INFORMATION TECHNOLOGY TEACHER'S GUIDE GRADE 9

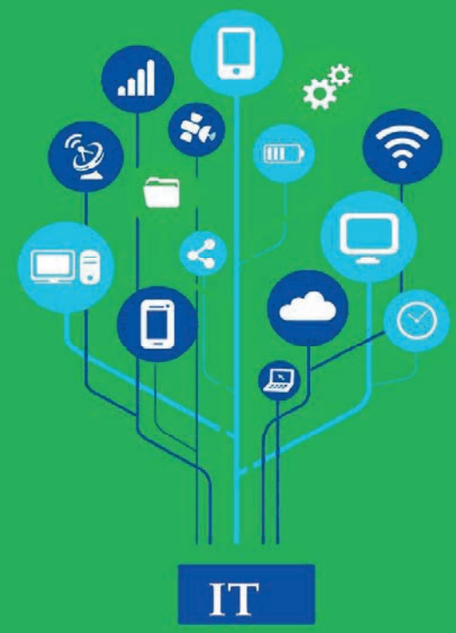
ISBN 978-99990-0-044-4



INFORMATION TECHNOLOGY

Grade 9

TEACHER'S GUIDE



Federal Democratic Republic of Ethiopia Ministry of Education

Federal Democratic Republic of Ethiopia Ministry of Education



INFORMATION TECHNOLOGY

Grade 9

Teacher's Textbook

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FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA
MINISTRY OF EDUCATION

HAWASSA UNIVERSITY

First Published August2023by the Federal Democratic Republic of Ethiopia, Ministry of Education, under the General Education Quality Improvement Program for Equity (GEQIP-E) supported by the World Bank, UK's Department for International Development/DFID-now merged with the Foreign, Common wealth and Development Office/FCDO, Finland Ministry for Foreign Affairs, the Royal Norwegian Embassy, United Nations Children's Fund/UNICEF), the Global Partnership for Education (GPE), and Danish Ministry of Foreign Affairs, through a Multi Donor Trust Fund.

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The Ministry of Education wishes to thank the many individuals, groups and other bodies involved – directly or indirectly - in publishing this Textbook. Special thanks are due to Hawassa University for their huge contribution in the development of this textbook in collaboration with Addis Ababa University, Bahir Dar University and Jimma University.

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Printed by:

GRAVITY GROUP IND LLC

13th Industrial Area,

Sharjah, UNITED ARAB EMIRATES

Under Ministry of Education Contract no. MOE/GEQIP-E/LICB/G-01/23

ISBN:978-99990-0-044-4

Forward

Education and development are closely related endeavors. This is the main reason why it is said that education is thekey instrument in Ethiopia's development and social transformation. The fast and globalized world we now live in requires new knowledge, skill and attitude on the part of each individual. It is with this objective in view that the curriculum, which is not only the Blueprint but also a reflection of a country's education system, must be responsive to changing conditions.

It has been almost three decades since Ethiopia launched and implemented new Education and Training Policy. Since the 1994 Education and Training Policy our country has recorded remarkable progress in terms of access, equity and relevance. Vigorous efforts also have been made, and continue to be made, to improve the quality of education.

To continue this progress, the Ministry of Education has developed a new General Education Curriculum Framework in 2021. The Framework covers all pre-primary, primary, Middle level and secondary level grades and subjects. It aims to reinforce the basic tenets and principles outlined in the Education and Training Policy, and provides guidance on the preparation of all subsequent curriculum materials – including this Teacher Guide and the Student Textbook that come with it – to be based on active-learning methods and a competency-based approach.

In the development of this new curriculum, recommendations of the education Road Map studies conducted in 2018 are used as milestones. The new curriculum materials balance the content with students' age, incorporate indigenous knowledge where necessary, use technology for learning and teaching, integrate vocational contents, incorporate the moral education as a subject and incorporate career and technical education as a subject in order to accommodate the diverse needs of learners.

Publication of a new framework, textbooks and teacher guides are by no means the sole solution to improving the quality of education in any country. Continued improvement calls for the efforts of all stakeholders. The teacher's role must become more flexible ranging from lecturer to motivator, guider and facilitator. To assist this, teachers have been given, and will continue to receive, training on the strategies suggested in the Framework and in this teacher guide.

Teachers are urged to read this Guide carefully and to support their students by putting into action the strategies and activities suggested in it.

For systemic reform and continuous improvement in the quality of curriculum materials, the Ministry of Education welcomes comments and suggestions which will enable us to undertake further review and refinement.

Addis Ababa, Ethiopia
August 2023

Federal Democratic Republic Of Ethiopia
Ministry Of Education

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UNIT 1 ORGANIZATION OF FILES

UNIT OUTCOMES

At the end of this unit, learners will be able to:

- Explain file, folder and drive.
- Manipulate file and folder.
- Explore drive on computer system.

UNIT OVERVIEW

This unit introduces the students about file and file organization in computer systems. A computer file can be both system generated and created or transferred from other sources in to computer. They will learn how to manipulate files (creating, copying, renaming, deleting and searching).

A file folder is a mechanism to keep your computer files in an organized manner. This unit will also introduce folder manipulation mechanisms that operating systems provide.

Suggested Lesson Plan

This unit is expected to be covered in **12 periods**.

No.	Subunits	Number of Periods Alloted
1.1	Basics of Files and Folder s	2
1.2	Managing Files and Folders	7
1.3	Basics of Computer Drives	3
	Total	12

Minimum Learning Competency (MLC)

- Perform file management

1.1 Basics of Files and Folders

In this subunit, you will teach about basic concepts of files and folders to raise awareness of the students on what file and folder virtually in a computer and physically in real life such as in office. The topics to be learnt under this subunit are:

- Files
- Folders

At the end of this section, students will be able to:

- Define file.
- Define folder.
- Explain the advantages of folder.

These topics are expected to be covered in **2 periods**.

Instructional Strategies

Respected teacher, start the lesson by asking students a brainstorming question listed before moving to defining files and folders. After students raise some points, you can summarize student ideas and lecture what are files and folders in both real life and virtually in a computer. You can conclude the brainstorming question as traditional file and folder management system is created, maintained and used manually as a paper document. Students' *edir* and *ekub* associations and their school system may use this traditional methodology in order to manage user information. Traditional file and folder management is easily damaged, misfiled or misplaced, difficult for searching and locating files and needs lots of space to store in an office. Computer-based filing systems are easy to create and manage and are delivered by networks, disks, flash memory and CD/DVD and stored on a file system.

After summarizing students' ideas on brainstorming questions, let two to five students form a group and do activity 1.1 and, at the end, let them summarize the advantages of folder.

Required Instructional Resources

Dear teacher, you can bring real life folders, the so called manila folders or **dossiers,** to show students how similar files are grouped together in it. Or if it is possible bring a person who works in data clerk (he/she can be the school data clerk) at any office and let him/her describe how he/she manages files and folders in his/her office.

Assessment Strategies

- Observe and facilitate students' group discussion.
- Observe and examine while students present their group work to class.
- Evaluate students out of 5 points while doing the activity under this subunit.

Answers to Activity 1.1

Folders help you keep related files organized together so that you can locate them easily.

Alternative Teaching Approaches, Enrichment Material

The IT teachers can use Internet, charts, worksheets and models, go for educational field trips or invite subject experts for seminars to enrich the teaching level and in turn help the students learn organization of files and folders in a computer system better.

Additional Class Activity for Fast Learning Students or Slow Learners

Identify file types

Let the student identify different kinds of files by using file extension. For example

- If it is .docx, then it is word document.
- If it is .pptx, then it is PowerPoint file.
- If it is .xlsx, then it is spread sheet file.
- If it is .mp3, then it is an audio file.
- If it is .mp4, then it is a video file.

