ICT

FOR TTCs

YEAR ONE

STUDENT'S BOOK

Options: SME, SSE, ECLPE, LE

FOREWORD

Dear Student Teacher,

Rwanda Basic Education Board is honored to present Year One ICT Student Teacher's book which serves as a guide to competence-based teaching and learning to ensure consistency and coherence in the learning of the ICT subject. The Rwandan educational philosophy is to ensure that learners achieve full potential at every level of education which will prepare them to be well integrated in society and exploit employment opportunities.

In line with efforts to improve the quality of education, the government of Rwanda emphasizes the importance of aligning teaching and learning materials with the syllabus to facilitate your learning process. Many factors influence what you learn, how well you learn and the competences acquired. Those factors include the relevance of the specific content, the quality of tutor's pedagogical approaches, the assessment strategies and the instructional materials available. We paid special attention to the activities that facilitate the learning process in which learners can develop ideas and make new discoveries during concrete activities carried out individually or with peers. With the help of the tutor, you will gain appropriate skills and be able to apply what you have learnt in real life situations. Hence, you will be able to develop certain values and attitudes allowing you to make a difference not only to your own life but also to the nation.

This is in contrast to traditional learning theories which view learning mainly as a process of acquiring knowledge from the more knowledgeable who is mostly the teacher. In competence-based curriculum, learning is considered as a process of active building and developing of knowledge and understanding, skills and values and attitude by the learner where concepts are mainly introduced by an activity, situation or scenario that helps the learner to construct knowledge, develop skills and acquire positive attitudes and values.

In addition, such active learning engages you in doing and thinking about what you are doing and you are encouraged to bring your own real experiences and knowledge into the learning processes. In this view, your role is to:

- Develop knowledge and skills by working on given activities which lead to the content;

- Communicate and share relevant information with other learners through presentation, discussion, group work and other active learning techniques such as role play, case studies, investigation and research in the library on internet or outside;

- Participate to and take responsibility for your own learning;

- Carry out research/investigation by consulting printed /online documents and resourceful people, and present your findings;

- Ensure the effective contribution of each group member in assigned tasks through clear explanations and arguments, critical thinking, responsibility and confidence in public speaking;

- Draw conclusions based on the findings from the learning activities.

I wish to sincerely extend my appreciation to the people who contributed towards the development of this book, particularly REB staff who organized the whole process from its inception. Special appreciation goes to the teachers who supported the exercise. Any comment or contribution would be welcome to the improvement of this textbook for the next versions.

Dr. MBARUSHIMANA Nelson

Director General, REB

ACKNOWLEDGMENT

I wish to express my appreciation to the people who played a major role in the development of this book. It would not have been successful without active participation of different education stakeholders.

I owe gratitude to different universities and schools in Rwanda that allowed their staff to work with REB in the development of this book through the in-house textbooks production initiative. I wish to extend my sincere gratitude to lecturers and teachers whose efforts during writing exercise of this book was very much valuable.

Finally, my word of gratitude goes to the Rwanda Basic Education Board staff who were involved in the whole process of writing this book.

Joan Murungi

Head of CTLR

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Key Unit competence

Identify different features of XO laptop and use them

Introductory Activity

1. 1.   Kamanzi wanted to write a letter to his parents and asked the school head teacher to lend him a computer. The head teacher lent him an XO laptop. Kamanzi complained that since he has never used an XO laptop he is not going to be able to use it as the keyboard may have different keys than an ordinary computer and the text processing program may also be different.

   a. Give the roles of the keys which are specific to an XO laptop that Kamanzi will have to know before using his borrowed XO laptop

   b. Give examples of application programs found in an XO laptop that are very similar to office programs

2. Open XO laptop programs that are used in programming and describe what you can do with each of those programs

The microcomputer type of computers consists of many types of computer namely desktop computers and laptop computers but there is an extra type which is the laptops intended to be used by children called an XO laptop. Like other computers, the parts of an Xo laptop are the hardware and the software parts. The look of the hardware may be different from a conventional computers and the softwares are also different but it is a computer in the bigger sense of the term.

1.1. The keyboard keys touchpad

1) You are already familiar with the keyboards of laptops and desktop computers.

    a) observe the keys that are on the keyboard of xo laptop, identify the function of each key

    b) What are the keys that are on the XO laptop computer keyboard that cannot be found on a keyboard of a desktop computer?

    c) What is the similarities between a laptop touchpad and a mouse?

An Xo laptop hardware has different parts comprising of an input unit, an output unit and the processing unit. Among the parts that constitute the input unit are the keyboard and the touchpad.

A. Keyboard

The keyboard is the part of a computer whose role is to receive keystrokes as text, characters and other commands into a computer or any other similar device. The figure below shows an XO laptop keyboard
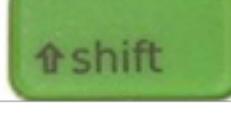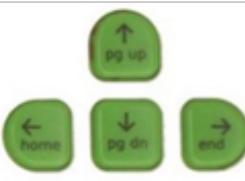
Figure 1. 1. XO laptop keyboard

The keyboard above has different keys consisting of special keys, text keys, number keys

A.1. Special keyboard keys

Here is a list of special keys found on an XO laptop keyboard and their roles functions:

SN	Key name	Key image and name	Key function
1	Escape Key		The escape key is used in combination with the control key(ctrl + esc) to quit the current activities
2	Tab Key		This key is used in combination with the Shift and Alt keys to display open Activities. Holding the Alt and Tab keys will display the running activities one after another
3	Control Key	◆ctrl	The control key is used in combination with other keys to carry out some activities which are otherwise done using the program's menu. For example in Abiword, ctrl + c copies text while Ctrl + V pastes it.
4	Shift Key	⇧shift	The shift key is used in combination with other keys so as to shift between lowercase and uppercase in Latin-based alphabets.
5	Fn Key	fn	The function key to activate the second function on a key with dual purpose key
6	Alt Key	◇alt	This key is used with other keys to alter the other key's command.

7	Space bar		It provides a space between letters and words.
	Alt Gr Key		The alt graphics key is used in combination with other keys as a modifier, most commonly to select an alternative letter or generate an accented character
8	Grab key		It turns the trackpad into a scrolling device
9	Arrow keys		These are used for screen navigation for page up, page down, home, and end of the page.
10	Enter Key		It starts a new paragraph in a document.
11	Erase Key		The erase key deletes the character behind the cursor (Backspace). fn + erase deletes the character in front of (or on) the cursor.
12	Frame Key		The Frame key toggles the presence of the Frame on the screen. The Frame is the black border around the screen that holds the Activity taskbar, clipboard, wireless connections, battery level, and so on.

13	Volume Control Key		This key lowers or raises the audio level.
14	Brightness Control Key		This key increases or decreases the brightness of the screen backlight.
15	View Keys		This key takes the user to the Neighborhood view, the Group view, the Home view, and the Activity view
16	Search Key		This key brings the Journal window and places the text cursor in the search box

Table 1. 1. XO Laptop special keyboard keys

Note: Most of the special keys above are similar to those found on ordinary laptops and desktop computers keyboards.

A.2. Shortcut keys

Using XO laptop keyboard keys one can perform a task very quickly instead of going to the corresponding menu of a given program. For example while in Spreadsheet one can copy text in another location by clicking on edit then Copy and choose the location where to put the text then choose past, using a shortcut key this can be done by simply holding down Ctlr+C (Copy) and going to the appropriate location and choose Ctlr+V (Paste). Shortcuts on XO laptops start with either one of these keys: **Ctlr, Alt, Shift, Fn**

B. Touchpad

A touchpad is an input device on laptops or some keyboards that is used to move the cursor using a finger in place of a mouse. As a computer user moves the finger on the touchpad, the cursor also gets moved.

Like mice, a touchpad has two buttons, one on the left and another on the right. Those buttons play the role of the left and right buttons of a mouse.
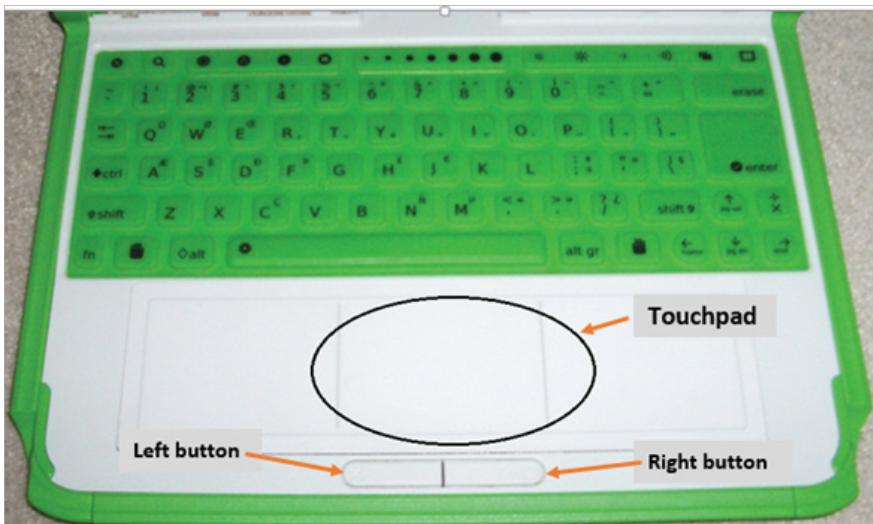
Figure 1. 2. XO laptop touchpad

Application activity 1.1

1. Using an XO laptop verify the use of different special keys where possible
2. Give at least 20 examples of shortcut keys that can be used with XO laptop

1.2. Brief introduction to different XO laptop interfaces

ACTIVITY 1.2:

1. Open your XO laptop and switch from Sugar to Gnome interface and from Gnome to Sugar interface
2. Describe each interface you have opened

In the world of computers, an interface is a boundary between two or more components of a computer system. The computer system components can be software, hardware, peripheral devices and humans. An interface between a computer and a human is a **Human Computer Interface**. For a human to use an XO laptop the available interfaces are **Sugar** and **Gnome**

1.2.1. Sugar interface

Sugar is the interface that appears when an XO laptop is started. It has different options which are presented as icons or activities such as Turtle art,

Browser, scratch, etc. In Sugar interface, everything is saved automatically in *Journal.* To access the data, a user will need to open the ***Journal Activity.***

When in the Sugar interface the first to appear is the **Home View**. The Home View has several modes. Each mode has a different arrangement of Activities like the Ring mode in which favorite Activitiesare presentedin a ring, the Freeform mode in which favorite Activities are arranged in freeform and a List view mode in which the installed Activities are presented in a list.
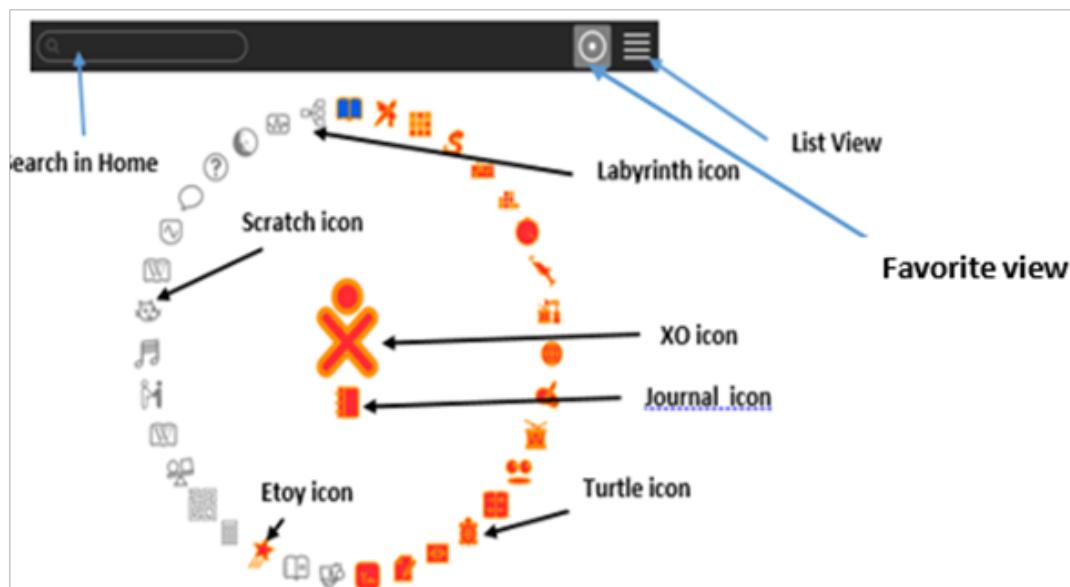
Figure 1. 3.The Sugar interface main window with activities icons

A.1. The journal

Journal is not an interface like Sugar but is one of the available options when one is on the Sugar interface. Journal is like an XO laptop storage as whatever activity is done on the computer, it is saved in this location. For this reason, it is good to delete some unwanted content of the Journal so as to liberate space and make the XO laptop not so slow.

The Journal activity is an automated diary of everything done with an XO laptop. The Journal can be used to organize work or revisit a past project. Teachers and parents can use it to assess a child's progress.
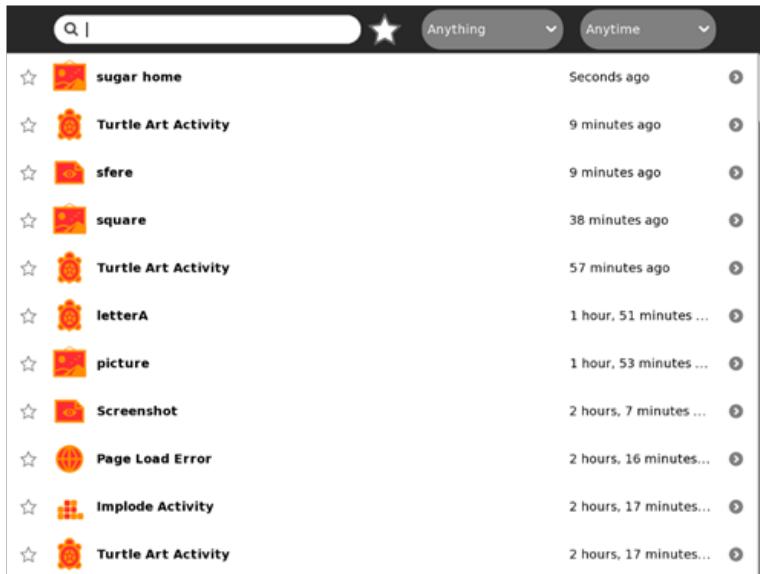
Figure 1. 4. The Journal window

The Journal application presents items in a list view. Items can be arranged in order of time or any other order chosen by the user.

1.2.2. Gnome interface

Gnome is another interface which is available in an XO laptop. It is an interface through which one can have access to a number of programs like Abiword, Spreadsheet,

In order to go in Gnome user interface while in Sugar go through these steps:

Click on **my settings,**
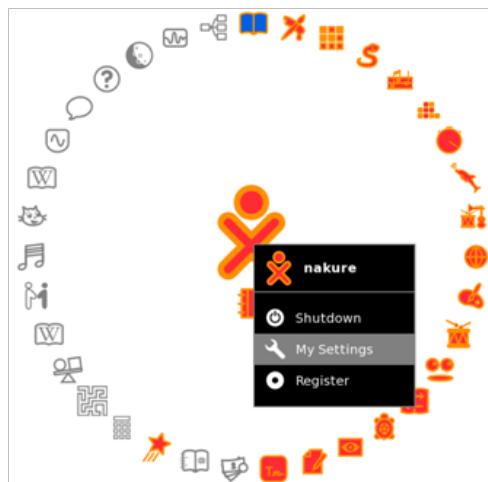
Figure 1. 5. The My Setting option of the Sugar interface

Once My Setting is clicked on choose Switch Desktop in the window that will appear
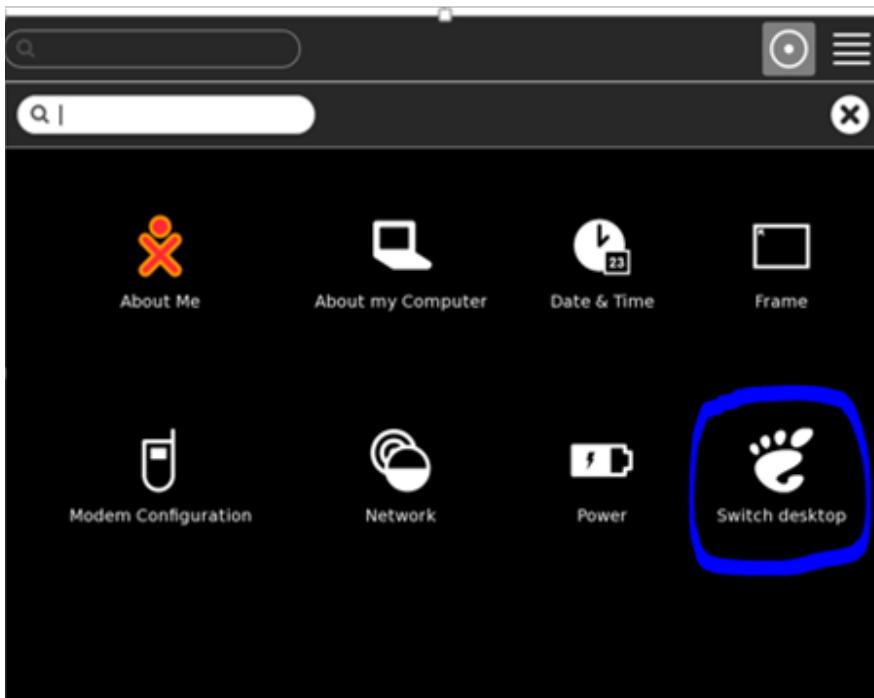
Figure 1. 6. My Setting main options

After clicking on **Switch Desktop**, click on **Switch to GNOME** on the window below that will appear:
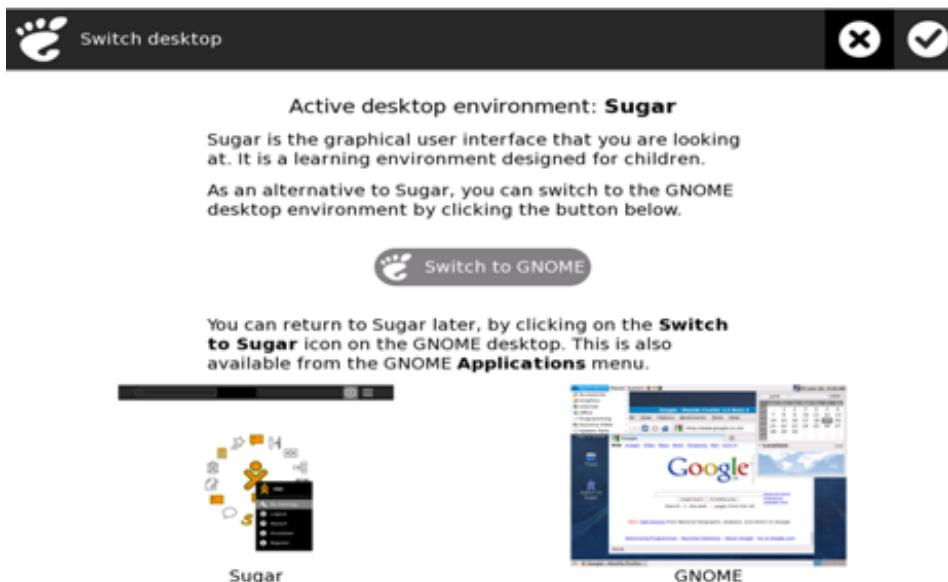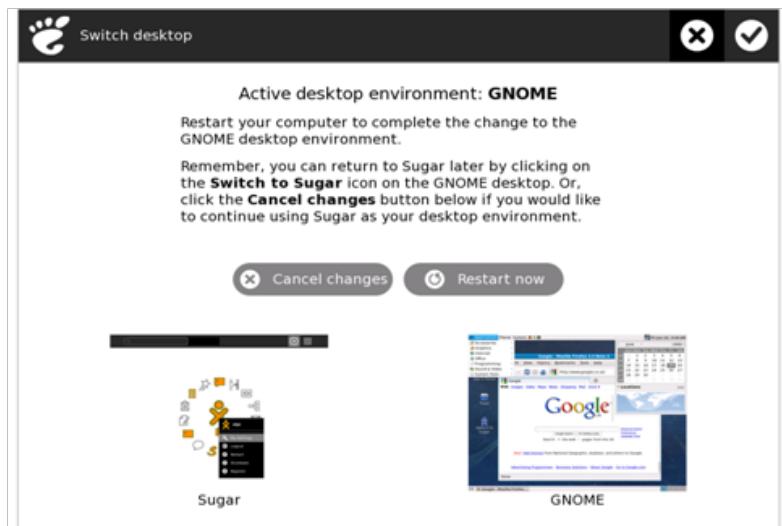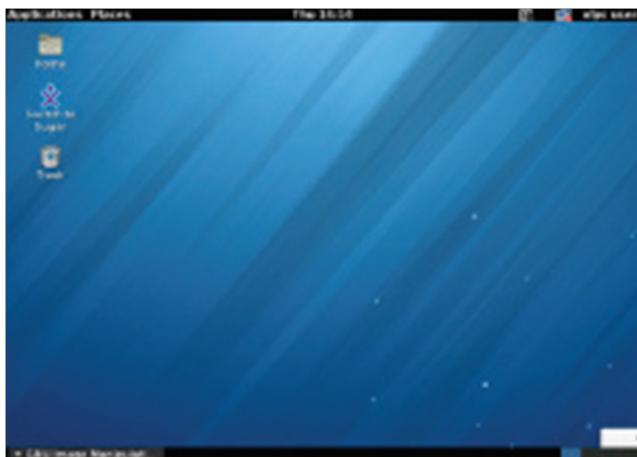
Figure 1. 7. Switch to GNOME window

*Click on **Restart Now***

Figure 1. 8. Switch Desktop window with Restart Now option

The Gnome interface that will appear after restarting will look like in the image below:

Figure 1. 9. The Gnome interface main window

Once in the Gnome interface, a user can switch back to Sugar interface by clicking on **Applications**, then **System Tools** then go to **Switch to Sugar** the choose **ok** on the **Switch Desktop** window.

Application activity 1.2

1. Using an XO laptop open the Sugar interface and start the Write activity to write your curriculum vitae (CV)

1.3. Abiword window

1. Using the knowledge you have on Microsoft Office Word, open Abiword and identify its different menu

2. Write a small paragraph of three lines on your school and save it

Abiword is a word processing program which has basic word processing features such as list, indents and character formats, and more sophisticated features like tables, styles, page headers and footers, footnotes, templates, multiple views, page columns, spellchecking, and grammar checking, etc.

A. Starting Abiword

To start Abiword go through these steps:

- Go in the Gnome interface
- Go to applications,
- In the drop down list that will appears choose and click on Office,
- Choose and click on Abiword. The window below will pop up:

Figure 1. 10. Application Places window from where to start Abiword
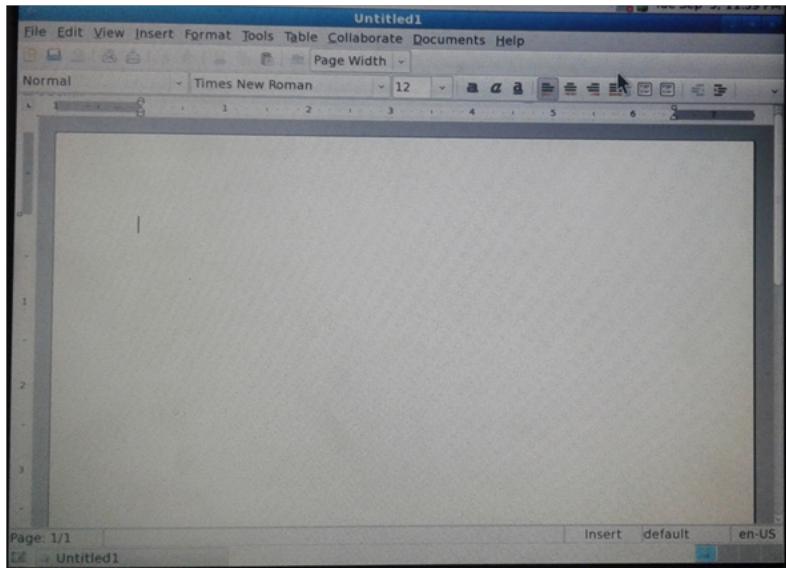
Figure 1. 11. AbiWord main window

B.   Opening, saving and renaming an Abiword document

B.1. Opening a document

To open an Abiword go through these steps:

- Click on the Open option available under the File menu,
- Browse in the files/folders in order to choose which Abiword file to open. The Abiword document to open has to have a .doc document
- Double click the located file to open it

B.2. Saving a document

Once an AbiWord user has written text in the Abiword main window, there is a need to save so that the text written does not get lost once the XO laptop is switched off.

To save an Abiword document do the following:

- Click the *File* menu
- Select '*Save As*' option or click on the *Save* icon,
- Write the file name
- Choose the folder in where to save the file
- Then choose the file extention which is by default an AbiWord extension (. abw; zabw; abw.gz) and click *Save*
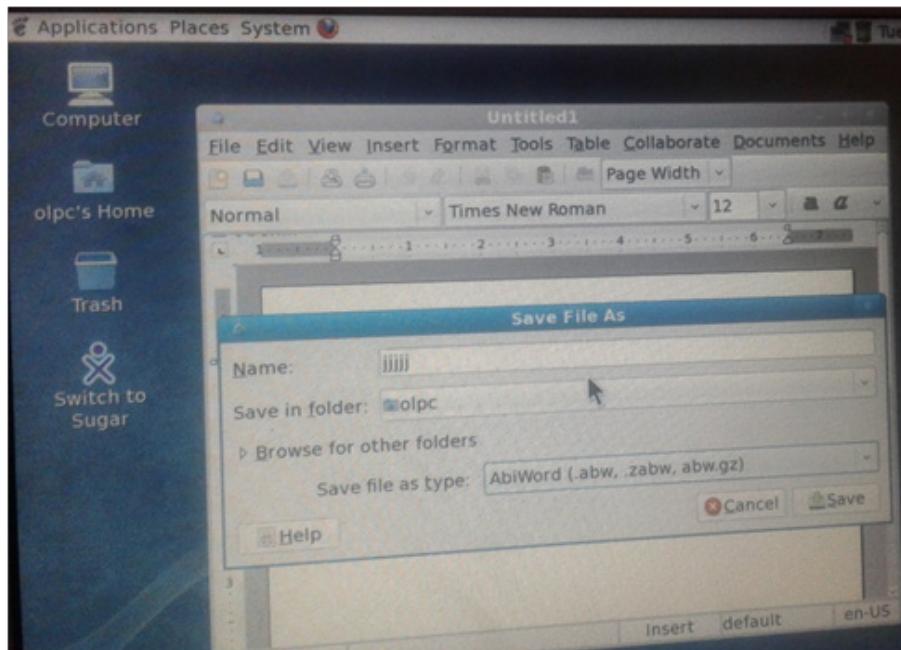
Figure 1. 12. Window for saving a file in AbiWord

B.3. Renaming a document

Renaming a file requires first to locate it and once it is located select it then do a **Right Click** and choose **Rename** in the drop down list that will appear. Write the new name of the file and press the **Enter Key.**

Application activity 1.3

1) Open Abiword program and write an essay on the history of XO laptops and save it under your name on the desktop

1.4. Programming for children

1.4.1. Turtle Art

ACTIVITY 1.4:

Write a Turtle Art program to draw:

    a. A rectangle

    b. A pentagon

    c. Letter B

Turtle Art is a program found in an XO laptop with which one can draw colorful artwork by dragging and dropping programming blocks which fit into one another in order to create a Turtle Art program. The artwork or shapes are drawn by repeating instructions and conditionals following instructions.

To open Turtle Go to home page of the Sugar interface and click on turtle art icon ![icon] then select it and click on Start or start new. The Turtle Art main window will appear
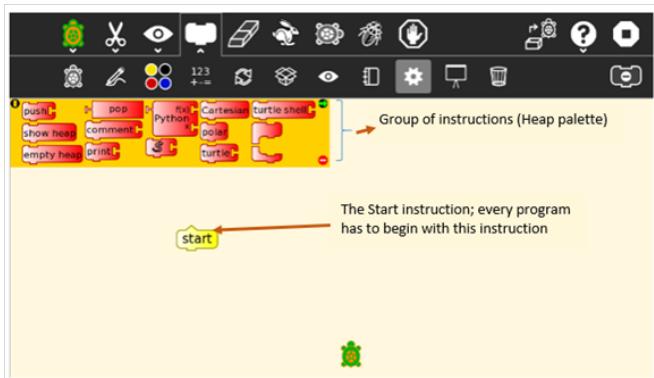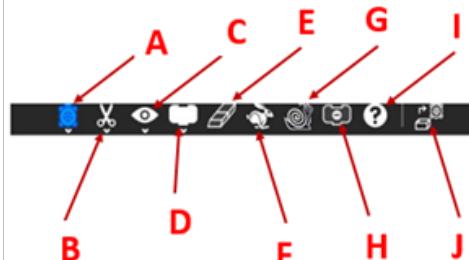
Figure 1. 13. Turtle Art main window

A.   Elements of turtle art window

The turtle Art environment has got different tools including toolbars, palettes,

A.1. Turtle Art Tool bars:

This has all the tools that a Turtle Art programmer uses in order to assemble instructions which create an Art program.

Figure 1. 14. Turtle Art toolbars

Name of each toolbar

A: Turtle block activity, **B**: Edit toolbar, **C**: View toolbar, **D**: Palette toolbar, **E**: Clean canvas, **F**: run project fast (rabbit), **G**: run project slow (snail), **G**: hide blocks (This button is replaced by the stop button when the project is running), **I**: help, **J**: load examples;

When each of the toolbars is clicked on, a number of available instructions is displayed. The programmer will choose one or another instruction depending on what is to be produced as an output of the program.

A.2. Turtle Art palettes

There is a number of palettes used for program construction. Programming in Turtle involves adding blocks to a program by dragging an instruction from the palette to the main area. Blocks can also be deleted by being dragged back to the palette. The main principle is that the program blocks have to fit into one another.

The main palettes found in the Turtle Art are displayed on the image below:
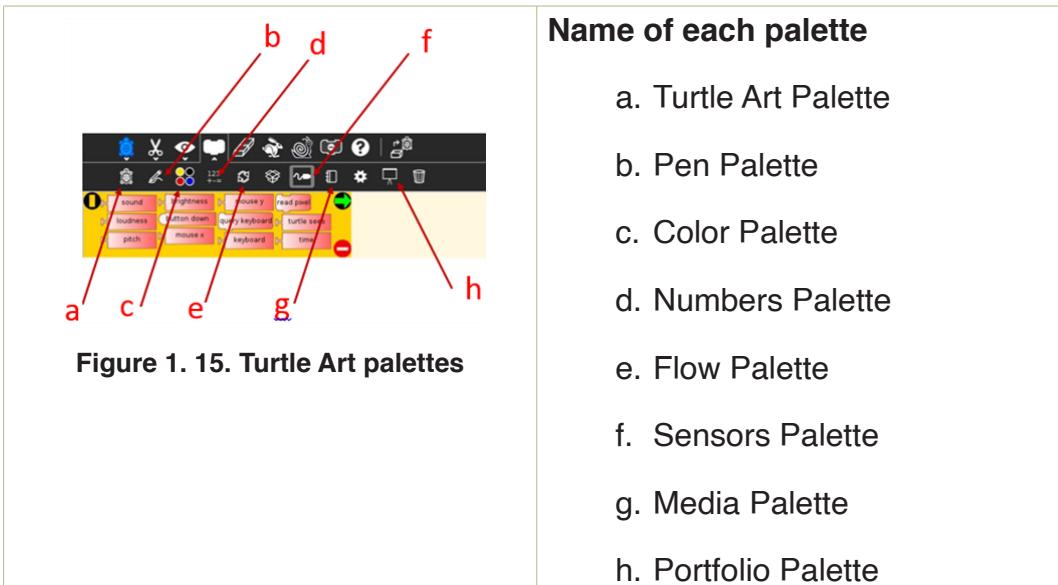
Figure 1. 15. Turtle Art palettes

Name of each palette

    a. Turtle Art Palette

    b. Pen Palette

    c. Color Palette

    d. Numbers Palette

    e. Flow Palette

    f. Sensors Palette

    g. Media Palette

    h. Portfolio Palette

A.2.1. Instructions available for each palette

#	Palette name	Available instructions
1	Turtle Art Palette	They are used to control the movements of the turtle. Those are: Forward, Back, Clean, Pen Down, Left, Right, Arc, Set xy, Seth, Xcor, Ycor, Heading.
2	Pen Palette	It is used to write or draw and control the attributes of the turtle's pen. Those are: Pen Up, Pen Down, Set Pen Size, Fill Screen, Pen Size, Set Color, Set Shade, Set Gray, Color, Shade, Gray.
3	Color Palette	It is used with the set-pen-color block. The available colors are: Red, Orange, Yellow, Green, Cyan, Blue, Purple, White, Black

4	Numbers Palette	It is used to write numbers in the Turtle Art program. It has arithmetic and Boolean operators. Those are: Addition, Subtraction, Multiplication, Division, Identity, Modulo, Square Root, Random Number, Number Block: Greater Than, Less Than, Equal To, Not, And, Or.
5	Flow Palette	This controls the program flow. The instructions are: Wait, Forever, Repeat, If/Then, If/Then/Else, Vertical Spacer, Stop Action, While, Until
6	Sensors Palette	Query Keyboard, Keyboard, Read Pixel, Turtle Sees, Time, Sound, Loudness, Pitch, Brightness, Button down, Mouse x, Mouse y.
7	Media Palette	Journal, Audio, Video, Description, Text, Show, Set Scale, Save Picture, Save SVG, Scale, Media Wait, Media Stop, Media Pause, Media Resume, Speak, Sine Wave,
8	Portfolio Palette	Hide Blocks, Show Blocks, Full Screen,List Slide,Picture Slides, Left,Top, Right, Bottom,Width, Height

B.   Example of different instruction use in Turtle Art programs

1.A program to draw a Square

A square is a geometric shape with four sides of equal size and four angles of equal size. The window below shows program blocks and output for a program to draw a square.
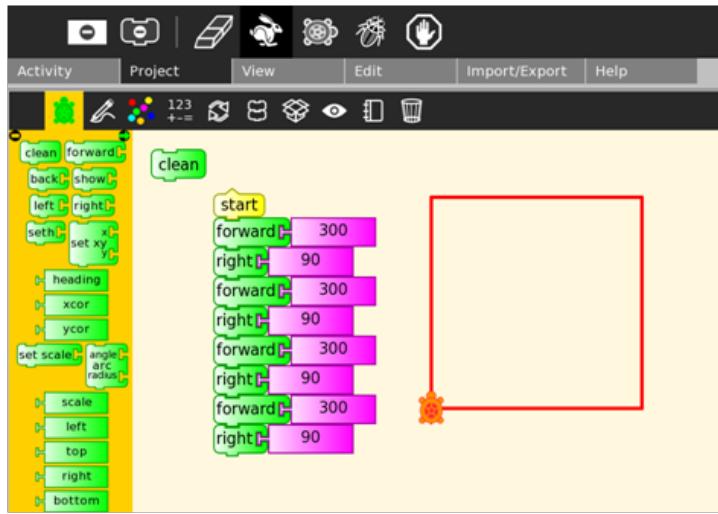
Figure 1. 16. Program to draw a Square

Program interpretation

- The program starts with the Start instruction symbolizing the beginning of the program

- The forward command that follows instructs the turtle to move for a specified distance (300)

- The Right command instructs the Turtle to turn right by 90 degree

- The two instructions are repeated four times to draw the four lines

The program in the screenshot above can be rewritten by using Flow Palette instructions to remove instruction repetition
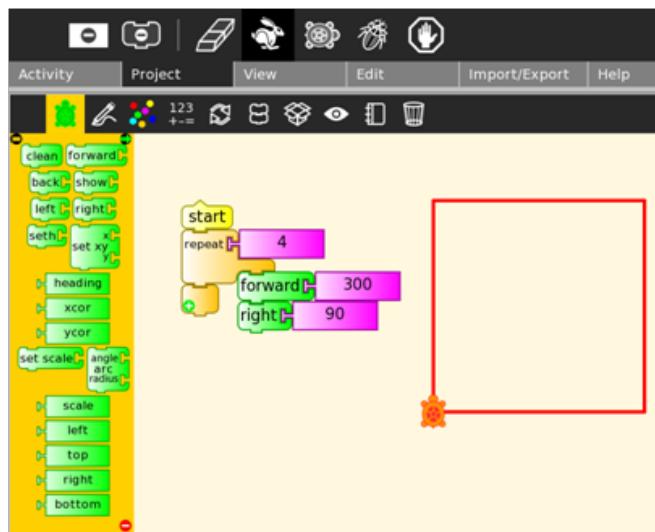
Figure 1. 17. Square program with Flow Palette instructions

2. A program to draw letter A

The screenshot below contains program blocks and its output which is letter A. Blocks have been assembled by dragging them from the palette. Blocks that can work together have gaps that can fit into one another. Blocks from the same palette are of the same color.

Figure 1. 18. Program to draw letter A

Program interpretation

- The program starts by cleaning everything

- Then the screen is filled with a light blue color by the use of Fill Screen command

- The line to be drawn is made to have a bigger size by the Set Pen Size command which is set at 10. The Set Color command changes the line's color

- The Turtle start drawing under the instruction of the Forward command which instructs the Turtle to move by a distance specified in its arguments

- The Arc command will create part of a circle by specifying the angle size and the radius of the circle. After drawing this circle, the turtle will move forward as instructed by the Forward command that follow the arc command

- The Pen Up will pick up the pen so as not to continue to draw

- The back command will make the turtle return using the same route. As

the pen is already up nothing will be drawn
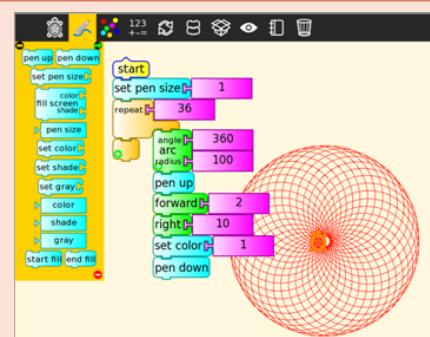
- The pen down will make the pen ready for drawing. This is followed by the right command which will to make the turtle turn to the right with an 90 degree angle

- The Forward command will then draw the horizontal line found in the letter A

Note: For Turtle to draw and shape on the screen the pen needs to be down by using the Pen Down instruction block. The Turtle Art pen may be not down as a result to the previously run program which made the pen up

Application activity 1.4

1. Using Turtle Art program write a program

a. To create a star on a green background

b. To write your name

2.

Write the same program as in the screenshot below and run it. What is the output? Interpret this program on how the Turtle will proceed to draw the output

1.4.2. Scratch

ACTIVITY 1.5:

1. Start Scratch program by clicking on its icon located on the Sugar interface, open two preexisting examples and execute them

a. Summarize your observation on the program you have opened

b. Referring to the observed examples explain the role of Scratch and what one can do with it

A. Starting Scratch

Scratch is a block-based visual programming language and online community targeted primarily at children.

To start Scratch go to the Sugar interface and click on the Scratch icon 🐱 then choose Start new (or Start) or just click on the Scratch icon. The window below will appear as the Scratch home page:
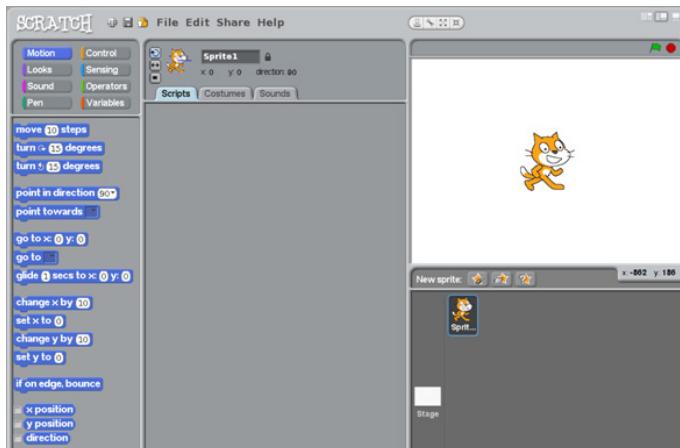
Figure 1. 19. Scratch main Window

The Scratch interface has three main sections: a stage area, blocks palette, and a coding area to place and arrange the blocks into runnable scripts. The Scratch main window has these menu: **Motion, Control, Looks Sensing, Sound Operators, Pen, Variables.**

SN	Section of the Block	Description
1	Motion	Moves sprites, changes angles and changes X and Y values.
2	Looks	Controls the visuals of the sprite; attach speech or thought bubble, change of background, enlarge or shrink change transparency and shade
3	Sound	Plays audio files and programmable sequences
4	Pen	Draw on the canvas by controlling pen width, color, and shade. Allows for turtle graphics.
5	Control	Conditional if-else statement, "forever", "repeat", and "stop", etc
6	Sensing	Sprites can interact with the surroundings the user has created

7	Operators	Mathematical operators, random number generator, and-or statement that compares sprite positions
8	Variables	Variable and List usage and assignment

An open program can be edited using the three main options to name **Scripts** which is used to write instructions, **Costume** used to choose a Sprite or an image to use in a program and Sound for adding sound to be played while the program is being executed.

