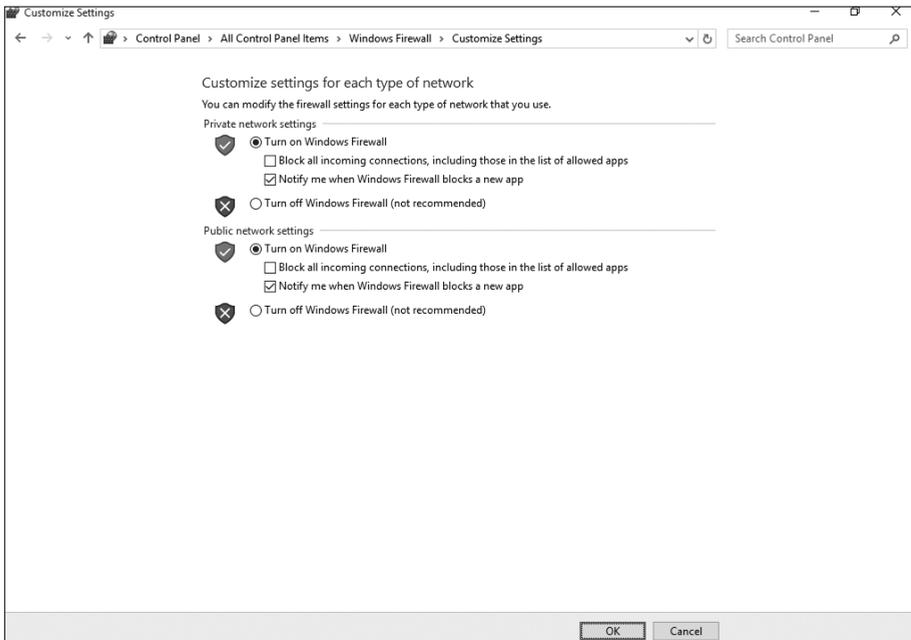
Picture 9.3: Customise Settings screen

3.　(a)　Visit the computer laboratory, turn on computers. Find out whether the computer network and or Internet is available without opening a browser.

　　(b)　Which of the two images X and Y below indicates that a network or Internet is unavailable?

Image for Internet or network
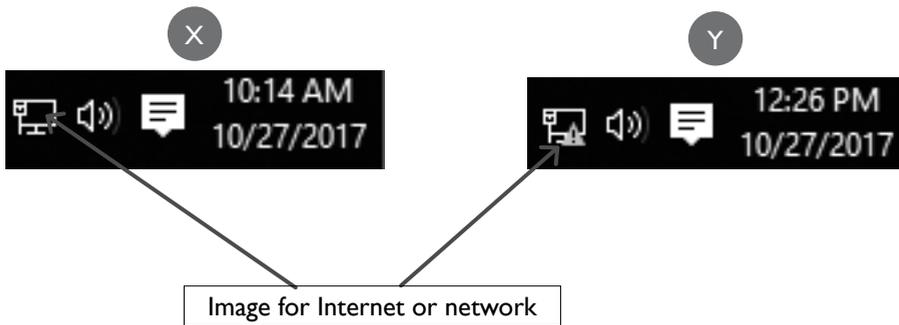
　　(c)　If your Internet or network is unavailable, perform a troubleshooting process find the problem and if possible fix it.

Suggested answers for remedial and extended activities

1.　The types of network security that can be implemented in the school include:

- Access control
- Use of Antivirus and antimalware
- Application security
- Behavioural analytics
- Data loss prevention
- Email security application
- Firewalls
- Mobile device security
- Web security
- Wireless security

Check this guide for more information about the network securities given above.

2.　Observe the image for Internet/Network. If it is having a yellow symbol inside it, it means the network has problems or is unavailable. Start troubleshooting process by right-clicking on the icon in the system tray and then select"Troubleshoot problems".
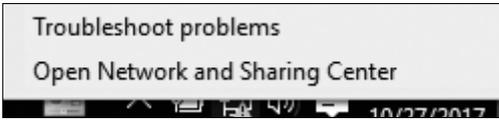
Picture 9.4: Shortcut menu for network icon in System Tray.
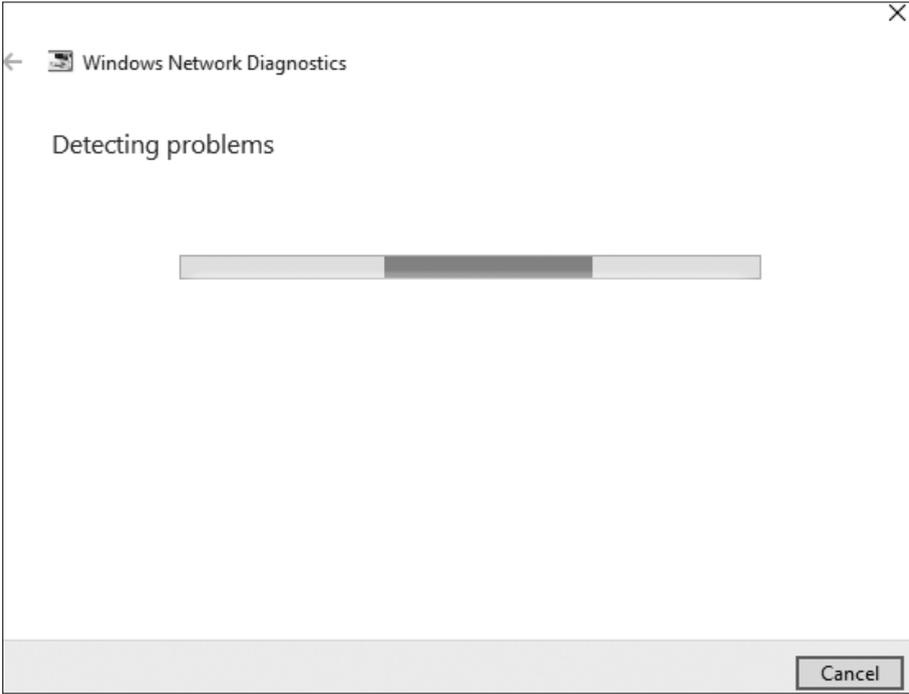
Picture 9.5 (a): Windows Network Diagnostics screen
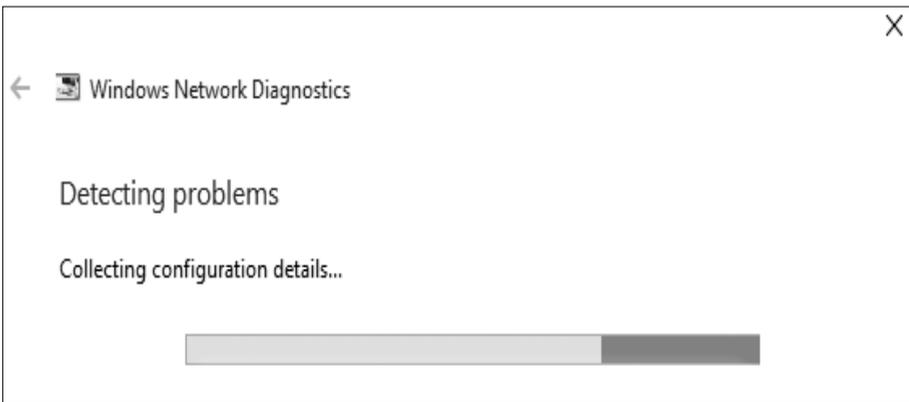
Picture 9.5 (b): Windows Network Diagnostics screen
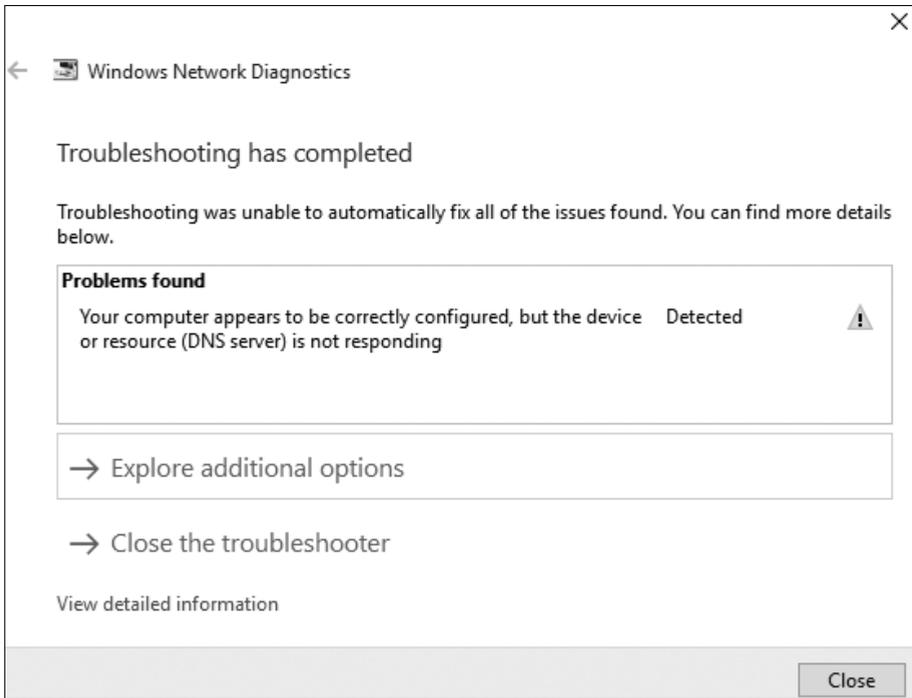
Picture 9.5 (c): Windows Network Diagnostics screen