1.2 Managing Files and Folders

Under this subunit, the students are expected learn about how to manage files and folders in a computer. The topics to be covered are:

- Using File Explorer
- Opening File Explorer
- Creating a New File
    - Creating a word document
    - Creating text file
    - Viewing, editing and creating image
    - Create an audio file
- Creating a New Folder

- Copying a File
- Renaming a File and Folder
- Accessing Files and Folders
  - Using the address Bar
  - Using Forward and Backward button to see previously visited folder
  - Using from the folders pane
  - Using Search function
- Displaying Subfolders
- Moving Files and Folders on Computer
  - Cut and Paste
  - Drag and Drop
  - Using Move to Folder
- Deleting File, Folder or Directory
  - Using Right-click method
  - Using file menu
- Finding a File on a Computer

Competencies

At the end of this section, students will have a skill for file and folder management which includes creating, copying, renaming, accessing, deleting, finding and etc. using file explorer application software in a computer.
This topic is expected to be covered in **7 periods**.

Instructional Strategies

Dear teacher, before moving to managing files and folders, please let students discuss on the brainstorming questions under these sections. You can conclude the discussion as: Just like we can name, rename, copy (carbon copy), delete or move paper-based filing system, we can do the same file and folder management in computer-based filing system.
After concluding the brainstorming questions' discussion, open a File Explorer on a projected computer in the lab and show them the 9 parts of File Explorer and tell the students the advantages of them (Refer to table 1.1 and Figure 1.4 from Student's Text book).
After overviewing the File Explorer interface elements, show your students different methods used to open File Explorer from their Window 10 desktop

computer. After this, let the students be in a group of 2 or 3 students in a computer lab and practice the case study for creating a document file on a given title. In addition to creating word file, let them be in groups and create different kinds of files such as image file, PowerPoint file, spreadsheet file, etc. in Practical Exercise 1.2 and Practical Exercise 1.3.

After this, show students step by step, ways of creating new folder, copying a file, renaming a file(s) and folder(s), accessing file(s) and folder(s), moving file(s) and folder(s), deleting file(s) and folder(s), and finding files and folders. After doing this, students work in a group of 2-3 students in a computer lab to do Practical Exercise practicing managing files and folders and at the end, you may summarize the main points.

For those who are **visually impaired** student, the IT teacher may use ***narrator*** application for file and folder management.

Required Instructional Resources

Dear teacher, bring students to a computer lab to practice file and folder management using file explorer application software. To do this, you need a desktop computer with latest version or Window 10 operating system installed or open source operating system such as Linux operating system. One of the popular desktop version Linux operating system distributions is Ubuntu and the current version is Ubuntu-19.

Assessment Strategies

- Observe and facilitate students' group discussion.
- Observe and examine while students present their group work to class.
- Evaluate students out of 5 points while doing the lab activity (Practical Exercise 1.5) under this subunit.

Answer to Practical Exercise 1.4

Find an icon of a file that you saved on yoxxur desktop before or identify any file that is not important anymore to keep and delete it using one of the methods that you have learnt.

Follow the following steps to delete unwanted files from a computer.

1. First, view your computer desktop by right clicking on the taskbar and choosing "Show the desktop", or use the Windows key + D keyboard shortcut.

2. Find the file icon that you saved to your desktop previously or any file (that is not important) or create one for this activity.
3. Right-click on the document icon that is on the desktop and choose the "Delete" command from the menu, then click "Yes" or press Enter key on your keyboard to confirm the deletion of the file in the dialog box that appears.

Answers to Practical Exercise 1.5

Use the following steps to management files and folders in computer.

1. Creating a folder

Open File explorer ➜ Open Documents Folder by clicking it from navigation panel ➜ Create two folders called **Test1** and **Test2** by right clicking inside opened Documents folder.

2. Creating Files

Open Note pad application ➜ Write "I Love Ethiopian Cultures" ➜ Click on File➜ Save ➜ Select Document ➜ Select subfolder Test1 ➜ Name the text file "testfile1.txt". By now Test1 folder will have the file testfile1.txt.

Create testfile2 text file in folder Test2 following the above procedures and write your school's name on it.

3. Copying a File

Copy testfile1 to Test2 folder: to do this follow this steps

Open folder Test1 ➜ highlight the file testfile1 and right click ➜ Select copy option ➜ choose folder Test2 ➜ Right click on empty space inside Test2 folder ➜ Select paste option ➜ Now the file is duplicated on both Test1 and Test2 folders.

4. Moving a File

Move testfile2; copy from Test2 folder to Test1 folder. To do this, follow these steps.

Highlight the file testfile2 inside Test2 folder and right click ➜ Choose Cut option ➜ Select Test1 folder as destination folder from File Explorer ➜ Right click on empty space of the Test1 folder ➜ Choose past➜ Now testfile2 is removed from Test2 folder and moved to Test1 folder.

5. Renaming a File

Rename testfile2.txt file in Test1 folder as testfile3.txt. See section 1.2.5 to revise

how you can do this. To do it, follow the steps mentioned below.
Right click the file testfile2 in Test1 folder ➜ Select Rename optionà ➜ Insert new name testfile3 ➜ Click on the empty area of the folder ➜ Now the file name is changed.

Note: There are also other methodologies to do this; you can refer back to file and folder management section of this book.

6. Deleting a Duplicated File

Notice that we have a file named testfile1.txt both in Test1 and Test2 folders. Thus, the file is a duplicate. What is the problem of keeping duplicate files in your computer? Remove testfile1.text from Test2 folder. Open the Recycle Bin and search for the testfile1.txt file. Why is it found in the Recycle Bin?
In order to delete it, follow the steps stated below.
Highlight the testfile1.txt in Test1 folder ➜ Press delete key from your keyboard ➜ Now this file disappears from the Test1 and will be in Recycle Bin.
Deleting duplicated file from a computer is important because it helps you to free up storage and organize files better. However, having duplicated files in different storage devices for a purpose of backup is a good practice in which we can use the other if one file fails to open.

Alternative Teaching Approaches

The teacher may use his/her phone or other students' to practice file and folder management, in case if there is no computer laboratory in the school.
The IT teachers can use internet, charts, worksheets and models, and go for educational field trips or subject experts can be called for seminars to enrich the teaching level and, in turn, to help the students in learning organization of files and folders in a computer system.

Additional Class Activity for Fast learner or Slow Learners and Their Answers

Using File Explorer options for File and Folder Management

a. Open Desktop and create folder on it.

Answer

1. Open your computer.
2. After the computer completes the boot up process, it brings up your desktop, or if you open it before and there is another window already opened, you

can open your desktop using **Window key + D.**

3. On the Desktop, right click and create a **new folder**. Save the folder as "My_Exercise_Folder-1".

b. Create two files, one in Notepad and the other in Paint, and then rename them.

Answer

1. Create and save two files to your "My_Exercise_Folder-1" folder, one file using a text editor application that comes with Windows called Notepad and the other in Paint, a painting and drawing application that also comes with Windows.
2. Go to your Start menu, start typing Note pad, then it searching Note pad , and then click on Notepad (again, this is a plain-text editor application used for computer program coding purposes). Save this file to your My_Exercise_Folder-1 folder and name it "Sample-Plain-Text-File." Then write some notes in the note pad and save your work and quit Notepad.
3. Now go to the Start menu group again and start the Paint application that also comes with Windows.
4. From pull-down menu of the top menu bar, select and click Save. In the window that opens, browse to your My_Exercise_Folder-1folder, and in the File name field at the bottom, name it "SamplePaint-File" and then click the Save button. Then add some drawings you wish and save your work. After this, close Paint and return to File Explorer.
5. Where you will see the two files, you just created in the right-hand pane of the window (you may need to re-select the My_Exercise_Folder-1folder in the left-hand pane in order to see the files).
6. Now you will rename the two files. Right-click on the Notepad file; choose the "Rename" command from the menu that add "Additional Lab Ex." to the beginning of the file name without removing the rest of the file name.
7. Rename the paint file in the same manner.

c. Using File Explorer options for viewing file list and previewing files before opening

Answer

1. Open previously created folder "My_Exercise_Folder-1."
2. Here you will experiment viewing the contents of the right-hand pane in File Explorer with different options. To the far right of the menu in File Explorer (to the left) are the menus "Home", "Share", "View" and the "Search" Menus),
3. Click on View and you see a layout display options group.
4. Try each of the options in order, starting with "Extra Large Icons."
5. Add "Date Created" additional column heading so that you can list files based on "Date Created". To add additional "Date Created" column heading, right click on any column heading, from drop down menu; click on "Date Created". Then you will see Additional Date Created column heading on File explorer.
6. Now you will learn how to display **previews of file contents** using the preview pane in File Explorer. In **view** menu under **panes** group of file explorer, you will see the "**Preview pane."**
7. Click on this icon and then you will be able to see preview of the contents of the two files you created above in folder "My_Exercise_Folder-1" without opening them.

d. Changing How Your Files and Folders are Displayed

Answer

It is possible to change the icons look of file and folder as well as display different information about each folder.