B. Object animations

Objects are animated using programs that are created by dragging and putting together program blocks while in the Script area. Before animating an object first it is chosen as a costume. The common costume is Sprite but this can be replaced by a custom made costume.

To choose a costume while in the scratch program Click on **Costume**, then **Import** and browse folders for the new image to use as a costume. When the programmer wants to have many images that will follow each other as they are being played, it will be necessary to click on Import and browse for those images many times
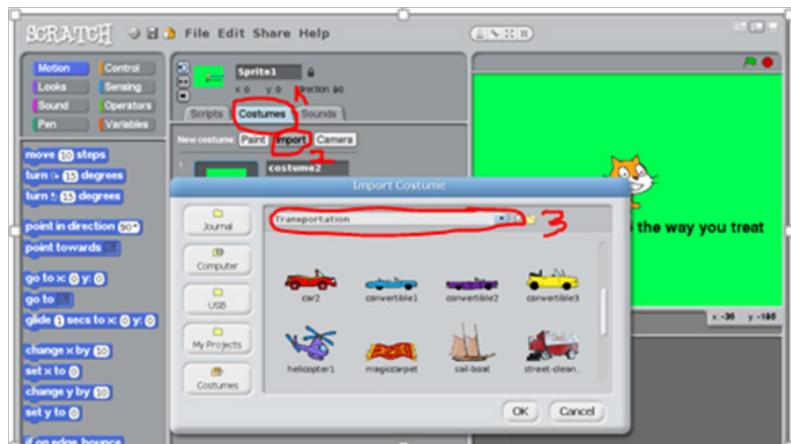
Figure 1. 20.Illustration of steps for choosing a costume image

A chosen image can be edited in the paint editor or copied so as to have many same costumes.

A sound can be added to the image by clicking on the Sound menu then Import and again browse the different sound available in the XO laptop this sound can also be recorded by clicking on the Record menu next to the Import menu. The window for importing sounds is much like the one above.

The table below shows the different options available with costumes and sound

Menu window	Explanations on different options
 Costume options	The costume options are: • **Paint:** the costume/image can be drawn from or edit an existing image • **Import:** a costume can be taken from an the XO memory or external memory like a flash disk • **Camera:** a direct picture can be taken using the computer camera and used as a costume
 Sound options	Options for sound are: • **Record:** the sound is directly recorded using the XO laptop • **Import:** the sound is taken from the many sounds that are available in an XO laptop

Example1:

Consider a scenario in which we want to have an aeroplane in the air which is in motion and making the usual aeroplane noise and when this aeroplane is clicked on it changes the direction by 30 degree.

Step 1: choose the costume by clicking on **Costume** then choose the **Import** option then browse for an aeroplane image

Step 2: Choose the sound to be produced by the aeroplane in motion preferably choose an aeroplane sound. To do this go to **Sound** click on **Import**

Step 3: now that the costume and sound have been chosen, arrange code blocks depending on what is expected as an output from the program. In this case simply the aeroplane will move and will produce aeroplane sound.
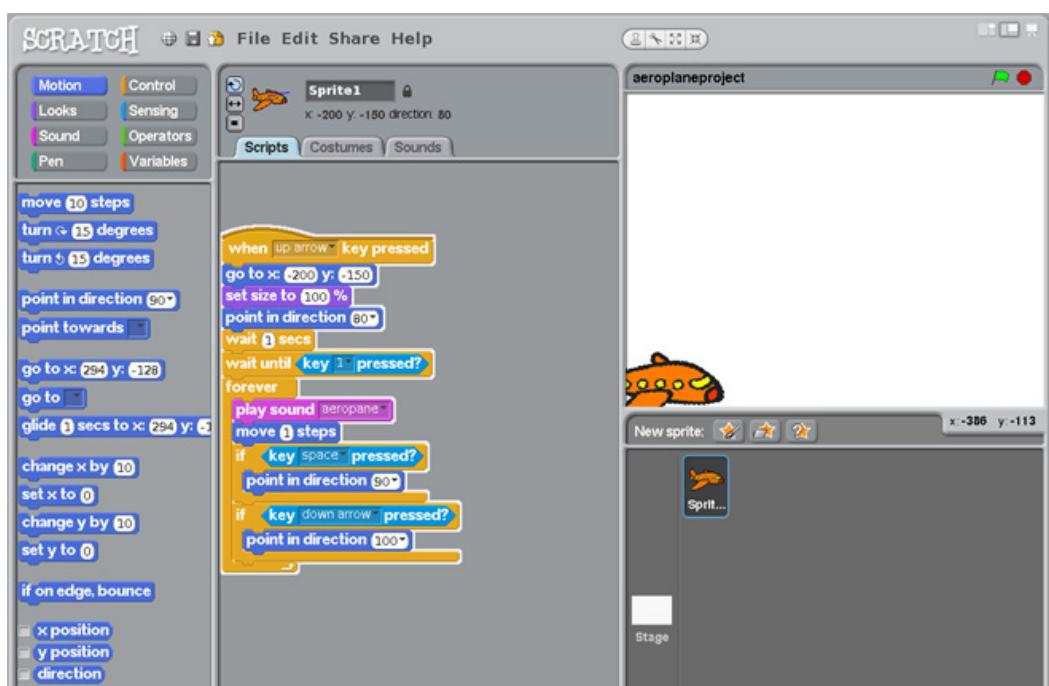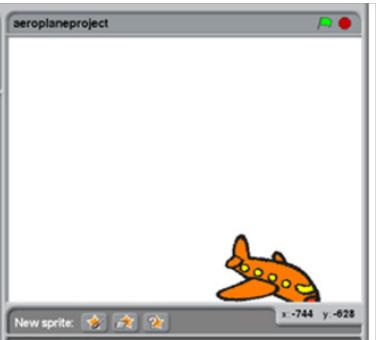
Figure 1. 21. Scratch program to animate an aeroplane

Program interpretation:

- The program above is ready to be executed after the up arrow key is hit and the plane moves to the specified coordinates (x=-200, y=-150).

- The plane gets inclined at 80 degrees and waits for the "1" key to be hit after at least one second. When "1" keys is hit the plane ascends

- The plane roars (plays sound) and move forward

- The plane is inclined at an angle of 90 degree as the space key gets hit

- Now that the Down Arrow is hit, the plane gets an inclination of 100 (descent-landing)
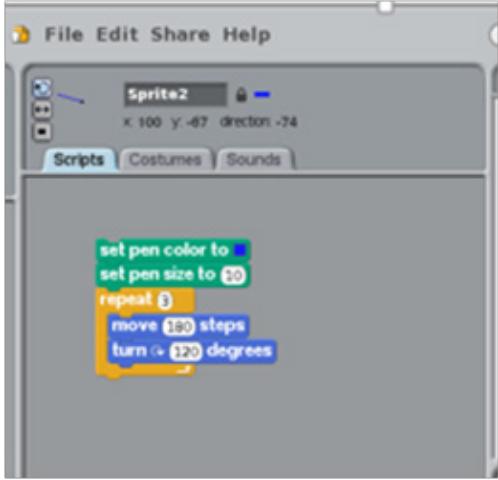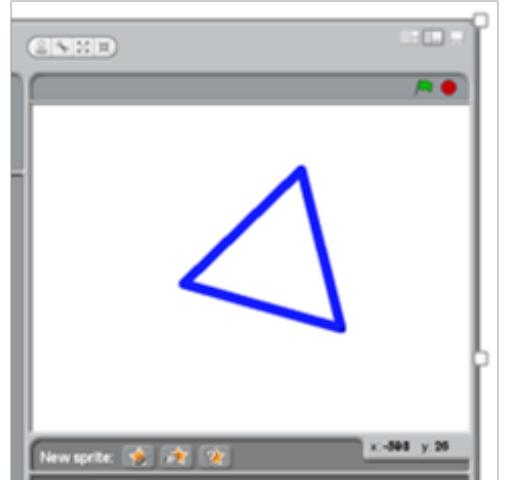
Appearance of the aeroplane before executing the program	Plane ascents as the "1" key is hit	The plane descends as the Down Arrow key is hit

C. Drawing geometric shapes

Geometric shapes are drawn using the Pen menu which is made to make motions by using the **Pen's** own instructions and those found in other menu namely **Motion, Looks, Sound, Control, Sensing, Operators and Variables**.

C.1. Example of a program to draw a Triangle

A triangle is a geometric shape having three sides and three angles meaning that each angle has 120 degrees. The angle size here is important as it is specified to set the turn angle of the pen. When a wrong angle is set, a wrong shape is drawn.
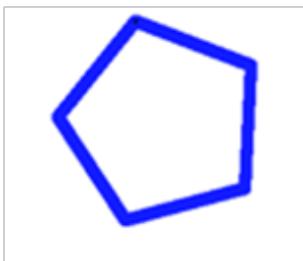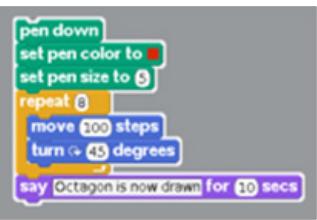
Program block:	Program Output:

C.1.1.Program interpretation

Before writing this program, a dot has been set as a new sprite as the current sprite cannot be used, the changing of the sprite has been done manually; it is not in the codes.

- The **Set Pen Color** to instruction changed the color of the pen, in the above program the color has been changed to blue
- The Set Pen Size increases the size of the pen or decreases it
- Sides can be drawn by using the **Move** and **Turn** instructions and this must be done many times depending on the number of sides to draw. To avoid that a program be too long the **Repeat** instruction found in the **Control** menu is used.

C.2. Examples of other geometric shapes

SN	Program blocks	Output
1	 Description: this program draws a pentagon. The angle size is 72 which is equivalent to 360/5 and the used pen is set to blue	
2	 Description: this program draws an octagon (shape with 8 sides). Then writes the text "Octagon is now drawn". The angle to use is 45 (360/8)	

D. Background setting

A background is an image or scene that constitute a setting to the main figure or objects. The outputs of the programs so far seen are on a white area, this area can be of a different color, can have an image embedded in it.A background is set as a stage and before a background be used the image to use can be imported by browsing for it in the compute, painted by using the tools available under the paint tab or taken using the XO laptop camera.

Steps for changing the background:

Step 1: Click on the existing stage image so as to get the stage's tabs (Scripts, Backgrounds and Sounds)

Step 2 : Click on the Background tab

Step 3: Choose one of the options (Paint, Import and Camera) depending on where to get the background from and follow the prompts.
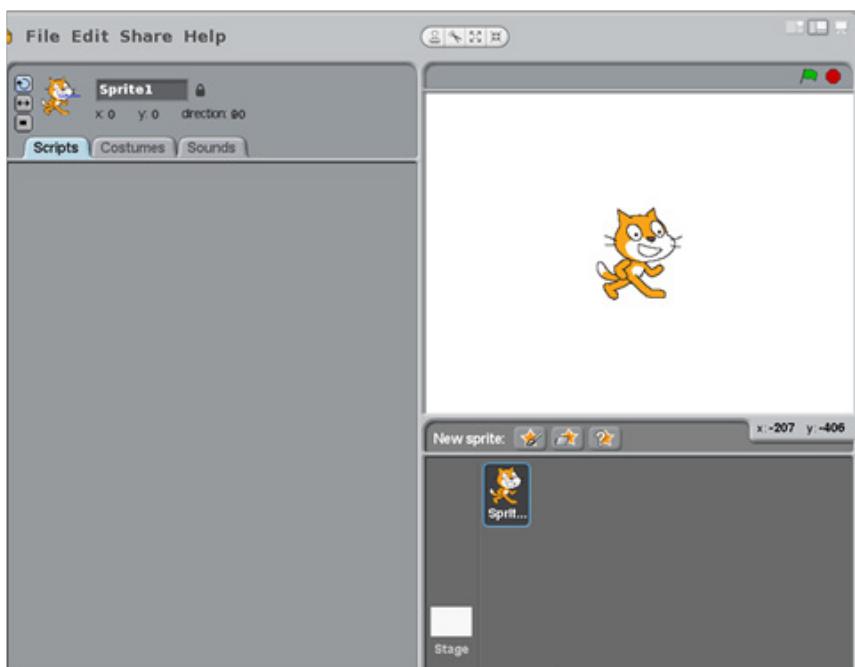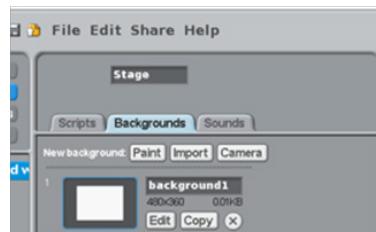
Figure 1. 22. Scratch window with a stage having a white background
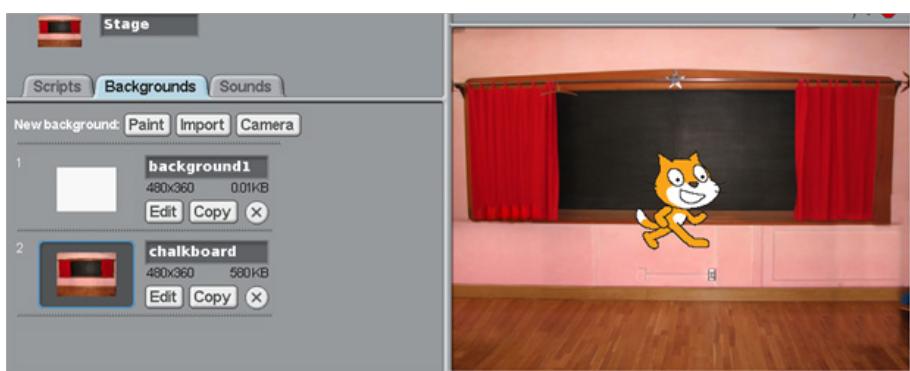
After clicking on the current stage the stage tabs appear like below (step 1):	After clicking on the Backgrounds tab the tabs in the image below appear (step 2)

The background is now changed using the Import tab (step 3)

A program illustrating background setting and other functionalities available in scratch:
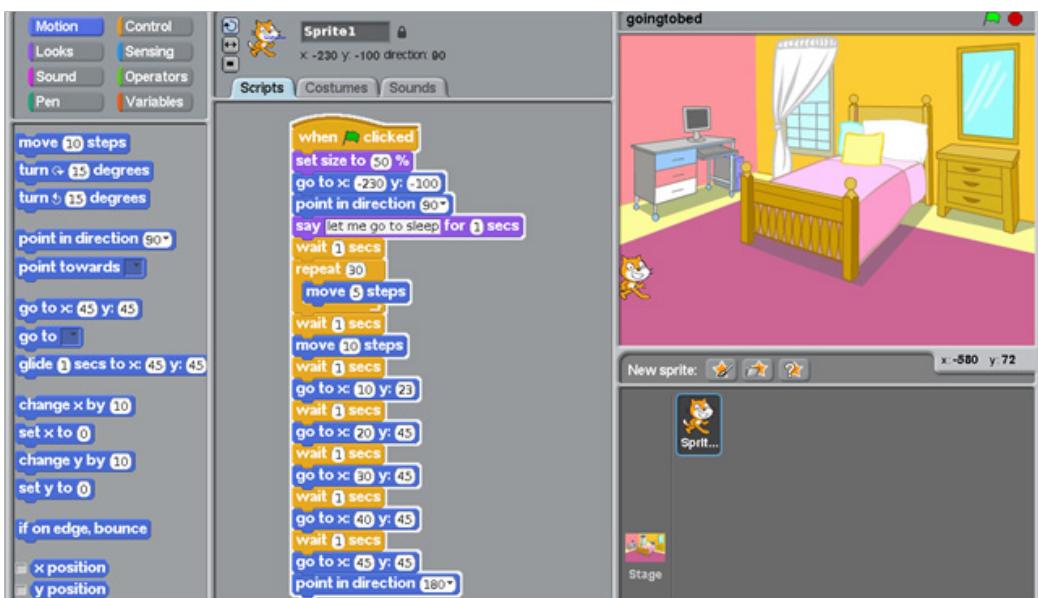
Figure 1. 23.A program to animate a Sprite so that it moves to the bed

E. Sound

For adding more life to an animated object in Scratch motion is not enough. An animated object can produce sound and a background sound can be set as well.

The sound produced by an animated object (Sprite) or to be used as a background (stage)sound can be regulated using instruction blocks.

Application activity 1.5

1. Using the Scratch program paint at least two cows. Make them graze in a pasture and as they do so they make cow sounds

1.4.3. Etoys Projects:

ACTIVITY 1.6:

1. Open Etoys by clicking on the ⭐ icon and do a right click and click on Start. Click on the "Gallery of Projects" and open the Car and Pen Project (or any project)

a. Interpret the output of this project in relation to its program codes

b. Edit the program code, observe the change in the object's animation and interpret them

Etoys is a GUI (graphical user interface) environment software that allows to program by joining together code snippets that are already written hence making programming with very easy. With Etoy one can make games, multimedia presentations, computer art, animated storybooks, computer simulations and many other projects.

A. Starting Etoys

To start Etoys go to the Sugar interface and right click on the Etoys icon and choose Start. Immediately the Etoy main window below will appear:

Previous/Next Project icons to help navigate

The Supplies icon used to get prebuilt items to be used as images in a project

Icon used to locate in the Journal projects to open

Icon used to save a project in the Journal

Close icon

The Paint icon used to draw painting to use in a project

Icon for choosing the language

Name of the current project. A project name can be changed from here

To make your own project click here.

For starting a new Etoys project

MAKE A PROJECT

Icon for the scripts of the current projects

This balloon is used to open existing/inbuilt projects

GALLERY OF PROJECTS

Icon used to allow the sharing of a project: Private/My Neighborhood

This is the script that controls the car. Experiment and try changing some numbers

O Car script1   !   ticking
Test Car color sees color
   Yes
      No Car turn by 160 + random (40)
Car forward by 5
Car turn by 1
Car bounce silence

TUTORIALS AND DEMOS

When this balloon is clicked on demonstration lessons on Etoy are displayed

Scripts for the current project (Home project)

Figure 1. 24. Etoys project main window

Now that the main window is opened, the programmer may start a new project by clicking on the **"Make a Project"** balloon then click on the paint icon to draw an image to use in the project or choose from existing projects and then paint the image by choosing appropriate tools.

To make your own project click here.

MAKE A PROJECT

(Step 1): Click on Make Project Balloon 1

(Step 2): Click on icon 1(new) or 2

(Step 3): Use these Paint tools to draw 1

Figure 1. 25. Steps to draw a painting for an Etoy project

B. Create animations: project to animate a car

Consider a project in which a car is going to be drawn in Paint then animated using program blocks. For starting this project first the Etoys project will be opened as explained in the previous page then start painting the car go through the steps below:

Step 1: draw a car using the the paint tools
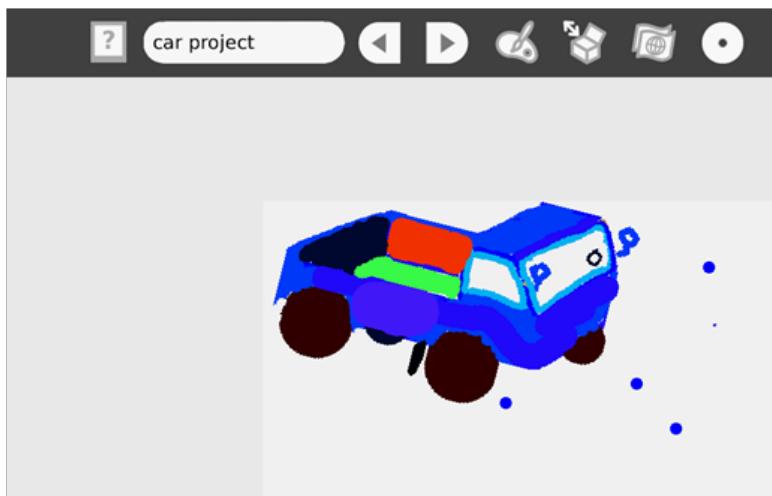
Figure 1. 26.Painted car

Step 2: Write program codes using the available blocks in order to animate (make move) the car

To do this select the painted object (car) then do a right click and immediately the image handles appear. Click on the little Eye handle to get the program Viewer
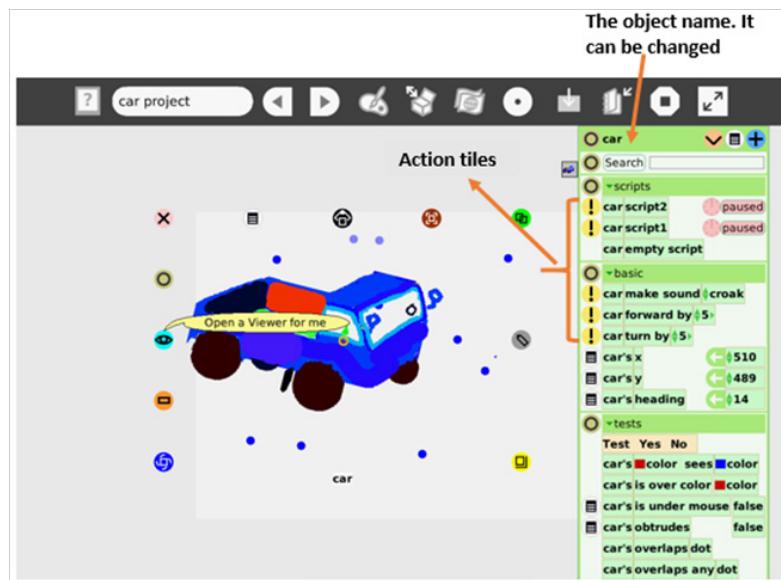
Figure 1. 27. The image with its Script

In the Script block there are two types of tiles; those with an exclammation point   in front of them called Action Tiles and those without that.
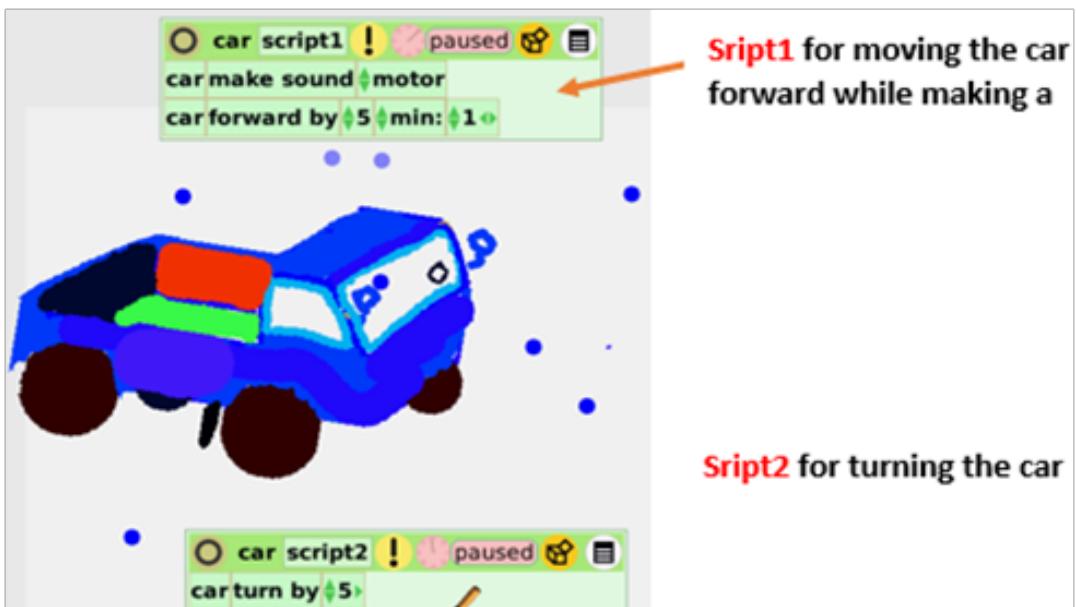
Figure 1. 28. Car objects with its animation scripts

With the scripts in the image above, the car can be made to move forward by running (executing) the script1 like it can be made to turn by using script2. Running a script is done by clicking on the clock icon **ticking** and once the clock is clicked on the script is now being executed the stick starts moving and the script status shows **"ticking"** instead of **"paused"**

C. Save, Open, Delete and Rename a project
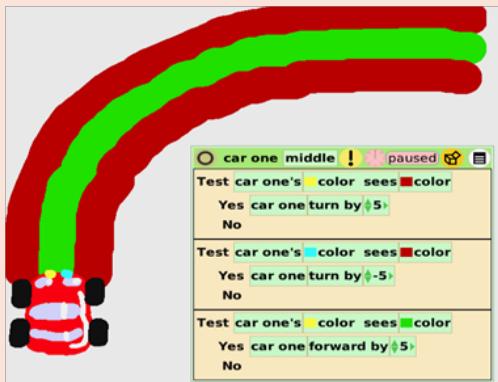
Once a project is done it can be saved in the Journal by clicking on the **"Keep a Copy"** icon and the project will then be saved in the Journal. That same project can be opened by locating it where it is stored and clicking on it. It can also be opened by using the main Etoys menu **"Find an Entry in the Journal"** icon which will direct the user to the Journal on the file that need be clicked for opening.

To delete a project locate it in the Journal do a right click and choose Erase. For renaming a project also locate it and click on its name and immediately the name will be highlighted; you can now write the new name. It is also possible to rename a project directly from Etoys main menu. The window below shows how to delete and rename a file/project.

1. Deleting a file/project in Journal

2. Renaming a file/Project stored in Journal

3. Renaming a project from the project main menu

1. Observe this image and its accompanying code. What does this program do?

2. Draw a roundabout (road) and make the car move in it. This car should make a car noise as it moves

End unit assessment

1. Take screenshots of the projects (Turtle, Scratch and Etoys projects) you have opened and save them on your flash disk

2. Using Turtle, Scratch and Etoys create a program to draw a house. Houses to be drawn are three (one for each project) and the one created using Etoys has to be animated in such a way that the door opens and closed itself.

3. Through manipulating special keys found on an XO laptop keyboard explain their functions,
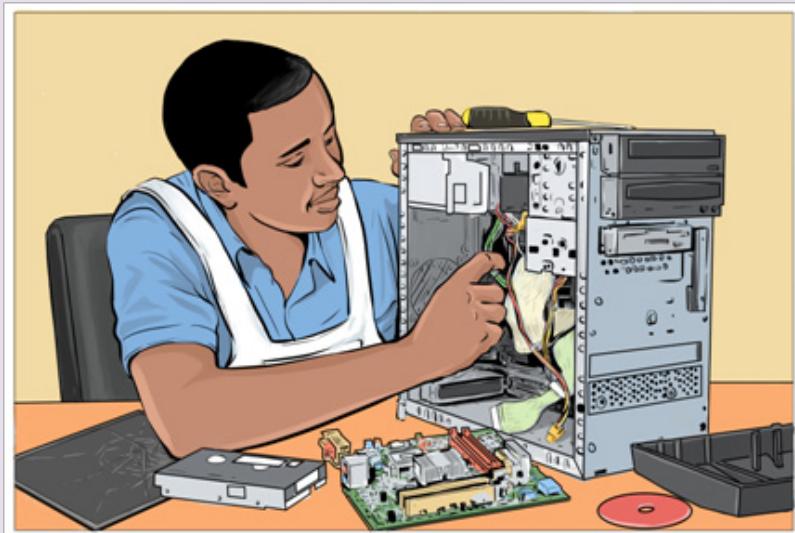
Key Unit competence:

To be able to assemble and disassemble a computer, Identify hardware issues and fix them and install software

Introductory Activity

1. Observe the image below and answer related questions:

a. What is the task being accomplished by the person in the image above

b. List out any five names of devices found on the figure above

2.1. HARDWARE:

Hardware refers to any physical or tangible part of a computer. The computer hardware consist of internal and external parts.

A. Internal computer components

Those are all components that are found inside the system unit such as disk drives, motherboard, processor, power supply, memory, etc.
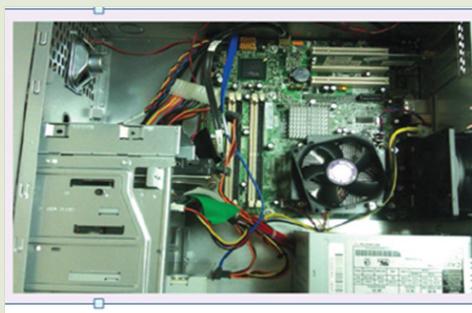
B. External computer components

External components of a computer also known as **peripherals** refer to all externals devices connected to central housing known as the system unit. They can be input devices, output devices such as the monitor or storage devices such as a hard drive or flash drive, memory card. Peripherals devices are connected to the **system unit** through different ports found on the computer.

2.1.1. Elements of the computer system unit and their roles:

ACTIVITY 2.1:

1. Open the system unit cover to expose the internal components as shown in Figure below.

   a. Identify various components inside the system unit

   b. Briefly state the role of each component identified in a)

The system unit, which houses all the internal components of a computer, has a number of components inside it such as the power supply and the motherboard on which are connected other parts like microprocessor (or CPU)disk drives, adapter cardsand memory.

Different components of the computer case and their roles are elaborated in the content to follow.

A. Power supply

The power supply is unit is the one which is directly connected to the power outlet through the power cable. The Power Supply Unit (PSU) converts alternating current (AC) from the power outlet to direct current (DC) required by internal computer components.

Figure 2. 1.power supply

B. Motherboard

A motherboard also known as circuit board is the main printed circuit board onto which all components of the computer interconnect into one another. It also allows communication of those different parts as it has routes from/to those parts.

Motherboard size varies depending on whether a computer is a desktop or a laptop and the size also varies depending on manufacturers but the devices found on each and their functions don't vary. A particular desktop computer looks like in the image below:
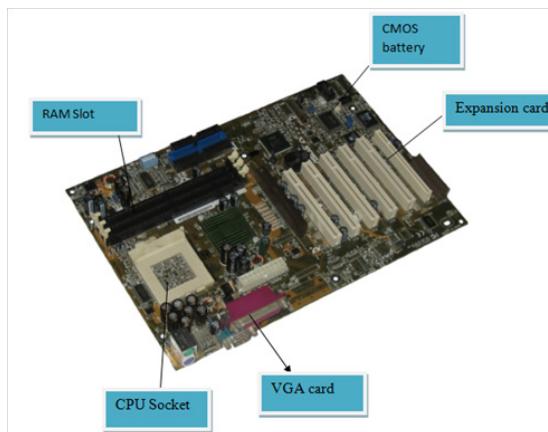
Figure 2. 3.Motherboard and some of its parts

On the motherboard are connected different devices which are CPU, hard disk, video card, RAM, ROM, expansion slots, data buses, etc.

B.1. Central processing unit (CPU)

The **Central Processing Unit (CPU)**, also known as the processor or microprocessor, is the most important part of the computer which is considered as the **"brain"** of the computer because all processing activities are carried out inside it.

The processor controls the retrieval, interpretation, and execution of instructions in a computer. It consists of three components namely the Arithmetic **and Logic Unit** (ALU), **the Control Unit** (CU) and the memory units, known as **registers**.

i. The Arithmetic and Logic Unit (ALU)

It is the part of the CPU that performs two main functions, namely **arithmetic operations** such as addition, subtraction, division, and multiplication and **logical operations** such as OR, AND, and NOT among others. These two functions are necessary in the execution of different instructions by the CPU.

ii. The control unit (CU)

The control unit coordinates all processing activities in the CPU as well as input, storage and output operations. It also performs tasks like controlling, supervising, and overseeing all the activities of the computer. It oversees fetching instructions from the main memory, decodingthe instructions in a format the computer can understand, executes the instructions by issuing commands to respective components where action is supposed to be taken and controlling the transfer of data and information within the available storage space.

iii. Registers

Registers are temporary storage locations located inside the processor that are used to hold data, instructions or information waiting processing or output. There are four types of registers namely: instruction register, accumulator register, address register, and storage register.All the four types of registers store information that is temporarily needed for program execution. The **Instruction register** holds an instruction before it is converted to machine readable format,the **Address register** stores the address of the next instruction to be processed, the **Accumulator register** holds the last processing step of the Arithmetic Logic Unit and the **Storage register** holds information waiting to be outputted.

B.2. Hard disk

A hard disk also known as hard disk drive (HDD) is a non-volatile computer storage device containing magnetic disks or platters with high speed. It is

a secondary storage device used to store data and program permanently, the term Non-volatile means data and program are retained even when the computer is turned off.

Figure 2. 4. Hard Disk

B.3. Video card

Video cards also referred to as graphics cards are components that are connected to the motherboard of a computer system and generates the quality of images on output devices such as screen. Graphic cards have processors or a graphic processing unit and are directly connected to the motherboard which allows it to accept information from the CPU and send output to the monitor.

Figure 2. 5.VGA card

B.4. Random Access Memory (RAM)

Random access memory (RAM) also known as working storage is used to hold instructions and data needed by the currently running programs. It is referred to as random access because its content can be read directly regardless of the sequence in which it was stored.

RAM is a temporary or volatile storage because its content disappears when the computer is switched off. Therefore, before switching off the computer, it is important to save the work in a device that offers relatively permanent storage facility.

Figure 2. 6. An example of a Random Access Memory

B.5. ROM

Read-Only Memory (ROM) is a type of non-volatile memory used in computers and other electronic devices. As the name indicates; data stored in ROM may only be read and cannot be electronically modified after the manufacture of the memory device. Unlike RAM (Random Access Memory), **ROM** is non-volatile, which means it keeps its contents regardless of whether or not it has power.
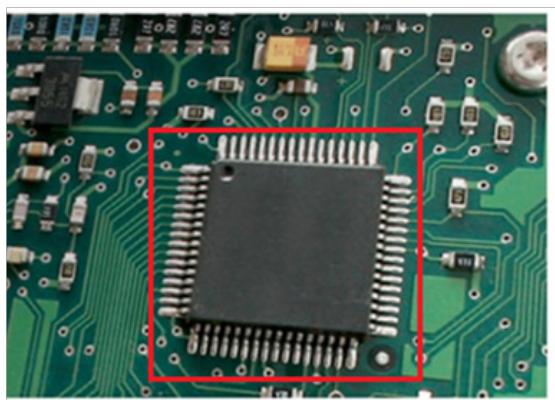
Figure 2. 7.Read Only Memory

B.6. Expansion slot

Expansion slot alternatively referred to as **bus slot** or **port** is a connection on the motherboard to which an expansion card can be plugged in order to expand thefunctionalities of a computer.
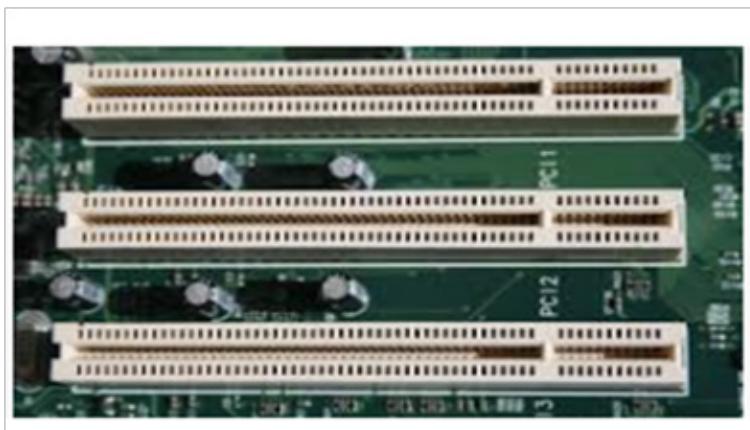
Figure 2. 8. Expansion slot

B.7. Data buses

Data buses are those used to transfer data and instructions between components inside the computer.

Figure 2. 9. Data bus

B.8 Complementary Metal- Oxide Semi Conductor(CMOS) Battery

Complementary Metal- Oxide Semi Conductor(CMOS) is the term usually used to describe the small amount of memory on a computer motherboard that stores the BIOS settings. The basic activities carried out by CMOS is to test the availability of computer basic input and output devices (POST) and make sure no errors exist before loading the operating system.

Figure 2. 0. CMOS batter

Application activity 2.1

By doing a research using books or the internet:

1. Explain three types of ports available on a desktop or laptop computer.

2. Research on the internet about primary, secondary and tertiary memory and answer the questions below:

   a. Which devices are referred to as primary, secondary or tertiary storage devices?

   b. Why are some of these devices referred to as mass storage devices?

2.1.2. Computer maintenance principles

Activity 2.2:

1. Identify five factors that need to be considered in order to minimize health risks such as RSI(Repetitive Strain Injuries) and eye strain while using computer

2. Explain why it is not advisable to take food substances and drinks in the computer lab.

Computers are expensive to acquire. They are also useful to human being because they carry out tasks that are sometimes so difficult. As an important tool in the life of a human, a computer needs to be in good working conditions. Some computer components can easily get damaged hence need to be handled with care. To protect computers, certain rules, precautions and practices must be obeyed while using computers and their components.

This would help to avoid damage to the computers.

Computer maintenance is the practice of keeping computers in a good state. Computer maintenance can be carried out on the hardware or software. The principles of software maintenance can be updates firmware, operating system, application and data security such as encryption, cache clearing, and secure deletion. On the hardware side of maintenance there can be cleaning and properly connecting hardware components, monitoring peripherals, maintaining cooling and testing individual components for integrity such as power supplies, RAM modules and the hard disk. On the software side there is running different tools and software aimed at optimizing the working of a computer.

Below are principles to be followed for computer maintenance:

A. Hardware:

1. Clean dust from the computer.

Computers are some of the most efficient dust collectors. Apart from looking gross and possibly being an allergy hazard, a dusty computer will trap heat, which can reduce its performance and lifespan.

2. Clean up the cabling and everything else

Cables may collect a lot of dust as they are sometimes on the floor. If there are many peripherals consider cleaning them regularly.

3. Organize the installation disks

Keep memories for different software organized. Don't mix CDs with memory sticks or external memories and separate each memory depending on the type of software stored. Installation software can be Operating systems, application and utility software.

4. Properly interconnects components

Electronic device components are designed to fit into one another without using mechanical force, when interconnecting a component into another requires force this may be an indication of connecting it wrongly and it can result in the breaking of pins making the whole device unusable.

B. Software

1. Properly switch on/off the computer

To properly switch off the computer gives time for the whole process required to unload running programs. Switch off the computer when all programs are

closed and use the available computer menu (click on Start then on Shut down). Never press the power button for switching off the computer. When programs fail to close use the combination key **Ctlr + Alt + Delete** to open the task manager which will help in closing those stubborn programs.

2. Delete unused files and programs

Unused Files and empty folders occupy space and make the computer run slowly. Delete temporary files, old audios and videos as these occupy bigger space. Delete also programs that are not used and don't keep two versions of the same program if they are not both needed.

3. Back up the data.

A data backup is the result of copying or archiving files and folders for the purpose of being able to restore them in case of data loss. Data backup should be done regulary in order to avoid total catastrophe in case there is a problem with the computer.

4. Run antivirus and scans regularly

Antivirus software is a type of utility software used for scanning and removing viruses from a computer. Scan so as to avoid computer being infested.

5. Clean up the OS

Disk cleanup is a maintenance utility used to free up space on a hard disk by deleting unnecessary files and Windows components that are no longer in use. This includes temporary internet files, downloaded program files and files in the recycle bin. The disk clean up procedure will be discussed later.

6. Clean up the software.

Every few months, look through the 'Add or Remove Programs' interface that is found in the control panel. If there's a software that that is no longer needed, it must be deleted.