Note: When the last screen still brings the yellow error alert as shown in screen above, check network cables if they are fixed in well, or contact the system administrator for the school network or the teacher.

Suggested answers for End of Unit 9 Assessment

1. Check in the Learner's Book page 323.

2. Check in the Learner's Book page 321.

3. (a) and (b) check in the Learner's Book pages 314–315.

   (c) Hacking is an act of involving unauthorised access into a computer network or computer by a person called a hacker. The hacker changes the security features of the network to accomplish his goal.

4. (a) Spam is irrelevant unsolicited messages (usually commercial) sent via Internet. It means flooding the Internet with many copies of the same message.

   (b), (c), (d), check in the Learner's Book pages 314–315.

   For other questions, review the Learner's Book.

PROGRAMMING

Platform Game Programming

Key Unit Competence

To be able to use complex expression, operators and controls to design platforms.

Prerequisites for Unit 10	To successfully handle this unit, learners need to have knowledge about music sprite programming with scratch from S.1; and game programming with scratch in S.2. All these shall make platform game programming easier. This unit has links with Fine Art and Mathematics.
Cross-cutting issues to be addressed	• Gender education should be emphasised when teaching this unit. Let male and female learners equally support each other as a team. Encourage the learners to give each other equal opportunities in using computers to make *a platform game using sample commands*. This helps them to positively work and cooperate with each other regardless of gender. • Peace and values education should be emphasised while teaching this unit. Guide learners to discuss in groups with respect and harmony on how to associate scratch tools to produce planned platform and also to participate in finding answers to questions both complex and simple. Noise and any form of discomfort must be cleared immediately. • Inclusive education should be stressed and demonstrated when tasks or instructions presented to learners do not discriminate any.

Generic competencies	• Research and Problem solving is generated when a learner participates in finding solutions to questions by discussing and exchanging ideas using previous knowledge. • Communication competence is generated when learners either individually or in groups, present their answers, exchange ideas and opinions amongst themselves to test their worth in answering the questions using acceptable languages in Rwanda. • Critical thinking is developed as learners think and accommodate thinking discomfort to discover correct answers to questions either individually or in group work activities.
Vocabulary or key words or concepts	Concepts of platform game such as platform, sprite and blocks.
Guidance to the problem statement	Pose an activity that will make learners get interest in the unit and search for more information about it. Learners shall find solutions to the question (s) on their own in their groups. Present to learners this question at the start: *Use Internet facility and find out information on "how to create a platform game". Pick one game of interest from samples given and follow it up to know how it can be created using scratch tools. You will present individual work of the game at the end of the unit.* Learners will find solutions and discover a lot that will lead them to acquire much knowledge about this unit.
Attention to special educational needs	A learner, new or old but has a special educational need must be attended to properly, for example learners with hearing and vision difficulties shall sit in front near the teacher and explanations have to be repeated for them provided they are organised in a small group. Every small achievement done should be praised and credited. Talented learners should be given extended activities and additional information they might need to accomplish the activity.

List of lessons in Unit 10

Lesson number	Lesson title	Number of periods
1	Concepts of platform and its usage	2 periods
2	Creating a platform sprite	2 periods
3	Build a combo block	2 periods
4	Add level of a game	2 periods
5	Sample commands and controls for sprite manipulations	2 periods
Total number of periods		10 periods

Lesson 1: Concepts of platform and its usage (Learner's Book page 331)

Learning objectives	Learners will be able to: • Explain or describe the meaning and role of platform. • Practice creation of platform sprites.
Prerequisites/ Revision/Introduction	Greet learners, ask them questions connected to game programming which they learnt in S.2 and introduce the new unit in a way that draws all learners' attention. Introduce the lesson with a lesson title "concepts of platform and its usage".
Teaching aids	Computers, scratch editor, digital material and projector. You can also have textbooks and interactive board. In schools with few computers; the teacher will use one (or more) available computers; first to explain the platform and its role, then demonstrate how to create and interact with platform sprites in Scratch; and afterwards allow learners to work in manageable groups. Learners with hearing difficulties should sit and use computer(s) close to the teacher.
Learning activities	• Teacher explains to learners different concepts of platform and its role/usage. • Learners read and research individual work on producing platforms.
Synthesis	By the end of the lesson, learners will be able to explain the meaning and role of a platform. Be able to create platform sprites.