Note: Changes you make will apply to the contents of the current folder only.

a. To change the icons look of a file and folder, follow the steps mentioned below.

1. Navigate to the folder you want to change the display style.
2. Click on the **View** tab to display the Ribbon as shown in Figure 1.1 below.

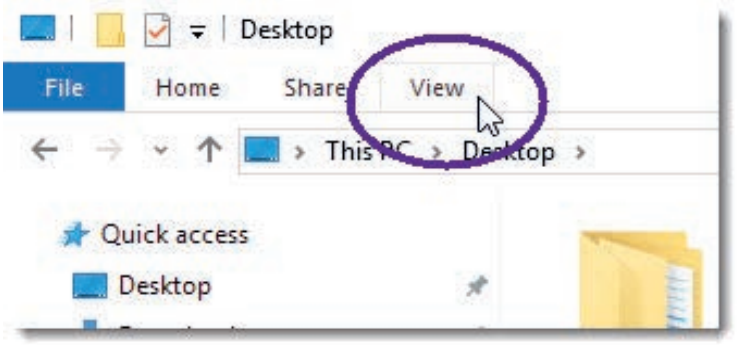


Figure 1.1 File Explorer View menu

3. In View, you will see the following available display options (Figure 1.2).

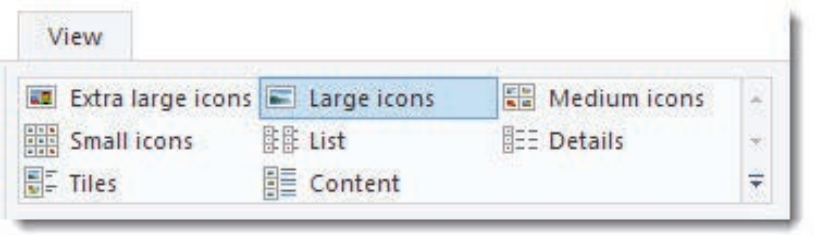
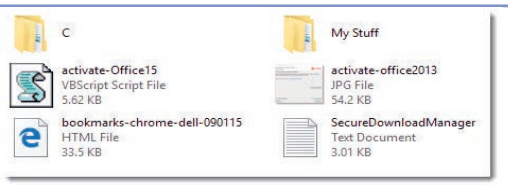
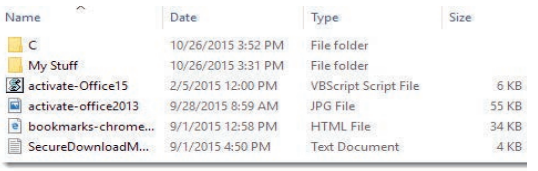
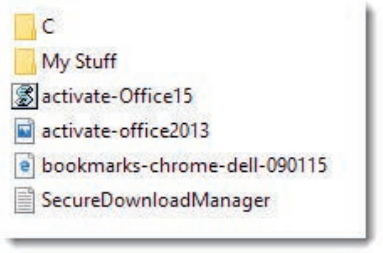
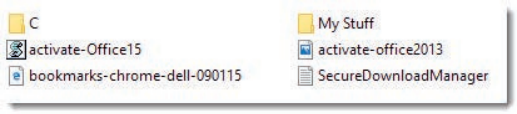
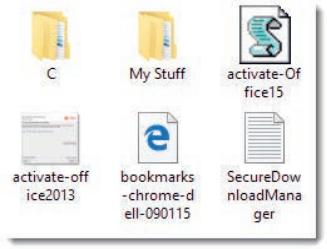
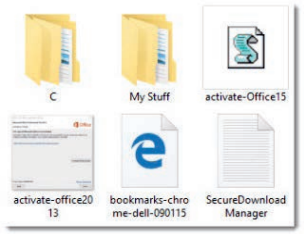
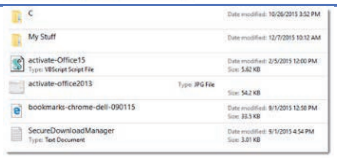


Figure 1.2 File Explorer View option icons

Move your mouse over each option to see a quick preview of that option in the area where your files and folders are displayed. To choose an option, just click on it. The following table (table 1.1) lists and briefly describes each display option.

Table1.1 Description of file explorer view options

File/ Folder View	What It Looks Like	Description
Tiles		Shows icons of each item. Files also show file type and file size.
Details		Lists and shows information about your files and folders. In this view, folders show date last modified; files also show file type, file size and date created.
List		Shows you the file or folder name and its associated icon

Small icons		Virtually the same as the List view
Medium icons		Virtually the same as the Tiles view, except that only the file or folder name is displayed. Windows displays a thumbnail of images.
Large icons		Shows a larger view of file and folder icons. Only the name of the file or folder is displayed. Windows displays a thumbnail of images.
Extra -large icons		Shows the largest available view of file and folder icons. Only the name of the file or folder is displayed. Windows displays a thumbnail of images.
Content		Displays a list of files, folders, and program shortcuts and their associated icons. In this view, you will see an item's last modified date and file size (if a file), and date taken if an image.

b. Adding a Column Heading

It is possible to add a column heading to display additional information about your files and folders as shown in figure 1.3. This is only done in Details view. Steps to be followed are:

1. Navigate to the folder from which you want to add a column heading.
2. Right-click on any column heading.
3. From the drop-down menu, click on the heading you want to add so that a check mark appears. (In the example below, the heading "**Date created**" is being selected.)

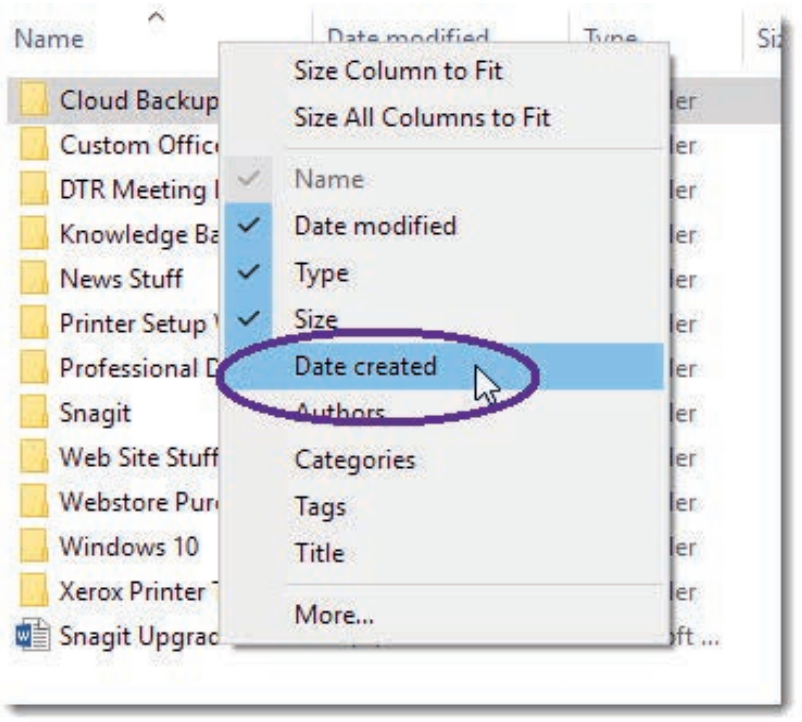


Figure 1.3 Adding a column heading

4. The heading you added will be displayed as shown in Figure 1.4 below.

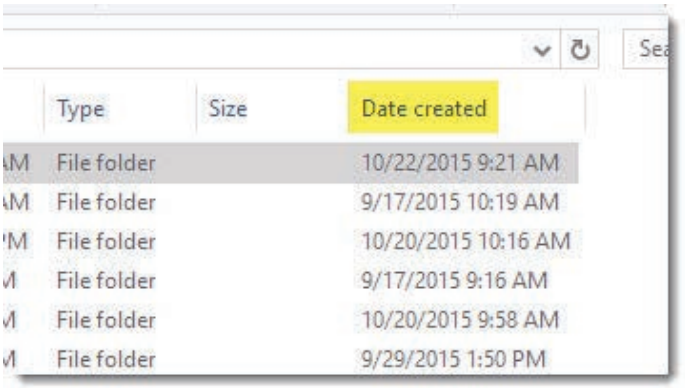


Figure 1.4 Additional column heading on File Explorer

5. Repeat steps 2 and 3 until all the desired columns' headings are added.

c. Removing a Column Heading

1. Navigate to the folder from which you want to remove column headings.
2. Right-click on any column heading to display a drop-down menu of column headings; the headings that are currently displayed have check marks next to them, as shown below.