7. Update everything

Check for updates for the hardware and software. This includes running Windows Updates, checking for updated drivers, and checking for software patches.

8. Defragment

Defragmentation is the process of moving file fragments to contiguous clusters to optimize the storage space and performance.

2.1.3. Computer capacity

Activity 2.3:

One day, Peter wanted to borrow films from Jacques who had many but when he went to Jacques's home with his flash disk to borrow, the flash was able to keep only two.

  a. What should Peter do so as to get all the films?

  b. The two films stored on the flash were of equal size and the flash dish's size is 1GB. What is the size of each film?

A. Storage size

In digital computers, data is represented using a sequence of bits, bytes and words.

- **A bit** is a short form for binary digit referring to a single digit which can be either 0 or 1 used to represent any data in digital computers. In other words, a bit is the smallest unit used to represent data in digital computers.

- **A byte** is a storage unit capable of representing a single character, such as a letter, number or symbol. Technically, computers represent any type of data using a sequence of 8 bits. A byte can store 28 or 256 different values, which is sufficient to represent standard ASCII characters (letters, numbers and symbols)

- **A word** is a unit of data used by a particular processor

Storage capacity also known as **storage size** refers to the amount of data a storage device can hold. It is measured in kilobytes (KB), megabytes (MB), gigabytes (GB) and terabytes (TB). Since most files contain thousands of bytes, file sizes are often measured in kilobytes. Larger files, such as images, videos, and audio files, contain millions of bytes and therefore are measured in megabytes. Modern storage devices can store thousands of these files,that is why storage capacity is typically measured in gigabytes or even terabytes for larger memories.

Standard units of measurement used for data storage are in the table below:

Unit	2^N value	Size	Approximative Size in Byte
bit (b)		0 or 1	1/8 of a byte
byte (B)	2^3	8 bits	1 byte
kilobyte (KB)	2^{10}	10241 bytes	1,000 bytes
megabyte (MB)	2^{20}	1,232,896 bytes	1,000,000 bytes
gigabyte (GB)	2^{30}	152,879,104 bytes	1,000,000,000 bytes
terabyte (TB)	2^{40}	1,073,741,824(KB)	1,000,000,000,000 bytes

A.1. Reading memory/storage size

It is possible to know the size of the memory plugged in a computer or found inside it.

i.Hard disk size

The hard disk size and its different disks can be viewed by going to the **Computer** or This **PC** icon depending on the operating system. These icons can be found on the desktop or on the startup menu.The window below will appear:
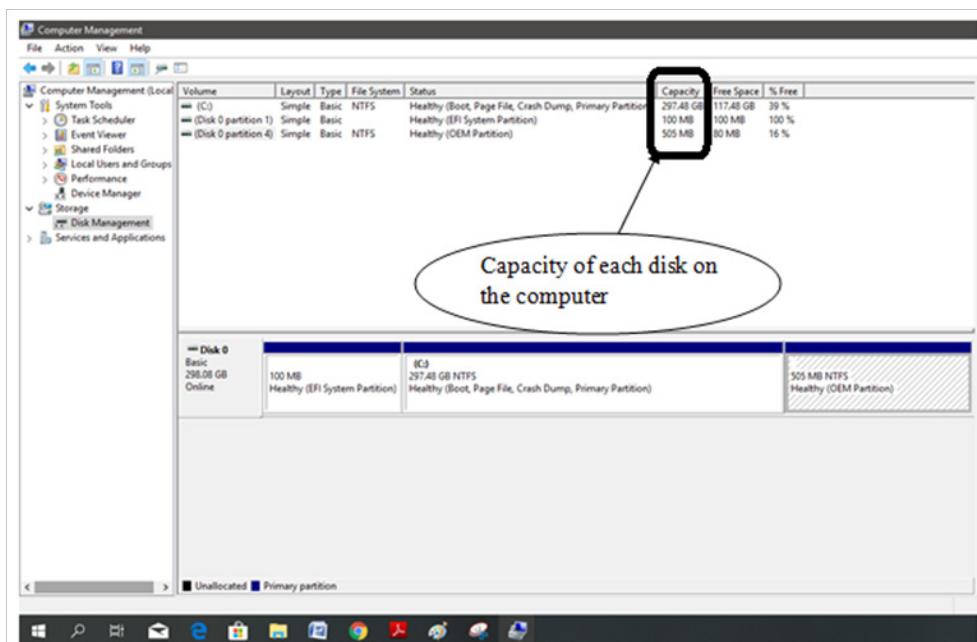
Figure 2. 11. Window to view different disks size

The window above shows that the computer has three disks each disk having respectively 297.48GB, 100 MB and 500 MB. The size of the hard disk is obtained by summing up the size of all the individual disks.

NB: When there is an external memory mounted on the computer, the name of that memory will be displayed in the window used to view the hard disk's size and the size of that memory can also be viewed in the same window.

ii. RAM size

Proceed through the following steps to obtain basic information regarding the capacity of primary memory (RAM) installed in the computer

- Press control panel icon
- Through all Control Panel Items select System.

A shortcut can also be used by using Right click on this PC icon and select properties. The figure below showing information of installed RAM will appear.
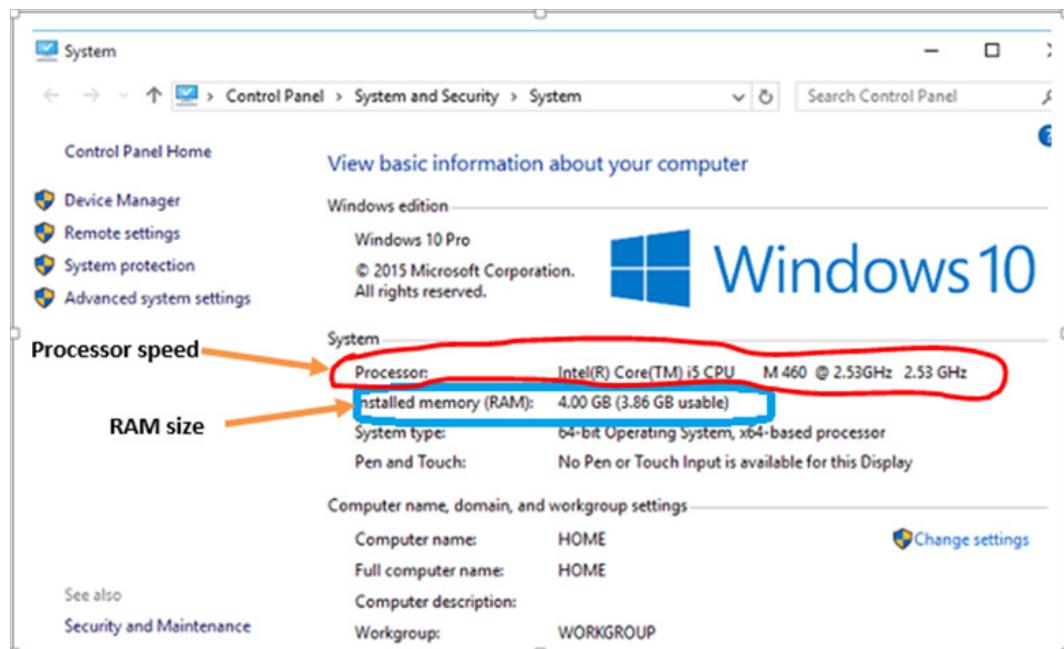
Figure 2. 12. Window to view Memory size (and processor speed) in Windows 10

B. Processing speed

Processing speed is defined as the number of cycles per second at which the central processing unit (CPU) of a computer operates and is able to process information. It is measured in megahertz and is essential to the ability of a computer to run applications.

The processing speed is measured in terms of **Clock Speed** which is measured in gigahertz (GHz), with a higher number equating to a higher clock speed. Faster clock speeds mean that tasks ordered from CPU are completed quicker, making the computer user experience seamless. The processor speed can be viewed using the same window as the one used to view the RAM size.

Application activity 2.3:

1. If a CD contains 700 MB, how many number of CDs a DVD of 4,7 GB can contain

2. If a 4MB document is downloaded within 6seconds, what time (in hours) is required to download a **4GB** movie?

2.1.4. Identifying and addressing hardware issues

Activity 2.4:

Explain how you would connect both projector and monitor to a single computer.

Computers are built with all security to protect sensitive components and hardware housed inside a casing against any form of dust and other harsh elements. However, some common computer hardware problems occur despite the protection. It's very crucial to identify and recognize such problems. The following are some of the commonly found hardware related problems on computers.

2.1.4.1. Common hardware related problems

A. The Check POST test fails

POST stands for "Power OnSelf Test". This is part of a computer's startup program used to diagnose the keyboard, random access memory (RAM), disk drives and other hardware to make sure they are working properly. If the POST detects any errors in the hardware, it will either display a text error message on the screen or a series of short and long beeps.

If an error message appears as the computer is booted, read careful the error message and correct it or type the exact error message into a search engine to find more information about it.

B. Blank monitors

A blank monitor is the most common computer problem. Most people who work with computers might have dealt with such non-working blank monitor at least once. In such cases, first and foremost check the supply cord and power systems. Sometimes, the video cable might be loosened. Just push the video cable and place it again.

C. Mouse Problems

The mouse is used for a variety of purposes, such as playing games or opening files and moreover, it facilitates easy navigation. The most common problems related to the mouse include failure to move, connection problems, freezing on the screen or damage to the mouse. Mouse with PS/2 connection are prone to damages in its pins, once such a mouse is not functioning its pins must be checked for blockage or bending.

D. Jumpy Mouse

A jumpy mouse is just a muted mouse that cannot be scrolled. In case of a track and ball mouse the problem can be solved by opening the ball container, removing the excess debris and cleaningthe dirt that lines the rollers. For an optical mouse, eliminate the dust that has collected around the optical sensor.

E. Computer does not recognize USB

In this case, even when the USB is connected, the computer might not be able to recognize it and hence displaying errors like "**Device not recognized**" This might be due to the USB connector problems or the software malfunctions.

F. Keyboard Problems

Keyboard is a vital part of any computer. It not only allows typing, but also gives commands. Common potential problems with the keyboard include keyboards that will not connect to the computer, stuck keys, broken keyboards or keyboards where the letters end up jumbled.

G. Power Cord Problems

Whether it is a laptop or a desktop, power cords are a vital part of any computer. A laptop can run on batteries for a limited amount of time but then needs the power cord for recharging. The most common problem with the power cord is an improper connection.

H. Motherboard Problems

The motherboard has several parts of the computer including the RAM, BIOS system, mass storage and CPU. The computer motherboard contains several devices, which can create numerous potential problems. Problems with the motherboard range from too little RAM to BIOS problems. Fixing the problems will depend on the specific problem and, in the worst case scenario will require purchasing a new motherboard to fix the problems.

I. Insufficient Memory

Processor-intensive programs also demand a lot of memory. Random access memory (RAM) aides the central processing unit (CPU) by storing instructions linked to common operations. Without enough RAM, software crashes and slowdowns can occur.

2.1.4.2. Checking for hardware problems

Many computer problems are caused by hardware failures or problems with hardware drivers. Windows will usually notify about devices that have problems. Device Manager can be used to check the status of different hardware devices. The Device Manager which is the Control Panel extension of Microsoft Management Console, provides users an organized, central view of the Windows-recognized hardware attached to a computer. This includes devices like keyboards, hard disk drives, USB devices etc. It sorts out all hardware, listing them on the basis of various criteria and when a device malfunctions or stops working altogether, it immediately notifies the user. Thus it can be used to control devices, enable or disable them, configure them, identify conflicts between devices, and so forth.

To check for window hardware problem using device manager go through this process:

- Open Control Panel
- Click on the Hardware and Sound link for Windows 8 or 10 or Click System and Security for Windows 7.
- Check under Devices and Printers in Windows 8 and 10, and under System in Windows 7, to find Device Manager.
- Once Device Manager is open, user can view device status, update device drivers, enable or disable devices or do hardware management as shown in the figure below:
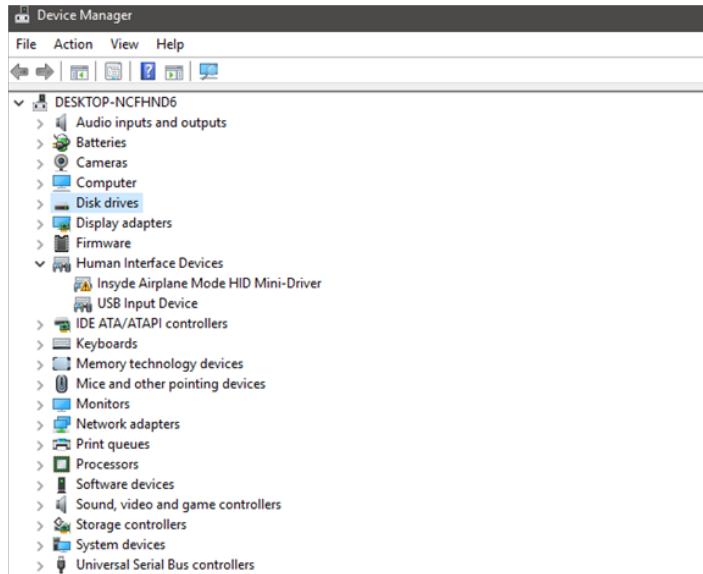
Figure 2. 14.Window device manager

Note: Depending on version of Windows, Control Panel is usually available from the Start Menu or the Apps screen.

2.1.5. Assembling a computer & disassembling a computer
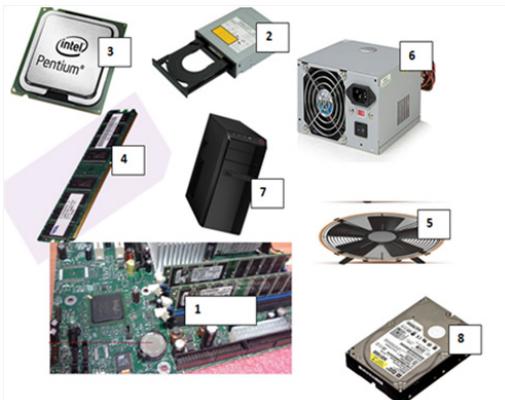
Activity 2.5:

1. By searching the internet identify tools used in assembling and disassembling a computer

2. Explain the reasons that may prompt a technician to remove any internal part of a computer

A. Assembling a computer

Assembling a computer is putting together the computer components mainly the internal ones so that they get interconnected and work together. Assembling a computer can take 20 to 40 minutes provided all parts to assemble are available.

Assembling a computer requires that the technician have simple hand tools kit, such as a screwdriver and a pair of pliers. Always remember to wear a grounding strap when handling any internal components as static electricity can ruin those components. Some computer components to be assembled are shown in the figure below:

1. Motherboard
2. Optical Drive
3. Processor(CPU)
4. Memory (RAM)
5. Fun
6. Power supply
7. Computer case)
8. Hard drive

Figure 2. 15. Computer devices to be assembled

Steps to assemble a computer

Step 1: Gather Tools and Supplies

Some tools such as Screwdriver, Wire cutters and strippers, Needle-nosed pliers, Small flashlight, Small container to hold screws, Grounding Strap are helpful to open or fix the screw and need to be made ready before. Also make sure all parts are available and are organized in a way to facilitate identification of which part to fit in the computer case first.

Step 2: Prepare the Case for Assembly

There are three things that need to be considered before assembly

Before assembling consider removing the cover for the optical drive and make note of the cables pre-installed in the case. These should be front panel connections for features such as the power switch, audio jacks and USB ports.

Step 3: Install the Motherboard

During motherboard mounting all standoffs need to be installed in the case. After installation of standoffs it is necessary to checkfor screw holelocations on the motherboard for exact placement. The next stage requires lowering the motherboard into the case and aligning with the I/O bezel and installing
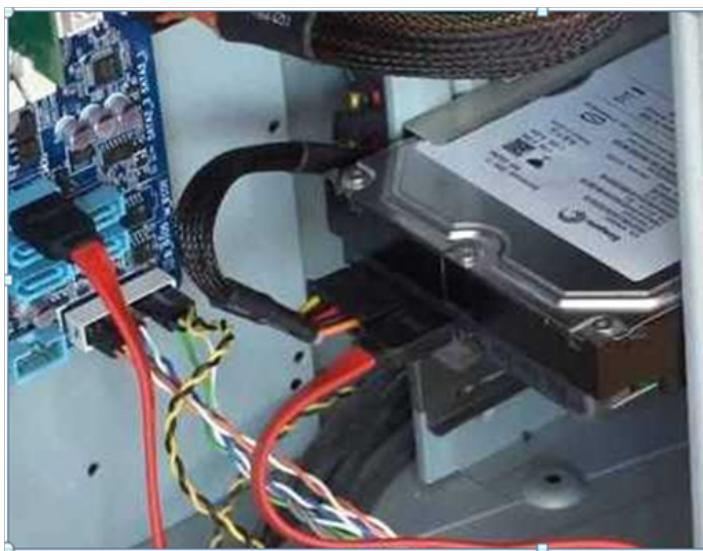
the screws. The standoffs and screws are installed in order to prevent damage to the motherboard.

Step 4: Install Hard Drive

Hard disk drives are usually connected to the motherboard through Enhanced Integrated Drive Electronics (EIDE), Small Computer System Interface (SCSI) or Serial Advanced Technology Attachment (SATA) cable interface. Because with the SATA technology a drive can be detached or attached to the motherboard while the computer is switched on

The following steps are used to mount the drive into its hole:

1. Find drive bay to install the drive in. If there is a trouble finding a place to mount the drive consult the case documentation for suggestions.

2. Slide the drive into place until the screw holes on the sides are lined up with the holes in the case and put/tighten the screws in place.

3. Connect wires that need to be connected

Figure 2. 17. Hard drive installation

Step 5: Install Optical Drive

The optical drive is installed in the drive bay.The following steps are used to mount the optical drive into its hole:

1. Slide the drive into the drive bay until the screw holes are lined up and the front of the drive is flush with the front of the case. Make sure that it is orientated correctly.

2. Install the screws and install wires to the right places

Step 6: Install the CPU

The CPU is the brain of the computer. It is installed on the motherboard's appropriate socket.

The slot where CPU is installed
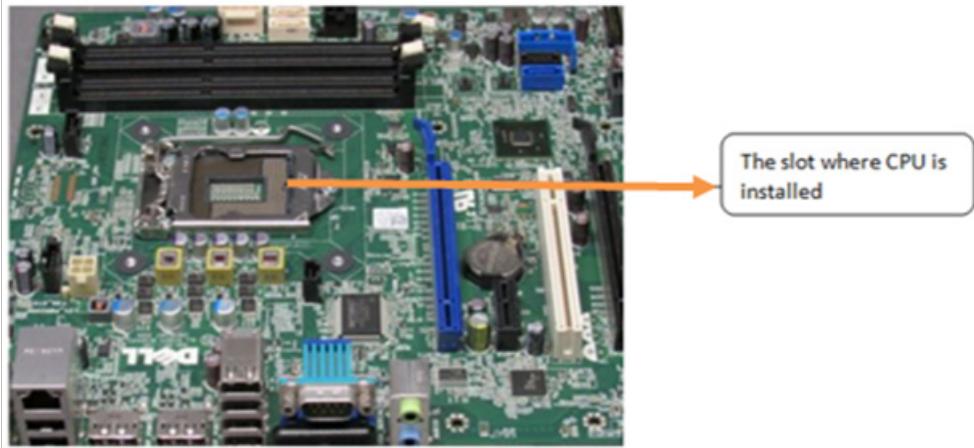
Figure 2. 18. CPU Socket

To install the CPU, first locate the corner marking that designates pins of the CPU. The second stage require to lift the small metal rod next to the socket and then find the corresponding marking on the CPU socket to insert the CPU so that the markings are lined up. Last push the rod down to lock the processor in place.

Step 7: Install RAM

The RAM is the temporary memory locationthat the processor works from. Permanently stored data is pulled from disks and stored in RAM while the processor works with it

The following steps are gone through to mount RAM into its exact position:

- Set the RAM board in the socket. Check to see that the notch in the board is in the correct location

- Press firmly on both ends of the board to set it into the socket. Make sure the tabs lock into place and press the board only when the tab is aligned as not doing so can damage the RAM or even the motherboard.
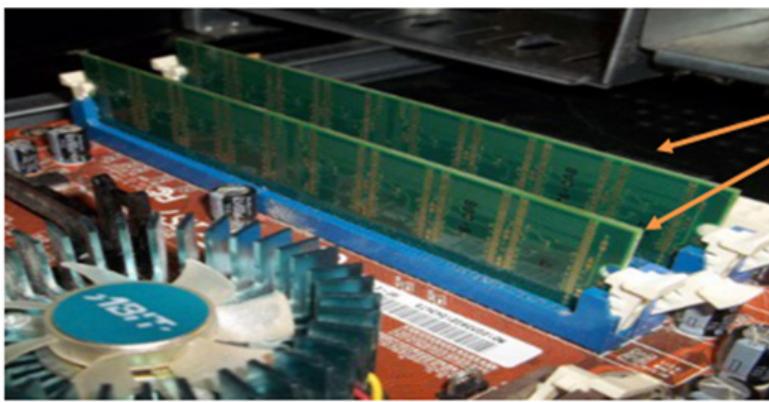
Figure 2. 19. RAMs mounted on the motherboard

Step 8: Install the CPU Fan

The CPU fan is a combination of a heat sink and fan together. The unit draws heat away from the CPU. To install the fan the following steps are followed:

- Firstly Place thermal compound to the CPU following the instructions provided with the compound,
- Secondly, set the fan assembly on the CPU with mounting tabs aligned,
- Pull the locking rod down on the fan assembly to lock into place,
- Connect the fan assembly's power connector to the motherboard.

Note: Failure to apply thermal compound results in insufficient cooling and can cause damage to the CPU or motherboard.

Step 9: Install Case Fan

The case fan is usually installed on the back panel of the case. To mount the fan do the following:

1. Align the mounting holes by holding the fan to the mounting pad on the inside of the case. The fan needs to be mounted so that it blows air out of the case.
2. Insert the screws from the outside of the case and tighten them

Step 10: Install Power Supply

The following steps are followed to install power supply:

1. Align the mounting holes in the case and power supply.
2. Insert screws and tighten.

Step 11: Connect Cables

Figure 2. 20. Cable connections

When all of the components installed in the case, it may be possible that there are some parts which may not be supplied with the power. It is important to consult the motherboard manual in order to make sure proper connections are made. There are two kinds of connections, power and data.

About power connectors, every device installed needs power. The motherboard has two power connections, connectors specifically for SATA devices (drives) other connectors for running fans and or non-SATA devices. While **data cables** connect drives and front panel devices to the motherboard. Incorrect connections can damage components.

Step 12: Wrap-up

Now that the components are completely installed, the last thing to do is to reinstall the side panels on the case. The computer is now ready to be turned on. If the computer has problems starting up, check all component connections and mounting to make sure that everything has been attached correctly. Otherwise consult individual component manuals for specific troubleshooting information if problems persist.

B. Disassembling a desktop computer

Disassembling a computer means disconnecting external and internal components from the system unit. This process involves unplugging,

unscrewing and sliding out components depending on the mechanism used to connect to the system unit or mount it onto motherboard. To disassemble a computer, the following process is followed:

1. Disconnect the computer from the power source by unplugging the power cable from power supply unit.

2. Unplug peripheral devices attached to the system unit such as monitor, keyboard, mouse and printer.

3. Open the outer cover of the system unit by unscrewing or sliding it out.

4. Remove the adapter cards by first unscrewing them and gently unplug them off the motherboard

5. Remove the fixed drives such as hard disk and optical (CD/DVD) drives by unscrewing and disconnecting them from power supply unit. Next, disconnect the IDE or SATA interface cable that connects the drive to the motherboard.

6. Remove memory (RAM) modules by pressing the tabs located on both ends down away from the memory slot. Carefully hold the slightly lifted module by the edges and remove it from the motherboard.

7. Remove the power supply unit starting with the power connector to the motherboard, CPU fan, cabinet fan, power buttons and drives if any. Next, unscrew the unit to disconnect it from the system casing

8. Remove the CPU and its fan by first unscrewing the cooler fan from the motherboard.

9. Finally, unscrew the motherboard to unplug it from the system unit casing so as to have an empty shell of the casing

1. Demonstrate how to mount a motherboard using the following guidelines:

- Line it up properly on the chassis, screw and fit it into place.
- Mount the processor, RAM modules and any expansion cards separately.
- Plug in the power cable connector from the power supply unit.
- Connect other internal components onto the board, and then connect the monitor, keyboard and mouse to the system unit.
- Test for power and ensure that internal and external components are initializing correctly during POST (Power-On Self-Test).

2. Do a research and explain five types of expansion cards used on desktop computers.

2.2. SOFTWARE

2.2.1. Software installation principles

Activity 2.6:

1. Explain the importance of reading the user manual before installing new software.
2. State three factors you would consider before purchasing application software.
3. State three hardware requirements to be considered when installing application software.

Software is another part of a computer. It is the invisible part which consists of instructions which operates a computer and executes specific tasks. Software can be classified into two main categories namely system software and application software.

System software is the one that performs a variety of fundamental operations that helps to make computer resources available to the user. It can be divided into Operating systems, Utility software, Firmware and Networking software.

Application software is the one used in a computer in order to perform tasks, functions for the benefits to the user. Application software available in a specific computer depends on the needs of the computer user. For example

one may have VLC to play videos while another may not have it depending on the needs.

The number of computer software or programs installed on a computer is only limited to hardware specifications such as processor type, memory and storage capacity. Once a computer meets recommended specifications, software installations is automatically carried out.

A. System requirement

Before installing computer program whether operating system or application software, there are minimum system specifications that have to be considered in terms of: **Memory (RAM) capacity, Free hard disk space, Processor type with speed and Graphics display.**

For example, the following are the minimum and recommended system requirements for the installation of Windows 10 operating system:

- **Memory capacity:** 1 Gigabyte (GB) of RAM on a 32-bit or 2 GB on 64-bit machine
- **Storage space:** 16 GB free-disk space on 32-bit or 20 GB on 64-bit machine
- **Processor type and speed:** 1 Gigahertz (GHz) of CPU Speed
- **Graphics card:** Microsoft DirectX 9 graphics controller with WDDM driver(Windows Display Driver Model)

B. Application software goes with specific operating system

An operating system has specific application software that it is designed to accept, that is due to the fact that an application software needs a working environment that is made ready by an operating system and while developing a program, the developer takes into account the environment provided by that specific operating system. For example Windows operating system can not accept application programs developed for Linux.

2.2.2. Computer software issues:

A. Operating System issues

Being the one that directly interacts with the computer hardware through the Operating system kernel, an operating system issue is a serious problem that may make even accessing the computer's different applications impossible. The various operating system issues are elaborated in the subsequent content.

i. The computer won't start

Operating system has the function of managing hardware and other application software resources. A complete damage of an operating system leads a computer to do not start even not function

ii. Abnormally Functioning Operating System

If the operating system or other software is misbehaving, close it forcefully and reopen it. A virus scan can also help if a reliable anti-virus software is installed.

iii. Operating system is not booting up

When the operating system is not loading, it is a serious problem that requires a fresh reinstall of an OS.

iv. Operating system blue screen of death

A blue screen of death pops up when Windows encounter a critical error and indicates a serious error with a computer device. Incase this occurs, users are prone to losing important data since regular apps don't normally have a right to save their open data. The main reasons for this issue are:

- Crashing of a low-level software or drivers
- Drivers updates going wrong
- A faulty hardware
- A virus attack on a system

How to fix the blue screen of death issue:

- Do a system restore which will help undo any recent installed driver.
- Update device drivers since as time goes by some drivers become incompatible with the regular OS updates which could cause the computer drivers to crash more frequently.
- Start PC in Safe Mode and troubleshoot any problem from the blue screen details and scan it for viruses since some viruses are known to cause the Blue Screen of death.
- Reinstall the Windows OSif none of the above works.

v. Windows freezes or stops responding

The operating system may sometimes stop responding and freeze. In this case a cursor may not move, an application may not respond or just a computer user gets stuck on a certain action. Potential causes of the random freeze and unresponsiveness on a PC may include:

- Software related issue including malicious software, virus attack and driver related issues,
- Running too many programs at the same time,

- Memory issues and general hardware failure

- Solutions to windows freezing or stopping to respond

- The best solution is to give the computer some time to process, since it might be handling a complex task that could be taking most of its CPU and RAM

- If giving it more time does not work, then force end the task or program that is not responding by pressing Ctrl + Alt + Del to open the Task Manager. After the Task Manager opens highlight the non-responding program or process and choose "End Task".

- Reboot the PC by pressing down on the power button until the computer turns off and restart it after a few seconds

- If after rebooting the computer still freezes then reboot the PC in Safe Mode and uninstall any recent driver that might be causing the computer to freeze.

- Determine if there is a defective piece of hardware that might be causing the device to freeze and replace it immediately. Also check on thecomputer's memory such as RAM to know if it needs upgrading.

- When none of the above solutions work a clean install of the Windows Operating System can be considered

vi. Less free storage than before after an operating system upgrade

This happens because files from the previous operating system are still left in the system in a folder known as **"Windows Old"**the "Disk Clean-up" tool can be used to prevent the computer from running slowly.

Steps to delete unnecessary files after an operating system upgrade

- Irrespective of the operating system used, either Windows 7, 8, 8.1, or 10 go to the start then search and type **Disk Cleanup**

- The disk cleanup app shows, click on it to launch

- From the Apps interface, select the drive on which the OS is installed which is usually C by default in many PCs.

- After selecting the drive click **Ok** and the disk cleanup app will scan for the unnecessary files that can be deleted and present them as a list.
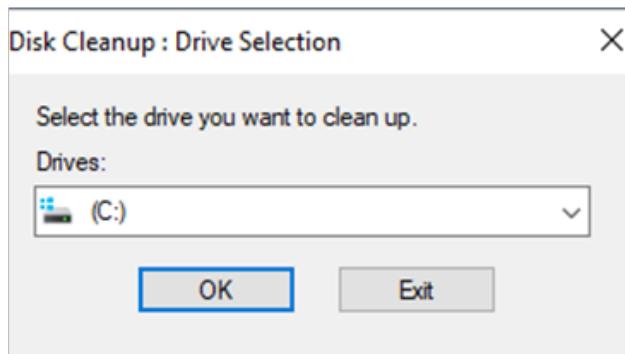
Figure 2. 21. Disk cleanup selection (C drive)
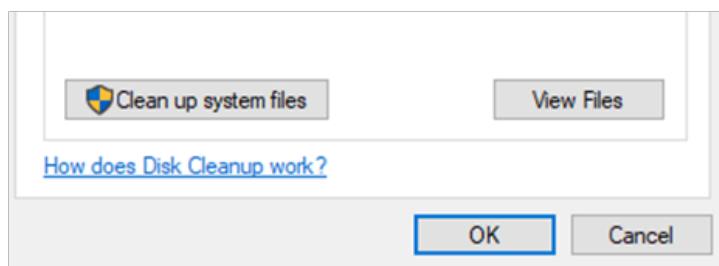
Figure 2. 22. Disk cleanup ready to start

- The disk cleanup then does another search and gives another list now with all the necessary files to delete. From the list select all the unnecessary files taking up on the space including "Previous Windows installations"

- Click OK and a box asking whether to permanently delete these files will pop up. Click Delete Files.

There are thousands of problems an operating system might encounter. However most of those problems are rare and the existing few have been documented. The various common issue and how they can be solved has been looked atin the above content.

B. Applications issues

Common computer software issues or fault can include the following:

1. **Inadequate software performance:** This refers to slow system response time and transaction throughput rates.

2. **Obsolete software**: Software that no longer works due to new hardware or support software changes

3. **Inconsistent processing:** Software that only works correctly in one environment. This refers to software that has been designed for only one environment and cannot be easily transported and used in another environment.

4. **Unreliable results or performance**: This means that the software does not deliver consistently correct results and cannot work correctly each time it is used.

5. Incorrect software version being installed on a computer

6. Virus and malware infection on a computer, etc.

The most common way to rectify software issues include uninstalling and reinstalling a software, upgrading the software, running a virus and malware scan. It is also a good practice to check for the manufacturers' website for patches

C. Malware

Malware are harmful programs or malicious softwarethat are specifically designed to gain access or damage a computer without the user's knowledge. They affect the smooth running of a computer system or carry out illegal activities such as collecting information from the infected user's computer.

The categories of harmful programs include viruses, worms, Trojan horses, rootkits, spyware, crimeware, and adware. In this section we will discuss on viruses.
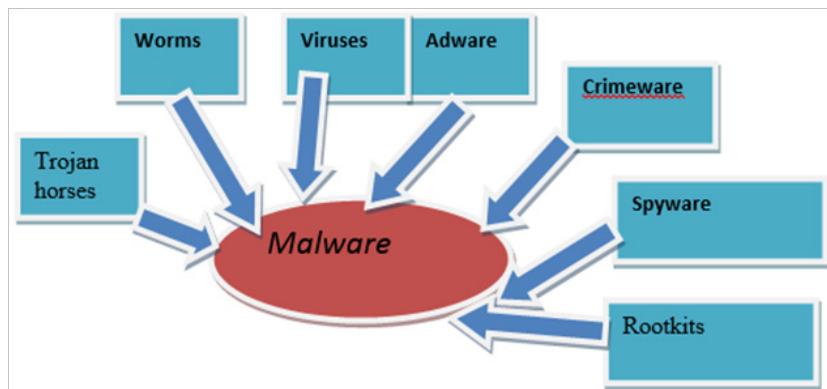
Figure 2. 23. Diagram showing different types of malwares

a) Virus

A virus is a self-duplicating computer program or piece of code that is loaded into a computer without the user's knowledge. Viruses can spread themselves from computer to computer, interfering with data and software.

The source of computer viruses is the internet and storage devices or media. .

To Prevent Harmful Programs the following measures can be taken:

i. Install an antivirus program

An antivirus will check for suspicious files and disinfect them or delete them. Make sure the antivirus is up to date so that it can detect even newly created viruses.

ii. Avoid non-secure sites

Avoid visiting unfamiliar suspicion sites and block special sites that should not be accessed using the computer browser.

iii. Scan emails for viruses

Do not open email attachments unless they are from legitimate known source.

iv. Install anti-spyware software

This is a type of program designed to prevent and detect unwanted spyware program installations.

b) Trojan

Trojan or Trojan Horse is a malicious software that is disguised as legitimate. Trojan misrepresents itself as useful, routine, or interesting in order to persuade a victim to install it on a computer. Trojans do not replicate themselves and appear harmless but in fact malicious.

c) Worms

A worm is a computer program that sits in the computer memory, duplicates itself continuously until the system runs out of memory and crashes. Worms infect networks by replicating themselves and transmitting their multiple copies to all the nodes connected on the network

d) Rootkit

A rootkit is software used by a hacker to gain constant administrator-level access to a computer or network. It is installed through a stolen password or by exploiting system vulnerabilities without the victim's consent or knowledge.

Rootkits primarily aim at user-mode applications. Rootkits can completely deactivate or destroy the anti-malware software installed in an infected computer, thus making a rootkit attack difficult to track and eliminate. When done well, the intrusion can be carefully hidden so that even system administrators are unaware of it.

e) Spyware

Spyware is a software code installed on a computer without user's knowledge to monitor or supervise user activities.

Spyware can do the following:

- Gather personal information and can transmit it without user's knowledge,
- Change computer settings,
- Corrupt windows Registry files,
- Slow down internet connection speeds and the computer itself by taking up memory and space on the computer,
- Can make a computer to malfunction or totally crash.

f) Adware

The term adware is used to describe a form of malicious software which presents unwanted advertisements to the user of a computer. The advertisements produced by adware are sometimes in the form of a pop-ups or in a window that cannot be closed.

Adware is considered a dangerous programs, its main objective is to collect information about the user, to remove the browser's restrictions, settingsand default search engine. When data collection is complete, the current opened program starts to be active, and user gets low-quality sites in response to any request.

g) Crimeware

Crimeware is distinct from spyware and adware. It is designed to commit identity theft through social engineering in order to access a computer user's financial and retail accounts for the purpose of taking funds from those accounts or completing unauthorized transactions.

Crimeware can have the following impact:

- Install keystroke loggers to collect sensitive data login and password information for online bank accounts.
- Redirect a user's web browser to a counterfeit website controlled by the thief even when the user types the website's proper domain name in the address bar.
- Steal passwords cached on a user's system.
- Enable remote access into applications, thus allowing a break into

networks for malicious purposes

- Encrypt all data on a computer and require the user to pay a ransom to decrypt it

2.2.3. Computer software installation

2.2.3.1. Installation of an OS

The term **Software Installation** means the process of copying installation files of a given program onto the hard disk in a format that allows the computer to run the program. It means putting a computer program on a computer and make it ready to use. Before installing any software read the manufacturer's installation manual to correctly install programs. This manual describes all the procedures and the necessary system requirements for successful installation.

Most programs are installed by downloading the program from online sources. Programs can be installed from an external storage medium such as a DVD or USB stick. If a programis being installed from the disk, the installer will automatically start when a memory is insertedin the DVD drive. What the one doing the installation will have to do is just follow the instructions..

Installation of an Operating System is a fundamental process that starts with identifying minimum or recommended system specifications.

Installation of Windows 10

Like other versions of Microsoft Windows, installation of Window 10 is a three-phase process consisting of: **copying files from either bootable USB or CD/DVD, installing features and drivers and configuring settings.**

a. Copying files,

At this first stage of installation the all files are moved from either bootable USB or CD/DVD to computer which require installation

b. Installing features and drivers,

At this stage the copied files with respect to their features start to be installed together with the drivers, recall that the role of drivers is to provide a software interface to hardware devices, enabling operating systems and other computer programs to access hardware functions without needing to know precise details about the hardware being used.

c. Configuring settings

This is where installer is asked to choose from available options. This stage of configuration require to be taken carefully as some of the settings once disabled may lead to the malfunctioning of the computer

Step 1: This is the first screen to see while installing Windows 10 using a bootable USB flash drive or DVD. Here's where to choose the Operating System's language, time and currency format, and input method. Once everything is chosen appropriately choose Nextto continue
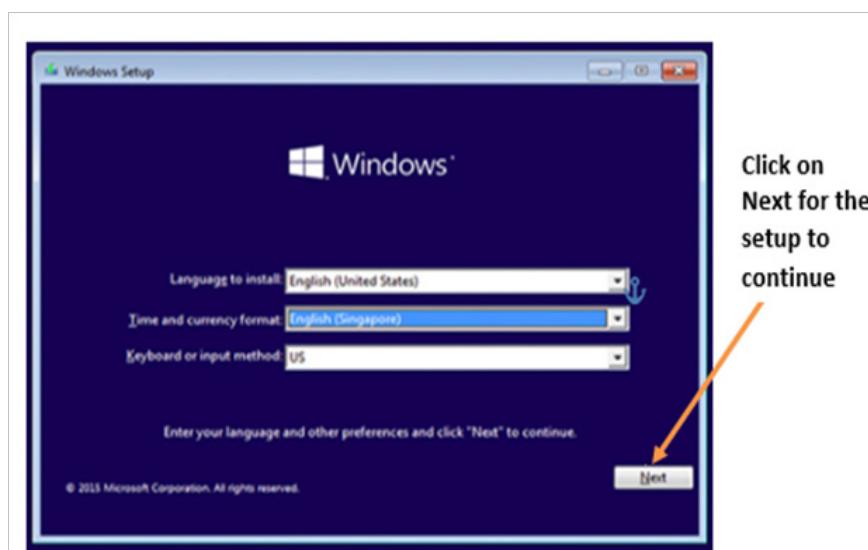
Figure 2. 24. The first screen for installing Windows 10

Step 2: In the new window that appears click on Install now
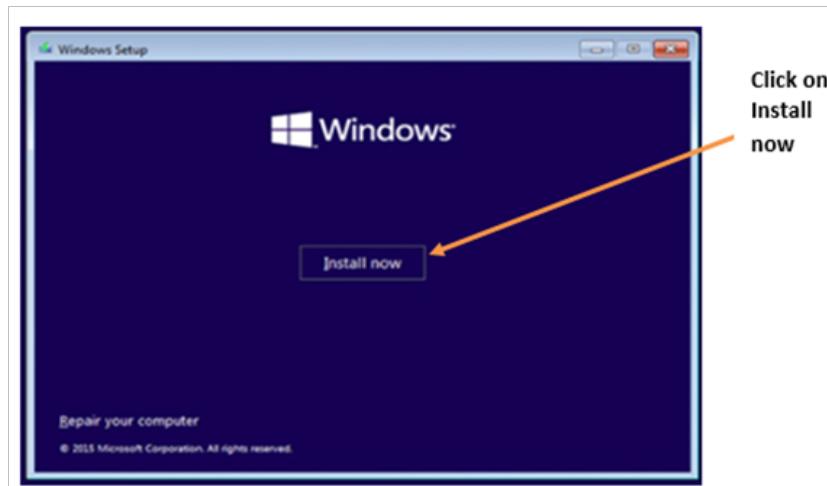
Figure 2. 25. Install now window

Note: If the repair option is chosen, the Troubleshoot screen where to choose to reset the PC and re-install windows will appear. Therefore, keep or remove the files

Step 3: In the window that appear next enter the Windows product key. This can be found online, in the confirmation email so that they can be purchased, or on the DVD packaging.
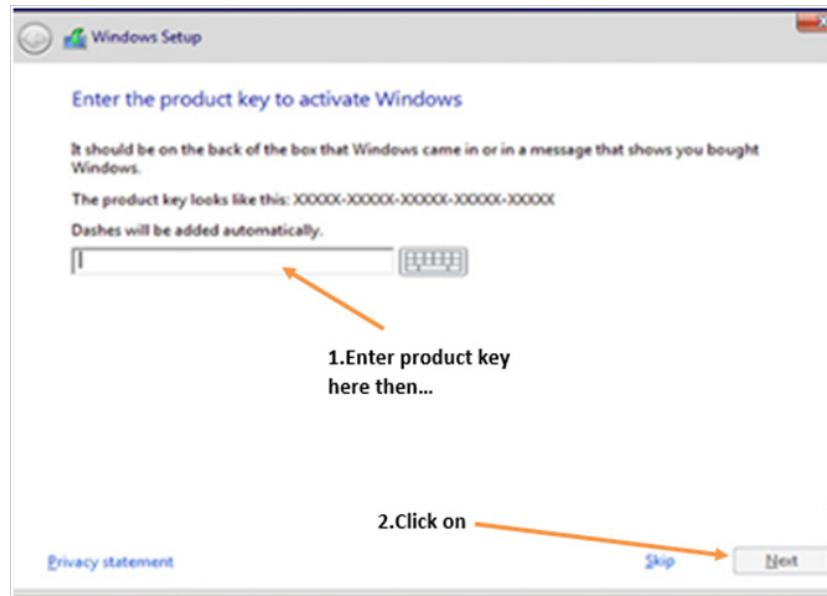
Figure 2. 26. Entering product key window

Step 4: Accept the licence terms. This stage deals with reading software licence terms and condition to install window 10.