Lesson assessment	**Ask learners the questions below:**
	Question 1: Define the following: platform sprite, avatar, platform game.
	Answer: - A platform sprite is an immobile sprite usually a stage background and can interact with other sprites on stage.
	• An *avatar* is usually a picture representing a particular person or something in a game or forum. • A **platform game** is a type of video game and a sub-category of action game where a player character (avatar) is guided to jump between suspended platforms or over obstacles.
	Question 2: How to sprites interact?
	Answer: Two or more sprites may interact with each other when they touch each other, or touche certain specified colours, move in certain direction, etc.

Method

10.1   Concepts of platform and its usage

Step 1:   Introduce the lesson with a title "Concepts of platform and its usage." (Learner's Book page 331)

Define some concepts like sprite, platform, platform sprite and give the usage of a platform.

Provide a video of a platformer/platform game and learners watch it and after ask them to explain the meaning of platform sprites and discuss the role of platforms in scratch, how platforms interact by using text on pages 331–333.

This could take about 20 minutes.

Step 2:   Interact with platform sprites (Learner's Book page 332)

Explain and the discuss with learners how to create sprites and platform sprites and how sprites interact.

Guide learners to do Activity 10.1(a) to learn about sprite interactions. Learners will use the previous knowledge of Scratch together with your demonstration to do the activity.

Demonstrate to learners how to import or draw a sprite (as reminders) and to duplicate, delete and save a sprite.

Continue with the above activity and show learners how to add scripts given and play them. Encourage learners to modify the scripts as needed. Afterwards, let them do the activity by themselves.

This could take about 55 minutes.

Step 3:   Summarise the lesson

Instruct learners to save their work safely. Tell learners the title for the next lesson for research purposes and for further reading.

This can take about 5 minutes.

Lesson 2:   Creating a platform sprite (Learner's Book pages 333–337)

Learning objectives	Learners will be able to: • Apply different colours to produce interesting backgrounds. • Practice on creation of platform sprites.
Prerequisites/ Revision/Introduction	Greet learners and ask them questions about the previous lesson e.g. ask the role of platform. Introduce the lesson with a lesson title "create a platform sprite".
Teaching aids	Computers, scratch editor, digital material and projector. You can also have textbooks and interactive board. In schools with few computers; the teacher should use one (or more) available computers; first to demonstrate how to create a platform sprite, pick colour, copy or edit sprites, use fill tool, and build a combo block (using sample commands); and afterwards allow learners to work in manageable groups. Learners with hearing difficulties should use computer(s) close to the teacher.
Learning activities	• Individual work on producing platforms. • Group discussion on how to associate scratch tools/ facilities and produce a planned platform.
Synthesis	By the end of the lesson, learners will be able to practice creating platform sprites and to apply colours to produce more interesting backgrounds.

Lesson assessment	Ask learners the questions below:
	Question 1: Identify specific actions platform sprites do in platform?
	Sprites in a platform can fall, move, slide, jump, and bounce, etc.
	Question 2: Identify important role done by platforms in a game.
	Answer: Platforms act as area of sprite interactions such that sprites can move, jump, rotate, bounce, etc.

10.2   Creating a platform sprite (Learner's Book page 333)

Method

Step 1:   Greet learners and provide a short exercise to recall the last lesson. Ask them to brainstorm the role of platform.

Introduce the lesson with a lesson title, "creating a platform sprite". (Learner's Book pages 333 – 337). Briefly discuss about platforms and how they are created.

This could take about 10 minutes.

Step 2:   Using Activity 10.1(b), guide learners to create a platform sprite. Learners should be guided and instructed on how to pick a colour and scratch tool to design a needed item (background or player sprite). Demonstrate to learners how to copy/duplicate sprites and scripts.

Let learners do the activity on their own.

This may take about 65 minutes.

Step 3:   Summarise the lesson

Watch over learners as they do the activity above.

Guide learners to save their work safely. You can tell them the title for the next lesson for further reading and research.

You can do this in 5 minutes.

Lesson 3: Build a combo block (Learner's Book page 337–341)

Learning objectives	Learners will be able to: • Build combo blocks for platform sprites. • Produce platforms and apply combo blocks on them. • Arrange different tools and produce a platform.
Prerequisites/ Revision/ Introduction	Revise with learner's Activity 10.1 (b). Introduce the lesson with a lesson title "Build a combo block".
Teaching aids	Computers, scratch editor, digital material and projector. You can also have textbooks and an interactive board. In schools with few computers; the teacher should use one (or more) available computers; to demonstrate how to use controls in a game, such as If, Forever, repeat until, point in direction, move steps, touching colour, sow/hide, if else, switch to costume and set to. Afterwards allow learners to work in manageable groups and practice those commands. Learners with learning impairments should use computer(s) close to the teacher.
Learning activities	• Group discussions on how to associate scratch tools/ facilities and produce a planned game, emphasis is put on building combo blocks. • Individual work on building combo blocks.
Synthesis	By the end of the lesson, learners will be able to build combo blocks.
Lesson assessment	**Ask learners the questions below:** **Question 1:** Give steps you can use to copy or delete a sprite or another item. **Answer**: You can copy or delete a sprite by right-clicking on the sprite and in the shortcut menu select **Duplicate** to copy it or **Delete** to delete it (using scratch editor 2.0). **Question 2:** Identify some of the scratch painting tools for creating sprites. **Answer:** Scratch paint tools include: Brush tool, line tool, Eraser tool, Fill with colour tool, Stamp tool, etc.

Method

Step 1:   Provide a short exercise to recall the last lesson i.e. creating a platform sprite.

Introduce the lesson with a lesson title "building combo blocks". (Learner's Book page 337).

This could take about 10 minutes.

Step 2:   Guide learners to use some control commands for sprite manipulations such as: If, forever, repeat until, point in direction, move steps, touching, show/hide, if else, switch to costume, set to, etc. in a game.

Let learners do Activity 10.2 and 10.3 as you guide them.

Individually learners use these commands i.e. the above explained commands. This depends on how you demonstrate to the learners to do perfect work.

This could take about 65 minutes.

Step 3:   Summarise the lesson

Guide learners to save their work safely and properly.