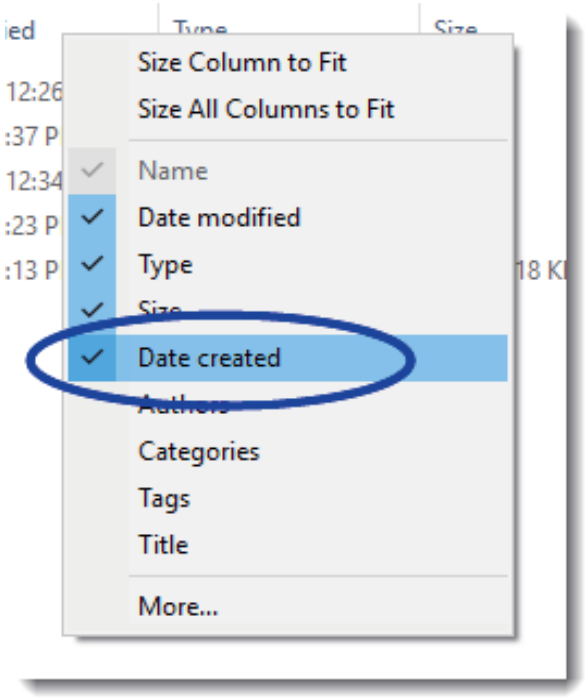


Figure 1.5 Removing a column heading

3. Click on the column heading to be removed so that the check mark no longer appears for that heading. The column heading will no longer be displayed for the current folder's contents.
4. Repeat steps 2 and 3 until all the desired column headings are removed.

d. Create an Audio File

To create an audio file, we suggest using the free Audacity program. An audio file might have a possibility to be recorded in different file format, for example MP3, MP4 and AVI.

e. Add or Pin folder to Quick Access section

1. To add any folder to the **Quick access** area that you go to frequently, right-click on the folder.
2. Select **Pin to Quick access** from the drop-down menu.
3. You will now be able to open the folder at any time from the Quick access area (See Figure 1.6 (a) and (b).

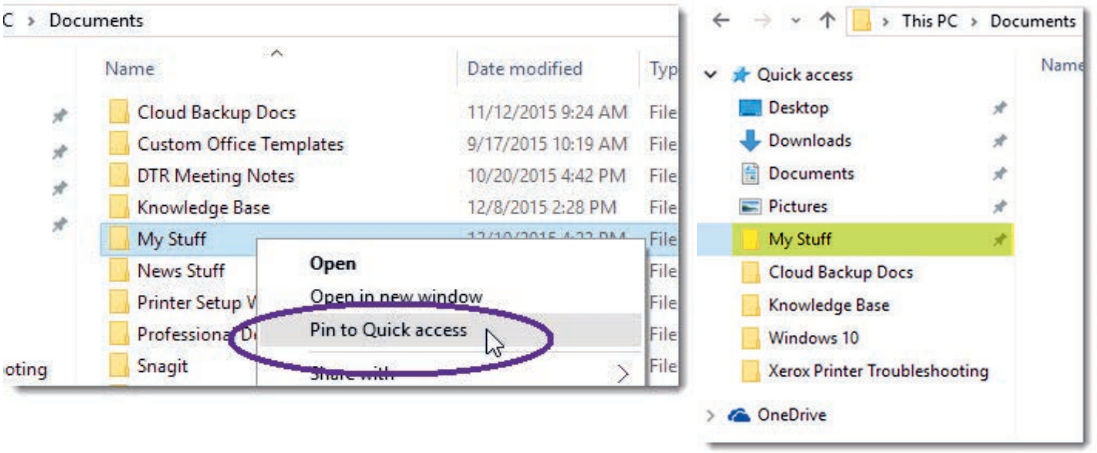


Figure 1.6 (a) Pin to Quick access (b) Pinned to quick access

1.3 Computer Drives

In this subunit, the students are expected to master learn definition and usage of computer drives. The topics to be learnt under this subunit is accessing all drives available on a computer.

At the end of this section, students will be able to:

- Define computer drive.
- Access all drives available on the computer.

These topics are expected to be covered in 3 periods.

Instructional Strategies

Dear teacher, discuss what computer drives are and their types in class. If access is there, the IT teacher may bring different drives to class and describe them with students. After having a clear picture about a computer drive, show them how they can access drives in a computer using File explorer application. After this, let two to five students form a group and do Practical Exercise 1.6. Eventually, please summarize the main points.

Required Instructional Resources

Dear honored teacher, you can bring different drives such as CD drives, Flash drives, Hard disk drives, etc. and plug them in a computer for practicing how to access drives in a computer. To do this, you need:

- Different drives.
- Computer with Window 10 operating system or later installed.

Assessment Strategies

- Observe and facilitate students' group discussion.
- Observe and examine while students are presenting their group work to class.
- Evaluate students while doing the activity under these subunits.

Answers to Practical Exercise 1.6: Accessing Removable Drive and Copying Files form It

1. Copying a file from a removable drive

To copy a file from removable drive into a folder created in your Documents folder follow the following steps.

1. Open File Explorer.
2. Click on This PC from the left pane.
3. Connect the removable drive to your PC's USB port.
4. Under the "Devices and drives" section, double-click the USB flash drive to see its data.
5. Select the files and folders you want to copy.
6. Click the Copy to button from the "Home" tab.
7. Click the Documents folder to copy files from a flash drive to your PC in Document folder.

Alternative Teaching Approaches

Alternatively, the teacher may use students' or his/her phone to practice drive management, in case if there is no computer laboratory in the school.
The IT teachers can use internet, charts, worksheets and models, go for educational field trips or invite subject experts to enrich the teaching level and, in turn, help the students in learning managing computer drives.

1.4 Unit Summary

Learning files and folders are important things in an organization. Computerized or manual files' and folders' management are everywhere and in every small or large organization. Organization maintains different files such as their human resource data, their day-to-day activity data, payroll files, customer's files, organizational documentation files, plan, schedule, etc. Students must know how

to manage files and folders in a computer system so that they can easily locate and search them, organize similar files together in a folder, delete unwanted files to make a room for important files and do similar activities on files and folders. The following are key points of files and folders organizations.

- A file is a collection of similar data stored in a computer system.
- A file in a computer is analogous to real world file which is used to store some data like students' data, teacher's data, etc.
- A computer file can be a document, picture, audio, video, application, etc.
- Each file in a computer has unique icons.
- A folder is like manila folder, which is a container of a file and other folder.
- A folder helps us organize similar files together so that it would easy to locate files in a computer.
- File explorer application is the best application in order to manage files and folders in window. Managing includes creating, deleting, renaming, sorting, viewing and similar activities on files and folders.
- Navigation Pane is a part of File Explorer which is used to view your computer files and folders in tree structure hierarchically. It consists of Quick access, One Drive, This PC and Network sections.
- Quick access section is used to navigate to folders quickly. It consists of Desktop, Download, Documents, Pictures and frequently accessed folders. If you click Desktop, you will get all files from your desktop. Browsers such as Internet Explorer, Microsoft Edge, Chrome, etc. will put all files downloaded from Internet by default in Download folder, so you can access your downloaded file from Quick access section in navigation pane. Documents contains word documents, letters, memos, etc.; Pictures contains photos you have shot yourself or saved from the Internet.
- To open File Explorer application, you can use:
    - the shortcut on task bar or on the desktop.
    - Start typing 'File explorer' after clicking start button
    - Window Key + E keyboard Shortcut
- To navigate to your files and folders using File Explorer in a computer

system, you can use either of the following methods.