Step 5: In the next image, one can choose to upgrade or custom install windows.

In the upgrade option, files, settings and apps are moved to Windows while in custom option these are not moved.The choice to make will depend on the one installing Windows and what is the needed outcome at the end of the installation.
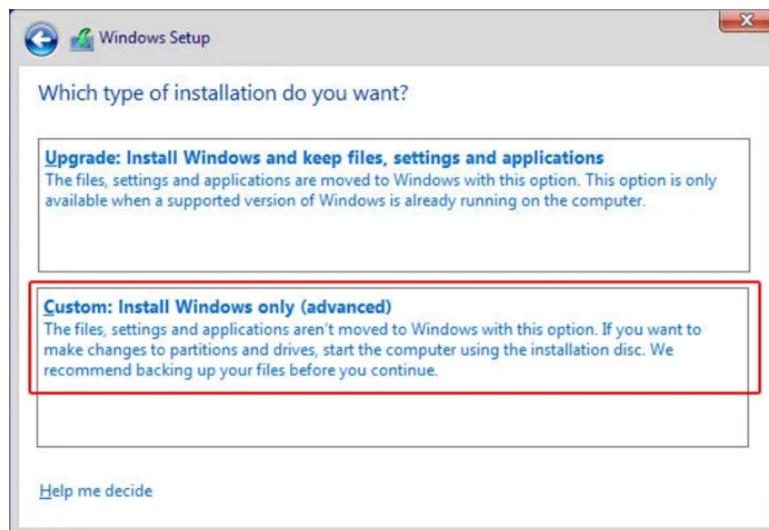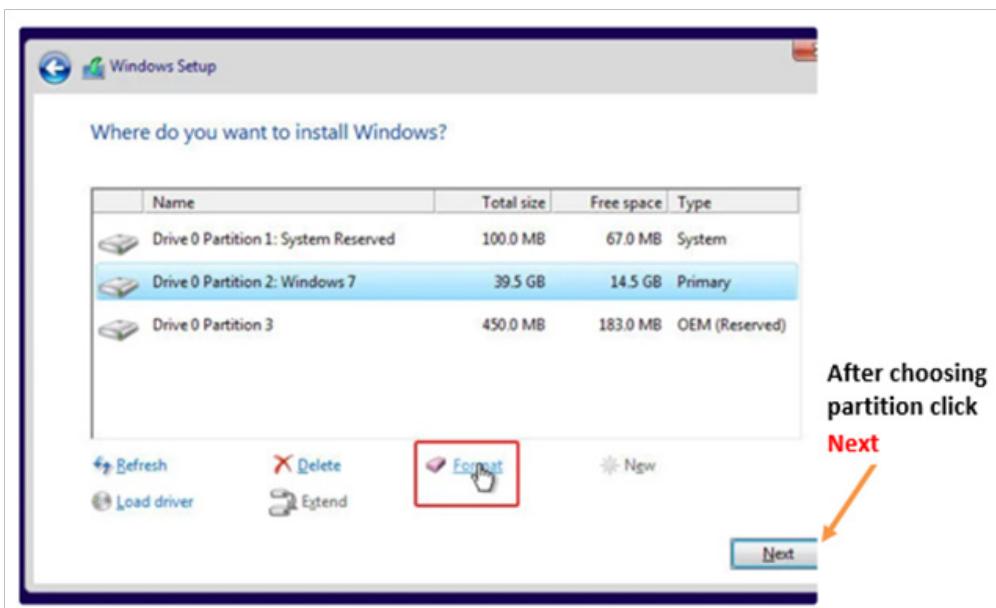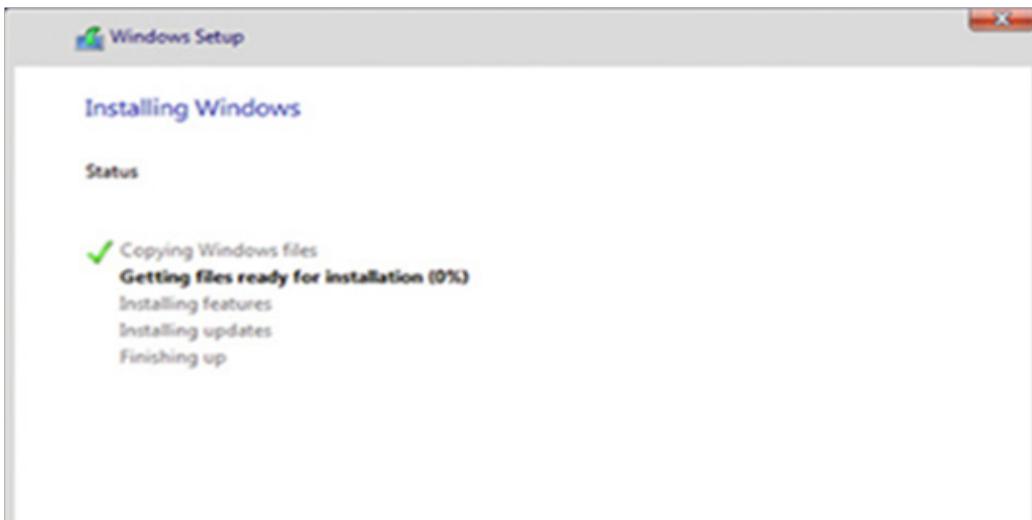
Figure 2. 27. Windows setup install options (upgrade and custom install)

Step 6: Select the drive to install Windows 10 on. At this step an existing drive can be formatted and used for installation like a new drive can be used for that purpose. Partition is also done.
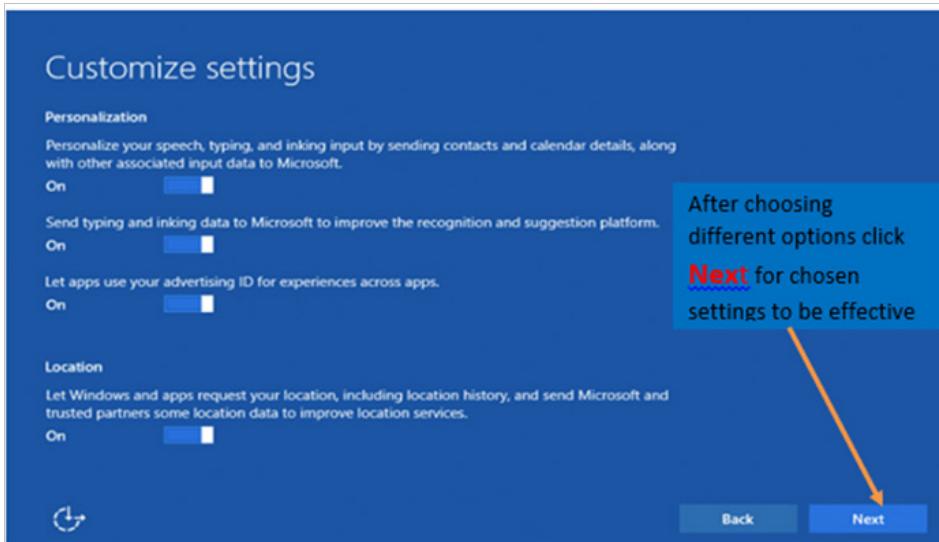
Step 7: Once the partition in which Windows will resideis specified, clicking the Next button moves the installation to the next phase of copying Windows 10 files onto the partition as shown in Figure below:

Figure 2. 29. Copying of Windows system files

At this stage after files have been copied configuration is started. During drivers and features configuration stage, the PC restarts several times.

Step 8: Do personalization of installed Windows

Figure 2. 30.Customization before using Windows

Read the settings to customize carefully before turning them on or off

Step 9: Sign in or create a Microsoft account when prompted to do so as shown in the figure below.
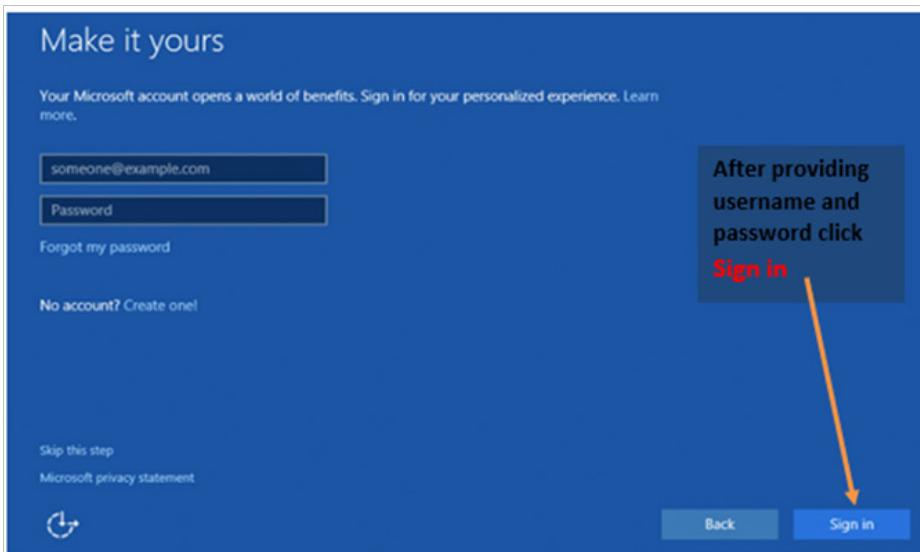
Figure 2. 31. Signing up to Microsoft Account before using Windows

Microsoft account is important as it allows the user to access Windows 10 resources like online emails, cloudand Apps.

Step 10: Let the installer configure Apps before the desktop shown in the figure below is displayed.

Figure 2. 32. Windows 10 desktop after completing installation

Now Windows 10 is ready to be used. The newly installed window will have on desktop three main items: **This PC**, **Network** and **Recycle bin**

Demonstrate and outline steps on how to install various versions of Microsoft Window operating systems such as window 7,8, etc..

2.2.3.2. Installation of Application software

Activity 2.9:

John bought a computer and connected a flash disk on it to play some music,unfortunately the computer refused to either play the music or open some documents stored on the flash disk but once the flash was connected to the friend's computer it played and opened the document. After reading this scenario:

   a. Suggest what should be the problem with John's computer

   b. How to handle the issue seen in a?

In order to have a computer accomplish a specific task that the computer user want, instead of having only the operating system, a specific software to accomplish a specific task is installed. That software to install is an application software.

A.General guidelines procedure to install application software on the Computer

The first most important step in software installation is to check whether the target systemmeets the general hardware requirements of the application. It is also necessary to make sure thatthe version of the application to be installed corresponds to the Operating System platform running on the computer.

Some computer programs also have software requirements prior to installation. Once all the initial requirements have been met, make sure that there are no unnecessaryprograms running before beginning the installation procedure.

Software installation can be done directly from the Internet or from aninstallation media

A.1. Installation from media

To install from the disk insert the CD/DVD drive. Once A setup wizard is running simply follow the prompts until the installation process is completed. In case there is no setup wizard window, open the Explorerand navigate to the optical drive. Double click on either the Autorun or Setup file.For novice users, accept the default values to minimize potential problems during the procedure.

A.2. For installation from the Web

Launch the browser application and download the setupfile to the hard drive.

After completion of the downloading process, run the setup program which is found in the **Downloads** folder to execute thesetup wizard that will handle the automatic installation of the software.

After the installation procedure has been completed and the setup wizard hasterminated, reboot the computer before launching the newly installed software.

A.3. Installation of Microsoft office 2013

Most software developers package several programs into a suite with good example being Microsoft Office 2013. Go through the following steps:

Step 1: Insert Microsoft Office 2013 DVD or USB installation media into the computer. In the licence agreement screen that appears, click the check box with the text **"I accept the terms of this agreement".**
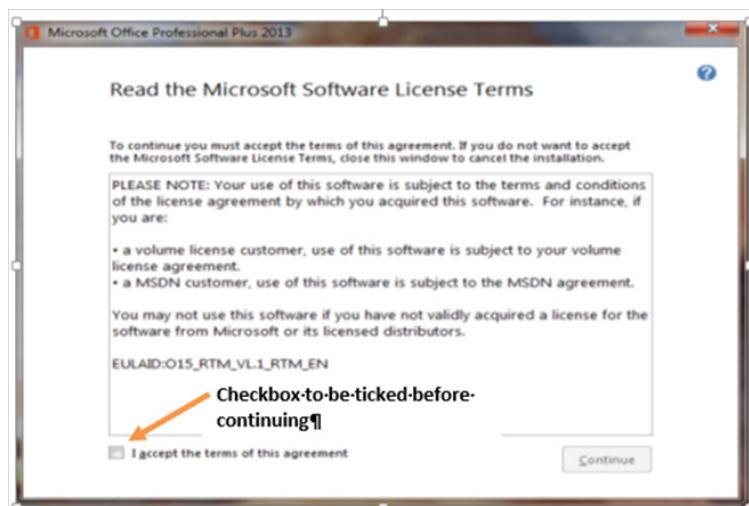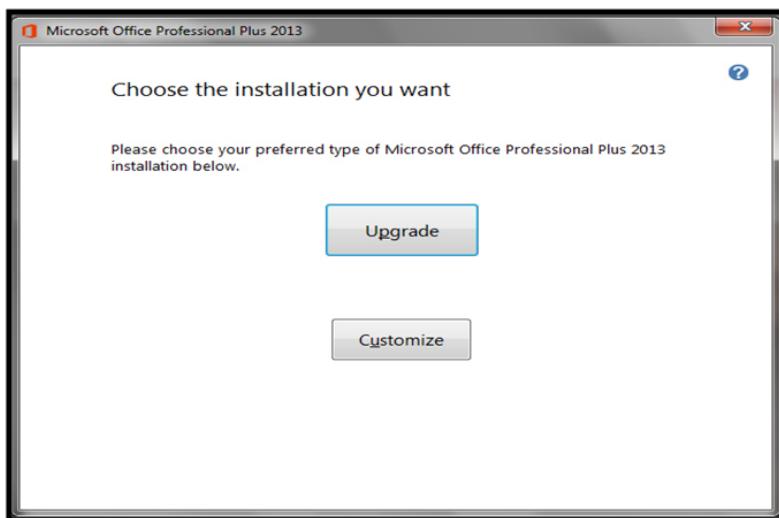
Figure 2. 33. MS Office Licence agreement window
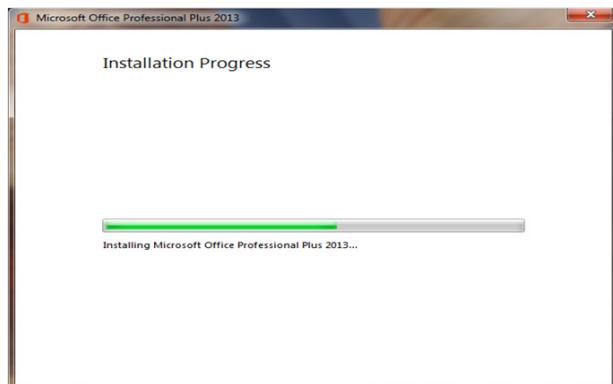
Step 2: Once the Microsoft terms of agreementare accepted, choose whether to upgrade an existing version or custom install a new copy.

Figure 2. 34.Choosing either Upgrade or Customize installation option

If an old version of office is already installed there is an option to upgrade it to a newer version but both the new and the old versions can be kept depending on the user's choice.

Step 3: To upgrade an existing version of Microsoft Office, click Upgrade. Make sure the radio button "Remove all previous versions" is selected, and then click Next. The installation progress screen shown in the figure fellow.

Figure 2. 35. Office 2013 installation process

Step 4: Once the installation process is complete, sign in for Microsoft account to get online access to theMicrosoft resources likeThe screen shown in the figure below is displayed to confirm that Office 2013 has successfully been installed.

Figure 2. 36. Microsoft office 2013 home page when firstly opened

Step 5: Open Office 2013 by clicking on the **Start** button then **All apps**. The list of installed Microsoft Office 2013 apps is displayed.

Note:

To install application software successfully there is a need to use an administrator login because with other types of accounts with limited privileges such an installation is not possible.

Sometime once a program is installed into a computer there may be a need for removing them from the computer for different reasons. The process or removing installed application software from computer is known as uninstallation. Here below are the procedures followed to uninstall some programs in window 10:
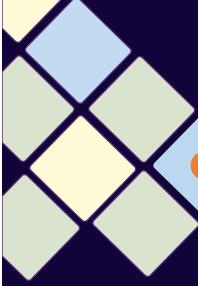
- Open the Start menu
- Select control panel
- Click on uninstall program
- Select the program to remove
- Click Uninstall
- Click on the program to uninstall

Application activity 2.9

2. You are provided with Microsoft Office 2016 Installation on DVD or on flash disk. Uninstall the current running Microsoft office and Install this provided application on your computer.

End unit assessment

1. Compare safety precautions applied in scientific laboratories such as chemistry, physics and those observed in computer laboratory

2. Study the motherboard of a computer and perform the following:

   a. Identify the CMOS cell battery and RAM mounted on the motherboard

   b. Detach and re-attach a CMOS batter and RAM using the following guidelines:

3. a. Explain briefly the meaning of operating system in the computer system.

   b. Explain three phases taken by operating system during its installation

   c. Discuss any five functions performed by the operating system residing on a computer.

4. State four factors to consider before purchasing application software.

5. Explain why motherboard is the first element to be installed in the process of assembling but the last one to be removed during the process of disassembling?

Key Unit competence:

Apply advanced skills to create suitable word documents

Introductory Activity

A student teacher doing an internship was asked to prepare a document presenting the features of his/her TTC . The document to prepare must contain at least five images which present the most aspects of the school. Those images can be classrooms, administrative blocks, dormitory, refectory and student teachers on the school assembly. The document must contain titles and have highlights of words to which more attention is needed. The highlighted words can be made bold, italic, underlined or can have any other color depending on the preferences.

a. Prepare such a document with at least 4 pages and give it the title "My beautiful TTC"

b. Insert page numbers in the created document

c. Create a table of content for that document

d. Create a cover page that is going to be the first page in the document but with no page number

3.1. Formatting a document

Instruction: Open a blank document in Ms Word and save it as"Inzu"; then type in the document "Hanohariinzuikodeshwa "

 Do the following:

1. Change the font size to 36
2. Change the font – type to Book Antiqua.
3. Change the textfont color to red.
4. Change text to Bold Italic and Underline it.
5. Change text to the UPPERCASE.
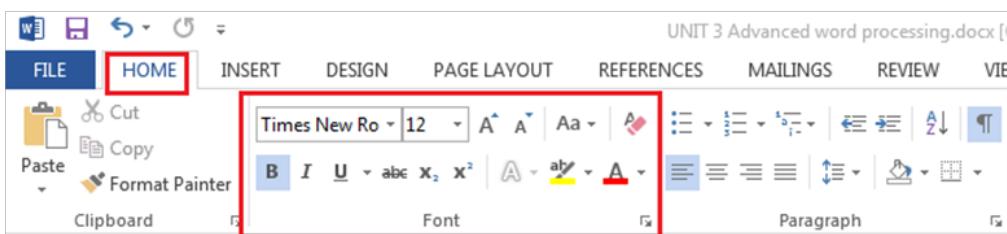
Formatting a document refers to the appearance or presentation of a document which is done in order to make that document look more beautiful by looking like a readable document rather than a letter or note to a friend.

3.1.1. Change the font

Text formatting allows the changing of the appearance and layout of text and other characters within a document. The font determines the way the text appears on the screen and when the document is printed. The more common font types are Times New Roman, Verdana and etc. there are also different font colors and size which are used depending on the user's choice.

It is possible to apply a font to either an entire document or to certain portions of a document. To apply a font:

•   Click on the **Home tab**

•   Go to the **Font group**

•   Select/click on the font to apply

Figure 3. 1. The font group (found under the Home tab)

Note: When the font is to be applied on a text already written the steps to apply a font will be preceded by selecting that text

A. Changing font size

The most used size of word characters is 12, however character size in word varies from 1 to 72 but can increased even up to 1638 for Microsoft Office word 2013. To change the font–size go through the following steps:

1.Select the text for which the size is going to be changed
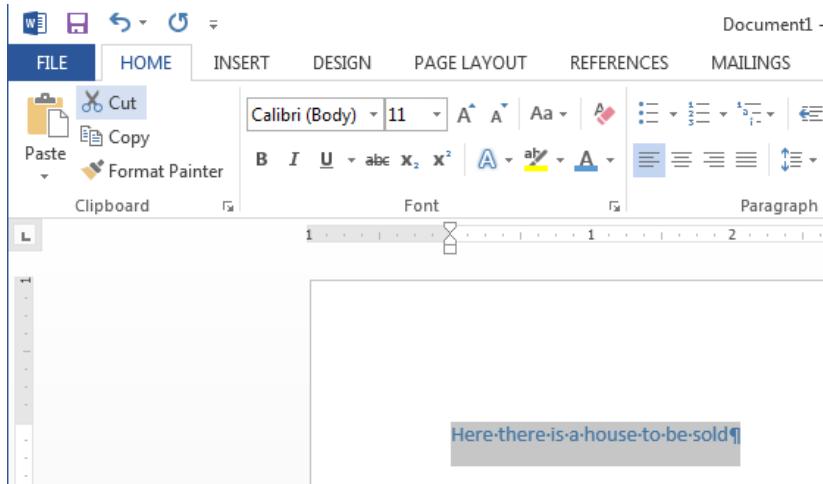
Figure 3. 2.Selected text

2. On the Home tab, click the Font size drop-down arrow. Select a font size from the menu. If the font size needed is not available in the menu, click the Font size box and type the desired font size, then presses Enter.

In the image below the font size of the text is now changed to 36.
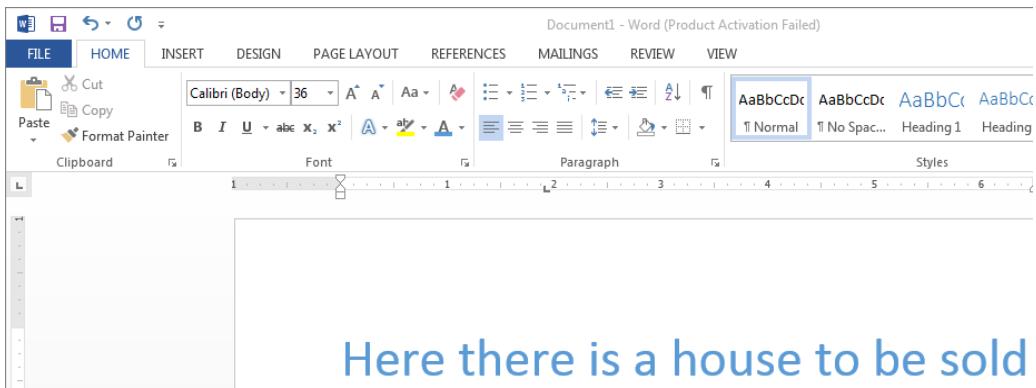
Figure 3. 3. Font size changed to 36 using the font drop down arrow

Note: It is possible to change font size using the Increase Font Size and Decrease Font Size commands (A˄ A˅).

B. Changing font type

By default, the font type of each new document is set to Calibri. However, Ms Word provides many other fonts to use in customizing the text. It is advisable to use the font type "Times New Roman" and the font size 12.

To change text's font type go through these steps:

1. Select the text to modify.
2. On the Home tab, click the drop-down arrow next to the Font box. A menu of font styles will appear.
3. Select and click on the font type to apply. Immediately the font types
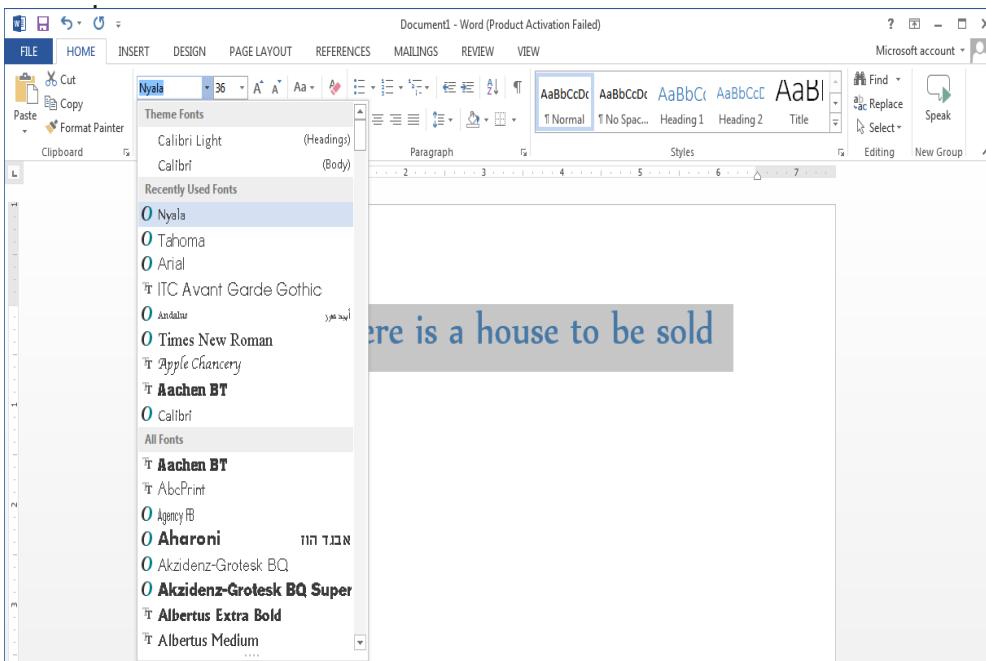
Figure 3. 4.Font style dialog box with different font types

C. Changing the font color

The most common font color for word text is automatic (near black) but there are other fonts available. To change the font color:

1. Select the text to modify.
2. On the Home tab, click the Font Color drop-down arrow. The Font Color menu appears.
3. Select the font color to use. The font color will change in the document.
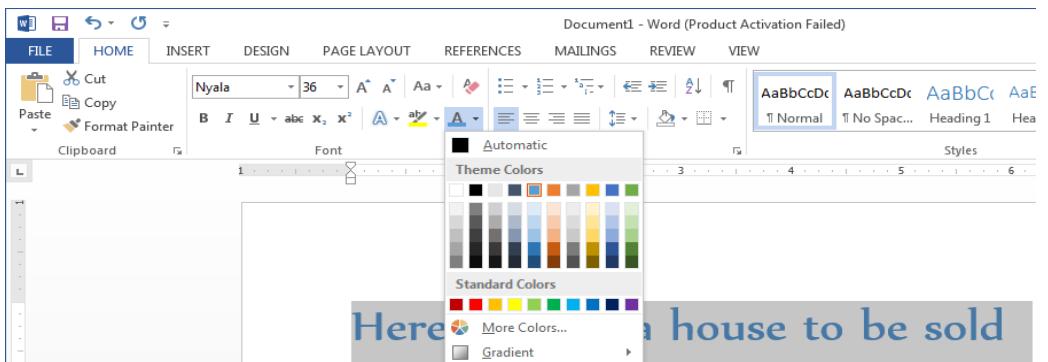
Figure 3. 5.Changing the font color

The Color to choose from are not limited to the drop-down menu that appears. Select More Colors at the bottom of the menu to access the Colors dialog box and choose one of the colors.
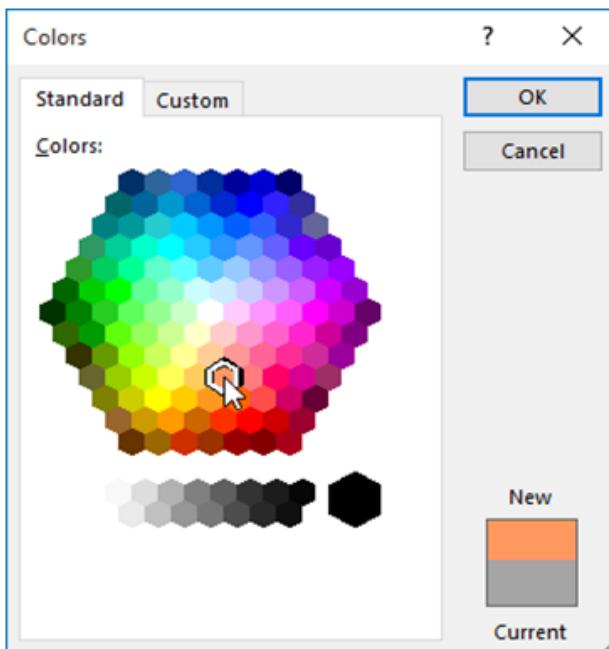
Figure 3. 6.Colors dialog box

D. Making text Bold, Italic, and Underlined

The **Bold**, **Italic**, and **Underline** commands are used to help draw attention to important words or phrases. To make text have these attributes do the following:

1. Select the text to modify.

2. On the Home tab, click the Bold **(B)**, Italic **(I)**, or Underline **(U)** commands in the Font group.

3. The selected text will be modified and made bold, italic and underlined as in the next image if all the corresponding icons were clicked on.
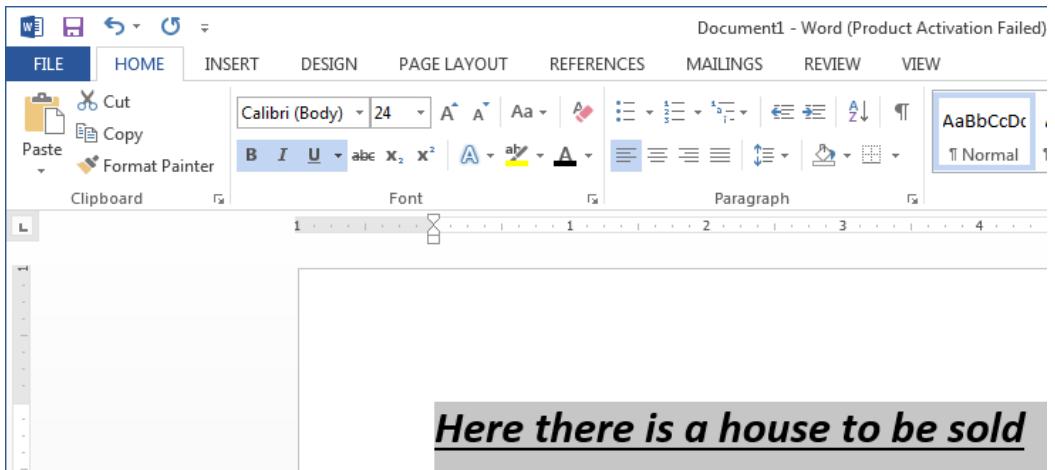
Figure 3. 7.Changed text in Italic, Bold and underlined

D. Changing text case

The text case is about the presentation of characters in words. A character can be in capital or small letter. The available cases are: Sentence case, Lower case, Upper case, Toggle case and Capitalize each Word. When changing the text case is needed, use the **Change Case** command instead of deleting and retyping the text.

To change the case:

1. Select the text for which to change the case.

2. On the Home tab, click the Change Case command in the Font group.

3. A drop-down menu will appear. Select the desired case option from the menu.
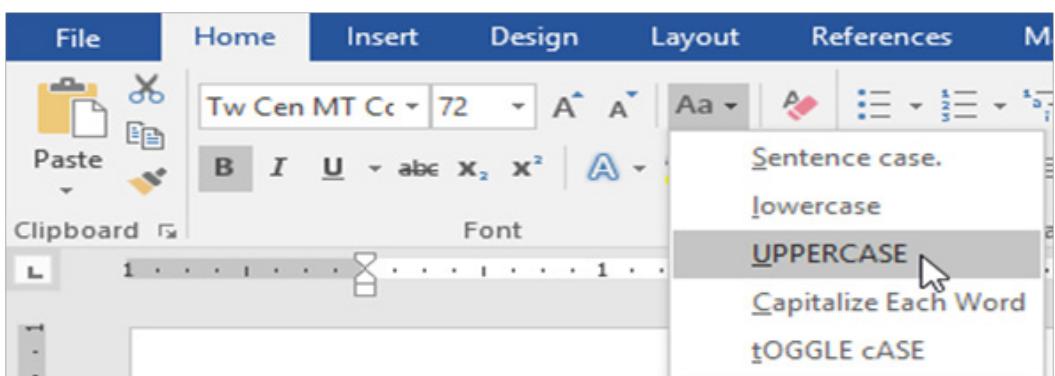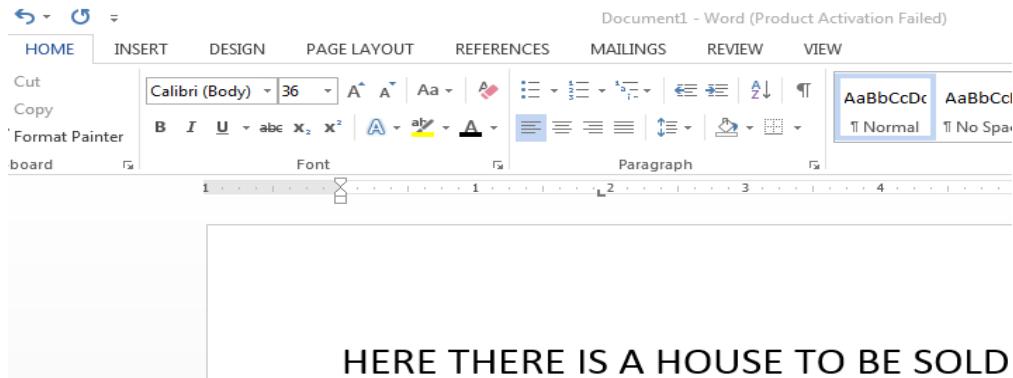
Figure 3. 8.Change case options

The text case will be changed in the document like in the next image whose text was in small letter before changing to upper case.

Figure 3. 9.Text changed to uppercase

Application activity 3.1

Write at least four lines of text which describes peace and do the following:

1. Change font type of the first and second sentences to **"Poor Richard"** ,font size to **"14"**, font color to **"Blue"** and make the sentences italic.

2. Change the third and fourth sentence to the font type "Tahoma", font size **"12"**, font color **"Red"** and underline those sentences.

3.2. Paragraph group

Activity 3.2

1. Type text in word processing software which describe your last holidays. The first paragraph talk about your daily activities, the second about what made you happy and sad during the holidays. Save it as "my activities" and do the following:

a. Apply on the text a line spacing of 1.0

b. Using the numbering option number your paragraphs as 1 and 2

c. Apply an indentation of 2.1 to the left on your paragraphs

A paragraph is a distinct section that describes a special idea.

Paragraph format contains one or more lines with a combination of words, numbers and other characters. Various commands are used to format a paragraph such as: **Text Alignments, Bullets, Numbering, Multi-Level list, Paragraph Indents, Sorting Text, Line Spacing** and many others.

3.2.1. Indent

Indent means how far to move the paragraph away from the left or from the right margin.

A. Method 1 of changing indent: the Tab key

The quickest way to indent is to use the Tab key which creates a first-line indent of 1/2 inch. That is done in this way:

1. Place the insertion point at the very beginning of the paragraph to indent.
2. Press the Tab key and the paragraph will be moved to the right by 1/2 inch.
3. The first line of the paragraph will be indented.

B. Method 2: Indent markers

In some cases, there is a need to have more control over indents. Word provides **indent markers** that allow to indent paragraphs to the needed location.
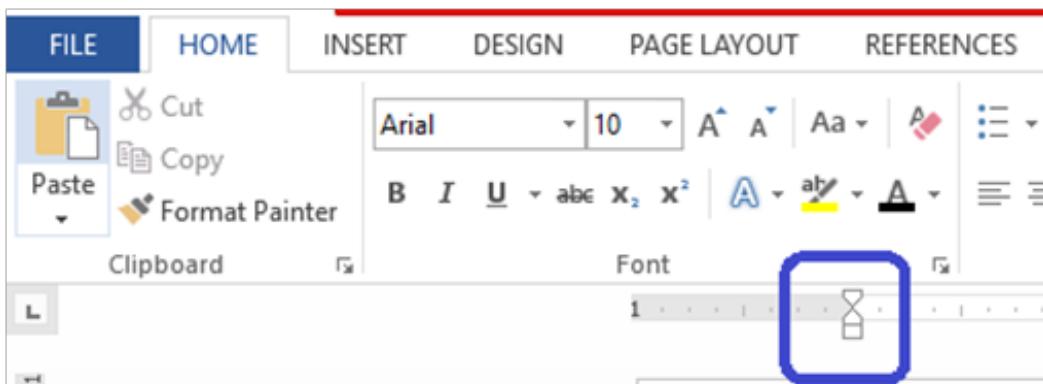
Figure 3. 10.Indent marker

The indent markers are located to the left of the horizontal ruler, and they provide several indenting options:

- **First-line indent marker** ▽ adjusts the first-line indent
- **Hanging indent marker** △ adjusts the hanging indent

- **Left indent marker** ☐ moves **both** the first-line indent and hanging indent markers at the same time (this will indent all lines in a paragraph)

Indent using the indent markers goes through the following steps:

1. Place the **insertion point** anywhere in the paragraph to indent, or select one or more paragraphs.

2. Click and drag the desired **indent marker.**
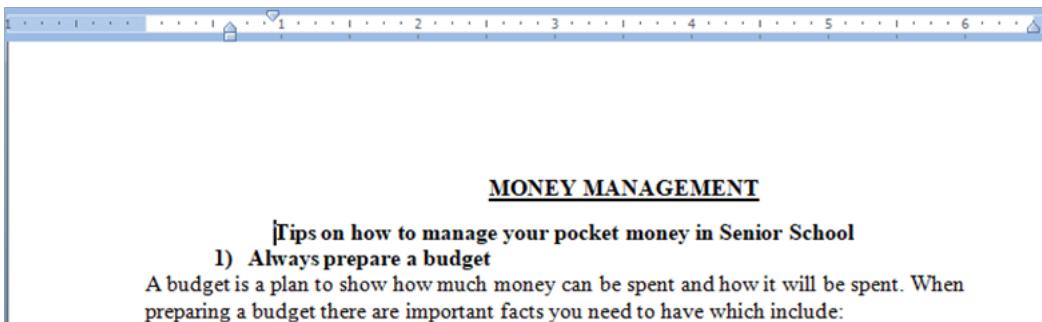
Figure 3. 11.Indented paragraph

3.2.2. Line Spacing

Line spacing is the space between each line in a paragraph. Word processing program allows to customize the line spacing to be single spaced (one line high), double spaced (two lines high), or any other space size.