You can do this in 5 minutes.

Lesson 4: Add level of a game (Learner's Book pages 342–348)

Learning objectives	Learners will be able to:
	• Use scratch tools and produce platforms.
	• Practice the creation of platform sprites.
	• Manage interaction with platform sprites.
	• Add a level to a game.
Prerequisites/ Revision/Introduction	Greet learners and ask them questions connected to previous lesson about combo blocks. Introduce the new lesson in a way that attracts all learners. Introduce the lesson with a lesson title "Add level of a game".

Teaching aids	Computers, scratch editor, digital material and projector.
	You can also have textbooks and an interactive board.
	In schools with few computers; the teacher will use one (or more) available computers; demonstrate how to create and interact with platform sprites and add level of a game in scratch; and afterwards allow learners to work in manageable groups.
	Learners with learning impairments should sit and use computer(s) close to the teacher.
Learning activities	• Practice how to use colours, copy, edit, scripts used and build combo blocks and add levels to a game.
Synthesis	By the end of the lesson, learners will be able to manage interaction with sprites and add level of a game.
Lesson assessment	**Ask learners the questions below:**
	Question 1: Explain the meaning of a combo block.
	Answer: This is a group of carefully arranged scripts that can make a sprite to move, jump, walk, make sound or affect the behaviour of the background platform.
	Question 2: Name sprites that can make a sprite to move right.
	Key (right**) pressed?** and **Move (**10 **)steps**

Method

Step 1: Provide a short exercise to recall the last lesson i.e. provide an exercise on building combo block.

Introduce the lesson with a title "Adding a level to a game".

This could take about 10 minutes.

Step 2: Let learners do Activity 10.4 as you guide them. Ensure that all learners are attentive and are following the given instructions.

This could take about 65 minutes.

10.3   Add level of a game (Learner's Book page 342)

Discuss and demonstrate to learners how to add level of a game using a previously created platform game.

Step 3:   Summarise the lesson

After ensuring that learners have successfully done the activity, instruct them to save their work properly and safely.

You can introduce the title to the next lesson for further reading and research.

You can do this in 5 minutes.

Lesson 5:   Sample commands and controls for sprite manipulations
(Learner's Book 348–350)

Learning objectives	Learners will be able to: • Produce more platforms using scratch facilities and different commands and controls. • Appreciate the platforms produced.
Prerequisites/ Revision/Introduction	Greet learners and introduce the lesson in a way that draws learners' attention. Introduce the lesson with a lesson title "Sample commands and controls for sprite manipulation".
Teaching aids	Computers, scratch editor, digital material and projector. You can also have textbooks and an interactive board. In schools with few computers; the teacher will use one (or more) available computers; to explain and demonstrate to learners how different commands and controls work. Afterwards, allow learners to work in manageable groups. Learners with learning impairments should sit and use computer(s) close to the teacher.
Learning activities	• Individual work on producing platforms, combo blocks, etc. • Practice on using commands to add a level of a game, controls and commands.
Synthesis	By the end of the lesson, learners will be able to produce more platforms using scratch facilities, build combo blocks, practice and use commands and controls and add level of a game.
Lesson assessment	**Ask learners the questions below:** **Question 1:** What items can you use to add level to a game? **Answer**: You can use objects, colours and edge of the platform.

	Question 2: Identify scripts you can use to make a sprite jump upwards.
	Answer: You can use "**When** (*up arrow*) **key pressed"** and a variable block "**set** (Jump) **to** 5".
	Note: *Parts of the block not bold are subject to change.*

Method

Step 1: Provide a short exercise as you wish for learners to recall the last lesson e.g. ask learners to add a level of a game.

You can use 5–10 minutes.

Introduce the lesson with a lesson title, "sample commands and controls for sprite manipulations".

10.4 Commands for sprite manipulations (Learner's Book pages 348–349)

Discuss with learners and also demonstrate how to use sample commands for sprite manipulations and sample controls. Most of those commands and controls have been used in our game.

This could take about 10 minutes.

10.5 Sample controls (Learner's Book page 349–350)

Step 2: Let learners do Activity 10.5 on Learner's Book page 345. Let learners do the activity as you guide them using the instructions in the Learner's Book.

This could take about 65 minutes.

Unit Summary

Instruct learners to save their work safely. Make a summary of the lesson and unit by putting emphasis on learners practicing the sample commands for sprite manipulations and all sample controls.

Guide learners to do end of unit 10 assessments (Learner's Book pages 351–352). They can do it as an assignment in their free time or an extra lesson created.

Suggested answers to Unit activities

Unit 10 is all practical, the skills and the results of the practical sessions are assessed by ensuring that learners follow the right steps given to them, during demonstration to use scratch features that generate a platform.

Answers to activities are therefore embedded in the Learner's Book.

Additional information for the teacher

Some people look at computer programming as a tiresome, specialised activity, open to only those with advanced technical training.   It is true that traditional programming languages such as Java and C++ are very difficult for most people to learn and use; but with scratch this is different.

Scratch, is a graphical programming language and aims at making programming much easier. The advances in computing power and interface design have made programming with scratch more engaging and accessible for children and adults who are learning to program.

Key features of Scratch include:

- Building-block programming. To create programs in Scratch, you simply place graphical blocks together into stacks or collections. The blocks are designed to fit together only in ways that make syntactic sense, so there are no syntax errors. Platform game programming requires a lot of block building actions.

- Media manipulation. With Scratch, you can create programs that control and mix graphics, animations, music, and sound. Scratch extends the media-manipulation activities that are popular in today's culture – for example, adding programmability to Photoshop-style image filtering.

- Sharing and collaboration. The scratch website provides inspiration and audience: you can try out other people's projects, reuse and adapt their images and scripts, and post your own projects. The ultimate goal is to develop a shared community and culture around scratch.

- Scratch offers a low floor (easy to get started), high ceiling (ability to create complex projects), and wide walls (support for a wide diversity of projects).

As learners work on scratch projects, they have opportunities to learn important computational concepts such as iteration, conditionals, variables, data types, events, and processes. Scratch has been used to introduce these concepts to learners of many different ages, from elementary school through college. Some learners shift to traditional text-based languages after getting introduced to programming with scratch.