- Use the Address bar (located at the top of File Explorer).
- Use Forward and Backward buttons of File Explorer.
- Use the Folders/Navigation pane
- Use the Search function which is located at the right side of File Explorer
- Click the right-pointing triangle next to the file on navigation pane to view the subfolders and/or content of each folder.

- To move files, you can use either of the following methods. These are:
  - Cut and paste
  - Drag-and-drop
  - Use the "Move to Folder" command.
- You can use F2 shortcut keys to rename file or folder after selecting it.
- A drive is a computer component used to store the data and it can be:
  - Static (built in) Drives: includes internal Hard Disk, SSD and the like.
  - Removable Drives: includes Flash Disk, Removable Hard Disk, CD, etc.
- To view all mounted or attached drives in window, File Explorer application is used.

1.5 Answers to the Unit Review Exercise

Part I: Answers to True or False Items

1. *False.* 'Copy and paste' can also be referred to as moving a file because moving a file is cutting and pasting, not copying and pasting.
2. *False.* Files are entities in a computer that contain other files in them because files can't contain other file(s), rather folder can contain other files.
3. *False.* Renaming file will remove the previous file because when we rename, only the name is changed.
4. False. Dragging a file will create multiple copies of files because, dragging is cutting and pasting, not copying and pasting.

5. *False.* Deleting a file will completely remove files from the disk because, unless deleted using shift key + delete, all deleted files can be restored from Recycle Bin folder.
6. *False.* We cannot access or open files and folders using address because file and folder in a computer does not have address in a computer because we can access files and folders using file explorer address element.
7. *False.* Windows does not allow handling multiple files. It is possible to manage files and folders in window simultaneously.

Part II: Answers to Multiple Choice Items

1. B	3. C	5. B	7. C	9. C	11. C
2. B	4. D	6. D	8. C	10. B	12. B

Part III: Answers to Fill in the Blank Items

1. Files
2. Copying a file
3. Moving a file
4. Searching
5. Delete
6. File Explorer

Part IV: Answers to Matching Items

1. E	3. A	5. F	7. B	9. J
2. H	4. C	6. G	8. M	

Part V: Answers to Short Answers Items

1. Files are collections of data and folders are containers of files and other folders.
2. Files are stored in folder and folders are stored in computer drives, which can be internal Hard Disk, CD, Flash Disk, etc.
3. To create a file on a desktop, follow the following steps.

   Step 1. Right click on a desktop of the computer.
   Step 2. Select the option New and then click on Folder.

Step 3. A new folder is created with folder name "New Folder."
Step 4. Edit the name "New folder "with your own name.

4. Files in the computer need to be kept in the proper place because it will be easy to locate whenever required.
5. To rename a folder, the following steps are used.

Step 1. Right click on the folder you want to rename.
Step 2. Click on rename options.
Step 3. Type the name of your choice.

6. To delete a folder, the following steps are employed.

Step 1. Right click on the folder you want to delete.
Step 2. Click on Delete option.
Step 3. The folder gets deleted.

UNIT

2 COMPUTER NETWORK

UNIT OUTCOMES

At the end of this unit, learners will be able to:

- Define what a computer network is.
- Identify the building blocks of a computer network.
- Compare and contrast the basic types of networks (LAN, MAN, WAN) and client server vs. peer to peer.
- Describe the topologies of network.
- Discuss the advantages and disadvantages of network.
- Draw simple network diagrams using network device symbols.

UNIT OVERVIEW

This unit focuses on computer network, on top of which Internet and Internet services emerged. Students learned about Internet and its services in grades 7 and 8. Do you remember about the different services that you can get from the Internet such as E-mail, WWW, FTP, HTTP as well as the more recent ones such as social media networks? There are also serious risks associated with unsafe and improper utilization of Internet. Can you mention some of them?

This unit discusses the fundamental concepts of computer networks. The unit is divided into four sections. The first section defines what a network is; the second lists and describes different components of computer network, both the software and hardware parts. The last two sections present types of network, and advantages and potential threats of connecting computers or other electronic devices into a network.

Suggested Lesson Plan

Dear teacher this unit is expected to be covered in **12 periods**.

No.	Subunits	Number of Periods Alloted
2.1	Definition of Network	1
2.2	Fundamental Elements of Network	4
2.3	Types of Network	4
2.4	Advantages and Disadvantages of Network	3
	Total	12

Minimum Learning Competency (MLC)

- Identifying and describing basic computer network

2.1 Definition of Network

In this sub unit, you will teach about basic concepts of network.

At the end of this section, students will be able to:

- Define network.

This topic is expected to be covered in **1 period**.

Instructional Strategies

Dear grade 9 IT teacher, start the lesson by asking students a brainstorming question listed or letting them make a group of 2-5 students and discuss on the brainstorming question before moving to defining network. After students raise some points, you can summarize students' ideas and provide definition of network. You can summarize as, sharing messages and files can be made between two or more mobiles through a wireless medium. There are different mobile applications that facilitate sharing of files such as flash-share, Cshare, Xender, etc. However, if it is SMS message, the message will go several base stations before reaching the destination, though the device are near each other. Today, almost all organizations such as banks, companies, schools and colleges utilize computer networks for their service provisions. After this, let 2-5 student form a group and do Activity 2.1 and at the end, provide summary of the main points.

Required Instructional Resources

Dear teacher, ask students to bring a cell phone and allow them to share documents, photos or anything else using Bluetooth connection. If it is possible, show them resource sharing using connected computer in the lab.

Assessment Strategies

- Observe and facilitate students' group discussion.
- Observe and examine while students are presenting their group work to class.
- Evaluate students out of two (2) points while they are doing the activity of this subunit.

Answers to Activity 2.1

1. A network is used when one or more computers are connected for sharing resources such as documents, hardware, software, etc.
2. Network changes the way we:
   - **Communicate**: from face-to-face communication to tele (remote) communication such as television, telegram, instantaneous messaging and chatting, podcasting, Wikipedia, etc.
   - **Learn**: changes from face-to-face teaching learning to online and e-learning
   - **Play and entertain**: examples online game, chatting, etc.
   - **Work**: allows remote working such as working from home.

Alternative Teaching Approaches

Dear teacher, you can use internet, charts, worksheets and models, go for educational field trips or invite subject experts for seminars to enrich the teaching level and in turn help the students in learning.

2.2 Fundamental Elements of Network

Under this subunit, students have to learn about fundamental elements of network. The topics to be learnt are:

- End Devices
- Intermediary Devices
  - Network Interface Card
  - Repeater
  - Switch
  - Router
- Communication Protocols
- Transmission Medium

- Wireless Medium
- Wired Medium

At the end of this section, students will be able to:

- List all elements of network.
- Describe the functionality of each of the elements of network during communication.

These topics are expected to be covered in **4 periods**.

Instructional Strategies

Dear teacher, you can use brief lecture to describe the functionalities of the hardware, software, communication medium and protocol elements of network. Let students discuss the brainstorming questions listed under protocol subsection. After they raise some points on it, you can summarize the concept as follows. We people use different protocols. We have different written or oral rules when we talk, eat, dress, write letter, etc. Computers also have a protocol, just like we have, so that different computers can understand common rules when they communicate. If there is no common rule (protocol) the communicating parties cannot understand each other.

Let students also discuss the brainstorming question listed under connection media subsection before moving to learning different media. Different internet service providers (such as Ethio-telecom and Safaricom Ethiopia) install cables and different wireless antennas across cities for providing services and connecting their customers. After this, use brief lecture to teach the two types of communication media.

After this, let 2 to 5 student form a group and do **Activity 2.2**; at the end, let you summarize the main points.

Let students use different available software for doing **Practical Exercise 2.1** and give marks to each group out of 5 points evaluating their work.