Steps to format line spacing:

1. Select the text for which to change the line spacing.

2. On the **Home** tab, click the **Line and Paragraph Spacing** command, then select the desired line spacing.
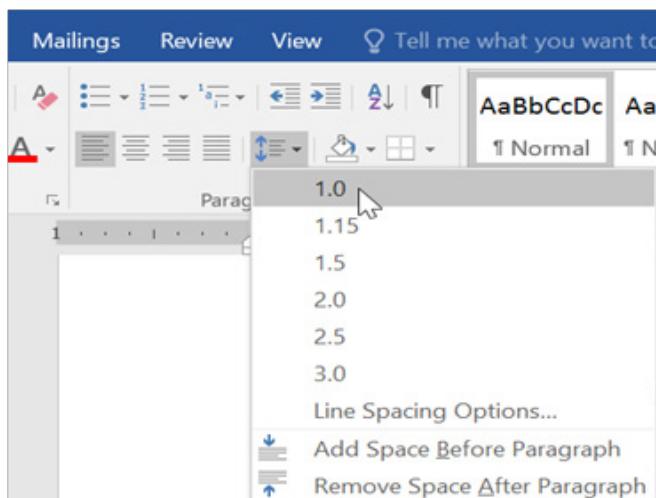
Figure 3. 12.Line and Paragraph Spacing

The line spacing will change. In the the image below the line spacing is 1.0

Use ICT to enhance student knowledge and skills.

If schooling is intended to be relevant to work and important to a society, success in school should be accompanied by the development of a broad body of knowledge and a complete range of skills—including literacy, numeracy, information literacy and independent-learning skills that contribute to achievement in later life.

Figure 3. 13.Line spacing changed from 1.0 to 2.0

3.2.3 Bullets and Numbering

Bullets or numbering are used for a list. It is possible to apply automatically simple bullets and numbering to lists in the document as it is being written.

Method 1: Custom made bullets and numbering

1. Start a bulleted list in Word by typing a character to use as a bullet at the beginning of the first item in the list and pressing the "**63**" key.

2. After pressing the "**Spacebar**" on the keyboard, the asterisk will turn into a bullet point.

3. Type the first line of the listand press the "Enter" key to move to the next line. The bulleted list will continue to be created.

4. To discontinue the bulleting, press "Enter" two times when finished with the list

Note: The character to use as a bullet can be a number or a letter. It can also be followed by a dot or a closing parenthesis.

Method 2. Bullets and Numbering found in the paragraph group

The paragraph group has bullets and numbering that can be chosen from. To apply them Go to the **Home** tab, in the **Paragraph** group, choose the **Numbering** button and then the style of bullets and numbering to use.
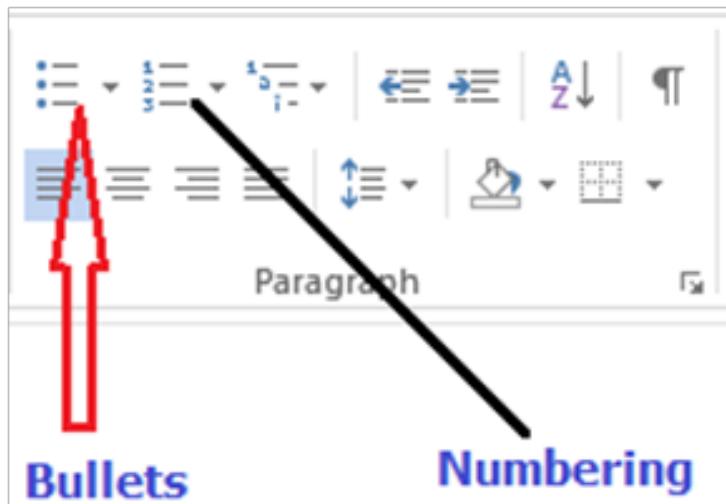
Figure 3. 14.Numbering buttons

3.2.4 Alignment

It refers to the arrangement of text relative to the left or right margin of a page. There are four types of alignments namely: Left, Right, Centre, and Justified Alignments.
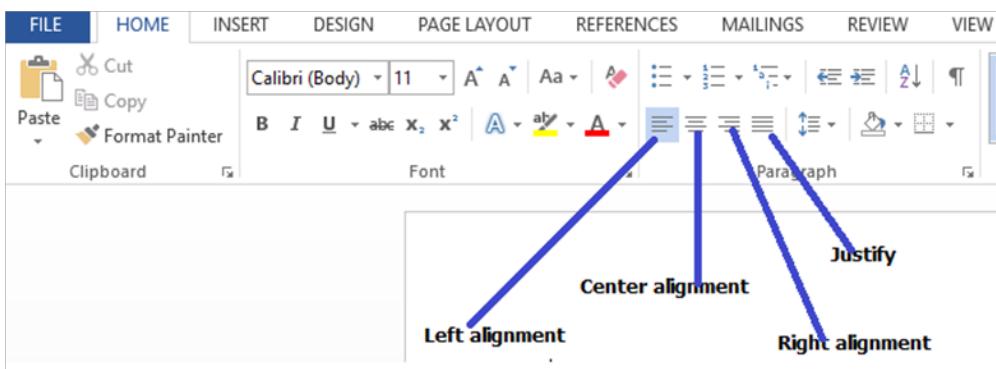
Figure 3. 15.Left, Right, Centre, and Justified alignments

Left alignment: Text is evenly positioned along the left margin but uneven at the right margin. Typing begins at the left margin and does not have to end at the right margin.

ICT IN EDUCATION

Information and **Communication Technology (ICT) in education** is the mode of **education** that use information and communications technology to support, enhance, and optimize the delivery of information. Worldwide research has shown that **ICT** can lead to an improved student learning and better **teaching** methods.

Figure 3. 19 Left alignment

Right alignment: Text is evenly positioned along the right margin but uneven at the left margin. Typing begins at the right margin and does not have to end at the left margin.

ICT IN EDUCATION

Information and **Communication Technology (ICT) in education** is the mode of **education** that use information and communications technology to support, enhance, and optimize the delivery of information. Worldwide research has shown that **ICT** can lead to an improved student learning and better **teaching** methods.

Figure 3. 16.Right alignment

Center Alignment: Text is evenly arranged at the center of the page but uneven both at the left and right margins. Typing begins at the center of the page.

ICT IN EDUCATION

Information and **Communication Technology (ICT) in education** is the mode of **education** that use information and communications technology to support, enhance, and optimise the delivery of information. Worldwide research has shown that **ICT** can lead to an improved student learning and better **teaching** methods.

Figure 3.17. Center alignment

Justification: Text is evenly arranged both at the right and left margins.

ICT IN EDUCATION

Information and **Communication Technology (ICT) in education** is the mode of **education** that use information and communications technology to support, enhance, and optimize the delivery of information. Worldwide research has shown that **ICT** can lead to an improved student learning and better **teaching** methods.

Figure 3. 18.Justified alignment

Application activity 3.2

Instruction: Using MS Word type a text from an English book, then do the following:

1. Indent the first sentence,
2. Change the font type to "Time New Roman ", size ="12", line spacing ="2.0
3. Change alignment from Left to Justified alignment

3.3. Referencing a word document

Activity 3.3

Using Ms Word type text about the use of ICT in Education and do the following tasks:

1. Insert page header text "ICT tools in education"
2. Insert page footer text "Enhancing students' learning"
3. Insert 2 footnotes to the text "My First Footnote" and "Second footnote"

3.3.1. Header and Footer

Headers are lines of text or graphics that appear above the top margin of a page or selected pages while **Footers** are lines of text or graphics that appear below the bottom margin of a page or selected pages.

To insert a header and footer do the following:

Step 1: Click **Insert Tab** from the menu bar; then click on **Header** or **footer command** from the ribbon.
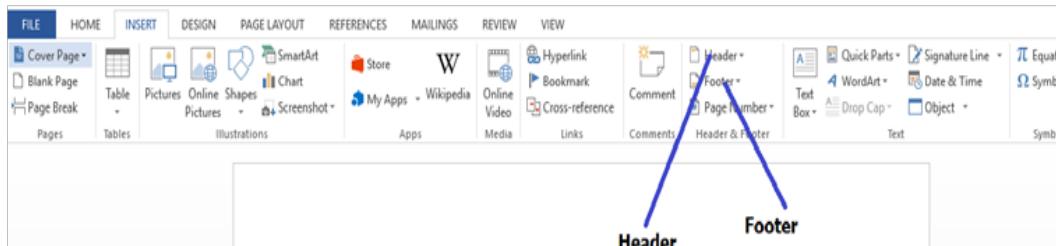
Figure 3. 19.Header or Footer command

Step 2: A drop down menu appears showing the different styles of footer or header. Click on the desired option.

Step 3: In the **Header** & **Footer** regions type the desired content to use as header or footer respectively. Then press Enter.

After entering the text to use the respective header and footer will look like in the following images:

Figure 3. 20.Header group

Figure 3. 21.Footer group

3.3.2. Insert Footnotes and Endnotes in Word
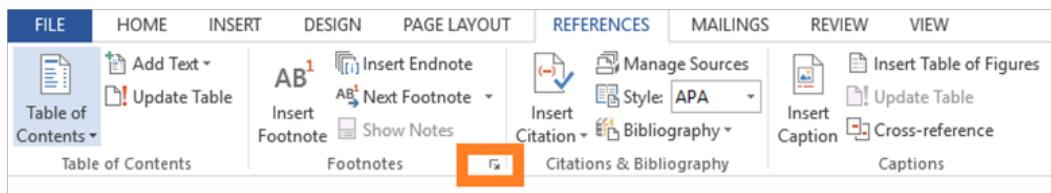
Footnote is the note citing a particular source or making a brief explanatory comment placed at the bottom of a page corresponding to the item cited in the corresponding text while **endnote** is a note citing a particular source or making a brief explanatory comment placed at the end of a research paper and arranged sequentially in relation to where the reference appears in the paper.

To insert footnotes and endnotes do the following:

Step 1: Place the cursor where the superscript number for the first note should appear.

Step 2: Select the References tab in the ribbon.

Step 3: Select the dialog box launcher in the Footnotes group.

Figure 3. 22.Footnotes group

Step 3: Select Footnotes or Endnotes in the Footnote and Endnote dialog box.
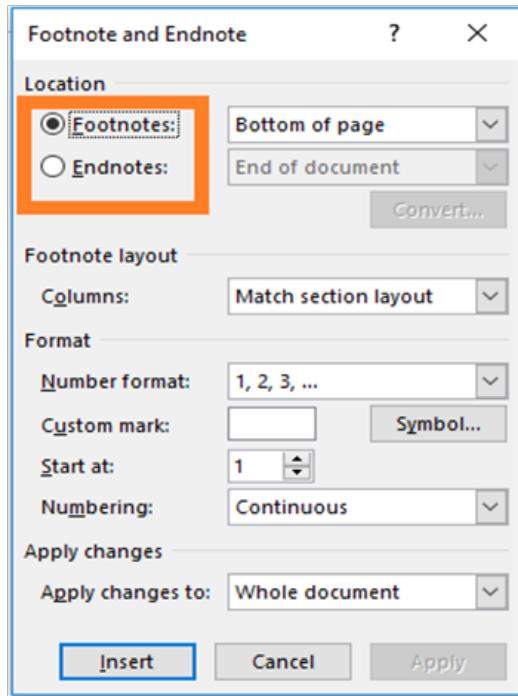
Figure 3. 23.Footnote and Endnote dialog box

Step 4: Select the note's location from the drop-down menu.
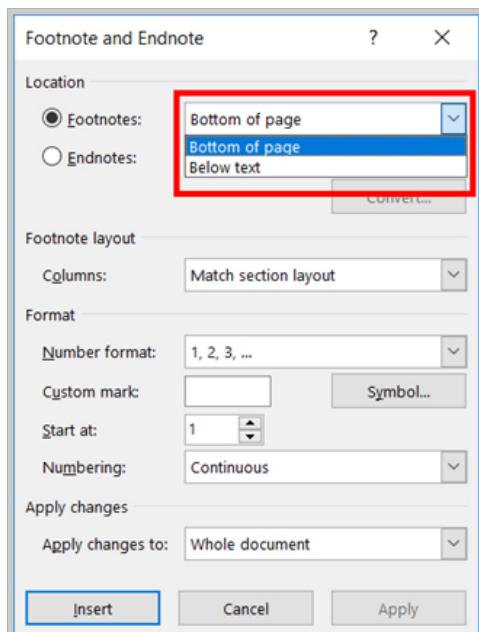
Figure 3. 24.Drop-down menu

Note: It is also possible to choose additional options in the Footnote and Endnote dialog box such as number formatting and whether the numbering applies to the whole document or to a specific section.

Step 5: Select the Insert button to create the first note.
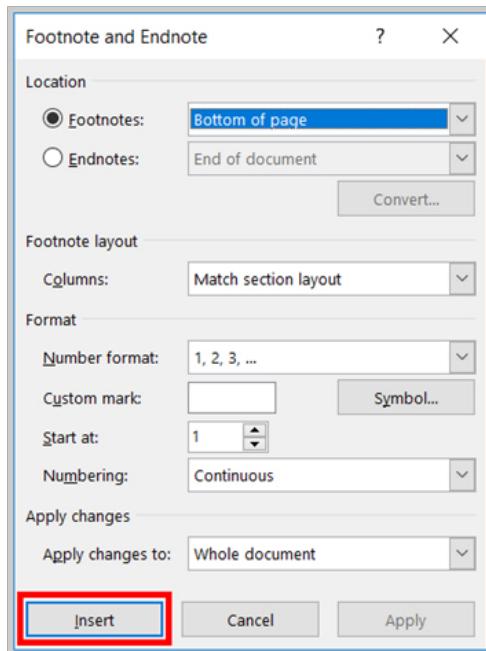
Figure 3. 25.Insert button to create the first note

After Word has created the superscript number, the cursor will automatically move to the note location selected in the Footnote and Endnote dialog box.

Figure 3. 26.Footnote and Endnote

Place the cursor where the superscript number for the next note should appear in the text and then select **Insert Footnote** or **Insert Endnote** in the Footnotes group in the ribbon to insert the next note.

3.3.3. Converting Footnotes to Endnotes

Step 1: Open the document and select the **References tab**. In the **Footnotes** group, click **Show Notes**.

Figure 3. 27.Footnotes group

Step 2: Select the notes to convert, and then right-click and Select Convert to **Footnote** or **Convert to Endnote**.
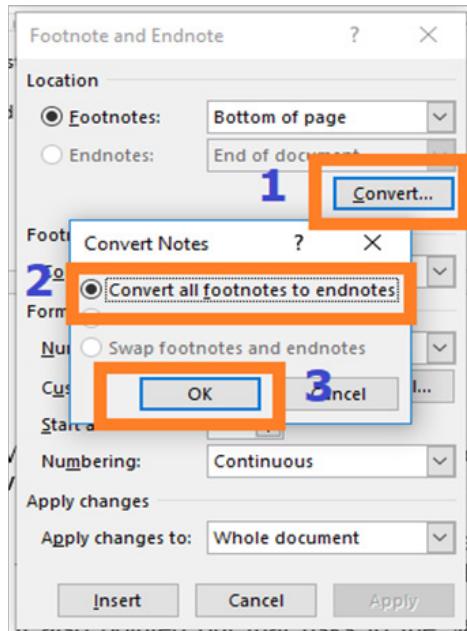
Figure 3. 28.Footnotes and Endnotes dialog box

Application activity 3.3

1. Differentiate footnotes and endnotes?

2. Open "use of ICT in Education" file created in the activity 3.3 and create 5 endnotes of your choice in that document:

3. Convert all the above Endnotes to Footnotes?

3.4. Creating and updating a table of contents

3.4.1 Creating table of content

Using MS Word, write text which describe computer hardware and software and save it as "Information and Communication Technology". The text to write should contain titles and in order to do it quickly you can copy text from the softcopy books available on the REB website. Make sure the document has at least 3 pages. Do the following with the created document:

1. Change the Font-Type to "Book Antiqua"
2. Change the Font Size to 12 and Line Spacing ="2.0"
3. Change Heading 1 to "Arial Black " and Font-size ="14"
4. Change Heading 2 to "Times New Roman " and Font-size ="13"
5. Change Heading 3 to "Book Antiqua " and Font-size ="12"
6. Insert the table of content at the beginning of the document

A Table of Contents (TOC) is an organized listing of chapters and major sections of a document. The role of Table of content is to help readers immediately see how thedocument is organized. A clear, concise, and well formatted Table of Content is the first indicator of a good document.

Below are steps to create a table of content:

Step 1: Set different titles to different headings depending on their importance.

Heading 1 is the biggest title in the document if it is a unit for example the **heading 1** may be the unit name. The other headings are those under the Heading 1. **In Heading 1** there are many **Heading 2** and in **Heading 2** there are many **Heading 3** and so forth. The font properties of the headings can be set by the computer user.

To set a title's heading select the title and while in Home click on the desired heading

Figure 3. 29. Headings available under the Home tab.

Note: MsWord will create a table of contents based the headings created in the whole document so do this for all of the text that will appear in the table of contents.

Step 2: Place the cursor where the table of contents will appear usually at the beginning of the document

Step 3: Go to References andChoose Table of Contents
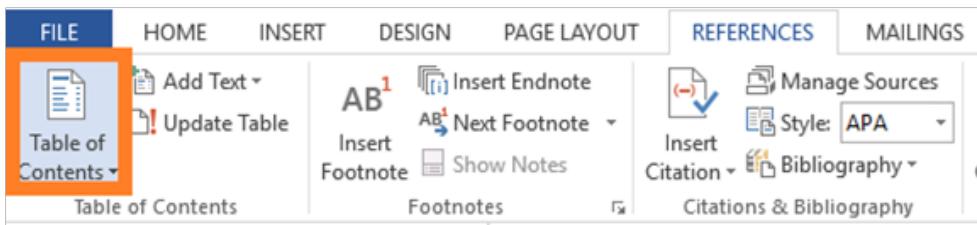
Figure 3. 30.References tab

Step 4: Choose the style to apply as the table of content. Immediately the table of content will be inserted where the cursor is.

TABLE OF CONTENT

UNIT 1. INTRODUCTION TO XO LAPTOP...6
1.1.   The keyboard keys and touchpad...7
1.2.   Brief introduction to different interfaces.....................................10
1.2.1.   Sugar interface 10
1.2.2.   Gnome interface...11
1.3.   Abiword window 14
1.4.   Programming for children 17
1.4.1.   Turtle Art 17
1.4.2.   Scratch..22
1.4.3.   Etoys Projects: 29
UNIT 2: COMPUTER MAINTENANCE...35
2.1. HARDWARE: 35

Figure 3. 31.Part of the Table of contents for ICT Year One

The table of content above is that of one part of the Student Book of ICT Year One in TTC schools. To create a table of content like the one above, the titles have been set to the following headings:

Heading 1	Heading 2	Heading 3
UNIT 1: INTRODUCTION TO XO LAPTOP	The keyboard keys and touchpad	Sugar interface
UNIT 2: COMPUTER MAINTENANCE	• Brief introduction to different interfaces • Abiword window • Programming for children	• Gnome interface • Turtle Art • Scratch • Etoys Projects

Note: If the Custom Table of Contents option is chosen, it is possible to format the way the table of contents will look: Choose a different style, hide page numbers, include more heading levels than the default three levels, and more.
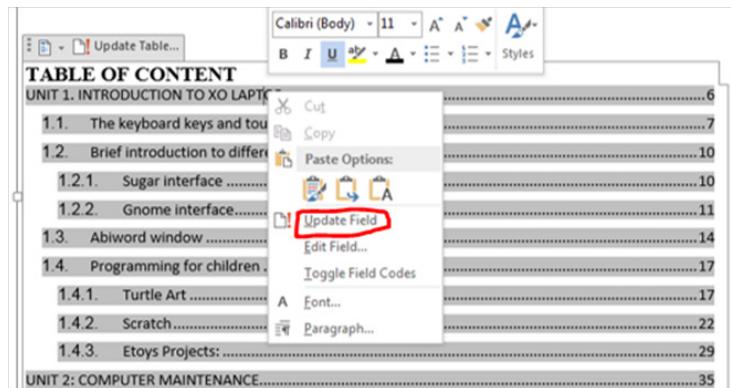
3.4.2. Updating the table of Content

As more titles are added and some removed, page numbers changed, the table of content needs to be changed to reflect the actual document. To update the table of content go through the following steps:

Step 1: Click on the **Table of Contents** to highlight the whole area (the whole area becomes grayed-out)

Step 2: Right-click to bring up the Table of Contents menu

Step 3: Click on **Update Field**

Step 4: Click on **Update page numbers only** or **Update entire table**
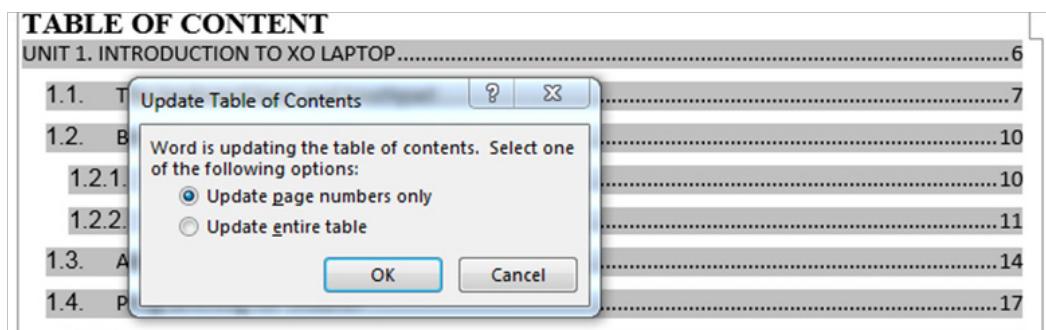
Figure 3. 32. The option to update page numbers only or entire table

Note: Use **'update page numbers only'** to keep the table exactly as it is and just update the numbering or **'update entire table'** if MsWord will regenerate the Table of contents.

Application activity 3.4

1. Create a document on ICT which has the following headings:

   Computer Hardware (Heading 1)

   Generate a list of computer hardware available in the school's computer Laboratory on the following categories which will be Heading 2

   - Input Hardware
   - Output hardware
   - Processing hardware
   - Storage hardware

   Create additional headings in Heading 2 where possible. Those headings will be Heading 3 and Heading 4

2. Add a new title "SOFTWARE" in the document. Make that title a heading appropriately and in it create other headings. Update your table of content

3.5. Page layout tab command

Activity 3.5

Using Ms Word, write a document which has a title Benefit of Learning ICT as Future Teacher and apply on it the following:

1. Change page orientation from Portrait to Landscape
2. Organize the text into 3 separate columns
3. Change page margin from 1.0 to 1.5 points

3.5.1 Page Setup Group

It is found on the ribbon when the Page Layout tab is clicked. It is used to specify the margins and the orientation of a page, size, number of columns among other specifications.

3.5.2. Setting Margins

Page margins are the blank spaces around the edges of a page. Text and graphics are normally inserted in the printable area between the margins. However, some items can be positioned in the margins such as headers, footers, and page numbers among others.

To set the margins do the following:

Step 1: Click **Page Layout** tab, from the **Page Setup** group and click **Margins** command.

Step 2: Click the margin type desired from the pull-down menu that appears. The margins are automatically adjusted.

Step 3: To set a customized margin, either click Margins, then select Custom Margins command or click on the dialog box launcher at the bottom of Page Setup group. A dialog box is displayed.

Step 4: Click on Margins tab on the dialog box that appears.

Step 5: Specify all the desired options and click **OK** to apply.
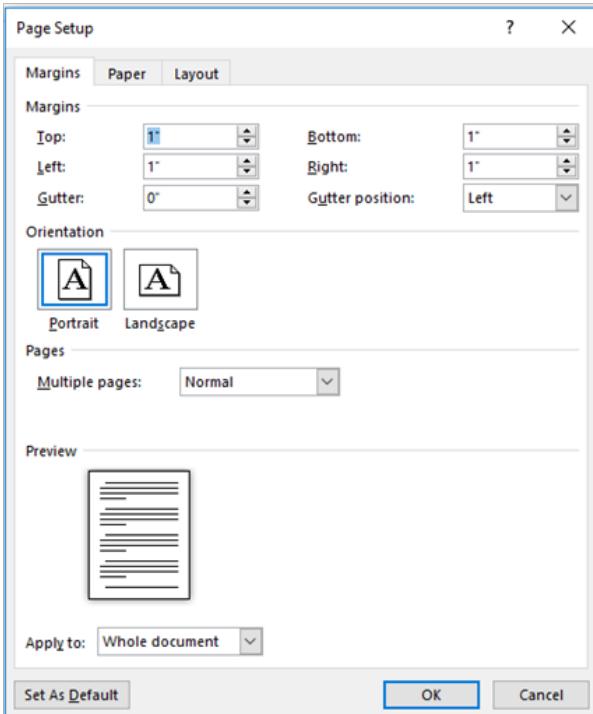
Figure 3. 33.Page setup dialog box

3.5.3. Page Orientation

This refers to the positioning of the page in relation to the text or graphics. There are two types of page orientation.

- **Portrait:** This is where text and graphics are printed with the longest side placed vertically and the shortest placed horizontally.
- **Landscape:** This is where text and graphics are printed with the longest side placed horizontally and the shortest placed vertically.

A. Changing the page orientation of an entire document

To change the page orientation of an entire document, proceed as follows:

Step 1: Click on the **Page Layout** tab, in the **Page Setup** group, click **Orientation**.
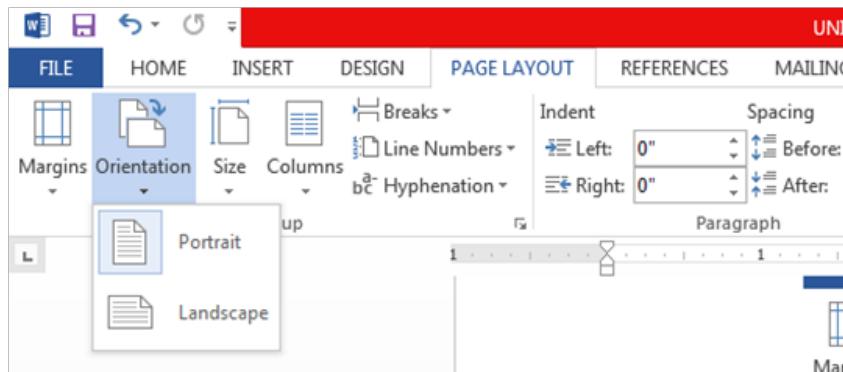
Figure 3. 34.Page Layout tab

Step 2: Select either **Portrait** or **Landscape**.

B. Using both portrait and landscape orientation in the same document

There can be a need to have both landscape and portrait pages in the same document. Such a need can arise for example when the document is in a portrait format and that there is a big table that cannot fit in the document if the page is not made landscape. Go through these steps:

Step 1: Select the content on the pages or paragraph(s) whose orientation is to be changed to portrait or landscape.

Step 2: Click on the **Page Layout** tab, in the **Page Setup** group.

Step 3: Click **Margins**, then select **Custom Margins** command or click on the dialog box launcher in the **Page Setup** group.

Step 4: Click on the **Margins** tab on the dialog box that appears.

Step 5: Under the **Orientation section**, select the desired orientation (Portrait or Landscape).

Step 6: Under the Apply to section, choose selected text option and click **OK** to apply.
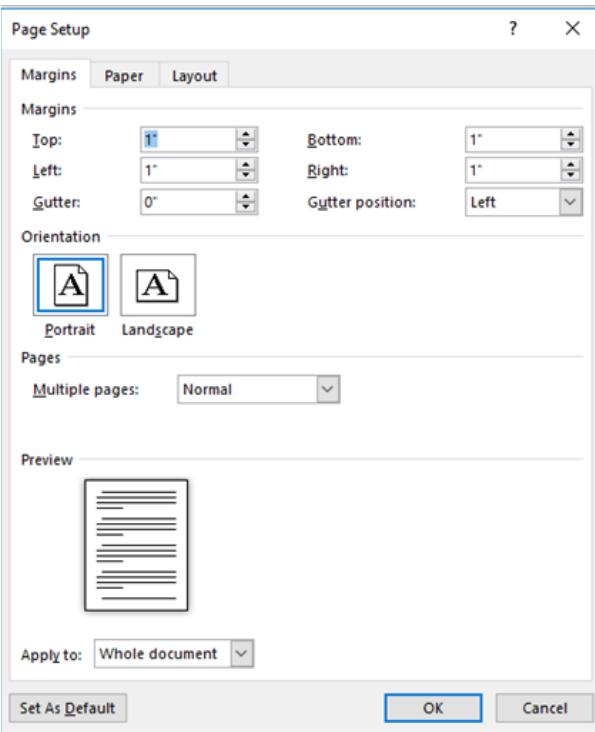
Figure 3. 35.Page setup dialog box

Note: If some but not all of the text on a page is selected to change to portrait or landscape orientation, Word places the selected text on its own page, and the surrounding text on a separate page.

3.5.4 Columns

Columns are created to enhance the look of a document. The flow of the content from the bottom of one column to the top of the next one in the same page should be consistent. Columns can either be created using predefined or user-defined options.

i. Predefined

To create a predefined column, do the following:

Step 1: Select the text.

Step 2: Click **Page Layout** tab from the menu bar; then click on the **Columns** command under Page Setup group.
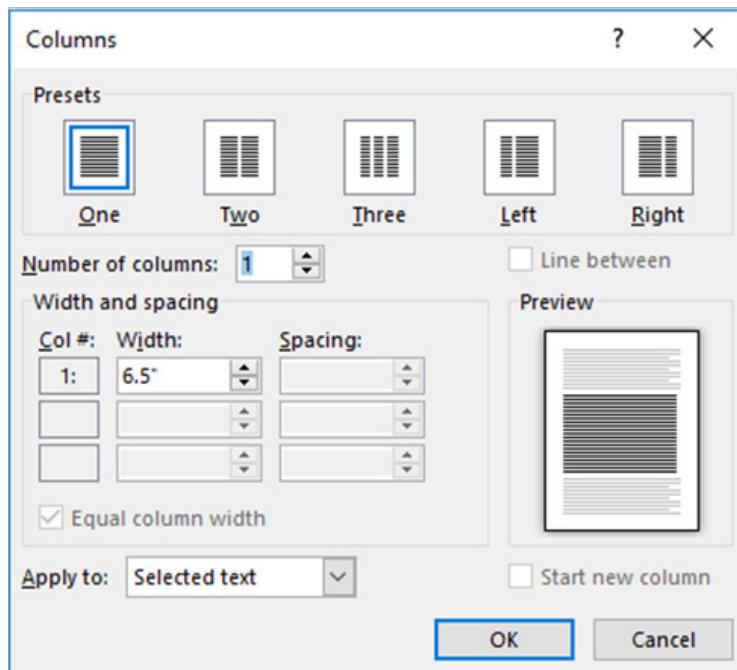
Figure 3. 36.Columns dialog box

Step 3: Click on the number of columns desired from the drop-down menu displayed.

ii. User Defined columns

Step 1: Select the text.

Step 2: Click**Page Layout tab** from the menu bar then click on the **Columns command** under Page Setup group.

Step 3: Select More Column option from the resulting pull down menu.

Step 4: Specify the column width and spacing, line between columns, number of columns, and where the column is to be applied.
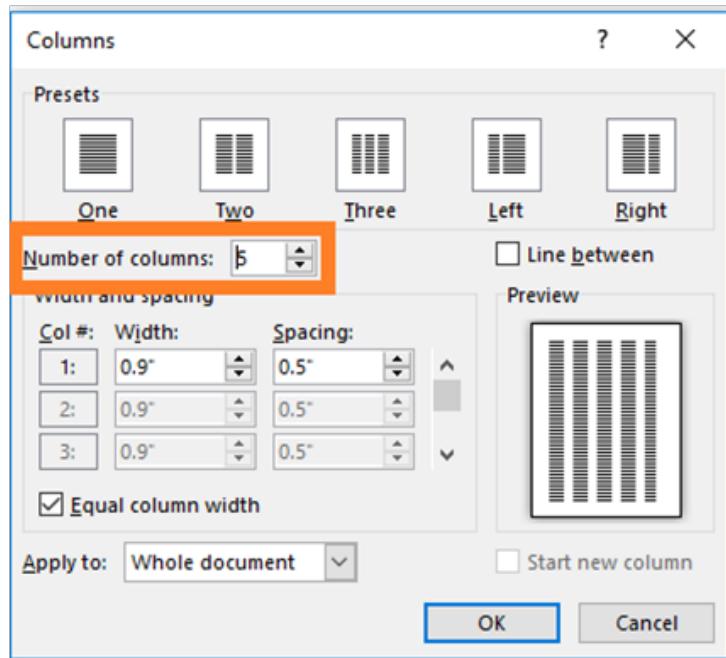
Figure 3. 37.User defined columns

Step 5: Click OK to apply once all the desired options have been selected.

3.6. Protecting a document from unauthorized access and changes

A word document can be protected from unauthorized access. This protection is done when the document contain sensitive and private information to which the owner does not want anyone to have access to.

3.6.1 Protecting Word files with a password

The followings are steps to follow when protecting a word file with a password.

Step 1: Select **File** then **Info**

Step 2: Select the **Protect Document** option

Step 3: Choose "**Encrypt Document with Password**"
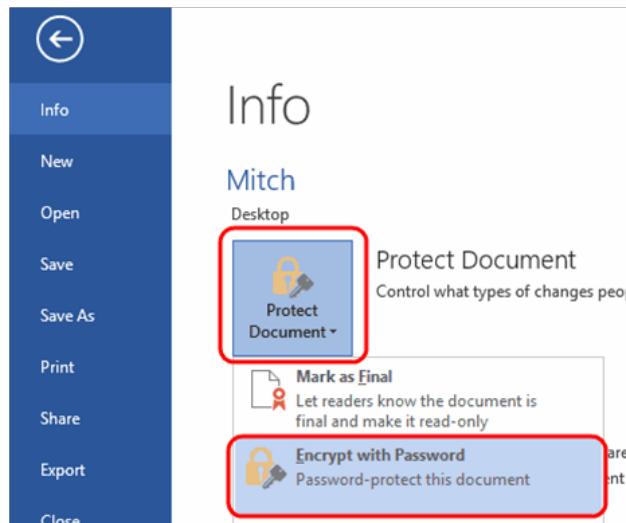
Figure 3. 38.Encrypt a document with Password

Step 4: Type the password to use, and then select OK

Step 5: Type the password again to confirm and then select OK

3.6.2 Protect a document and mark the parts that can be changed

Step 1: On the **Review** tab, in the **Protec**t group, click **Restrict Editing**.

Figure 3. 39.Restrict Editing command

Step 2: In the *Editing restrictions area,* select the *Allow only this type of editing in the document* check box.

Step 3: In the list of editing restrictions, click No changes (Read only).
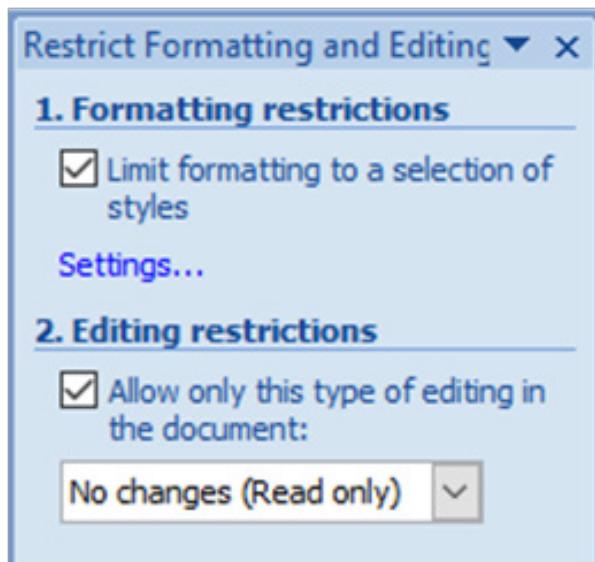
Figure 3. 40.Restrict Formatting and Editing window

Step 4: Select the part of the document where to allow changes.

Figure 3. 41.Select the part of the document where changes are allowed

The selected words in bracket, show where the other user can make change only. To select more than one part of the document at the same time, select one part then press CTRL and select more parts while holding down the CTRL key.

Step 5: Under *Exceptions*, do one of the following:

- To allow anyone who opens the document to edit the part that was selected, select the **Everyone** check box in the **Groups** list.

- To allow only particular individuals to edit the part that was selected, click more users, and then type the user names.
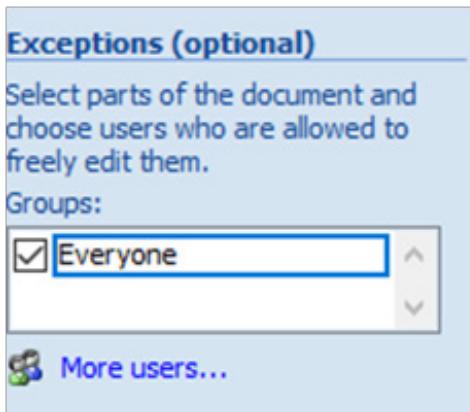
Figure 3. 42.Exception Selection

Step 6: Click **OK** and select the check boxes next to the names of the individuals that are to be allowed to edit the selected part.

Note: If more than one individual are selected, those individuals are added as an item to the **Groups box**, so that you can quickly select them again.

Step 7: Continue to select parts of the document and assign users permission to edit them.

Step 8: Under **Start enforcement**, click **Yes, Start Enforcing Protection.**

Figure 3. 43.Start enforcement box

Step 9: Do the following:

To assign a password to the document so that users who know the password can remove the protection and work on the document, type a password in the **Enter new password (optional)** box, and then confirm the password.
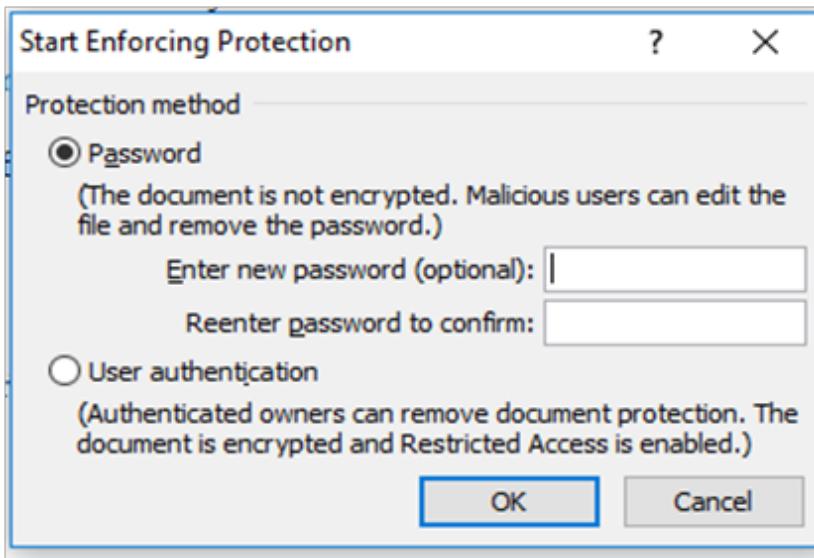
Figure 3. 44.Start enforcing protection dialog box

Use the above option if other people are going to work on the document at the same time and make sure to use strong passwords that combine uppercase and lowercase letters, numbers, and symbols.

Step 10: To encrypt the document so that only authenticated owners of the document can remove the protection, click **User authentication.** Encrypting the document prevents others from working on the document at the same time.

3.6.3 Unlock a protected document

To remove all protections from a document, use the password that was applied to the document or there is a need to be listed as an authenticated owner of the document.

For an authenticated owner of the document or if you know the password for removing the document protection, do the following:

Step 1: On the Review tab, in the Protect group, click Restrict Editing.