Suggested answers to the End of unit 10 assessment

2. a) The platform can be designed to look exactly as shown in picture 10.13 in the Learner's Book.
   b) The shark can be drawn with scratch paint tools or imported from library. If imported from library can appear as shown below.
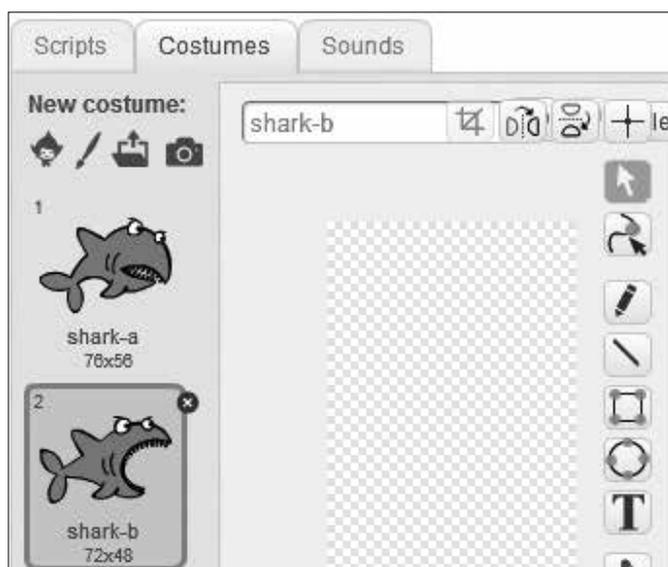
c) The following script blocks will make the shark to move up, down left and right and the shark will also be able to change costume.

```
when right arrow ▼ key pressed
point in direction 90▼
change x by 10
```

```
when left arrow ▼ key pressed
point in direction -90▼
change x by -10
```

```
when up arrow ▼ key pressed
change y by 10
if    touching color ■ ?  then
    change y by -10
```

```
when down arrow ▼ key pressed
change y by -10
```

```
when ⚑ clicked
point in direction 90▼
go to x: 0 y: 0
forever
    switch costume to shark-b ▼
    wait 0.5 secs
    switch costume to shark-a ▼
    wait 0.5 secs
    if on edge, bounce
```

```
when ⚑ clicked
forever
    wait until   Time = 20
    say Game over, check scores! for 2 secs
    stop all ▼
```

d) The following are proposed scripts for fish sprite and similar sprites you may introduce e.g. crab and other fish. When you use similar scripts on to another similar sprite, ensure that you adjust the x and y positions by some margin to make the shark hard to swallow them at the same time.

e) The backdrop or platform sprite will be designed to have the following scripts:
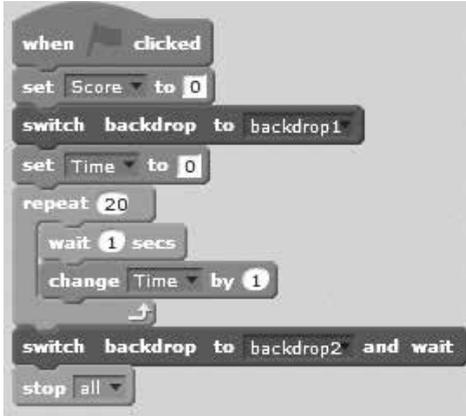
The platform to end the game may appear as shown below

Remedial and extended activities

Practical

1. Design a game called Funny Monkey in which there is a monkey and an apple to be taken by the monkey only after meeting a number of obstacles. Follow the guidelines below to build your game:

a) Create three backdrops as levels from which the monkey and an apple will interact. Use green colour as a platform of free movement for monkey and red colour as obstacles. (You can also change choice of their colours).

b) Each time the green flag is clicked backdrop1 or Level 1 should display to make the game ready for play. Blue colour should broadcast a message (Next Stage) for moving the monkey to next level.

c) (i) Choose monkey sprite from the library (you can also introduce your customised sprite from another source or create using scratch paint tools). Choose an apple from library or create with paint in a suitable colour. Create two other sprites in green colour using paint tools in form of lines where the monkey can jump to in case of need, place them in space in appropriate positions.

   (ii) The monkey sprite in the game should be capable of moving forward/right and backward/left using X-velocity as a variable. Create necessary combo blocks for these movements.

d) (i) The monkey should jump up and come down by Y-velocity as variable. Create a combo block for this movement.

   (ii) Organise scripts such that when a key is pressed to jump, the monkey changes the costume and when it touches an obstacle it goes back to the beginning of the level.

e) The monkey as it moves right or left will be changing between costumes. Organise scripts for this to take place.

f) Getting the apple by the monkey is most possible on the third level. Create combo blocks such that whenever the monkey touches the obstacle at the same time touching the apple, it goes back to the beginning of the level. When the monkey is touching the Apple and it is not touching the red obstacle then, say 'Game Over!' and stop everything.

   Note: Whenever the monkey jumps or moves he must be capable of changing to another costume.

Theory

1. Explain briefly how the following blocks are used in building a platform sprite:

   a) If () Then, Else

   b) Change X by ()

   c) If () Then

   d) Repeat ()