Required Instructional Resources

Dear teacher, you can show your students each element of network in a computer lab or you can bring some elements of network such as unshielded twisted-pair (UTP) cable, switch, hub and Wi-Fi router to class. If this is not possible, you can draw a network diagram (that looks like Figure 2.5) which constitutes all elements of network.

Assessment Strategies

- Observe and facilitate students' group discussion.
- Observe and examine while students are presenting their group work to class.
- Evaluate students while they are doing the activity under this subunit.

Answer to Activity 2.2

Student will report their network visit to their class. Dear teacher, evaluate them while they are presenting their report to the class.

Answer to Practical Exercise 2.2

Dear teacher, please help students when they draw a network topology using one of accessible network simulator.

Alternative Teaching Approaches

The IT teachers can use internet, charts, worksheets and models, go for educational field trips or invite subject experts for seminars to enrich the teaching level and in turn to help the students in learning the elements of network.

2.3 Types of Networks

In this subunit, you will teach about types of networks by considering different perspective. The topics to be learnt under this sub unit are:

- Based on Transmission Medium
  - Wired Network and
  - Wireless Network
- Based on Size of the Network
  - Personalized Area Network
  - Local Area Network
  - Metropolitan Area Network
  - Wide Area Network
- Based on Topology
  - Bus
  - Star
  - Ring
  - Mesh
- Based on Resource Security and access
  - Peer-to-Peer

- Client-Server

At the end of this section, students will be able to:

- List all criteria to classify network.
- Describe each type of network.

These topics are expected to be covered in **4 periods**.

Instructional Strategies

Dear teacher, start by asking students a brainstorming question. After students raise some points, you can summarize the brainstorming question as follows.
The home or school's network and Ethiopian airline's network are different in number of computers and need different devices such as router for connecting more than one network.
After this, you can use briefing and illustrating type of lecture to describe each type of network under each criterion. Use Figure 2.8 for this either projecting or drawing it on a blackboard. While lecturing types of network, let 2 to 5 student form a group and do the activities (Activity 2.3, Activity 2.4, Activity 2.5 and Activity 2.6) and at the end summarize the main points following their presentation.

Required Instructional Resources

Dear IT teacher, you can show them each type of network in a computer lab or any other available organization which have network. Or if this is not possible you can draw or project Figure 2.8 and each type of network.

Assessment Strategies

- Observe students' performance when they are describing types of network elements and their basic differences.
- Examine when students present their group work to class.

Answers to Activity 2.3

1. The answer of this question depends on students' observation result. It may contain wireless network, local area network, etc.
2. There are two types of network based on transmission medium. These are wired network or wireless network (commonly known as Wi-Fi network).
3. A typical organization can have different types of end devices such as computers, mobile phones, printers, scanners, copy machines, laptops, VIOP phone, tablets, etc. It can also have switch for wired network and access point for Wi-Fi connection as intermediate devices.

Answer to Activity 2.4

Network can be classified as personal area networks (PAN), local area network (LAN), metropolitan area network (MAN) and wide area network (WAN) based on size.

Answer to Activity 2.5

Based on network topology-computer arrangement on a network-we have bus, mesh, star and ring topology networks.

Answer to Activity 2.6

1. Peer-to-peer network is a small network that consists of only maximum of 10 computers in a network. Therefore, for small network, it is possible to use peer-to-peer and client server for school and laboratory networks.
2. Advantage and disadvantage of client-server and peer-to-peer network are described in the following table.

Table 2.1 Advantage and disadvantages of client-server and peer-to-peer networks

S.N	Client Server Network	Peer to peer Network
1.	Clients and servers are differentiated; specific server and clients are present.	Clients and server are not differentiated.
2.	Focuses on information sharing.	Focuses on connectivity.
3.	Centralized server is used to store the data.	Each peer has its own data.
4.	Server responds the service which is requested by client.	Each and every node can do both request and response for the services.
5.	Costlier than peer-to-peer network.	Less costly than client-server network.
6.	More stable than peer-to-peer network.	Less stable if number of peer is increased.

Alternative Teaching Approaches

IT teachers can use internet, charts, worksheets and models, go for educational field trips or invite subject experts for seminars to enrich the teaching level and in turn to help the students in learning types of networks.

Additional Class Activity for Fast/Slow Learners

Setting up peer-to-peer network sharing

A P2P network can also be set up using a hub or switch and UTP cable. The hub is usually a router that has more than one LAN ports.

Step 1: Connecting the network hardware and cables

1. Set up and turn on the power for the network hub or other networking device.
2. Connect the computers to the networking device.

Step 2: Setting up a home group

Set up a home group to share libraries and devices with other computers on the wired network. To do this, follow these steps.

1. In Windows, search for and open Homegroup.
2. If a homegroup has not been created, click Create a homegroup.
3. In the Create a Homegroup window, click Next.
4. In the Share with other homegroup members window, select Shared in the box next to the folders or devices you want to share, and then click Next.

Step 3: Sharing drives, folders and files

1. To access the computers on your wired network, you must turn on network discovery. You can also set files and printers to be shared as well as set sharing options for specific files or folders. To Turn on network discovery and file and printer sharing follow these steps:
    a. In Windows, search for and open Network and Sharing Centre.
    b. Click Change advanced sharing settings.
    c. Select both Turn on network discovery and Turn on file and printer sharing.
    d. Click Save changes.
2. Setting sharing options and permissions for specific files or folders:Set sharing options of files and non-public folders from the computer whose content you want to share. To share non-public folders on your wired network, do the following:
    a. In Windows, search for and open File Explorer.
    b. Browse the folder you want to share.
    c. Right-click the folder, select Share with and then click Home group

view, Home group view and edit or Specific people.

d. If you choose Specific people, the File Sharing window is displayed.

e. Click the down arrow and select the user you want to share with. If the user is not listed, type the user name and then click Add.

f. Click an arrow under Permission Level to set the permission level for each user or group.

g. Click Share.

Step 4: Testing the wired network

Check the network by browsing through the shared folders on each computer on the network. To verify the setup of your wired network and browsing the shared folders, follow these steps:

a. In Windows, search for and open Network.

b. Double-click the name of the computer or device to access.

c. If prompted, enter the user name and password to connect to the computer or device. If the computer is able to read and access files from a remote computer, the remote computer or device is set up correctly.

d. Browse every available computer or device from each computer on the network. If there are any issues, go back through these steps and verify that the settings are correct.

Step 5: Enabling Internet access and firewall

Once you have verified that your home network is capable of transferring files, connect and enable Internet connections for computers with Internet access.

Note: *Make sure that each computer with Internet access is well protected from security threats. At the minimum, each computer should have its Internet connection protected with a firewall and Windows should be updated with the latest critical updates from Microsoft Windows Update. If malicious activity comes though one computer, the activity can quickly spread through the entire network.*

2.4 Advantages and Disadvantages of Computer Network

In this subunit, you will teach about advantages of networks for a user and disadvantages of being connected over the network. The topics to be learnt under this subunit are:

- Advantages of Network
- Disadvantages of Network

At the end of this section, students will be able to describe advantages and disadvantages of network.

This topic is expected to be covered in **3 periods**.

Instructional Strategies

Dear teacher, you can use brief lecture to describe advantages and disadvantages of network in our day to day life. After this, let 2-5 students form a group and do activities (Activity 2.4 and Activity 2.5) and at the end summarize the main points.

Required Instructional Resources

Dear esteemed teacher, you can take students to a computer lab and show them some of the advantages and applications of network in the computer lab. If there is no such equipped lab, you can use different cell phones to show them how to share a document, photo or anything else.

Assessment Strategies

- Observe and facilitate students' group discussion.
- Observe and examine while students are presenting their group work to class.
- Evaluate students while they are doing the activity under this subunit.

Answers to Practical Exercise 2.2

1. Students may bring different services such as fixed line telephone, mobile telephone and Internet, multimedia services and the like.
2. Cyberattacks are malicious attempts to access or damage a computer or network system. Cyberattacks can lead to loss of money or theft of personal, financial and medical information. These attacks can damage student reputation and safety.