Step 2: In the **Restrict Editing** task pane, click **Stop Protection**

Figure 3. 45. Stop Protection command

Step 3: If prompted to provide a password, type the password.

3.6.4 Make changes in a restricted document

When opening a protected document, Word restricts what can be changed based on whether the document owner granted the permission to make changes to a specific part of the document.

The **Restrict Editing** task pane displays buttons for moving to the regions of the document for which there is permission to change.

If no permission is granted to edit any parts of the document, Word restricts editing and displays the message, *"Word has finished searching the document"*when the buttons in the **Restrict Editing** task pane is clicked

3.6.5 Finding word document parts to edit

If the **Restrict Editing** task pane is closed and there is a need to make changes where the user has not been granted permission, Word displays the following message in the status bar: *"This modification is not allowed because the selection is locked".*

To return to the task pane and find a region where there is permission to edit, do the following:

Step 1: On the **Review** tab, in the **Protect** group, click **Restrict Editing**.

Step 2: Click **Find Next Region I Can Edit** or **Show All Regions I Can Edit.**
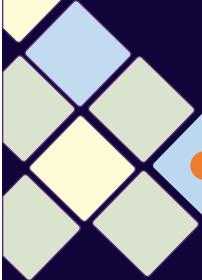
Application activity 3.6

Using Ms Word,

1. Open a document which describe the benefit of learning in your option that you protected and remove password

2. Type any text related to your career, Protect it and mark the parts that can be changed

End unit assessment

1. Explain the following concept
   a. Formatting
   b. Paragraph
2. Write at least one page on XO laptop hardware and do the following :

   a. Change line spacing to 1.5

   b. Change font-type ="Book Antiqua" , size=" 14" color ="Blue" , and alignment="Justified "

   c. Insert header =" ICT for children" and footer=" XO laptop for fun "

   d. Protect the document with a password of your choice and save it

Key Unit competence:

Apply conditional formatting and filtering and integrate spreadsheet to other applications

Introductory Activity

At the end of the year Teacher Peace was overloaded with work as she was required to prepare the end of the year report for pupils. The marks given to her are word softcopies for which total are manually. She has the task to write the marks in the word sheets, calculate the totals for the whole year, the average per subject for the whole year and the overall average for the whole year for each pupil. For this reason she is planning to buy a calculator and is considering hiring someone to help her which is against the ethics.

a. Advise Teacher Peace on how to handle this situation using the word files she has

b. Advise this same teacher on how excel program can help her

c. Compare the easiness of the task when Teacher Peace adopts the advice in a) and when she chooses the option presented in b

4.1. Conditional formatting

Open Spreadsheet program and enter data in the table below. Save the file as "Burera Ltd Sales data"

	Burera Ltd Sales data					
Salesperson	May	June	July	August	September	October
Abatoni	42,690	49,310	84,200	13,890	104,680	126,770
Berwa	40,520	34,700	38,620	11,260	55,030	106,860
Hirwa	5,541	29,230	45,960	20,120	135,470	219,830
Ingabire	35,020	47,980	22,480	10,580	62,670	129,820
Iradukunda	25,860	41,720	38,070	13,480	11,110	100,470
Ishimwe	39,670	49,060	90,070	21,130	130,900	139,630
Kagabo	46,850	27,790	75,490	10,400	100,240	183,890

Do the followings:

1. Using Burera Ltd Sales data, show salespersons who are meeting their monthly sales goals. The sales goal is 50,000 items per month

2. Highlight all salesperson whose sales are below the average

3. Highlight with blue color ,all salesperson whose sales are above 80,000

Conditional formatting is a spreadsheet functionality which allows Excel(spreadsheet) usesr to specify conditions allowing to get specific answers on data in the worksheet that was otherwise not easy to analyze.

It can be applied to a range of cells or an entire worksheet and makes cells meeting specified criteria have relative formatting (font). If the formatting condition is true, the range of cells is formatted according to the preset criteria, else that range is not formatted.

Conditional formatting is a feature in many spreadsheet applications that allows users to apply specific formatting to cells that meet certain criteria. It is most often used as color-based formatting to highlight, emphasize or differentiate among data and information stored in a spreadsheet.

Conditional formatting enables spreadsheet users to do a number of things. It calls attention to important data points such as deadlines and at-risk tasks. It can also make large data sets more digestible by breaking up the wall

of numbers with a visual organizational component. Among the options provided by conditional formatting are: **highlight cell rules, top bottom rules, customized rules, etc**

4.1.1. Highlight cell rule

Conditional formatting can be used to enhance the reports and dashboards in Excel. The conditional formatting statement under the Highlight Cells Rules category allow to highlight the cells whose values meet a specific condition.

The benefit of a conditional formatting rule is that Excel automatically reevaluates the rule each time a cell is changed provided that cell has a conditional formatting rule applied to it. Those rules include: greater than, less than, equal to, between, text that contain, A Date occurring, duplicate values, …

Here are the steps to apply the highlight cell rule:

Step 1: Select the desired cells on which to apply the conditional formatting rule

	A	B	C	D	E	F	G
1				Burera Ltd Sales data			
2	Salesperson	May	June	July	August	September	October
3	Muhirwa	39,470	5,570	38,630	11,170	82,370	86,900
4	Mukamana	44,110	10,420	93,550	11,000	101,850	187,490
5	Rugira	25,210	30,720	67,020	21,160	134,520	80,460
6	Uwera	47,520	37,550	44,150	10,890	44,040	201,140
7	Mwiza	49,640	31,520	116,010	11,220	31,700	107,330
8	Uwimana	23,270	40,520	37,260	11,350	88,170	185,240
9	Ishimwe	39,670	49,060	90,070	21,130	130,900	139,630
10	Rurangwa	53,630	5,210	45,050	10,240	35,280	152,750
11	Umutesi	32,750	34,280	39,730	17,160	48,390	137,140
12	Kalisa	38,600	15,620	29,450	11,010	58,500	150,650

Table 4. 1. Burera Ltd sales data with selected rows and columns

Step 2: From the **Home** tab, click the **Conditional Formatting** command. A drop-down menu will appear.
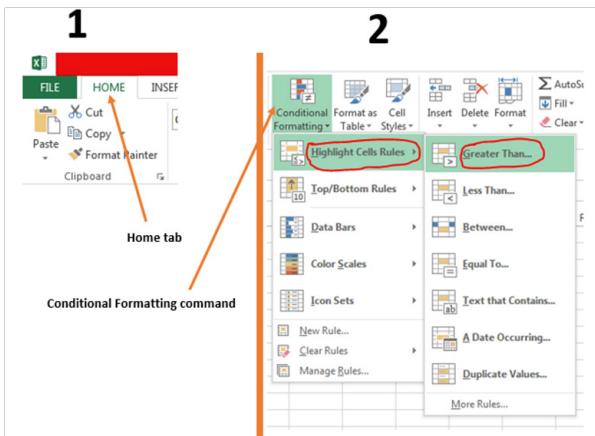
Figure 4. 1. Screenshots showing Home tab and Conditional formatting Command

Step 3: Hover the mouse over the desired conditional formatting type, and then select the desired rule from the menu that appears. In the Activity 4.1, cells that are greater than 50, 000 are to be highlighted.

Step 4: A dialog box will appear. Enter the **desired value**(s)into the blank field. In the case of the activity 4.1.the taken value is **50, 000**.

Step 5: Select a **formatting style** from the drop-down menu. In the Activity 4.1, the color to choose is **Green Fill with Dark Green Tex**t, then click **OK**.
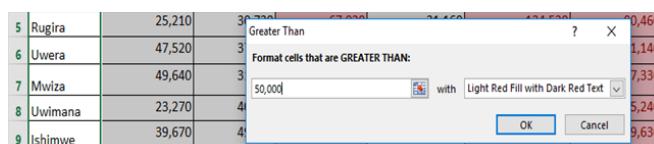
Figure 4. 2. Setting the Highlight cell rule to Greater than 50000

Step 6: The conditional formatting will be applied to the selected cells. In this case, it's easy to see which salesperson reached the 50, 000 sales goals for each month.

	A	B	C	D	E	F	G
1				Burera Ltd Sales data			
2	Salesperson	May	June	July	August	September	October
3	Muhirwa	39,470	5,570	38,630	11,170	82,370	86,900
4	Mukamana	44,110	10,420	93,550	11,000	101,850	187,490
5	Rugira	25,210	30,720	67,020	21,160	134,520	80,460
6	Uwera	47,520	37,550	44,150	10,890	44,040	201,140
7	Mwiza	49,640	31,520	116,010	11,220	31,700	107,330
8	Uwimana	23,270	40,520	37,260	11,350	88,170	185,240
9	Ishimwe	39,670	49,060	90,070	21,130	130,900	139,630
10	Rurangwa	53,630	5,210	45,050	10,240	35,280	152,750
11	Umutesi	32,750	34,280	39,730	17,160	48,390	137,140
12	Kalisa	38,600	15,620	29,450	11,010	58,500	150,650

Table 4.2. Results of applying highlight cell rule (>50000)

Note: It is possible to apply multiple conditional formatting rules to a cell range or worksheet. This allows to visualize different trends and patterns in data.

4.1.2. Clear rule

Rules that have been used to highlight cells that meet certain conditions can be removed and have text with no highlight when the rules are no longer needed or when there is a need to set new rules.

To clear rules, do the following:

Step 1: Select the desired cells for clearing the conditional formatting rule

Step 2: On the Home tab, in the Styles group, click Conditional Formatting

Step 3: Click C**lear Rules** then click **Clear Rules from Selected Cells**
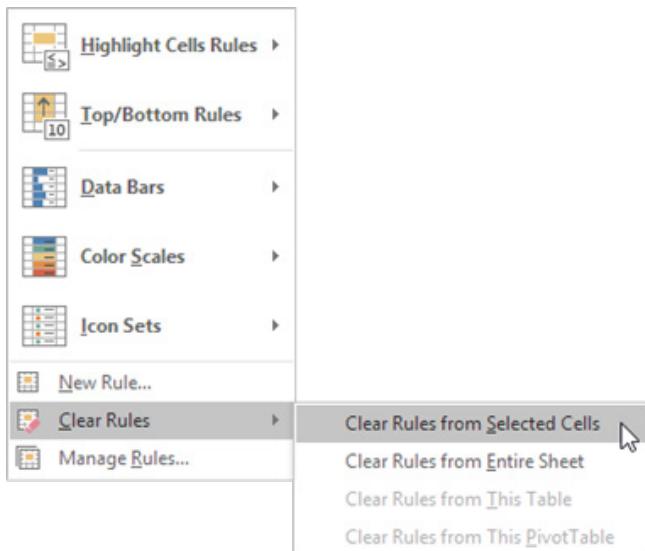
Figure 4. 3. Clear rule options

After clearing rules for selected cells, cells are no longer colored, there is no more formatting in cells.

4.1.3. Create Top/Bottom Rules

Top/Bottom rules are another useful Conditional Formatting in Excel. These rules allow users to call attention to the top or bottom range of cells, which can be specified by number, percentage, or average. The steps to create Top/Bottom rules are:

Step 1: Select the desired cells for the conditional formatting rule

Step 2: From the Home tab, Select Conditional Formatting then Top/Bottom Rules then click Above Average…
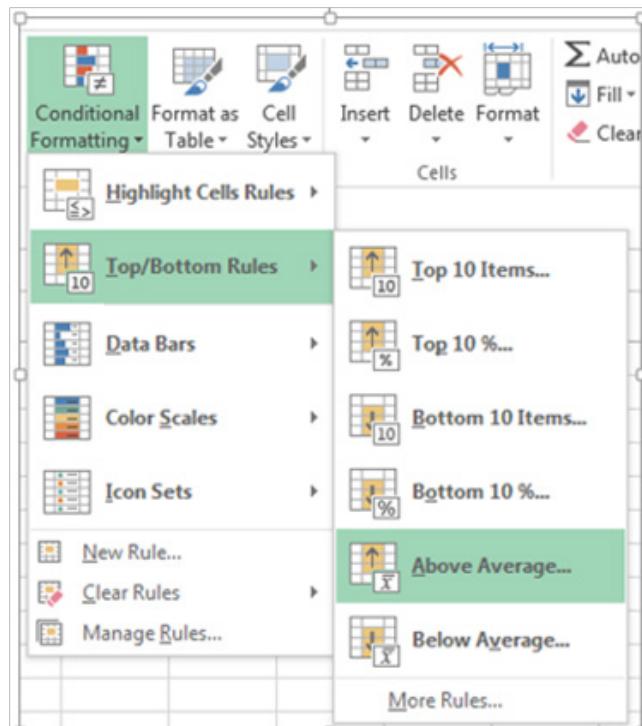
Figure 4. 4.Top/Bottom rules-Above average

Step 3: A dialog box will appear. Choose color format to use like "Light Red Fill with Dark Red text".After choosing cells format, Press "**OK**"

	A	B	C	D	E	F	G
1				Burera Ltd Sales data			
2	Salesperson	May	June	July	August	September	October
3	Muhirwa	39,470	5,570	38,630	11,170	82,370	86,900
4	Mukamana	44,110	10,420				187,490
5	Rugira	25,210	30,720				80,460
6	Uwera	47,520	37,550				201,140
7	Mwiza	49,640	31,520				107,330
8	Uwimana	23,270	40,520				185,240
9	Ishimwe	39,670	49,060	90,070	21,130	130,900	139,630
10	Rurangwa	53,630	5,210	45,050	10,240	35,280	152,750
11	Umutesi	32,750	34,280	39,730	17,160	48,390	137,140
12	Kalisa	38,600	15,620	29,450	11,010	58,500	150,650

Above Average ? ×

Format cells that are ABOVE AVERAGE:

for the selected range with Light Red Fill with Dark Red Text ⌄

OK   Cancel

Table 4.3. Above average rule dialog box

Step 4: The sheet will now highlight the values above the average

	A	B	C	D	E	F	G
1				Burera Ltd Sales data			
2	Salesperson	May	June	July	August	September	October
3	Muhirwa	39,470	5,570	38,630	11,170	82,370	86,900
4	Mukamana	44,110	10,420	93,550	11,000	101,850	187,490
5	Rugira	25,210	30,720	67,020	21,160	134,520	80,460
6	Uwera	47,520	37,550	44,150	10,890	44,040	201,140
7	Mwiza	49,640	31,520	116,010	11,220	31,700	107,330
8	Uwimana	23,270	40,520	37,260	11,350	88,170	185,240
9	Ishimwe	39,670	49,060	90,070	21,130	130,900	139,630
10	Rurangwa	53,630	5,210	45,050	10,240	35,280	152,750
11	Umutesi	32,750	34,280	39,730	17,160	48,390	137,140
12	Kalisa	38,600	15,620	29,450	11,010	58,500	150,650

Table 4. 5.Top/bottom rules: Above average cells highlighted

4.1.4. Create new rule

Excel allows to create a formula-based conditional formatting rule. The available options are:

- Formatting cells based on their values,
- Formatting cells that contain certain values,
- Formatting only top or bottom ranked values,
- Formatting only values that are below or above average,
- Formatting only unique or duplicate values and using a formula to determine which values to format.

All those options are presented in the window below:
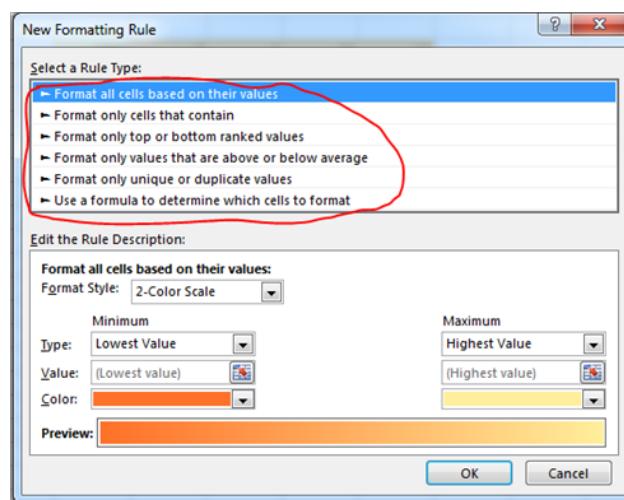
Figure 4. 5. Rule types to choose from while defining a new rule

Step 1: Select the cells tobe formatted. In the Home tab click on **Conditional Formatting** command and click **New rule**.
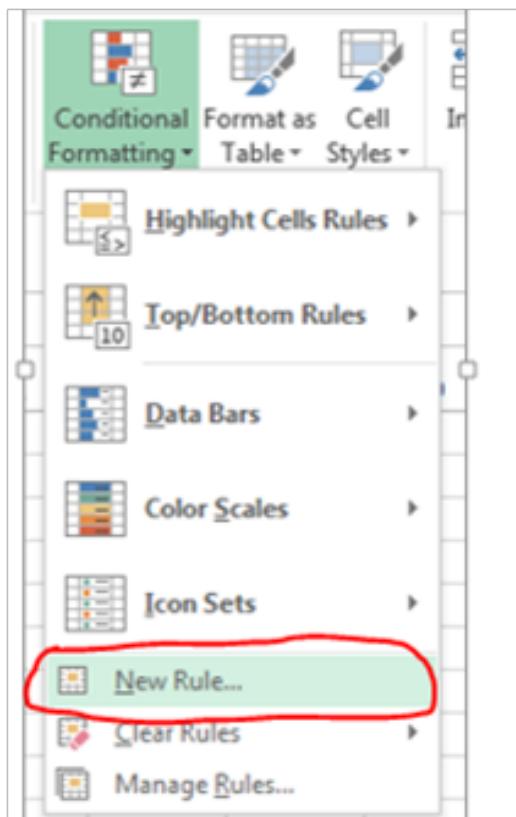
Figure 4. 6.New rule option

Step 2: Create a conditional formatting rule, and select the Formula option then click **OK**. In the window below the option **"Use a formula to determine which cells to format"** has been chosen

1. **Format all cells based on their values**

Step 1: New formatting rule window will be opened.

Step 2: Select Format all cells based on their values option, however this is by default selected.
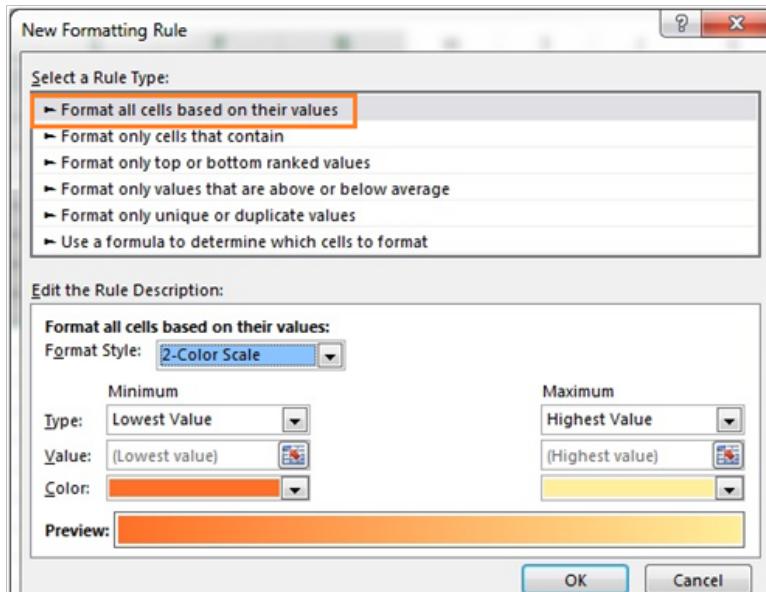
Figure 4. 7. Format all cells based on their values

There are at least four format styles that can be applied while applying conditional formatting on Excel data. Those formats are: Data Bar, Icon Set, 2-Color Scale and 3-Color Scale

a. 2-color scale

Step 1: Choose minimum and maximum values

Step 2: Click Ok button to apply this conditional formatting
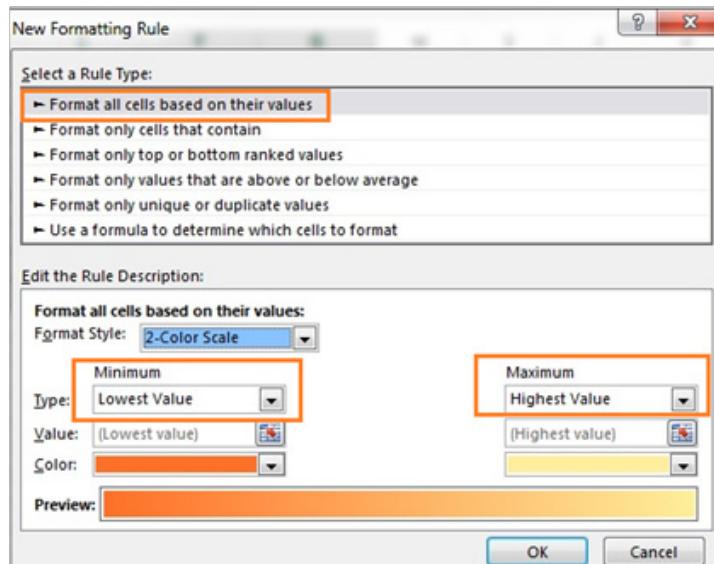
Figure 4. 8. Color Scale

Step 3: Data set with this condition formatting will look like below

Note: we have chosen minimum number to 50,000 and the maximum to 80,000, then selected a colors to separate both values.

	Burera Ltd Sales data					
2	**Salesperson**	**May**	**June**	**July**	**August**	**September**	**October**
3	Muhirwa	39,470	5,570	38,630	11,170	82,370	86,900
4	Mukamana	44,110	10,420	93,550	11,000	101,850	187,490
5	Rugira	25,210	30,720	67,020	21,160	134,520	80,460
6	Uwera	47,520	37,550	44,150	10,890	44,040	201,140
7	Mwiza	49,640	31,520	116,010	11,220	31,700	107,330
8	Uwimana	23,270	40,520	37,260	11,350	88,170	185,240
9	Rurangwa	53,630	5,210	45,050	10,240	35,280	152,750
10	Umutesi	32,750	34,280	39,730	17,160	48,390	137,140
11	Kalisa	38,600	15,620	29,450	11,010	58,500	150,650

Table 4. 6.   2-Color Scale results with a conditional formatting rule

b. 3-color scale

Step 1: New formatting rule window will be opened.

Step 2: Select Format all cells based on their values option, however this is by default selected.
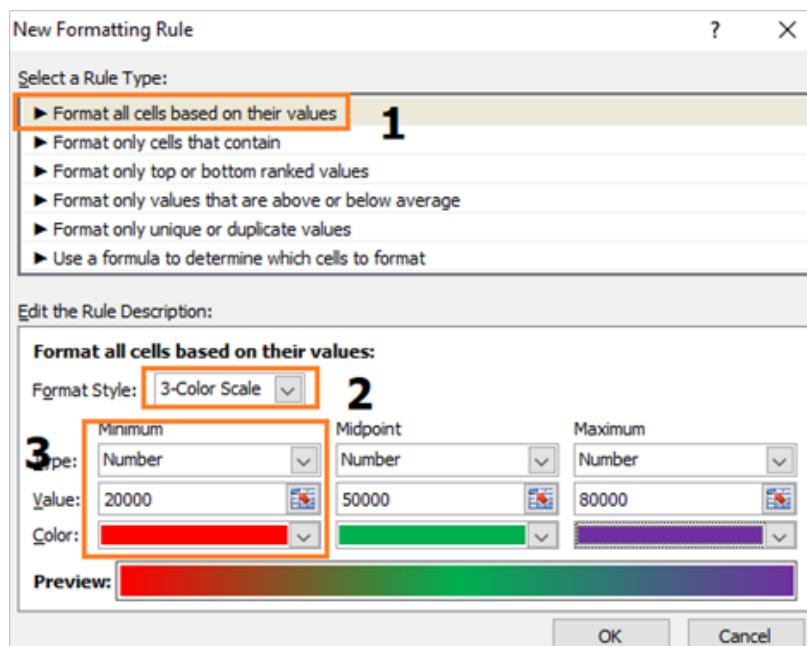
Figure 4. 9.   3-color formatting style

Below are steps to apply 3 -color formatting style

Step 3: Select **3 color scale** option in **format style**

Step 4: Choose the type; here we are taking as Minimum, Midpoint and Maximum

Step 5: Put values for number for Minimum, Midpoint and Maximum then, results are displayed as follows:

	Burera Ltd Sales data					
2	**Salesperson**	**May**	**June**	**July**	**August**	**September**	**October**
3	Muhirwa	39,470	5,570	38,630	11,170	82,370	86,900
4	Mukamana	44,110	10,420	93,550	11,000	101,850	187,490
5	Rugira	25,210	30,720	67,020	21,160	134,520	80,460
6	Uwera	47,520	37,550	44,150	10,890	44,040	201,140
7	Mwiza	49,640	31,520	116,010	11,220	31,700	107,330
8	Uwimana	23,270	40,520	37,260	11,350	88,170	185,240
9	Rurangwa	53,630	5,210	45,050	10,240	35,280	152,750
10	Umutesi	32,750	34,280	39,730	17,160	48,390	137,140
11	Kalisa	38,600	15,620	29,450	11,010	58,500	150,650

Table 4. 7.   Color formatting style result

2. Use a formula to determine which cells to format

New rules can be created by customizing own formulas. By using custom made formula, a custom condition that triggers a rule is created and can be applied as the user needs it to be applied. In the data that is going to be used the formula = B3>80000 has been applied for formatting.

To specify the formatting formula click on **Conditional Formatting** tab then New Rule and choose **Use Formula to determine which cells to format** as in the window below:
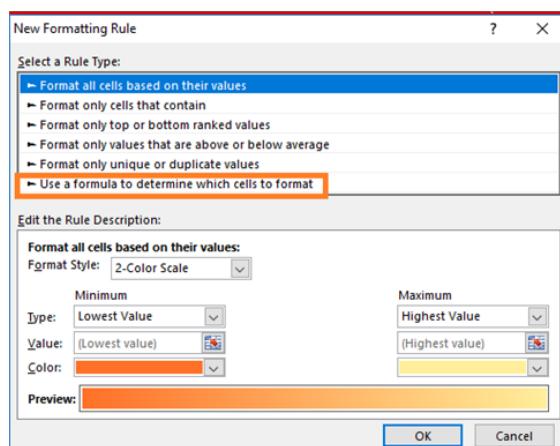
Figure 4. 10. Dialog box for new formatting rule

Step 3: In the window that will appear, enter a formula that returns TRUE or FALSE then set formatting options, save the rule and press **OK**
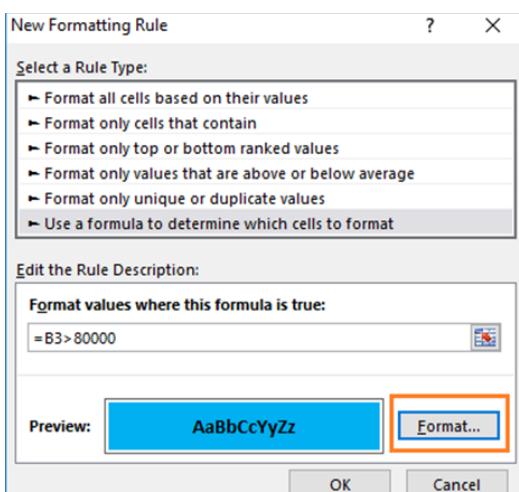
Figure 4. 11. Formatting options

After clicking **OK** cells that meet the formatting rule are highlighted as specified in the new rule. In the window below cells meeting the criteria are blue colored as it has been specified in the preceding window.

	Burera Ltd Sales data					
	Salesperson	**May**	**June**	**July**	**August**	**September**	**October**
3	Muhirwa	39,470	5,570	38,630	11,170	82,370	86,900
4	Mukamana	44,110	10,420	93,550	11,000	101,850	187,490
5	Rugira	25,210	30,720	67,020	21,160	134,520	80,460
6	Uwera	47,520	37,550	44,150	10,890	44,040	201,140
7	Mwiza	49,640	31,520	116,010	11,220	31,700	107,330
8	Uwimana	23,270	40,520	37,260	11,350	88,170	185,240
9	Rurangwa	53,630	5,210	45,050	10,240	35,280	152,750
10	Umutesi	32,750	34,280	39,730	17,160	48,390	137,140
11	Kalisa	38,600	15,620	29,450	11,010	58,500	150,650

Table 4. 8. Table with highlighted cells according to the new rule

Note: Always write the formula for the upper-left cell in the selected range and Excel will automatically copy the formula to the other cells in the selected range.

Below are some formulas that apply conditional formatting and return TRUE or FALSE, or numeric equivalents that can be used in setting formatting cell rules based on formula:

1. =ISODD (A1): This function is used to check if a numeric value is an odd number. ISODD returns TRUE when a numeric value is odd

and FALSE when a numeric value is even. If value is not numeric, ISODD will return the #VALUE error.

2. =ISNUMBER (A1): The function is used to check if a value is a number. ISNUMBER will return TRUE when value is numeric and FALSE when not.

3. AND (A1>100, B1<500): The AND function is used to apply more than one condition at the same time, up to 255 conditions. Each logical condition (logical1, logical2, etc.) must return TRUE Examples

AND (A1>100, B1<500) tests if the value in A1 is greater than100 and B1 less than 500

Application activity 4.1

Open the file "Burera Ltd. Sales Data"

1. Using Burera Ltd Sales data, show salespersons who are not meeting their monthly sales goals. The sales goal is 50,000 item per month

2. Highlight all salesperson whose sales are above the average

3. Highlight with green color all salesperson whose sales are below 80,000
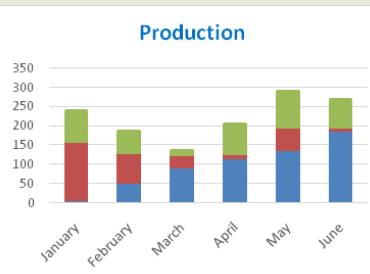
4.2 Charts

Activity 4.2

1) Open Spreadsheet program, enter data in the table below and save it as "Production"	2) Using Production data make the graph below:

Production

Month	Soja	Beans	Maize
January	8	150	80
February	54	77	54
March	93	32	10
April	116	11	76
May	137	60	93
June	187	10	72

Production

4.2.1 Create a Chart

In spreadsheet, a chart is often called a graph. It is a visual representation of data from a worksheet that can bring more understanding to the data than just looking at the numbers.

A chart is a powerful tool that allows to visually display data in a variety of different chart formats such as: Bar, Column, Pie, Line, Area, and many.

In order to create a chart, the following steps are followed:

Step 1: Select the desired cells in the chart creation

	Production		
Month	**Soja**	**Beans**	**Maize**
January	8	150	80
February	54	77	54
March	93	32	10
April	116	11	76
May	137	60	93
June	187	10	72

Table 4. 9. Production data to be used in creating charts

Step 2: On the Insert tab, in the **Charts** group, choose the type of chart to use. In this case the type chosen is the column chart. Click the column chart symbol
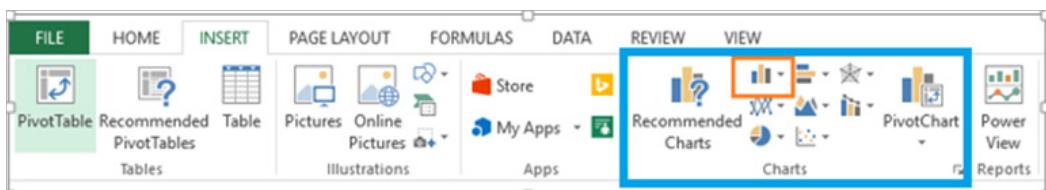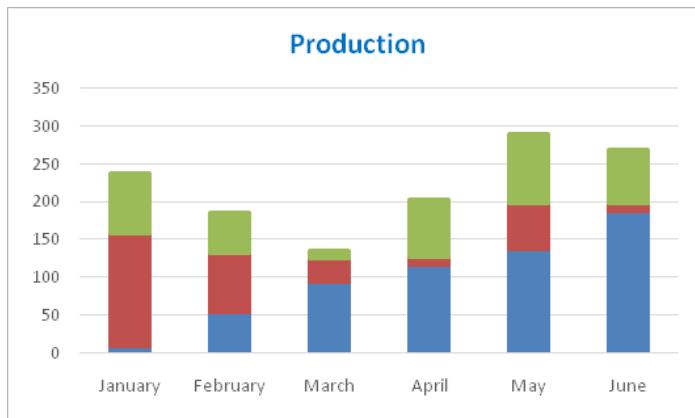
Figure 4. 12. Insert tab with its Charts group

Step 3: Choose the appropriate style. Here a Column Chart has been chosen. The chart looks like in the image below:
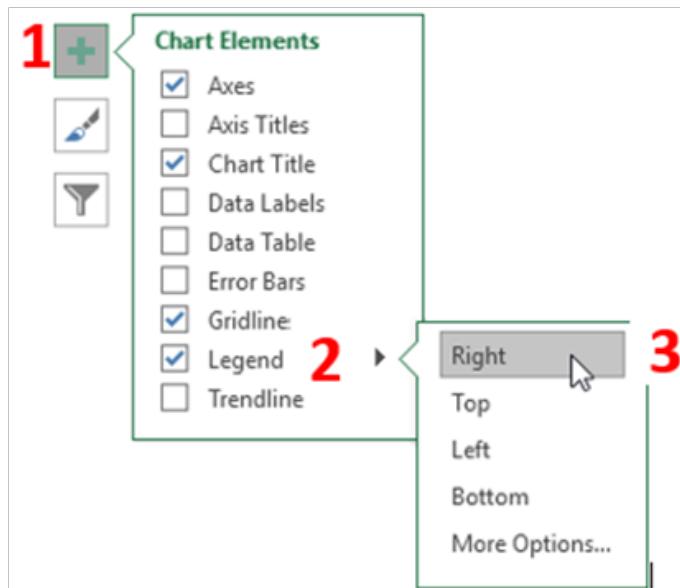
Figure 4. 13.Production Graph

4.2.2. Change Legend Position

To move the legend to the right side of the chart, go through the following steps.

Step 1: Select the chart.

Step 2: Click the button on the right side of the chart, choose Legend and click on the arrow next to it. Click on any option to apply in this case **Right** was chosen.

Figure 4. 14. Different options for chart legend

After changing the Legend style, the Legend will be located on the right side of the chart as it was specified in the steps. The chart looks like in the image below:
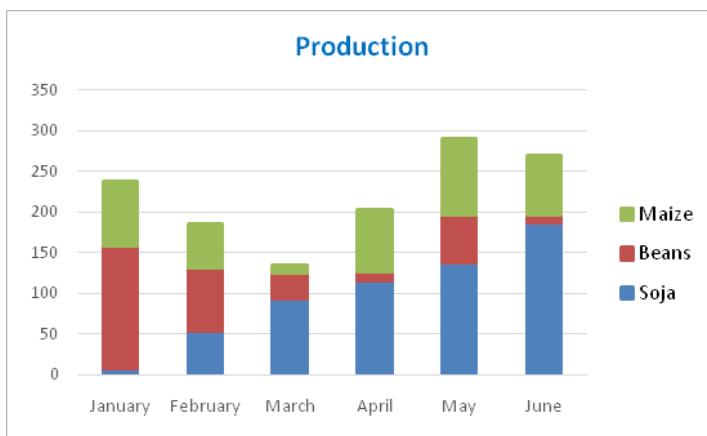
Figure 4. 15. Production chart with legend

4.2.3. Data Labels

Data labels focus the readers' attention on a single data series or data point. These labels can be arranged in the center of the bar, outside end or any other fashion that the reader wants. Data labels positions are set in this way:

Step 1: After selecting the chart click a green bar to select the **Data Labels.**

Step 2: Choose the position where data is going to appear, in this case **Center** has been chosen
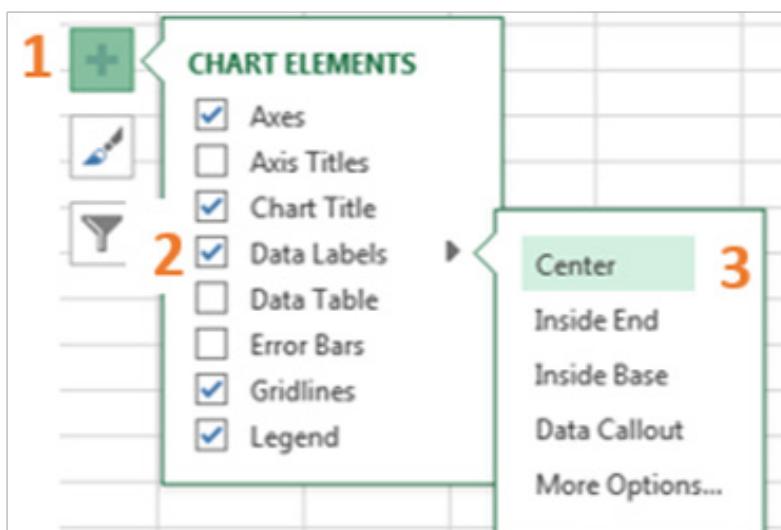
Figure 4. 16.Dialog box chart elements

The graph below with data labels in centers is the result:
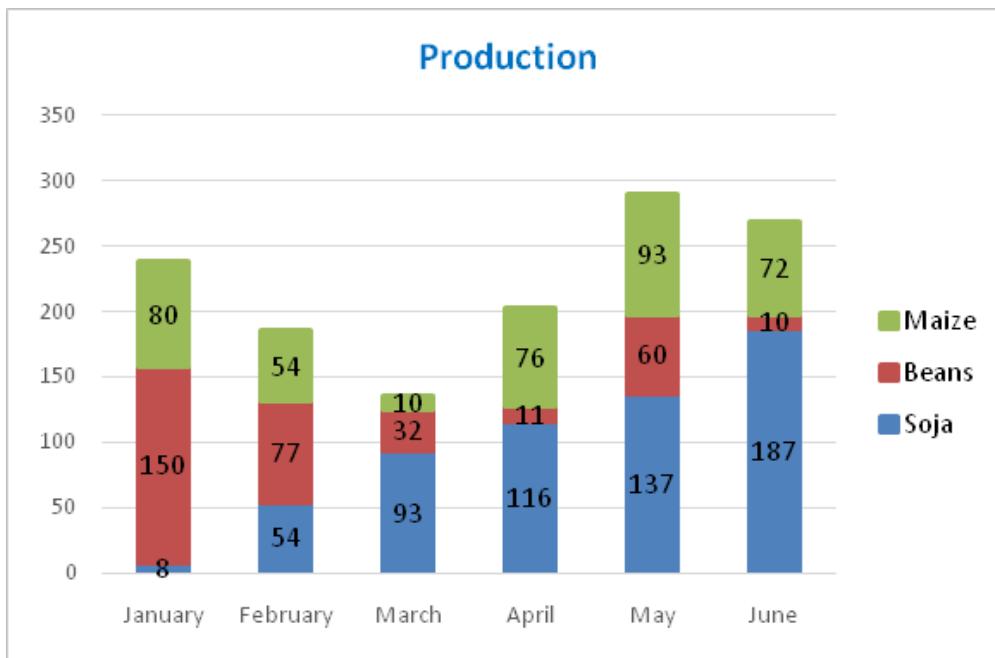
Figure 4. 17.Column chart showing data label

4.2.4 Change Chart Type

There are different types of chart which can be used depending on the data to display. Switching from one chart type to another is done in this way:

Step 1: Select the chart for which the type is to be changed

Step 2: Click on the **Design** tab found under the **Chart Tools** and in the Type group, click **Change Chart Type**.
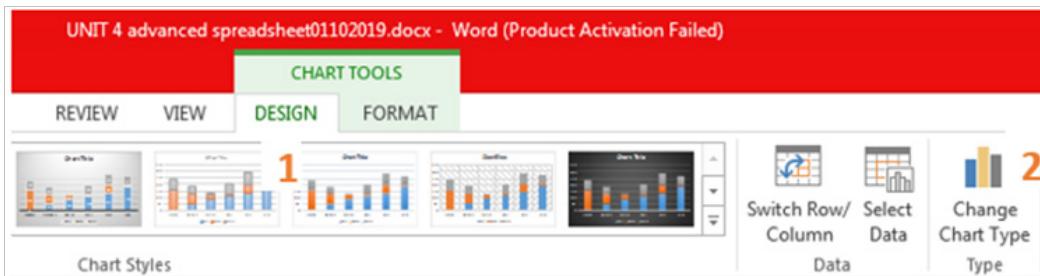
Figure 4. 18.Change chart Type option