Suggested answers for remedial and extended activities
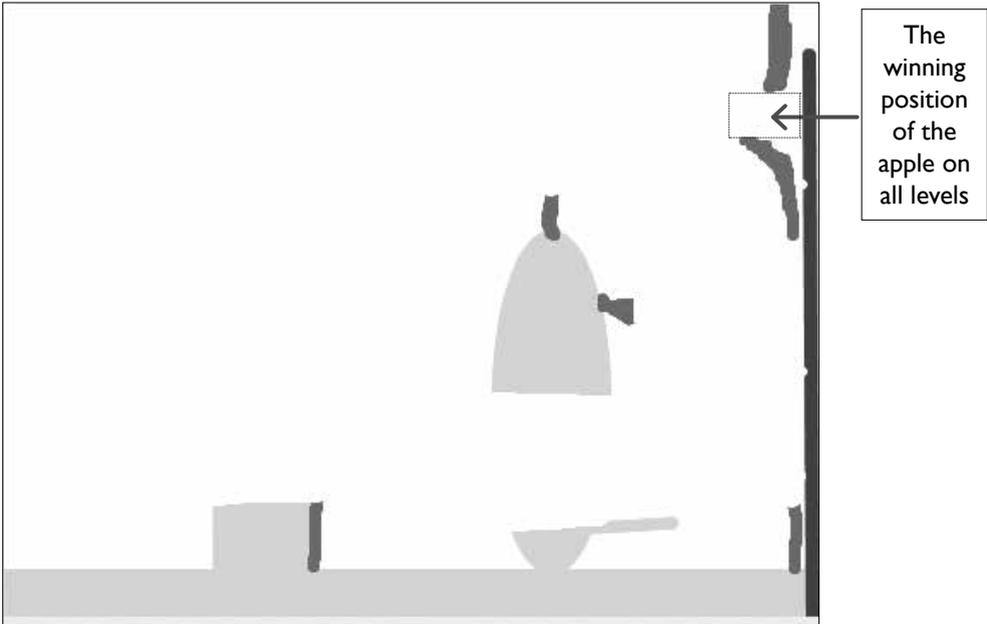
   a) The following backdrops below are the suggested three levels for the game called Funny monkey.
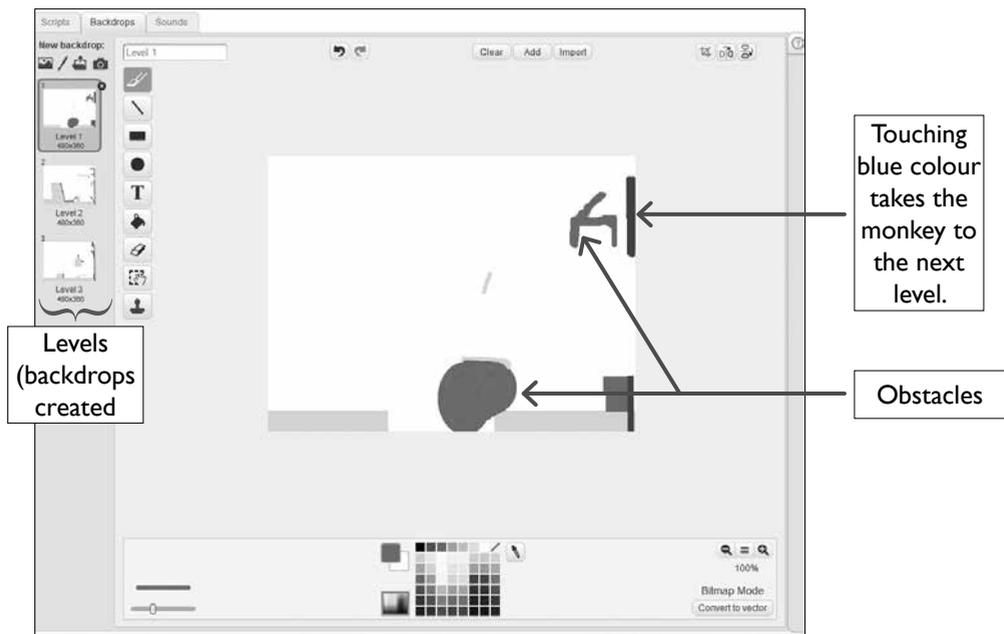
Picture 10.1: Level 1 background
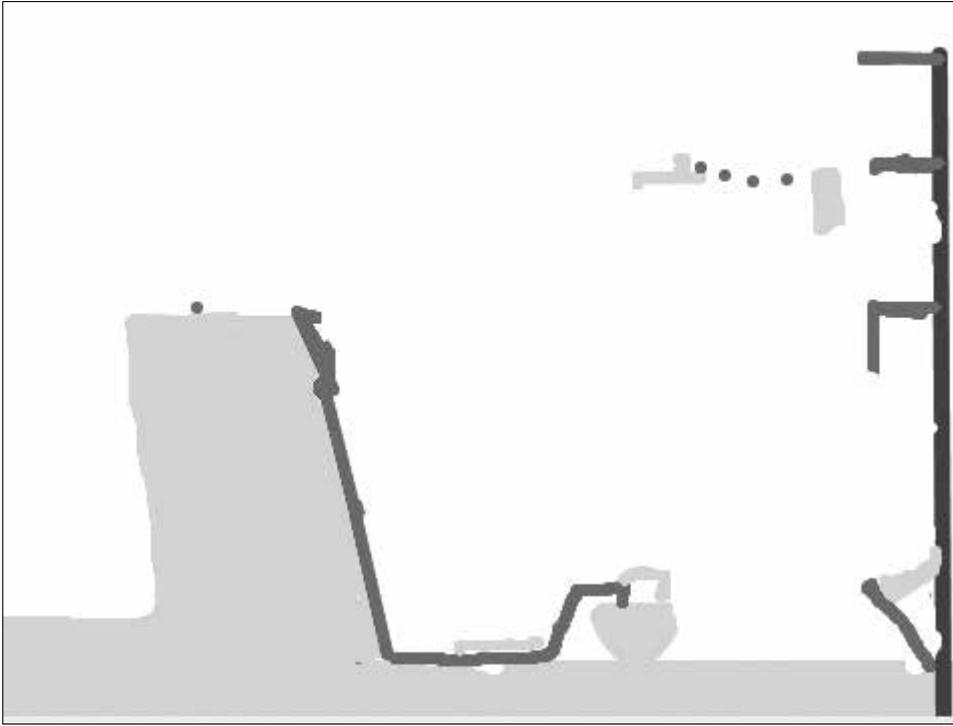
Picture 10.2: Level 2 background

The winning position of the apple on all levels

Picture 10.3: Level 3 background

b) The following scripts indicate that when the green flag is clicked, level 1 display, and when a broadcast message is received the next backdrop/level comes into play.

Block 1: Scripts for all background levels

c) (i) The appearance of level 1 backdrop when the monkey, the apple and two other sprites have been placed.
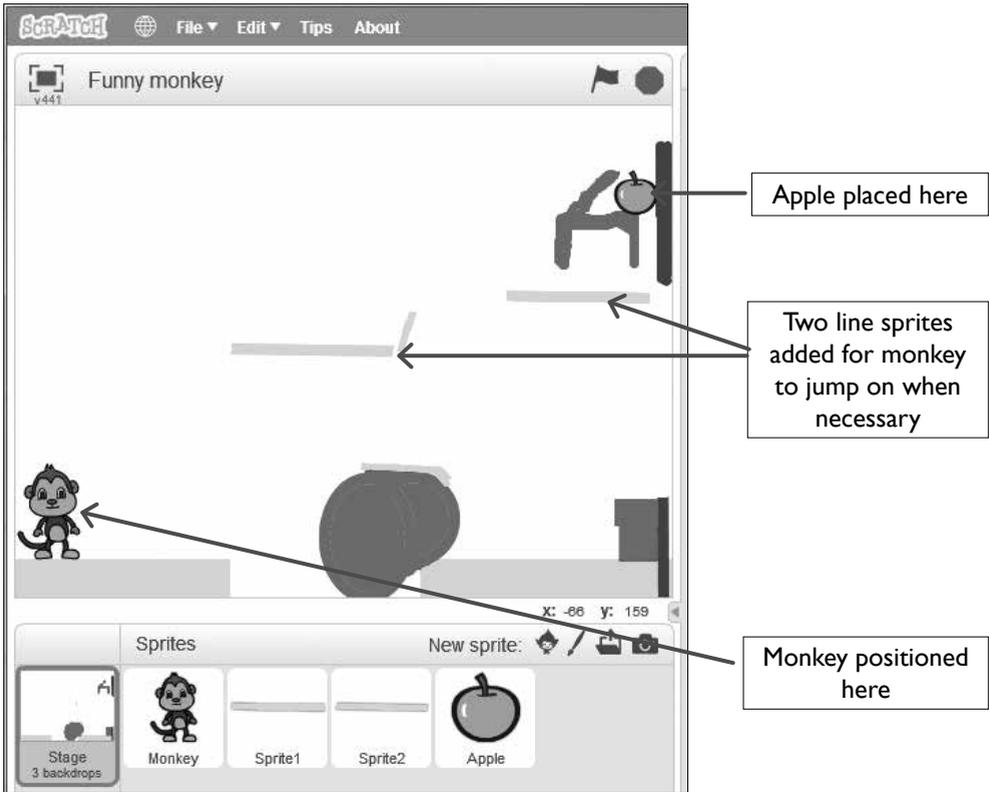
Picture 10.4: Monkey and apple have been introduced together with two other sprites in form of green lines