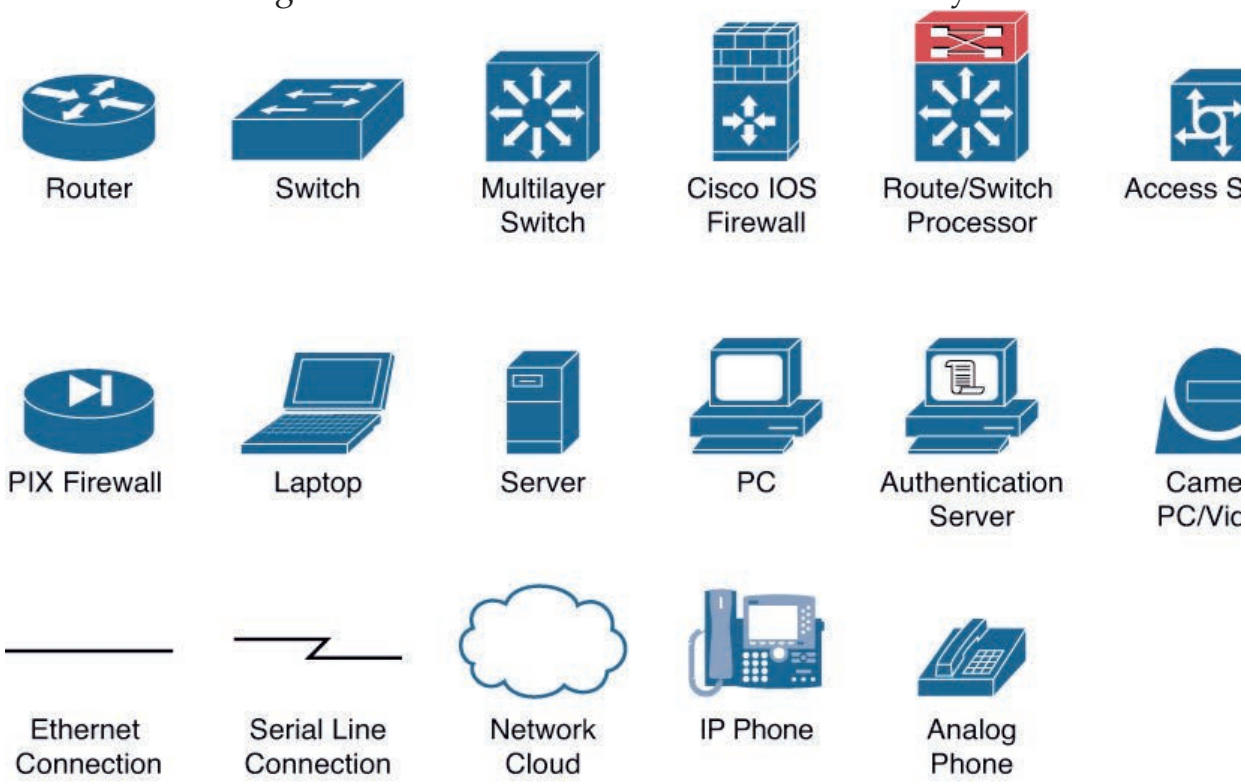
Table 2.2 Cybersecurity attack and their prevention mechanisms

Cyber-security Attack	Description	Prevention Mechanism
Misinformation/ disinformation	• Disinformation is false or inaccurate information deliberately spread with malicious intent • Misinformation is its unintentional spread • Includes inaccurate or false news or social media posts, manipulated or synthesized photo/video, or hacked websites, and can use any method of communication	• Question the source of content and question intent • Investigate the issue for other reliable sources before sharing • Think before you share, disinformation is designed to evoke an emotional response.
Cyberbullying	• Is bullying that takes place over digital devices like cell phones, computers and tablets • Can occur through SMS, text and apps or online in social media forums • Includes sending, posting or sharing negative, harmful, false or mean content about someone else • Include sharing personal or private information about someone else causing embarrassment or humiliation.	• Install monitoring software. • Build awareness on cyber bullying. • Explore different tools that social platform offers such as TikTok, Twittter etc. • Take empathy training: learning to respond appropriately to stress and developing a strong and positive parent-adolescent bond, teacher-student bond and the like.

Sex trafficking	• Sex trafficking is defined by the Trafficking Victims Protection Act of 2000 external icon as "the recruitment, harboring, transportation, provision, obtaining, patronizing or soliciting of a person for the purpose of a commercial sex act." • It involves the use of force, fraud or coercion to make an adult engaged in commercial sex acts. • Many times, traffickers use false employment opportunities in major cities for economically and politically marginalized people. For example, men and boys are sent overseas to work in construction and agriculture; they are also forced to perform commercial sex acts. Women and young girls may be offered jobs as models, nannies, waitresses or dancers.	• Encourage healthy behaviors in relationships. • Foster safe homes and neighborhoods. • Identify and address vulnerabilities during health care visits. • Reduce demand for commercial sex. • End business profits from trafficking-related transactions. • Question the source of job opportunity. • Create awareness.

Hate crime	• Hate crimes are acts of violence or hostility directed at people because of who they are. This could be because of their race, disability, religion, sexuality or gender identity.	• Monitor and report on hate crimes. • Acknowledge and condemn violent hate crimes whenever they occur. • Strengthen enforcement and prosecute offenders. • Provide adequate instructions and resources to law-enforcement bodies.
Financial scams	• Scammers can obtain your credit card information including hacking, phishing and the use of skimming devices. • Includes phishing, social media scams, phone scams, stolen credit card numbers, identity theft, etc.	• Never click on the links or provide account details. • Be conscious of what information you post online. • Scammers use social media posts to gather information about the traveling habits of potential victims. • Never provide your account information over the phone. • Before you use an ATM, look for suspicious devices that may be attached to the card reader.

3. The following are list of common Cisco network device symbols.



Alternative Teaching Approaches

The IT teachers can use internet, charts, worksheets and models, go for educational field trips or invite subject experts for seminars to enrich the teaching level and in turn to help the students in learning advantages and disadvantages of network.

2.5 Unit Summary

In this unit, the students are supposed to learn the basic concepts of network, types of network, and advantages and disadvantages of network. You shall develop essentials skills through the classroom learning, participation in activity-based activities and laboratory-based activities in the unit.

Computer networks helped us have such services as emails, online newspapers, blogs, chat and other networked services offered on the Internet. Therefore, understanding network will help students to become actors and beneficiaries of the networked society and share resources and have a faster communication.

The following are the main points covered in the unit.

- A computer network is interconnection of two or more computers or any devices able to connect over the network.
- To make a communication and interconnection between devices on

a computer network, networking hardware, also known as network equipment or computer networking devices, which are known as electronic devices, are required. These are end devices, intermediate devices, connection medium and protocol.

- End devices are the sender and the receiver which can be any device capable of composing and sending and receiving a message.
- Intermediate devices are interconnecting devices that found between end devices, as their name indicates. Intermediary device includes network cards, routers or network switches, modems and Ethernet repeaters.
- Network interface card, also called NIC, is used to plug a UTP cable to the computer. It has also wireless variety which allows a computer to connect to the network wirelessly.
- Repeater, as its name indicates, repeats and boosts the signal. It accepts weak signal on one port, illuminates the noise that makes signal week, regenerates signals and resends the boosted, cleared signal over the other port. It has an analogy version, which is also called **amplifier**. The main difference is that amplifier amplifies not only the signal but also the noise and sends it again.
- Switch is a more intelligent device than repeater because it forwards packet to the destined port or to a device connected to the port only after learning the network.
- A router is a device that connects different types of network and more intelligent than switch.
- Router uses routing tables.
- Router selects best path through networks.
- Protocol is a common set of rules used to manage communication (packet transmission) through network.
- Connection medium used in networks with wired and wireless media. Wired media are also known as guided while wireless as unguided media.
- UTP is the most common wired medium used in local area networks.
- Wireless medium can be radio waves, microwaves and infrared waves.
- Based on size, network can be classified as personalized area network

(PAN), local area network (LAN), metropolitan area network (MAN) and wide area network (WAN).