Step 3: In the new window that will appear click on either"**Recommended Charts**"or **"All Charts"**. Choosing all charts will display all the charts from which user can choose. In the image below the line chart was chosen. Select the type and click **OK**
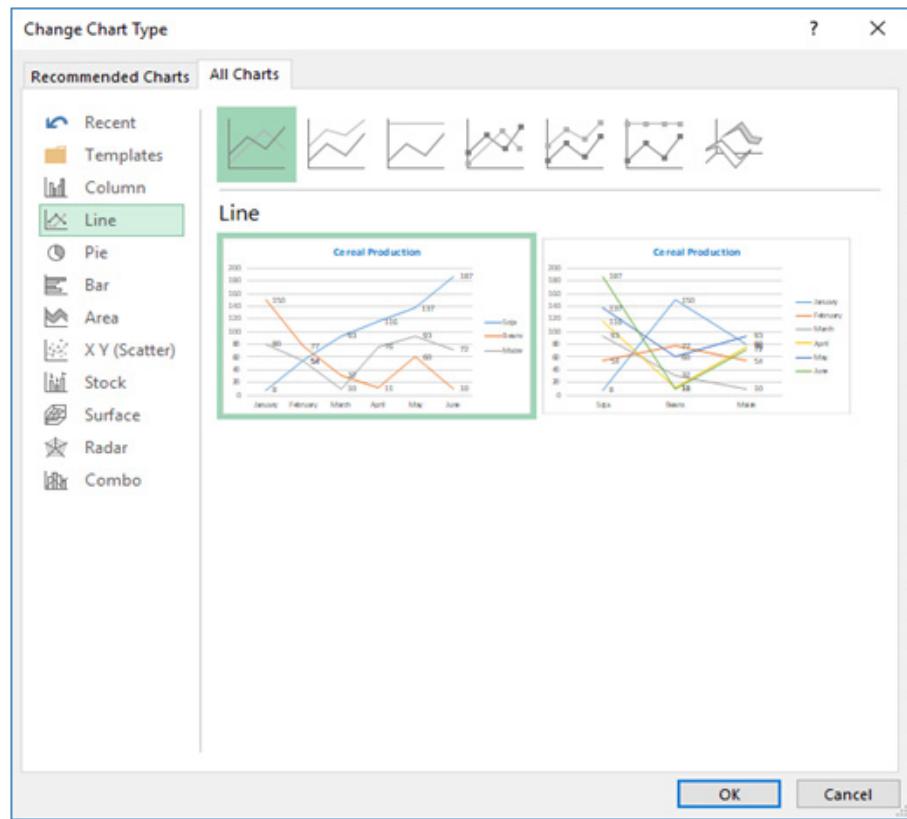
Figure 4. 19. Change chart type

The resulting graph will look like in the image below:
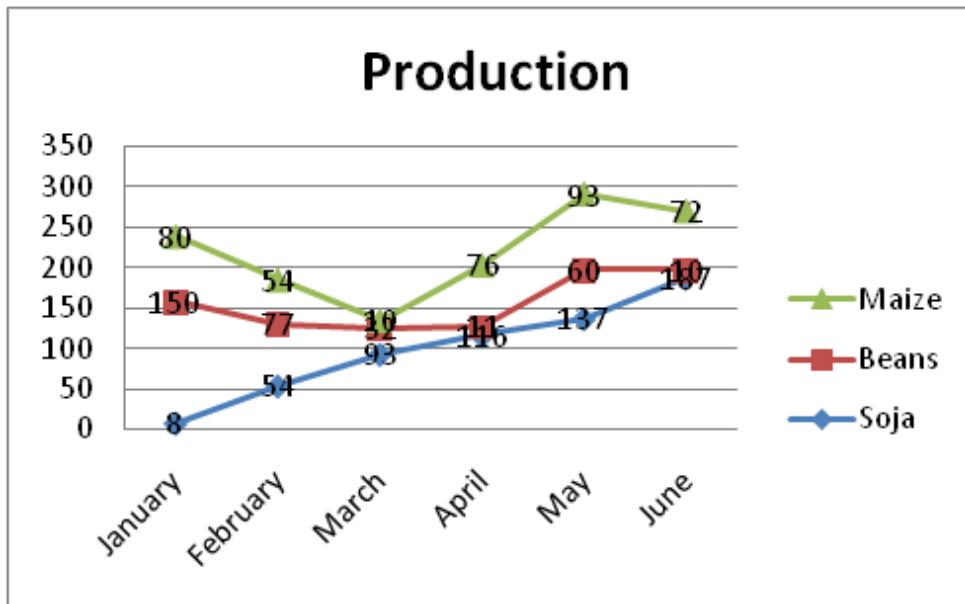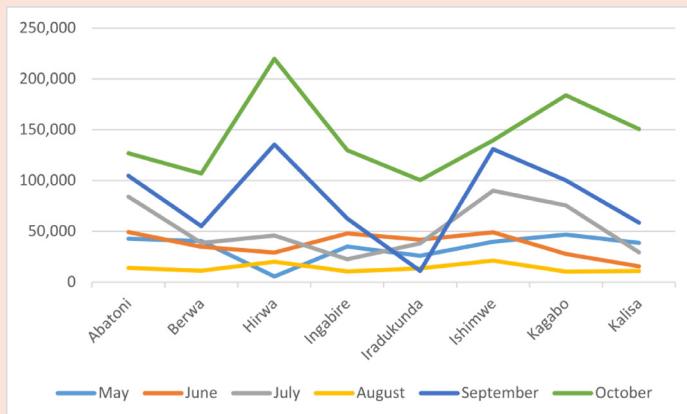
Figure 4. 20. Changed chart type

Open the file "Burera Ltd. sales data and do the following:

1. Create a bar column using Burera Ltd. Sales Data

2. You have the graph below. Change it to another type (Column chart)

4.3. Data organization

Activity 4.3

1. Open Burera Ltd Sales data file and update the table as follow:

	Salesperson	Region	May	June	July	August	September	October
1				Burera Ltd Sales data				
3	Muhirwa	Northern	39,470	5,570	38,630	11,170	82,370	86,900
4	Mukamana	Eastern	44,110	10,420	93,550	11,000	101,850	187,490
5	Rugira	Eastern	25,210	30,720	67,020	21,160	134,520	80,460
6	Uwera	Western	47,520	37,550	44,150	10,890	44,040	201,140
7	Mwiza	Northern	49,640	31,520	116,010	11,220	31,700	107,330
8	Uwimana	Eastern	23,270	40,520	37,260	11,350	88,170	185,240
9	Ishimwe	Northern	39,670	49,060	90,070	21,130	130,900	139,630
10	Rurangwa	Eastern	53,630	5,210	45,050	10,240	35,280	152,750
11	Umutesi	Western	32,750	34,280	39,730	17,160	48,390	137,140
12	Kalisa	Northern	38,600	15,620	29,450	11,010	58,500	150,650
13	Kagabo	Eastern	46,850	27,790	75,490	10,400	100,240	183,890
14	Berwa	Northern	40,520	34,700	38,620	11,260	55,030	106,860
15	Hirwa	Western	5,541	29,230	45,960	20,120	135,470	219,830
16	Mugisha	Northern	56,670	2,883	2,142	1,054	9,543	11,967
17	Abatoni	Northern	42,690	49,310	84,200	13,890	104,680	126,770
18	Ingabire		35,020	47,980	22,480	10,580	62,670	129,820

a. Show salesperson whose region is "Northern"

b. Show all salesperson whose sales are below the average

After data has been entered into an Excel worksheet and even after it has been organized into a table, it can still be manipulated and reorganized. One of the easiest options is to sort data in a particular order for example, sorting data in alphabetical order.

On the other hand, Filtering data allows to analyze data easily. When data is filtered, only rows that meet the filter criteria is going to be displayed and other rows will be hidden. Filters narrow down the data in a worksheet, allowing to view only needed information.

4.3.1 Filtering data

After entering data in Excel, it is also possible to filter, or hide some parts of the data, based on user-indicated categories. When using the Filter option, no data is lost; it is just hidden from view.

In order for filtering to work correctly, the worksheet should include a **header row** which is used to identify the name of each column and is used for filtering. Follow these steps for filtering data in an excel table:

Step 1: Select the **Data** tab, and then click the **Filter** command. Immediately a **drop-down arrow** ▾ will appear in the header cell for each column. The filter command can also be accessed by clicking the Home tab and finding it at the far right side of the menu in the Editing Group.
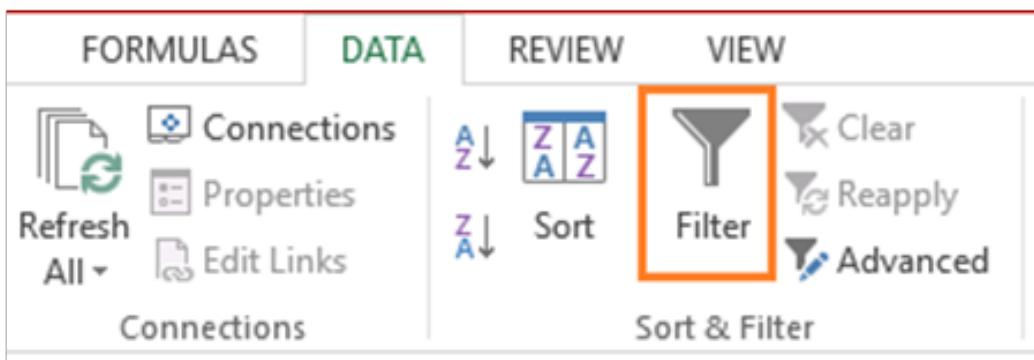
Figure 4. 21.Data tab with its filter option

Step 2: Click the **drop-down arrow** for the column to filter. In this activity column **B (Region) is filtered** to view only certain region.

	A	B	C	D	E	F	G	H
1				Burera Ltd Sales data				
2	Salespers(▼	Region ▼	May ▼	June ▼	July ▼	August ▼	September ▼	October ▼
3	Muhirwa	Northern	39,470	5,570	38,630	11,170	82,370	86,900
4	Mukamana	Eastern	44,110	10,420	93,550	11,000	101,850	187,490
5	Rugira	Eastern	25,210	30,720	67,020	21,160	134,520	80,460
6	Uwera	Western	47,520	37,550	44,150	10,890	44,040	201,140
7	Mwiza	Northern	49,640	31,520	116,010	11,220	31,700	107,330
8	Uwimana	Eastern	23,270	40,520	37,260	11,350	88,170	185,240
9	Ishimwe	Northern	39,670	49,060	90,070	21,130	130,900	139,630
10	Rurangwa	Eastern	53,630	5,210	45,050	10,240	35,280	152,750
11	Umutesi	Western	32,750	34,280	39,730	17,160	48,390	137,140
12	Kalisa	Northern	38,600	15,620	29,450	11,010	58,500	150,650
13	Kagabo	Eastern	46,850	27,790	75,490	10,400	100,240	183,890
14	Berwa	Northern	40,520	34,700	38,620	11,260	55,030	106,860
15	Hirwa	Western	5,541	29,230	45,960	20,120	135,470	219,830
16	Mugisha	Northern	56,670	2,883	2,142	1,054	9,543	11,967
17	Abatoni	Northern	42,690	49,310	84,200	13,890	104,680	126,770

Table 4. 10.Data ready to be filtered

Step 3: In the **Filter menu** that will appear **uncheck** the box next to **Select All** to quickly deselect all data.
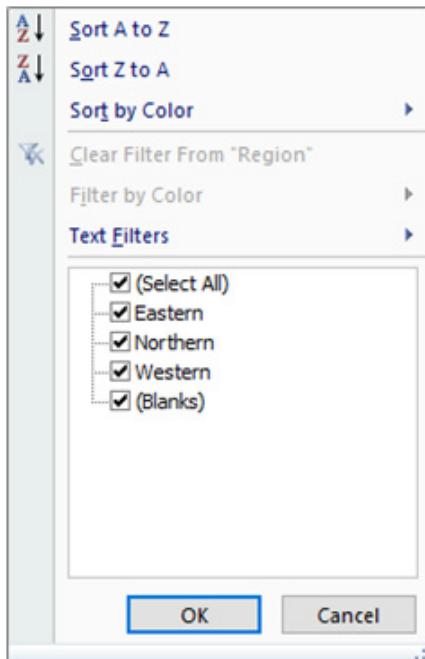
Figure 4. 22.Filter menu

Step 4: Check the boxes next to the data to filter, and then click **OK**.

In this example, **Northern** is checked to view only those types of equipment. The data will be **filtered**, temporarily hiding any content that doesn't match the criteria.

4.3.2 Clear a filter

After applying a filter, it can be removed or cleared from the worksheet. That can be in this way:

Step 1: Click the **drop-down arrow** for the filter that is going to be cleared the **Filter** options will appear. In the case of the activity4.3, the column B filter is going to be cleared.

Step 2: Choose **Clear Filter from [COLUMN NAME]** from the Filter menu. In this activity, select **Clear Filter from "Checked Out"**. This can also be done by selecting all the items (Northern, Eastern, Western) available in the filter

Step 3: The filter will be cleared from the column. The previously hidden data will be displayed.

|	A	B	C	D	E	F	G	H
1					Burera Ltd Sales data			
2	Salespers	Region	May	June	July	August	September	October
3	Muhirwa	Northern	39,470	5,570	38,630	11,170	82,370	86,900
4	Mukamana	Eastern	44,110	10,420	93,550	11,000	101,850	187,490
5	Rugira	Eastern	25,210	30,720	67,020	21,160	134,520	80,460
6	Uwera	Western	47,520	37,550	44,150	10,890	44,040	201,140
7	Mwiza	Northern	49,640	31,520	116,010	11,220	31,700	107,330
8	Uwimana	Eastern	23,270	40,520	37,260	11,350	88,170	185,240
9	Ishimwe	Northern	39,670	49,060	90,070	21,130	130,900	139,630
10	Rurangwa	Eastern	53,630	5,210	45,050	10,240	35,280	152,750
11	Umutesi	Western	32,750	34,280	39,730	17,160	48,390	137,140
12	Kalisa	Northern	38,600	15,620	29,450	11,010	58,500	150,650
13	Kagabo	Eastern	46,850	27,790	75,490	10,400	100,240	183,890
14	Berwa	Northern	40,520	34,700	38,620	11,260	55,030	106,860
15	Hirwa	Western	5,541	29,230	45,960	20,120	135,470	219,830
16	Mugisha	Northern	56,670	2,883	2,142	1,054	9,543	11,967
17	Abatoni	Northern	42,690	49,310	84,200	13,890	104,680	126,770

Table 4. 11. Filter removed

4.3.3 Sorting

Sorting refers to ordering data in an ascending or descending order according to some linear relationship among the data items. Sorting can be done on names, numbers and records.

Below are steps to sort data:

Step 1: Select the entire table to sort. In most cases, select just one cell and Excel will pick the rest of the data automatically, but this is an error-prone approach, especially when there are some gaps (blank cells) within the data to sort.

Step 2: On the **Data tab**, in the Sort & **Filter group**, click **Sort**
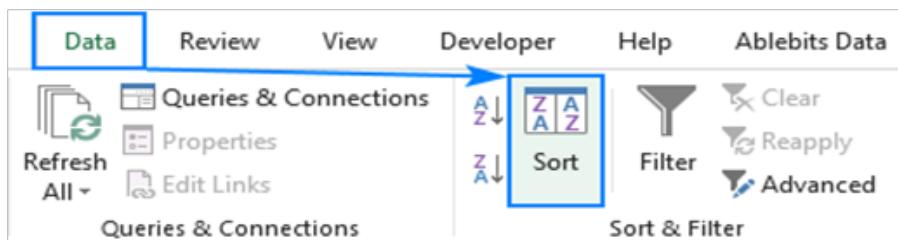
Figure 4. 23. Sort & Filter dialog box

Step 3: The Sort dialog box will show up with the first sorting level created automatically
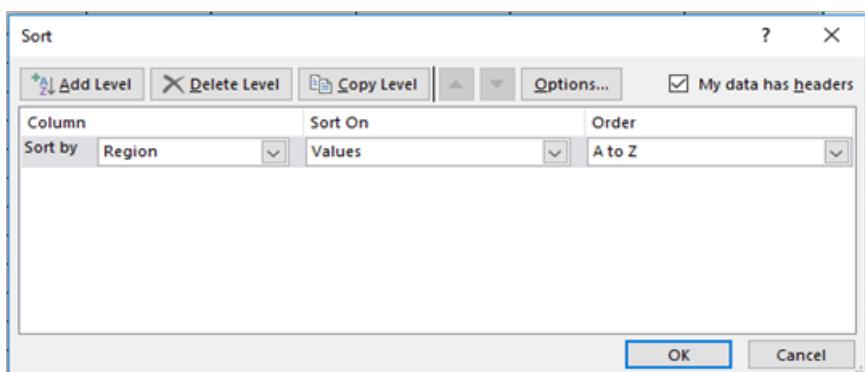
Figure 4. 24. Sort dialog box

Note: If the first dropdown is showing column letters instead of headings, tick off the *"My data has headers"* box.

Step 4: Click the **Add Level** button to add the next level and select the options for another column then click **Ok** if all needed levels are added. For sorting by multiple columns with the same criteria, click Copy Level instead of **Add Level**. In this case choose a different column in the first box.
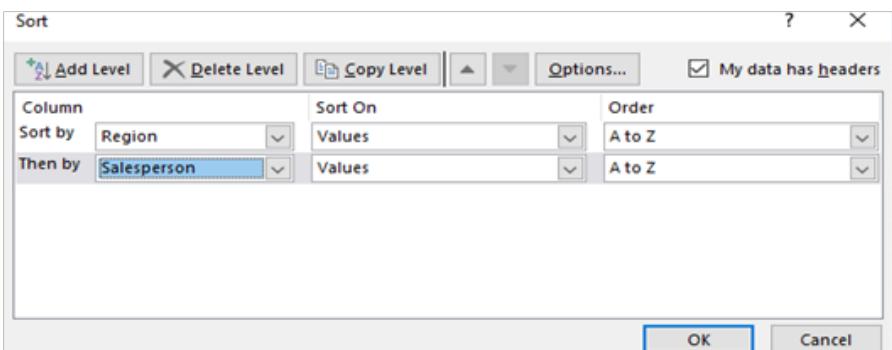
Figure 4. 25. Sort dialog box

After the sorting criteria are applied data will be sorted by Region then by Salesperson as it is clear in the image below:

	A	B	C	D	E	F	G	H
1					Burera Ltd Sales data			
2	Salesperson	Region	May	June	July	August	September	October
3	Kagabo	Eastern	46,850	27,790	75,490	10,400	100,240	183,890
4	Mukamana	Eastern	44,110	10,420	93,550	11,000	101,850	187,490
5	Rugira	Eastern	25,210	30,720	67,020	21,160	134,520	80,460
6	Rurangwa	Eastern	53,630	5,210	45,050	10,240	35,280	152,750
7	Uwimana	Eastern	23,270	40,520	37,260	11,350	88,170	185,240
8	Abatoni	Northern	42,690	49,310	84,200	13,890	104,680	126,770
9	Berwa	Northern	40,520	34,700	38,620	11,260	55,030	106,860
10	Ishimwe	Northern	39,670	49,060	90,070	21,130	130,900	139,630
11	Kalisa	Northern	38,600	15,620	29,450	11,010	58,500	150,650
12	Mugisha	Northern	56,670	2,883	2,142	1,054	9,543	11,967
13	Muhirwa	Northern	39,470	5,570	38,630	11,170	82,370	86,900
14	Mwiza	Northern	49,640	31,520	116,010	11,220	31,700	107,330
15	Hirwa	Western	5,541	29,230	45,960	20,120	135,470	219,830
16	Umutesi	Western	32,750	34,280	39,730	17,160	48,390	137,140
17	Uwera	Western	47,520	37,550	44,150	10,890	44,040	201,140

Table 4. 12.Sorted data

Application activity 4.3

1. Open Burera Ltd Sales data file and update it to make it look like the table below

|	A	B	C	D	E	F	G	H	I
1					Burera Ltd Sales data				
2	Salesperson	Region	May	June	July	August	September	October	Product
3	Muhirwa	Northern	39,470	5,570	38,630	11,170	82,370	86,900	Battery
4	Mukamana	Eastern	44,110	10,420	93,550	11,000	101,850	187,490	Flash disk
5	Rugira	Eastern	25,210	30,720	67,020	21,160	134,520	80,460	SD Card
6	Uwera	Western	47,520	37,550	44,150	10,890	44,040	201,140	Battery
7	Mwiza	Northern	49,640	31,520	116,010	11,220	31,700	107,330	Battery
8	Uwimana	Eastern	23,270	40,520	37,260	11,350	88,170	185,240	SD Card
9	Ishimwe	Northern	39,670	49,060	90,070	21,130	130,900	139,630	Flash disk
10	Rurangwa	Eastern	53,630	5,210	45,050	10,240	35,280	152,750	SD Card
11	Umutesi	Western	32,750	34,280	39,730	17,160	48,390	137,140	SD Card
12	Kalisa	Northern	38,600	15,620	29,450	11,010	58,500	150,650	Flash disk
13	Kagabo	Eastern	46,850	27,790	75,490	10,400	100,240	183,890	Battery
14	Berwa	Northern	40,520	34,700	38,620	11,260	55,030	106,860	SD Card
15	Hirwa	Western	5,541	29,230	45,960	20,120	135,470	219,830	Battery
16	Mugisha	Northern	56,670	2,883	2,142	1,054	9,543	11,967	Battery
17	Abatoni	Northern	42,690	49,310	84,200	13,890	104,680	126,770	Flash disk

a. Show salespersons whose region is "Western" and sale "Battery" as product

b. Sort Product in ascending order by showing the region where the product is sold

4.4. Exporting Excel files to PDF or other file types

4.4.1 Export Excel Files to PDF

By default, Excel workbooks are saved in the .xlsx file type. However, there may be times when there is a need to use another file type such as a PDF. Follow the steps below to export an Excel file to PDF

Step 1: Click on the **File** menu then **Export** on bottom of File Menu. A Panel will appear on right side to Export file in .PDF format. Click on **Create PDF/ XPS Document** then on **Create PDF/XPS**
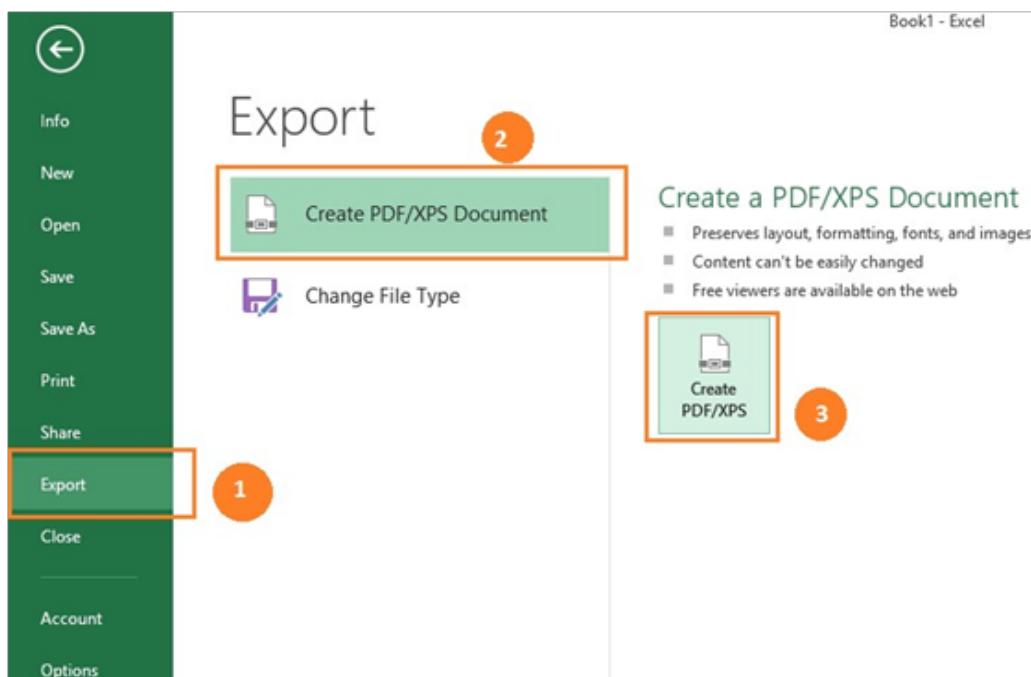
Figure 4. 26.PDF/XPS document panel

Step 2: A **Save As** window will appear. Select the location where to save the PDF file, give it a name and click **Publish**.
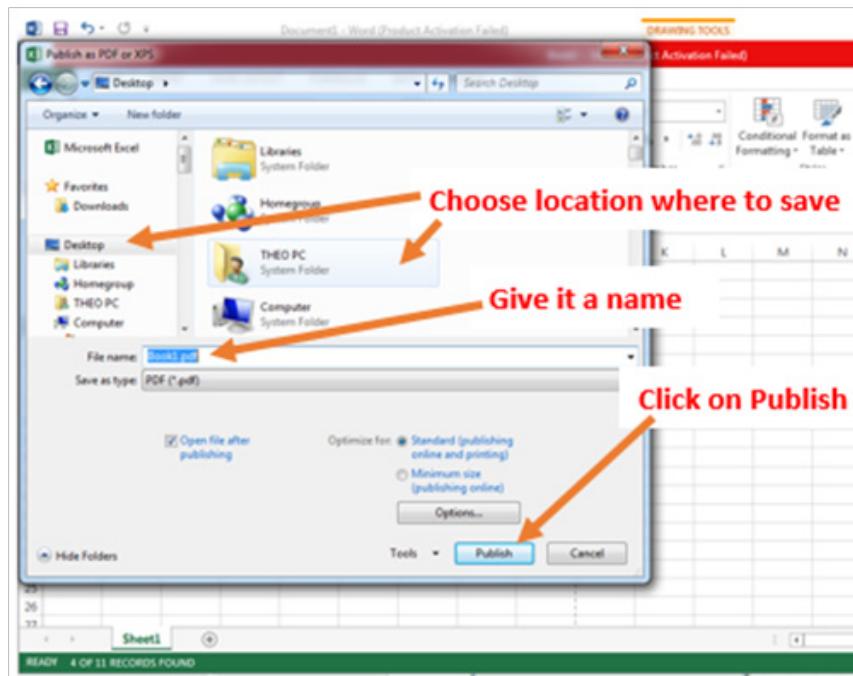
Figure 4. 27.Save as windows

Excel will Export only the worksheet that is currently active. For exporting to PDF a workbook that has more than one worksheet click on the **Option tab** available on the save as window then tick **"Entire workbook"** and click on **OK** then on **Publish**
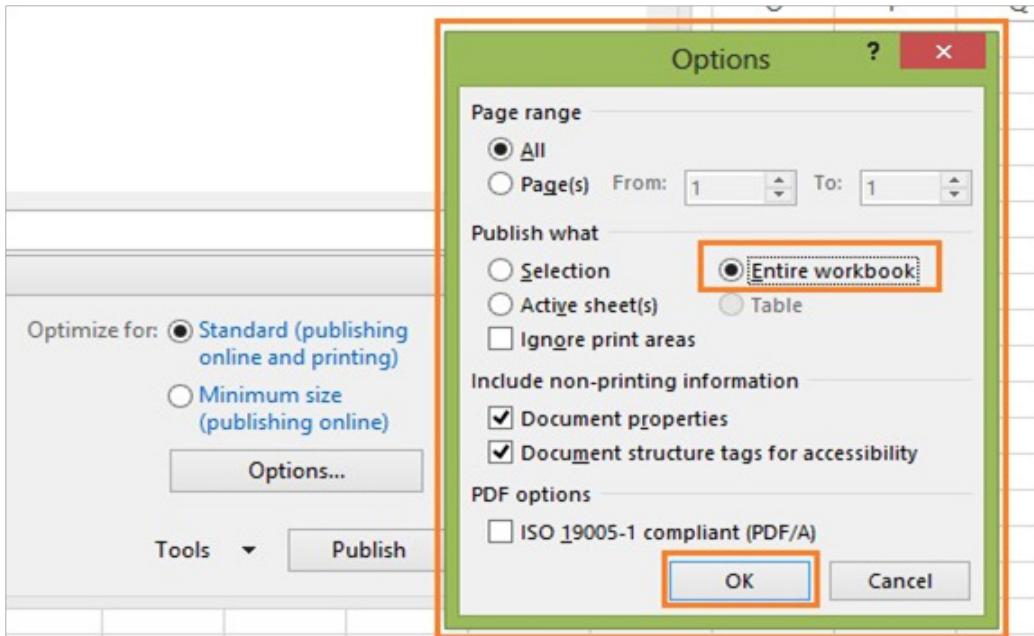
Figure 4. 29.Window for exporting the entire workbook

4.4.2 Exporting in another File Type

Apart from PDF and other file formats that can be used to save Excel, it is possible to export an Excel file in other formats like csv, binary workbook and many others.

To Export Excel files to other formats go through the following steps:.

Step 1: Go to **File**, then **Export**. Click on **Change File Type** and thewindow below with different file types will appear:
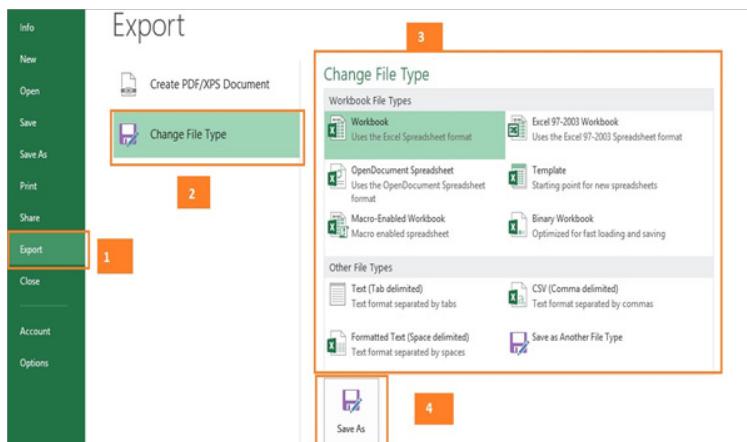
Figure 4. 30. Change File Type dialog box

Step 2: In the window that will appear choose the new file type to apply and click on **Save As** in order to provide the name and the location of the file. File types can be csv, OpenDocument spreadsheet, Macro-Enabled workbook, Text or any other available option.
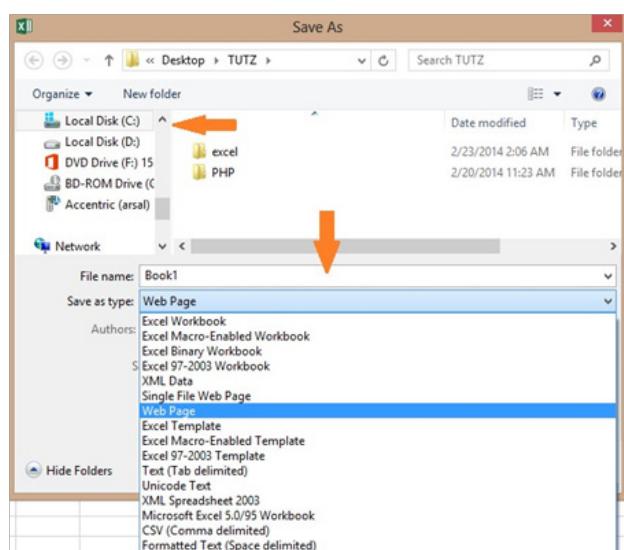
Figure 4. 31.Save As window for saving to other types of files

Application activity 4.4

Open Burera Ltd Sales that you have created in previous activities and do the following:

1. Export Burera Ltd Sales data File to web page file

2. Export this same file to PDF. What are the benefits of saving an excel worksheet to PDF?

End unit assessment

Enter the data below in Excel and save the file under the name "Senior 4 MPC Mark Sheet"

| Names	Math			Physics			Computer Science			General Paper			Entrepreneurship			
	TJ	Ex	Total	TJ	Ex	Total	TJ	Ex	Total	TJ	Ex	Total	TJ	Ex	Total	Grand Total
Munezero	4	3		6	6		2	5		6	10		9	7		
Umutesi	3	5		9	8		5	6		2	3		6	8		
Rurangwa	6	3		7	3		9	4		3	6		8	8		
Ishimwe	8	7		5	5		6	6		5	5		8	9		
Mugisha	1	6		8	9		2	7		6	6		3	5		
Keza	2	4		7	6		6	6		3	4		8	6		
Iradukunda	6	4		6	2		4	8		9	5		5	6		
Rugira	3	5		2	2		8	8		7	9		6	7		
Ingabire	6	6		3	7		7	5		7	8		5	5		
Kalisa	6	4		7	4		7	5		3	6		5	6		
Rugamba	5	3		6	4		2	3		8	7		7	7		
Mukamana	9	7		6	5		7	3		6	4		3	7		
Mwiza	3	8		4	6		4	5		5	6		7	5		
Sugira	8	9		2	3		8	8		4	5		4	5		

1. Calculate the total and the grand total for each student

2. Highlight in red and bold students who scored less than 5 points in each subject

3. Use Green fill with dark green text to Highlight students who have total above 12 in any subject

4. Using blue highlight show all students who scored 55 and above

5. Sort Grand Total in descending order
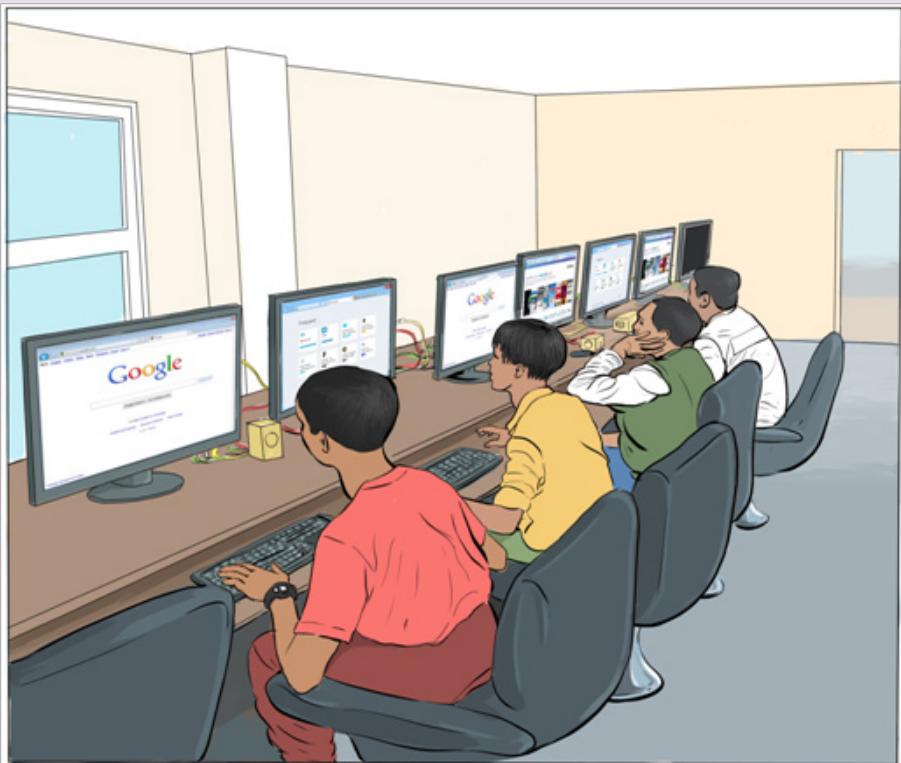
Key Unit competence: To be able to ethically use the internet in doing researches

Introductory Activity

1. Observe the image below and describe what the people sitting in front of the computers are doing.

2. What is a search engine? Observe closely and identify the search engine being used by the first and third person from the left

3. List all possible hardware and software elements that make this kind of communication possible

4. Discuss the importance of internet in teaching and learning

5.1. Internet ethics

During the end of the year holiday, Mugenzi, a student teacher in Year Two in one of the TTCs in Rwanda received a message from someone claiming to be a girl who studies in Year One at the same TTC. The girl claimed to have feelings for Mugenzi. They chatted as much as they could even confidentially, sent to each other pictures.

At the beginning of the new school year Mugenzi met the girl as they entered the school gate and tried to hug her but the girl seemed not to know him. Later he learned from her that they never chatted. Some weeks later Mugenzi received a message that if he does not pay 100 000 frws his nude pictures will be published on social networks.

a. "The girl seemed not to know him" Explain why while they introduced themselves to one another and have been sending pictures to one another

b. Discuss how Mugenzi would have prevented the threat of having his nude pictures shared

c. Have you encountered a problem like this while using the internet and social media? Discuss.

Internet is an interconnection of computer networks worldwide providing a series of information and communication facilities and thus being a big tool for carrying out researches.

Internet ethics refers to set of moral principles that regulate the use of internet. Thus the internet users must be honest, respect the right and property of others on internet.

The following are **ethical issues** that should be addressed at individual, social, and political level:

a. Flaming

Flaming refers to messages that contain offensive, obscene or immoral words spread via social media applications such as WhatsApp, Facebook and Instagram.

b. Forgery

Availability of computers and high resolution imaging devices has make it possible for criminals to forge certificates, money and identity cards.

c. Piracy

Piracy is a form of theft of intellectual property on copyrighted software products without proper authorization. To avoid violation of copyright laws, everyone needs to understand various software licences.

d. Terrorism

High penetration of internet and mobile phones has exposed most countries to evil plans of terrorists across the globe.

e. Pornography:

Availability of pornographic material in form of pictures and video has affected moral values of young children leading to immoral behavior such as homosexuality and premature sex.

f. Fraud:

Computers and mobile phones are being used to steal other people's account details or money through fraudulent means such as fake websites and SMS messages.

g. Corruption:

Corruption has become social evil in private and public institution because it is seen as the easiest means to gaining social, economic or political favors. In some countries, mobile and internet-based money transfer has opened doors to corrupt behavior that goes unnoticed by law enforcement agents.

h. Blackmail: is an action of asking money or any other benefits in exchange to not revealing private information on someone. That information can be nude pictures or videos and other compromising information about someone.

As internet ethics mean acceptable behavior of using internet below are Ten Commandments to guide anyone who uses the internet:

1. Do not use the Internet to harm other people.
2. Do not interfere with other people's internet work.
3. Do not snoop around in other people's internet files.
4. Do not use the Internet to steal.

5. Do not use the Internet to bear false witness.

6. Do not copy or use proprietary software for which you have not paid without permission.

7. Do not use other people's Internet resources without authorization or proper compensation.

8. You shall not appropriate other people's intellectual output.

9. Think about the social consequences of the program you are writing or the system you are designing if it is to be used over the internet

10. Always use the Internet in ways that ensure consideration and respect for your fellow humans

Apart from the commandments some of the ethics to be followed while using internet are here below:

- While using email and chatting, internet must be used for communication or for research purpose: Be on guard while chatting with stranger and avoid forwarding e-mail from unknown people or stranger

- Do not be rude and does not use bad language while using email, chatting, blogging and social network, be respectful to others' views.

- It is not advisable to use internet to fool others or pretending to be someone else, hiding one's identity to fool other on internet is a crime.

- It is not advisable to download and share the copyrighted material without permission.

Application activity 5.1

1. Brainstorm on how technology use has influenced our morals in terms of communication, privacy and intellectual property rights.

2. What are ethical challenges arising from the use of computers and mobile devices used to access the internet?

5.2. Web security spyware, hacking, firewall

Computers are indispensable tools in the life of human beings. Computers are used in different area such as banking, shopping, communicating between people through emails and chats, etc. However, some intruders join the conversations and try to read emails and other information for which they don't have the rights. Most of the time, they misuse their computers by attacking other systems, sending forged emails from computers, or examining personal information stored in others' computers.

Web security, spyware, hacking and **firewall** are among the terms that are common in the world of internet specifically when it comes to using the internet. The common attributes for all these terms is that they refer to the need to use the internet securely.

5.2.1. Web security

Web security refers to the techniques of protecting computers, networks, programs and data from unauthorized access or attacks. Major areas covered in web security are: **Application Security, Information Security, Disaster recovery and Network Security.**

The key Web services security requirements are **authentication, authorization, data protection,** and **no repudiation.** These are implemented in order to have more security while on the web.

a. Authentication

Is a process in which the credentials provided are compared to those in the database of authorized users' information on a local operating system or within an authentication server. If the credentials match, the process is completed and the user is granted authorization for access. Therefore, authentication verifies the identity and enables authorization.

b. Authorization

The term authorization is the process of giving someone permission to do or have something. In the field of computer an authorized user gains access to the system and is allowed to get the available resources depending on the access level attached to his/her credentials.

c. Data protection

Is the process of safeguarding important information from corruption, compromise or loss.