(ii)   We should first create a variable called X-velocity as shown below.
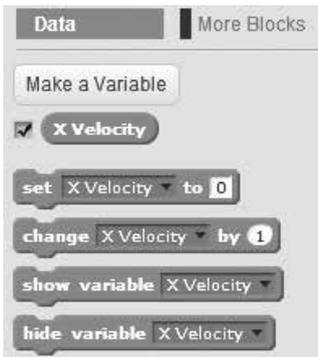
Picture 10.5: Data blocks for X velocity variable

Afterwards we then use some of x-velocity blocks that can (change x-velocity) move the monkey right/forward. Assuming that the monkey appears in a particular position each time the game starts, the following sprites will move the monkey right horizontally by X-velocity.


Monkey's initial position
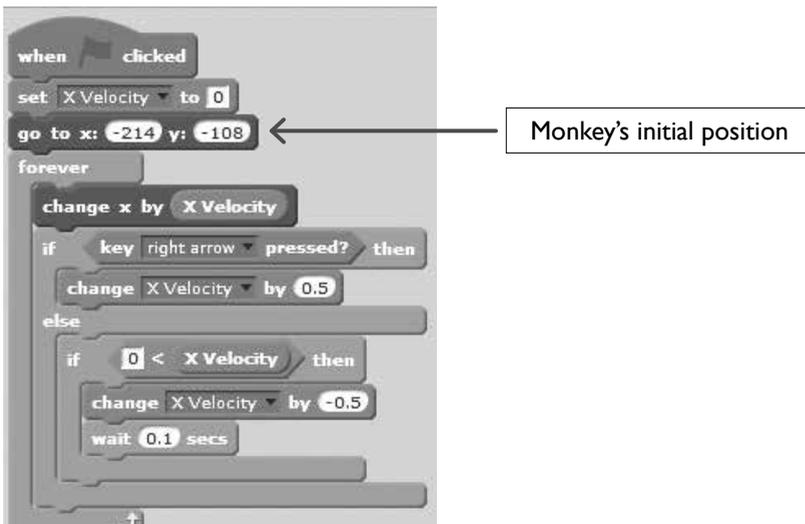
Block 2: Scripts will give the monkey motion to the right and if X-velocity is greater than 0, will change by 0.5

The scripts below will move the monkey sprite left/backward by x-velocity
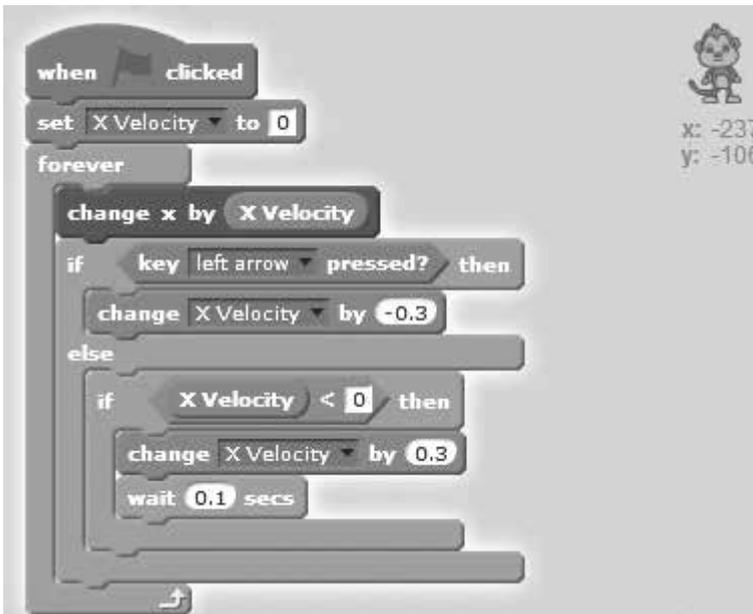
Block 3: These scripts will give motion to the monkey to the left by x-velocity and if x-velocity is less than 0, will change by 0.3

d) (i) The ability of monkey to jump shall be completed by Y-velocity, so we create Y-velocity.

Y velocity is created from Data block
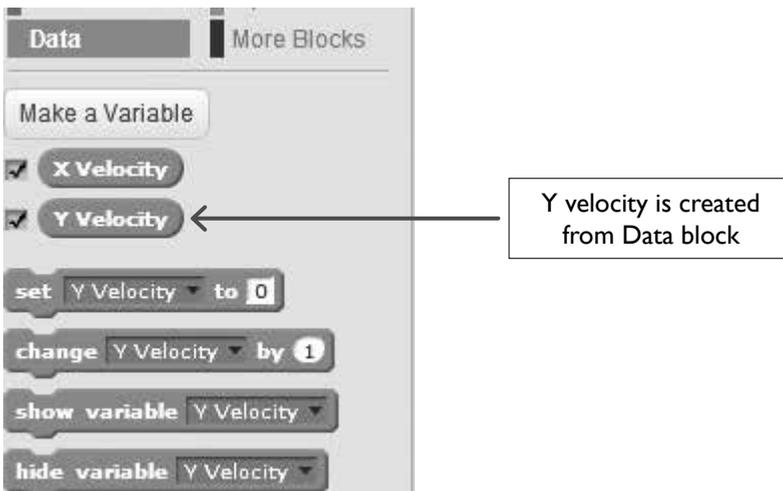
Picture 10.6: Data blocks for X and Y-variables

Two Script blocks for moving the monkey upwards to jump are set as shown below.

If the monkey is touching green and you press up arrow, velocity is set to 5 and Y is to change by Y velocity

If the monkey touches blue as it jumps a message is broadcasted for next level

Block 4: Scripts will make the monkey jump from green colour by 5 and vertical distance will change by Y-velocity.

These scripts will keep the monkey changing Y by small margins you set when touching green.

Block 5: If the monkey is touching green, velocity is set to 1 or else it is at -0.3

(ii) When up arrow is pressed the monkey will change costume and when it touches red colour it goes back to the beginning of the level in a specific position.
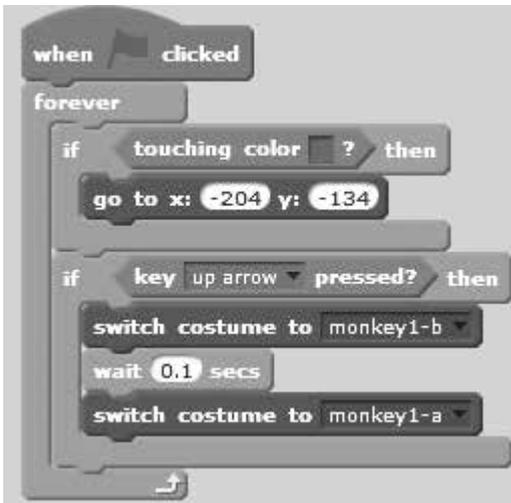
Block 6: If the monkey is touching red, it moves back to the beginning of the level as it jumps.

 e)   As the monkey is moved right or left, it will be able to change costume when appropriate keys are pressed.
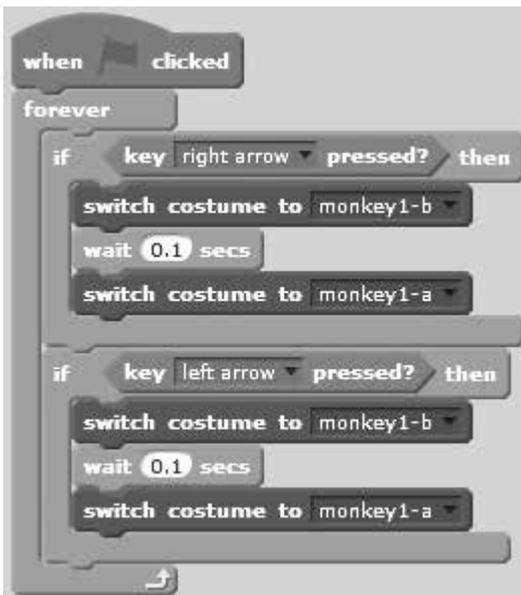
Block 7: The monkey can now change costume as it moves left or right

  f)   When the monkey is touching the apple and at the same time touching the red obstacle, it goes back to the beginning of the level but if it is touching the apple and not touching the red colour then the game ends (a win is registered and all scripts are stopped).

Block 8: Scripts that sets the monkey to register a win when the apple is touched

Note: You can add more levels to the game, but it is ready now for play. The appearance of the scratch window for this game is shown here below when everything is done.
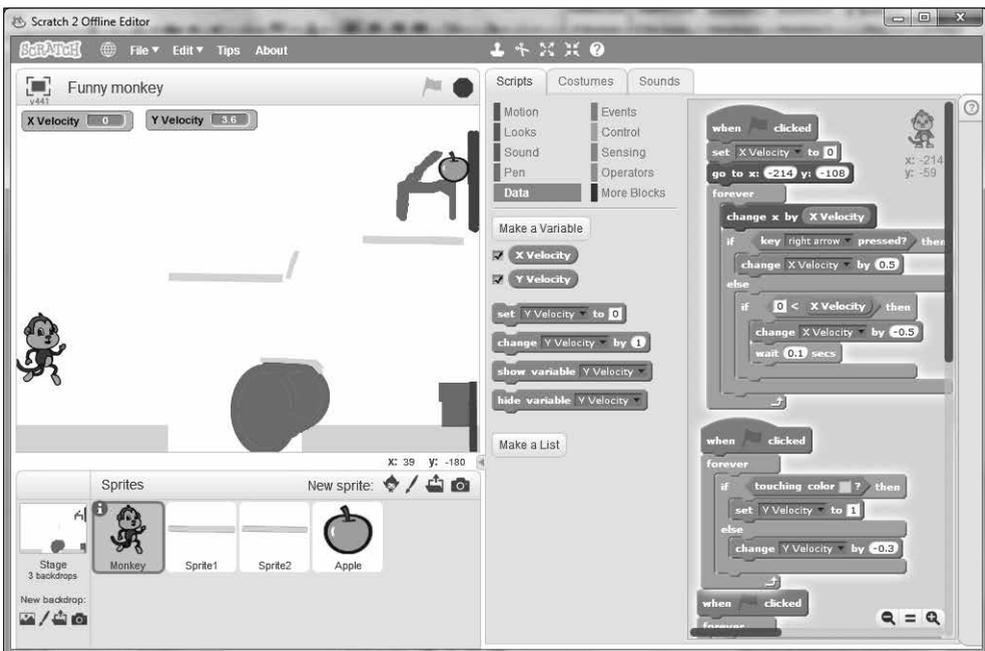
Picture 10.7: Funny monkey game with level 1 displayed and everything in its right position

2. There are many blocks that can be used to build interesting platform sprites and games among which are:

a) If () Then, Else :This block checks the condition so that if the condition is true, the blocks inside the first C will activate and if the condition is false, the blocks inside the second C will activate.

b) Change () by (): This script changes the specified variable by the amount.

c) If () Then: This block checks the condition so that if the condition is true, the blocks inside it (represented by brackets) will activate.

d) Repeat (): This is a loop that repeats the specified amount of times.

References

1. MINEDUC, (2013), Education Sector Strategic Plan, Kigali.

2. MINEDUC, (2014), ICT in Education Policy, Kigali: MINEDUC.

3. MYICT, (2011), National ICT strategy and plan NICI III-2015, Kigali.

4. National Curriculum Development Centre (NCDC), (2006), ICT syllabus for Lower Secondary Education, Kigali, Rwanda.

5. National Curriculum Development Centre (NCDC), (2011), ICT Syllabus for Upper Secondary, Kigali, Rwanda.

6. Curriculum Planning & Development Division, 2007, Computer Applications Syllabus Lower Secondary Normal (Technical), Singapore.

7. Niccola Perez, 2013, Secondary ICT, Moran Publishers Limited, Kenya.

8. Raymond Treier & Carmen Treuthardt Bieri& Michael Wuthrich & Martina Fortser, 2008, Geographic Information systems (GIS)-Basics and exercises for secondary education, MINEDUC, Kigali, Rwanda.

9. Free Online Learning at GCF Learn Free, Retrieved March 2014, http://www.gcflearnfree.org.

10. Information and communication technologies for development, Retrieved March 2014, http://en.wikipedia.org/wiki/Information_and_communication_technologies_for_development.

11. Scratch - Imagine, Program, Share, Retrieved July 2014, https://scratch.mit.edu/.