5.2.2. Spyware

Like virus, Spyware also comes under the category of malware attacks. Although the working of spyware is different from the other types of malware mentioned earlier in unit 2, Spyware as the name suggests is used to spy into a system. The job of the spyware is to silently sit inside the host system and observe the activities of that system.

i. Example of how spyware work

Suppose a user is logging on to any bank. Once the website of the bank opens, the user id and login password are input. After that if the user wants to do a financial transaction, the transaction password has to be entered. All this information is quietly registered by the spyware then the spyware sends all the information recorded from the user's computer to probably a hacker who is somewhere else on the Internet.

ii. How spyware is spread

Devices which use windows operating systems are more susceptible to attacks; here below are the most common ways, a computer can become infected with spyware:

- Accepting a prompt or pop-up without reading it first
- Downloading software from an unknown source
- Opening email attachments from unknown senders, etc.

iii. How to recognize spyware on the device

Spyware can be difficult to recognize in an infected device. But there are clues that can help one to know that a computer has been infected. The symptoms of a computer attacked by a spyware are that the device is so slow or crashes unexpectedly, it runs out of hard drive space and there are pop-ups when online or offline.

iv. How to remove spyware

If the device is infected with spyware, it is necessary to run a scan with current security software to make sure it has cleaned up everything it can. The best fight against a spyware is to install reputable anti-spyware removal tools.

v. How to help prevent spyware

Here are four main ways to help prevent spyware.

- Do not open emails from unknown senders.
- Do not download files from untrustworthy sources.
- Do not click on pop-up advertisements.
- Use reputable antivirus software.

5.2.3. Hacking

Hacking is a term used to describe actions taken by someone to gain unauthorized access to a computer belonging to other people. It is the process by which cyber criminals also known as hackers gain access to a computer. After entering in that computer, a hacker can find weaknesses (or pre-existing bugs) in the security settings and exploit them in order to access available information. Hacker can also install any malware such as spyware or Trojan horse, providing a back door in where to enter and search for information.

5.2.4. Firewall

A firewall is a network security device that monitors incoming and outgoing network traffic and permits or blocks data packets based on a set of security rules. Its purpose is to establish a barrier between an internal network and incoming traffic from external sources such as the internet in order to block malicious traffic like viruses and hackers.

i. How Does a Firewall Work

Firewalls carefully analyze incoming traffic based on pre-established rules and filter traffic coming from unsecured or suspicious sources to prevent attacks. Firewalls guard traffic at a computer's entry point, called ports which is where information is exchanged with external devices.

ii. Types of Firewalls

Firewalls can either be software or hardware, A software firewall is a program installed on each computer and regulates traffic through port numbers and applications, while a physical firewall is a piece of equipment installed between the network and the gateway.

5.3. URL and its parts

a. Web browser

Commonly referred to as a browser. It is a software program that allows a user to locate., access, and display web pages. They are used primarily for displaying and accessing websites on the internet as well as other content created using appropriate languages such as Hypertext Markup Language (HTML) and Extensible Markup Language (XML).

Examples of browsers: Mosaic, Netscape Navigator, Internet Explorer, Mozilla Firefox, Opera and Google Chrome

b. Website

Is a collection of related web pages stored as a single file in a web server. It is also defined as a group of World Wide Web pages usually containing hyperlinks to each other and made available online by an individual, company, educational institution, government, or organization

c. Webpage:

This is Hypertext and hypermedia documents containing information about an individual or organization. It is accessible through the Internet or other networks using an Internet browser.

A web page is accessed by entering a URL address and may contain text, graphics, and hyperlinks to other web pages and files.

5.3.1. Uniform Resource Locator (URL)

The term Uniform Resource Locator abbreviated as URL commonly known as **website address** is a unique address of each web page and identifies the location of that specific web page on the Internet. An example of URL is: http://www.yahoo.com

5.3.2. Parts of URL

The URL consists of three main parts namely: Protocol, Domain also known as host name and Resource ID.

i.   Protocol:

It is a set of rules that govern how data is transmitted over a network. There are many types of protocols used in a network. In a URL address, the protocol is shown at the beginning of the address followed with a colon and double slashes. In the example above the protocol is **http (Hypertext Transfer Protocol).**

Nowadays, HTTPS, which stands for Hypertext Transfer Protocol Secure, is the most common used protocol. It tells a web browser to encrypt any information entered onto the page, like the passwords or credit card information, so cybercriminals cannot access it.

ii.   Server name or Host name

It identifies the computer on which the resource is located. This computer is known as a remote server. Most web server names begin with the letters **www** (For example www.igihe.com)

The server name always ends with a dot and a three or two-letter extension called the domain name.

iii. Domain name

The domain is important because it usually identifies the company, agency or organization that is directly responsible for the information, or is providing the computer space where the information is kept. Sometimes it indicates the country where the server is located.

The Top-Level Domain (TLD) specifies what type of entity an organization registers as on the internet. For example, ".com" is intended for commercial entities. Here below are some common top level domain names:

- **com:** identifies company or commercial sites.
- **org:** for non-profit organization sites.
- **ac:** for academic/educational institution.
- **edu:** for educational sites.
- **go:** for government agencies sites.
- **net:** for Internet service providers.
- c**o:** for company.
- **mil:** for military organization.

Examples of country domains are **.rw** for Rwanda; **.ke** for Kenya; **.uk** for United Kingdom; **.jp** for Japan; **.tz** for Tanzania; **.us** for United States; **.au** for Australia; **.ca** for Canada; etc.

iv. Sub domain

Website is like a house, sub domains are like specific rooms in that house. A sub domain in a URL indicates which particular page of a website the web browser should serve up.

v. Resource ID

It identifies the file name and the folders or subfolders under which the webpage is stored on the remote server.

Example of resource ID is /index.php/ icons/services

Application activity 5.3

1. What do you understand by the term web address
2. Describe all parts of URL
3. What do mean by the term Top level domain?
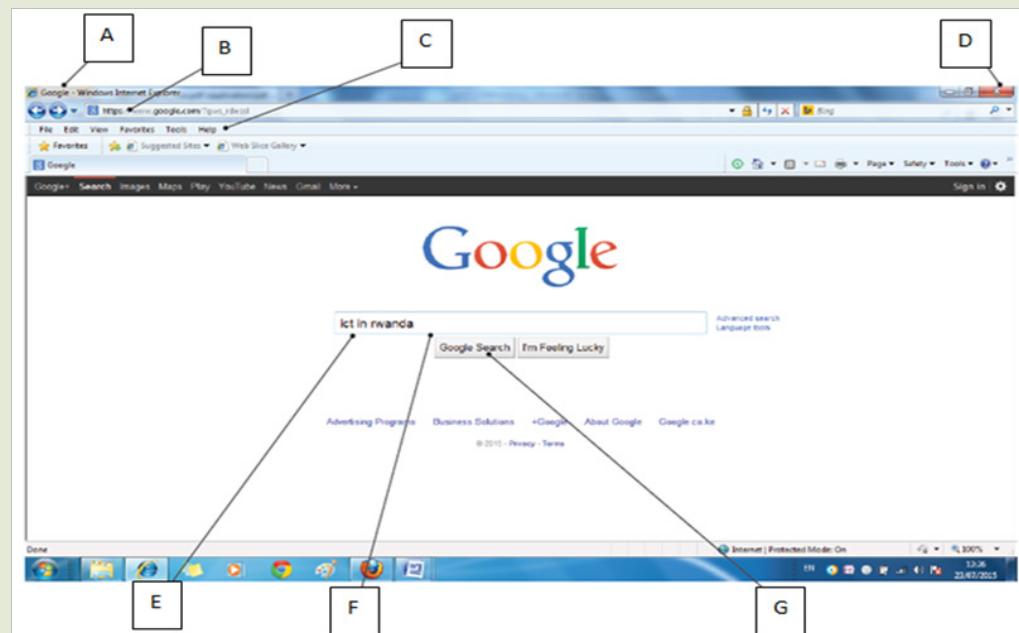
5.4. Search on the internet

5.4.1. Strategies for better search results:

5.4.1.1. Simple search techniques

1. Considering the image below of Google search engine window. Name the parts labeled from A to G

2. Open the browser in address bar, type the most used search engine and in search box type the following text "the proper use of ICT in Rwandan school" Explain what you observe after

Search on the Internet most of the time requires the use of search engines, such as Google or Ask, to look for information based. The words that are typed in the search box are called keywords, and should be directly related to the topic that one is searching for.

Understanding how to perform searches for online information increase the chances of finding the needed information.

Search Engine: Search Engines are programs that help the user look for and identify items that corresponds to keywords or phrases specified from the World Wide Web. Examples include; Yahoo, Google, Bing and Ask.com among others.

A. Strategies to pinpoint specific information online

Searching the internet can be a frustrating; researcher may enter a word or a phrase into a search engine and get irrelevant information. What is need is the ability to refine the search to get exactly what is needed.

1. Vary the Search Engine

Search engines search through about millions of active websites to provide content and source of content. No search engine is perfect they all have shortcomings that are avoided only by the techniques of the user while searching.

Keywords are the terms that searcher uses to find content on the internet. Making the keywords as specific as possible will lead search engine to track down the information that user needs.

2. Simplify the Search Terms

Some engines include **Stop Words** in their searches. These are frequently used words such as prepositions (in, of, on), conjunctions (and, but) and articles (a, the), which means that the search results have more pages of search results than needed.

It is usually best to eliminate **stop words** from the internet searches. The main exception is if the search is based on looking for a specific title or name that includes them.

3. Use Quotation Marks

Enclosing a search term also known as search query within quotation marks prompts the search engine to search for that specific word or phrase.

If the term is a single word, using quotation marks will cut out stemmed variations of it. For example, if searching for the word **director**, the researcher likely receives a lot of results for direct, direction, directions, and so on typing **"director"** with quotation marks, ensure that only results for that stem word are displayed.

If the search term is a phrase, the search will be for that specific phrase, rather than for all the component words as individual items. For example, if searching for the phrase **director of human resources**, without quotation marks, the search returns results based on all of the words in the phrase. Thus surrounding the term with quotation marks, will generate results that feature this specific term.

4. Remove unhelpful words

The use of a hyphen, small dash or minus sign immediately before a word excludes it from a search.

For example, typing in **marketing -digital** will exclude digital from the search engine, making it easier to find the information searched for. Typing **marketing -digital -social** would allow researcher to get rid of even more confusion.

5. Refine the search using operators

Other characters or terms, known as operators allow to narrow down the internet search in more targeted ways. A few of those are explored here below:

- **Wildcard Searches:** use the * symbol as a placeholder for another word. For example, searching for * man in the world returns results for the richest man in the world, the tallest, the oldest, and so on. Wildcard searches are also usefulfor example when researcher do not know the full text of a quote.

- **Combination Searches:** the OR operator enables user to search for two or more terms simultaneously, and is most useful when those terms are very similar. For example typing selling OR retailing, will return pages where either of the terms is used, without both needing to be present.

- Another way to combine searches is to use AND. This operator ensures that researcher receives only search results that include two or more terms.

- **Search in a Specific Site:** Typing the site followed by the URL of the website that researcher wish to search and a search term limit the search to a single website. For example the site: reb.rw"Director General" will return all the pages from reb.rw that feature the term "Director General."

- **Finding Related Sites:** A useful operator is Related. Typing this in front of a web address like in the search sentence "related: igihe.com" (don't consider the quotes) will deliver a range of websites that are similar to igihe.com.

6. Avoid the use of difficult word to recognize (Search Pitfalls)

Note: When searching online, it is important to bear in mind that the use of abbreviation cannot give the relevant result.

Whatever written in search box of search engine, the search engine tries to provide relevant information related to the search query. The window below shows what the search engine displays when researcher want to get information about current Rwandan District


Figure 5. 1. Districts of Rwanda Google search results

B. Keywords

Keywords are the words that the search engines use to find pages. Generally, the more specific the word, the better the returned results will be, because the page which contains that word is more likely have something user intended to look for.

1. Using Google search engine conduct a research about the topic" IMPACT OF GIRA INKA MUNYARWANDA"

2. Using **Search in a Specific Site**,Conduct a research about the all prime ministers of your country

5.4.1.2 Advanced search techniques

1. Conduct a research on internet about Boolean operators

2. Using different search techniques which include boolean operators, quotation marks,… do a research on the internet about the sexual development of a human from birth to adolescence

i. Advanced search techniques using Boolean operators

Boolean searching, also known as searching using **Boolean Operators** in between the search words is the single most effective advanced search techniques used to improve the search results, making them more relevant and precise. While using these operators capitalize the words AND, OR, and NOT to form the most effective search queries. Additionally, quotations are important when searching for a phrase or multiple phrases.
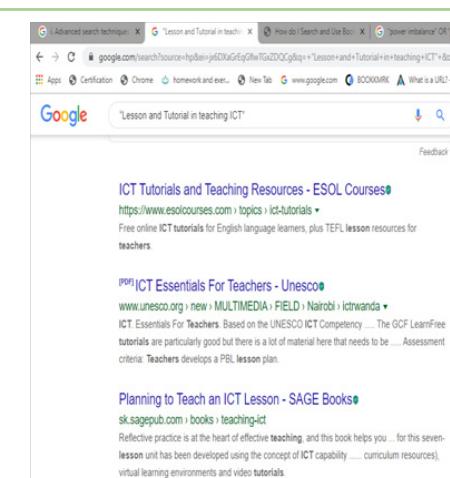
Examples:

- Keyword1 AND Keyword2: results must include both results

- Keyword1 OR Keyword2: results must include at least one of the keywords

- Keyword1 NOT Keyword2: results must exclude Keyword2
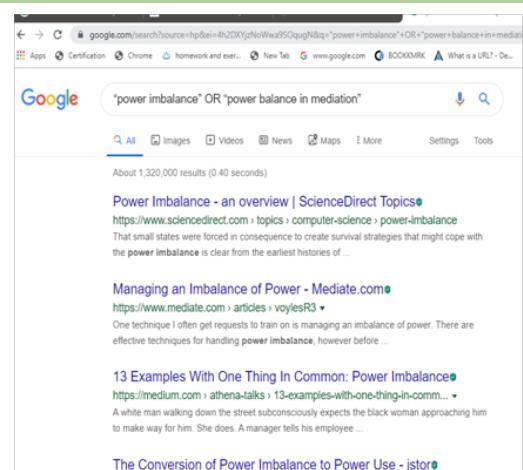
The Boolean logic expression **"Lesson and Tutorial"** once typedin search enginewill ensure that the engine returns document which contains both words.

The Boolean logic expression **"power imbalance" OR "power balance in mediation"**once typed in search enginewill ensure that the engine returns any document which had either of the terms.

The Boolean logic expression **"Lesson Not Tutorial"** once typedin search engine will ensure that the engine returns any document which contains Lesson but no document contain the word Tutorial will appear in the same page of search engine.


*Figure 5. 2. Searching using the AND operator*

Figure 5. 3. Searching using the OR operator

When the AND operator is used in the search query, the search engine return results whose content has both keywords on either side of the operator. In this case the words lesson and tutorial will appear in the search results. On the other hand using the OR operator will return only results containing one of the operand words.

Note: both or none of the keywords may not appear in the search results when the operator AND, OR are used but when the link is opened the opened page will contain those keywords

ii. Advanced search technique using quotation marks

Quotation marks ("") can be used in search engine to avoid finding similar terms or derived words. They are used around phrases. The use of quotation marks tell the search engine to only bring back pages with the typed term in exact order they were typed.

Example: typing the **"health and care reform"** in search engine is accurate than typing **health and care and reform** and will display in the search results that sentence in quotes

iii. Advanced search techniques using tilde sign (~)

When the tilde operator is placed in front of a keyword, it also searches for words that are synonyms of that keyword. The searcher can use the tilde operator (~) to get Google or other searchengines to expand the search with

related keywords. This is helpful when one does not know the entire search query to use.

iv. Advanced search technique using NEAR

This operator is a more specific form of the AND operator. It ensures that the document contains both terms and that they are located near each other. In many lengthy documents, just using the operator AND might not provide useful results as the two keywords might be located in very different parts of the document and might not be related to one another.

Example: The expression **"resistance NEAR physics"** used in the field of physics search engine will ensure that the engine uses both words in its search and ranking logic that both words appear

v. Advanced search techniques using parenthesis

The operators AND, NEAR, OR and NOT are powerful in their own right but when used in conjunction with parentheses, they can offer substantial control over the search logic executed by the engine. Parentheses are used in Boolean logic similar to the way they are used in mathematical equation, limiting and ordering relationships between variables.

Example: If one wants to find a web-based internet tutorial, it is better to use the search criteria **internet AND (tutorial OR lesson)**. The documents returned must contain both of the words internet and tutorial or internet and lesson. Obviously, the parentheses are used to distribute the keyword internet to one of the two "OR" words inside the parentheses.

Application activity 5.5:

1. Using the advanced search techniques seen search on the internet about these topics:

   a. Non-renewable energy

   b. The power of the mind

2. a)Discuss about the use of NEAR keyword used in advanced search techniques

5.4.1.3. Searching for documents, books, images, video on the internet

Activity 5.6:

1. One day an ICT teacher wanted to teach about the topics "assembling and disassembling computer". The day before the teacher gave homework to the students to go to the internet and watch for video showing how to conduct the activity to assemble and disassemble computer.

   a. Suppose you are in that class, search for those videos on the internet

   b. Analyse the videos got and compare them in terms of their relatedness to the topic

Finding specific information on the Internet is compared to searching for information in the library. It is not necessary to have experience in Internet searching or even to know where to locate search sites. Different ways of searching for document, books and video on internet are elaborated in the sections to follow.

A. Searching for documents

Most information is found on the Internet by using search engines. While searching for documents online using search engine simply require the typing of search query in search box, the search engine displays a lot of information which can be in millions of pages like in the image below where more that 6 million of pages are returned.
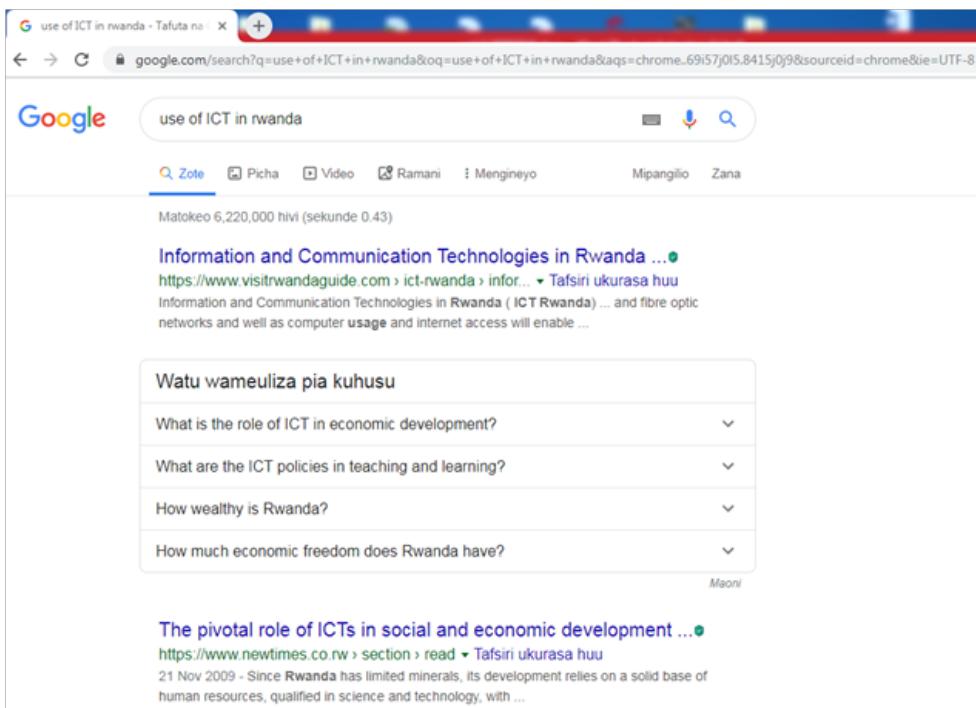
Figure 5. 4: Search result on search engine

Accessing document from internet

The process of getting information from the Internet is known as **downloading.** This document can be viewed, saved or printed. Any attachment sent in an internet needs to be downloaded.

The process of putting information, document, web pages, images and files onto a web server is also known as uploading

B. Searching for book

There are different ways to search for online book such as using Wikipedia, Google as search engine; researcher can even search for books which have been uploaded to any site such as in-house books uploaded to the REB website. When the searched book is found, the next step is to download it.

To search for a book using Wikipedia, a searcher need just to know the book Title, Author, publication house, and date of publication of the book.

There are free online websites such as www.free-ebooks.net but also there are some websites where books are found after payment. Those websites are like **amazon**, **barners** and **noble.**

C. Searching for image

Most people use the web to search for images. They like to search for images online and there are many sites and search engines dedicated just to searching different kinds of images. While searching for online images take into account the copyright issues before using them.

To search and download images from the internet follow these steps:

1. Type **"google.com"** in the web address to find the image to download.

2. Type the name of the image needed, in the available list of related images select the needed image.

3. Right-click to the image to save.

4. Click Save image as, searcher can even use **"copy image as"** option.

5. Choose location where to save the image.
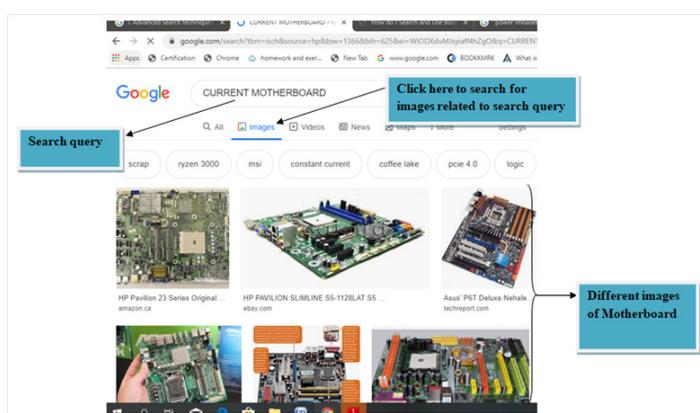
Figure 5. 5.. Search by image option in Google

D. Searching for video on the internet

Internet video or online video is the general field that deals with the transmission of video over the Internet. Internet video exists in different formats, such as MPEG-4 AVC, AVCHD, FLV, and MP4 MP, MP4A etc. Those videos can be accessed through several online video hosting services, such as YouTube, as well as Vimeo, Twitch, and Youkuvidmate etc.

D.1. Searching for video using search engine and video icon

It is easy to access videos through the use of video icon located on search engines. The process of locating videos simply requires to type the name and the author of the video in search box of search engine and thereafter click on video icon as shown in the figure below.

In the drop down list it is up to the viewer to choose the wanted video
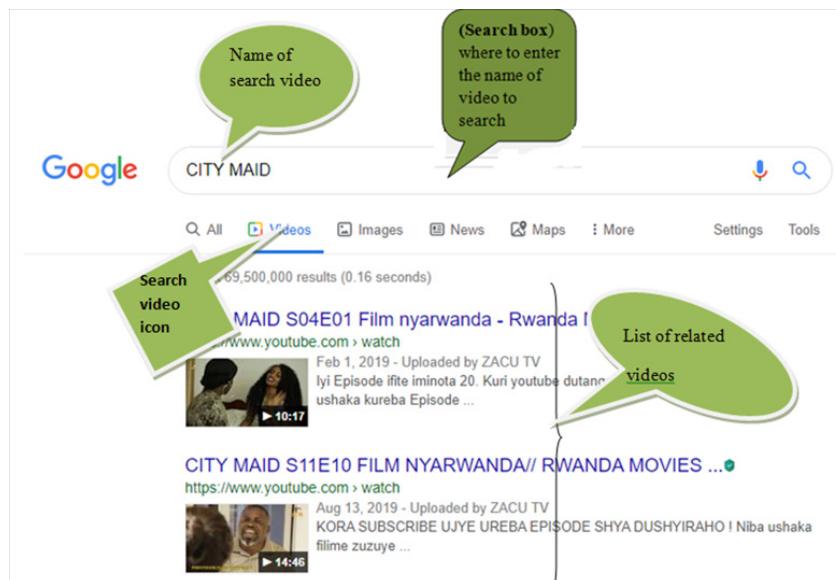
Figure 5. 6. Search for video option in Google

D.2. Search video on internet using online video hosting services

Internet video or online video such as YouTube, vimeo, Twitch, and youku, vidmate for Smartphone are very useful tools that help to search for video.

To search for video online proceed as follows:

- Open the browser

- In web address or URL type the online video hosting services such as youtube.com

- In the opened webpage just write the name of the video by specifying its author in order to avoid confusion.

Here is a figure showing how to find a video using YouTube online hosting service.
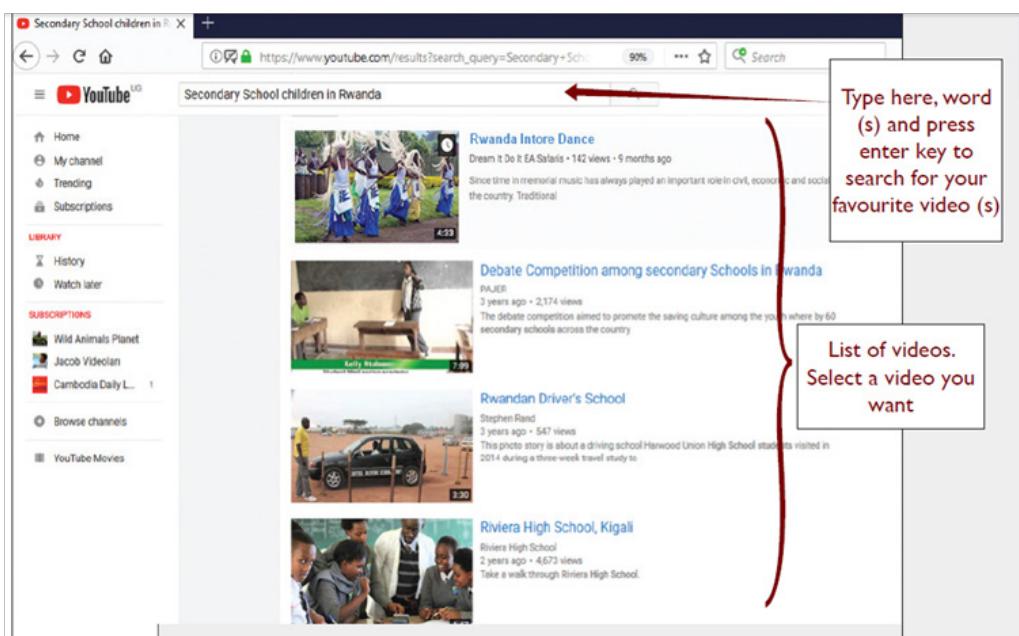
Figure 5. 7: Searching for Video on YouTube

Once a video is seen it can be watched online or downloaded and saved using different appropriate software such as YTD Video Downloader, Internet Download Manager so that they can be watched offline

D.3. Searching for images and videos on internet using add-on software

• Software add-on

This is a piece of software that adds a specific feature or capability to an existing software application. A software add-on cannot be run independently; it is just a software extension.

Examples of common add-ons are Adobe Flash, QuickTime, Download Helperand Silverlight.

• **Download Helper**

This is a tool used to extract videos and image files from websites and save them to the hard drive.

• **Download file (Video) using add-ons/download helper**

Type in the Address bar **"www.YouTube.com"**. Locate a favorite video and click on it.

To download a video on YouTube, there is a red button under ActiveVideo download. If Download Helper is used and there is an active video on any website, the icon is active for downloading it, see the figure below.
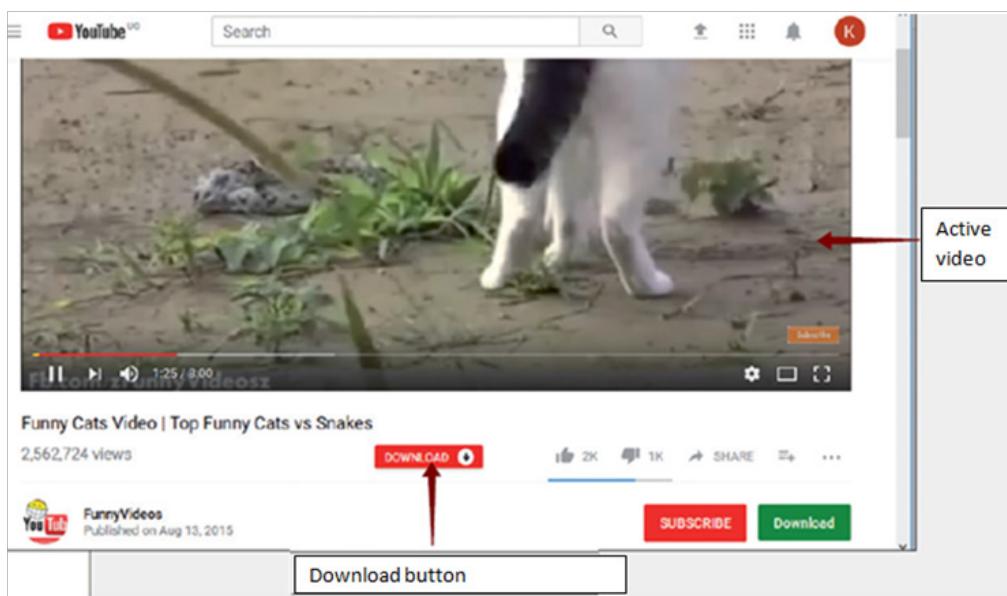
Figure 5. 8.YouTube showing active video that can be downloaded

Click the above **Download** button of the active video then **Save As** dialog box is displayed and at this stage user can select the location where to save the downloaded video.

Note: YouTube has been designed for users who only watch and view videos on their website. In case to save the video on computer is needed, select from a variety of online downloader programs to download the video.

Application Activity 5.6

1. a) Through the use of internet and by using different techniques, search for a video on any one of the three video hosting services (YouTube, Vmeo, Twitch). The video to search for is about "grain germination"

   b) Which one gives more related search results? Explain

2. Search on internet a book called "Imiganimiremire " written by Aloys BIGIRUMWAMI

3. Create a folder on Desktop and call it your name, thereafter Search on internet the current map of Rwanda and save it in the created fold.

5.4.2 Searching by image

The term search by image also called "**reverse photo lookup**" is a type of online search where, user instead of typing in a text-based keyword also known as search query, uploads an image to find visually similar images and relevant details about the query image. Here below are procedures to conduct the search by image:

1. Open Google Images (images.google.com)

2. Click on the camera icon in the **search box**.

Figure 5. 9: Search by image icon

3. Click Upload an **image.**
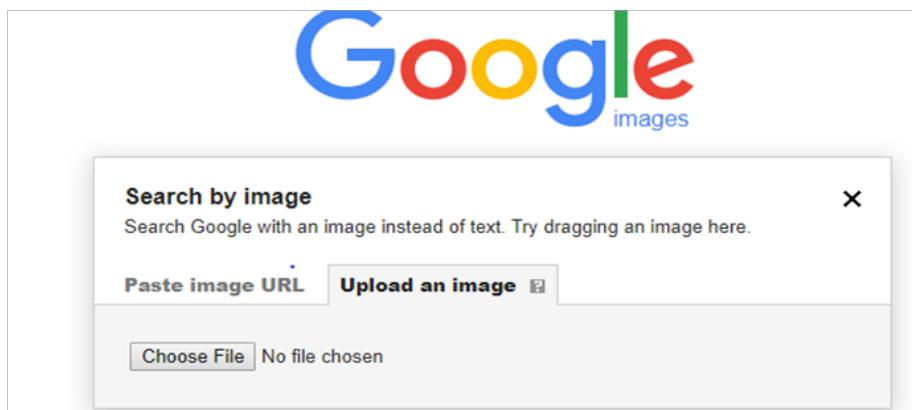
Figure 5. 10. Pasting image URL or Uploading image window

4. Click Choose file' and browse through the **image** from **PC**.

5. Select the **image** and upload it to Google **image**.

In the figure above images can be searched by pasting the address (Paste image URL) of searched image or by uploading it. The term upload have been seen earlier.

Here below is the description of the downloaded image called download33. The image show that it is related to images describing the smart classroom.

Figure 5. 11: Illustration of search by image

Download ICT books for your subject are available on the internet and save them on your computer.

5.3. Browser's Techniques for remembering

1. What is the role of the cord found in the book below

2. Tom Likes watching movies related to psychology on YouTube. Whenever he opens YouTube he finds psychology related topics displayed the first. For his friend Kamana who likes to watch videos on History of Rwanda videos on psychology are not displayed. Discuss the possible reason for this

People who use the internet testify that the internet seems to be intelligent based on the feedback and suggestions they get from it. Some websites offer the possibilities to store some data like details of a filled form, user name and passwords in such a way that on the next visit to the same website those data won't need to be refilled. Some websites like YouTube, social media websites and e-commerce websites provide suggestions to their visitors depending on their experience for the last visit on the same website. The different mechanisms through which this is achieved are elaborated in this topic.

A. Cookies

Cookies are small files which are stored on a user's computer. They are designed to hold a modest amount of data specific to a particular client and website and can be accessed either by the web server or the client computer.

A computer cookie consists of information. When user visits a website, the website sends the cookie to the computer. The computer stores it in a file located inside the web browser of the used computer.

The purpose of the computer cookie is to help the website keep track of user visits and different activities carried out by the users

- **Some activities of cookies**
    - Registering which people have visited what pages on a website. This information can then be used to choose the right advertisement or otherwise tailoring the pages the user may view. Many cookies used for advertising and tailoring content are third-party cookies.
    - Monitoring the traffic through statistics to improve the site and learn more about different target groups.
    - Keeping track of the selected language.

- **Where to locate, enable or delete cookies**
    1. **Open the browser**. Because cookies are stored in the web browser, the first step is to open the browser.
    2. **Find where cookies are stored**. Each browser manages cookies in a different location.

For example, in Internet Explorer, find them by clicking "Tools" and then Settings. And then click advanced settings"

In Chrome, choose "Preferences" from the Chrome menu in the navigation bar, display settings. Then expand the "Advanced" option to display "Privacy and security." From there, open "Content settings" and "Cookies."

    3. **Manage the cookies.** Every browser gives a range of options for enabling or deleting cookies. Internet Explorer for instance, allows managing cookies under "Privacy" and "Advanced." In Chrome, find where cookies are stored as outlined above, and then select the management options under "Cookies."

B. Bookmark

When referring to an **Internet** browser, a **bookmark** or **electronic bookmark** is a method of saving a web page's address. In Microsoft Internet Explorer, bookmarks are referred to as favorites

- **The purpose of bookmark**

A bookmark is very useful when user finds a webpage that should be remembered in order to be able to look at it another day. Bookmarking is like creating a shortcut for quick access to that web page.

Here below is a list of shortcut that can be used to access and view the bookmarks in a browser :

- **Google Chrome:** Ctrl+Shift+O
- **Mozilla Firefox:** Ctrl+B or Ctrl+ Shift+B
- **Microsoft Edge:** Ctrl+I
- **Internet Explorer:** Ctrl+I
- **Opera:** Ctrl+Shift+B

● **Process of viewing bookmark in Google chrome**
   1. Open the Google Chrome browser.
   2. Navigate to the page to bookmark.
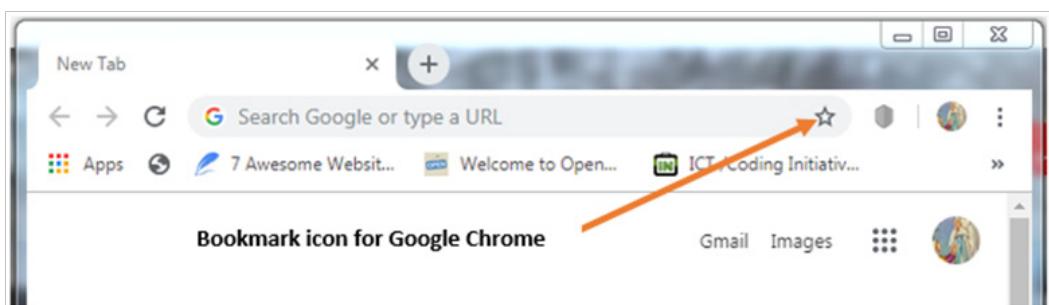
Figure 5. 12: Web page address with the bookmark icon

   3. Press **Ctrl+D** or click the **star icon** ☆ on the far side of the address bar
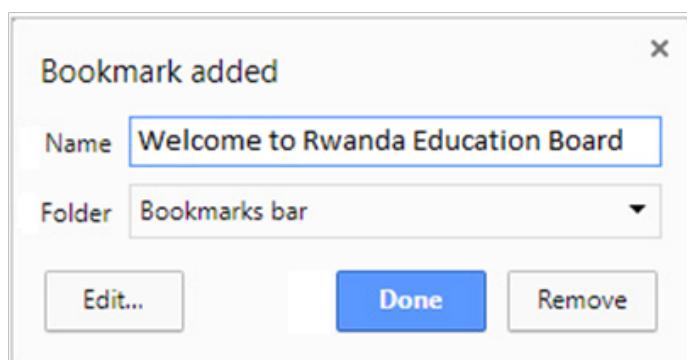

Figure 5. 13: Bookmark Window

d. Cache

A web cache also known as a HTTP cache or page cache is a system that temporarily stores data such as web pages, images and similar media content when a web page is loaded for the first time.

When a user visits a page for the first time, a site cache commits selected content to memory and when that same page is visited again, the site cache is able to recall the same content and reload it much quicker when compared to the first visit.

e. Browser history

In computing system, the term **web browsing history** refers to a list of web pages a user has visited recently and associated data such as page title and time of visit which is recorded by the web browser software as standard for a certain period of time. Web browsers software do this in order to provide the user with a back button and a history list to go back to pages they have visited previously as well as displaying visited links

Viewing browsing history in Google Chrome:

All web browsers keep a record of every page visited in their web history. Here are the steps followed to view a browser's history:

1. Open the browser.
2. Click the icon ⋮ located to the far right corner of Google Chrome under the closing icon.
3. Select History. This option is near the top of the drop-down menu. ...
4. Click History. It's at the top of the pop-out menu.
5. Review the browsing history
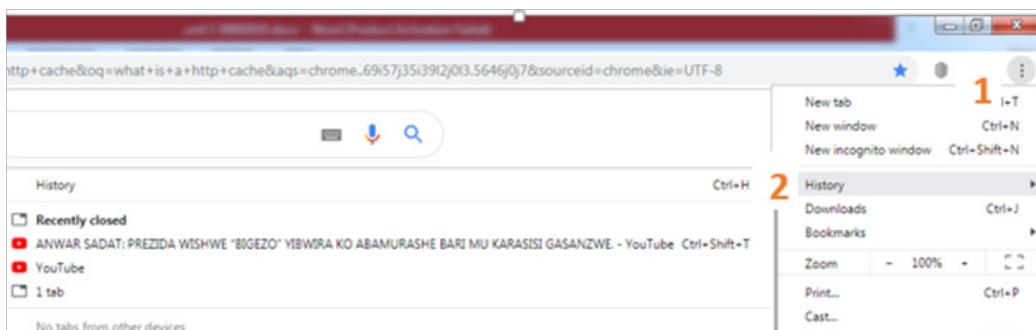
Figure 5. 14. Browser History view

1. Explain the purpose of Bookmark, cookies Cache.

2. Using internet explain three ways to view bookmarks using different browsers.

End unit assessment

1. What is URL? Explain the five parts of URL

2. What does the prefix https:// in a browser address field mean?

3. Differentiate web page from web site

4. When moving from one web page to another, it is a good to open each web page in a differentwindow. Try opening the following links, each in its own window: www.igihe.com, www.reb.rw, www.google.com

5. What is a browser's page history? What is its purpose?

6. Define the term search engine and list at least three examples of the most common ones

7. Nowadays most services are carried out online by using the web application www.irembo.gov.rw. With your computer connected to Internet, search for steps to be followed while applying for National ID using this web application.

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