- PAN is the smallest area network which can be made using Bluetooth network.
- LAN is larger than PAN and smaller than MAN in number of computers and geographical coverage. LAN can be a small office network like one campus or school network and so on.
- MAN covers area of a city and can contain multiple LANs.
- WAN covers very large area such as the globe.
- Network topologies include bus, star, ring and mesh topologies.
- A bus topology is a cheap network where computers are connected to a common backbone cable.
- In a mesh topology, every computer in a network is connected to each other independently. Mesh topology needs more cable and more ports on the computer.
- In star topology, all computers are connected separately to a central device which can be a switch. The failure of the central device results in the failure of the entire network.
- Ring topology, which looks like finger ring, connects devices in such a way that each device is connected to the other two adjacent devices. One node failure in ring topology network will affect the whole network.
- Peer-to-peer and client-server networks are based on resource access and sharing.
- In peer-to-peer network, resources are distributed among peers and each peer can be a server and client at the same time.
- In client-server, resources that need to be shared over the network are administered centrally and there is a dedicated server which provides resources called **servers;** there is also another dedicated **client** which requests a resource from the server.
- Network is advantageous in increasing communication speed, sharing data, hardware and software, and getting entertainment.
- Network also has disadvantage in security concerns and in incurring cost for setting up and administration of network hardware and software.

2.6 Answers to the Unit Review Exercise

Part I: Answers to True/False Items

1. False
2. False
3. False
4. False
5. False

Part II: Answers to Multiple Choice Items

1. D	3. B	5. A	7. A	9. B	11. A	13. C	15. D
2. C	4. A	6. A	8. B	10. A	12. A	14. B	

Part III: Answers to Fill in the Blank Items

1. Resources
2. Client
3. 4
4. Protocol
5. Internet

Part IV: Answers to Matching Items

1. K	3. I	5. H	7. F	9. N
2. L	4. D	6. M	8. E	10.A

Part V: Answers to Short Answer Items

1. Network is the connection of two or more computers. These computers are linked together.
2. Based on connection medium, we have wired and wireless networks. Based on size of the network, we have personalized area network (PAN), local area network (LAN), metropolitan area network (MAN) and wide area network (WAN). Based on network topology, we have bus, star, ring and mesh networks. Based on recourse security and access, network can be peer-to-peer and client-server.

3. Wired medium is a physical cable that runs between sender and receiver and can be coaxial cable, fibre optics cable and twisted pair cable whereas wireless medium, also called unguided medium, includes radio waves, microwaves, infrared waves, etc.

4. Network topology refers to the way computers and its peripheral environment is configured to form networks.
   - Bus topology – all computers are synchronized by a single line of cable.
   - Star topology – multiple computers are linked to a main computer, which is called a host.
   - Ring topology – each computer is connected to two other computers, with the entire network. It forms a circle.
   - Mesh topology – all computers are connected to every other computer.

5. We use network for:
   - Email exchange
   - File transfer from one computer to another
   - To access remote work station using telnet
   - Video conferencing
   - Instant messaging and chatting
   - etc.

UNIT

3 APPLICATION SOFTWARE

UNIT OUTCOMES

At the end of this unit, learners will be able to:

- Indent a paragraph.
- Align text by using icons on the menu bar and selecting paragraph from formatting menu.
- Apply bullets and numbers in text.
- Insert and delete page break and page number in a document.
- Add and delete headers and footers in a document
- Manipulate data in spread sheet.
- Create a presentation in PowerPoint

UNIT OVERVIEW

Students are expected to know that computer is a system that comprises hardware and software components in grades 7 and 8. They also learned input devices, output devices, computer memory and central processing units. In addition to this, they are expected to master how to use application software and system software such as operating system, utility software and driver software.

In this unit, students will enhance their skills of using application software such as word processor, spreadsheet and presentation software. They will practice exercises on different Microsoft Office Suite applications or any other free application software such as LibreOffice.

Suggested Lesson Plan

Dear teacher this unit is expected to be covered in **14 periods**.

No.	Subunits	Number of Periods Alloted
3.1	Using Application Software	1
3.2	Word Processing	5
3.3	Manipulating Data in Spreadsheet	4
3.4	Creating Presentation	4
	Total	14

Minimum Learning Competency (MLC)

- Execute word processor, spread sheet and PowerPoint presentation

3.1 Using Application Software

In this subunit, you need to remind students about the computer system and application software such as word processing, presentation software, spreadsheet software, using open sources such as LibreOffice or proprietary software such as Microsoft word from grades 7 and 8 IT subject.

The topics to be learnt under this subunit are:

- Word Processing Software
- Presentation Software
- Spreadsheet Software
- Desktop Publishing Software
- Database Management Software

At the end of this section, students will be able to explain usage of some application software used by users for accomplishing their daily tasks.

This topic is expected to be covered in **1 period**.

Instructional Strategies

Dear teacher, start the lesson by asking students a brainstorming question given on the Student's Textbook before moving to explaining application software. After students raise some points, you can summarize students' ideas as follows.

Computer System is a combination of hardware and software. Application and system software are the two types of computer software. Application software is the software that is directly used by the user for accomplishing tasks. Application software includes, but not limited to, word process software, spread sheet

software, games software, graphics software, database software, etc. while application software is set of programs that are essential for the computer to function. System software controls the working and processing capabilities of a computer hardware devices and provides user interface (means by which a user interacts with a computer). Operating system, utility software and device driver are some of system software.

After providing the summary above, revise the general usage of some application software in our daily task accomplishment.

Required Instructional Resources

Dear teacher, you can use brief lecture to revise the general usage of some common application software used during accomplishing our daily tasks. Let students establish group in the class and discus functions of different application software such as word processer, presentation software, spread sheet, desktop publishing software, database management software, etc.

Assessment Strategies

- Observe, facilitate and evaluate students on revision class.
- Observe and guide students' group discussion.

Alternative Teaching Approaches

IT teachers can use internet, charts, worksheets and models, go for educational field trips or invite subject experts for seminars to enrich the teaching level and in turn to help the students in learning the usage of common application software. If Microsoft Office application is not accessible due to ownership, you can use free word processor application such as LibreOffice.

3.2 Word Processing

Under this subunit, students will learn about how to process a word using Microsoft Word 2016. The topics to be learnt here are:

- Starting Microsoft Word 2016 program
- A Tour of the Word User Interface
- Paragraph Formatting
    - Setting Indents
        - The Tab Key Method
        - The Ruler Method
        - The Indent Command Method

- The Paragraph Dialog Box Method

- Text Alignment
  - Left-aligned Text
  - Right-aligned Text
  - Centre-aligned Text
  - Justified Alignment

- Manipulating Lists
  - Creating Bulleted List
  - Creating Numbered List
  - Customizing Bullets
  - Changing the Bullet Colour
  - Multilevel Lists
    - Changing Multilevel List Styles

- Line and Paragraph Spacing

- Inserting and Deleting a Page Break from a Document
- Inserting and Deleting a Page Number in a Document
- Adding and Deleting Headers and Footers in a Document
  - Inserting a Pre-Set Header or Footer
  - Editing Headers and Footers
  - Removing the Header or the Footer

Competencies

At the end of this section, students will possess skills of processing Microsoft Word document using different methodologies to format paragraph and managing page number, and headers and footer in a word document.
This section is expected to be covered in **5 periods**.

Instructional Strategies

Respected teacher, use Microsoft Word 2016 application software or any other version for this lesson or free word processor application such as (LibreOffice application suite). Start the section by asking the students a brainstorming question given in the textbook. After students raised some points, summarize the concepts as follows.

There is a lot of word processing software obtained either from licensed or free software package. Some of proprietary word processing software includes

Microsoft Word Processor, WordPerfect and the free and open source word processer such as Open Office Writer, LibreOffice and Google Drive Document. Then, explain the functions of word processing software. After this, please take students to computer lab and let them open the above specified application software in their group.

Dear teacher, revise basic interface elements of Microsoft word 2016 or any other version quickly (Use Figure 3.4 and Table 3.1). After doing this, use brief lecture to discuss what we mean by paragraph formatting and the basic usage of the paragraph formatting commands of Word 2016 (Use Figure 3.5 and Table 3.2).

Having overviewed the word interface elements and paragraph formatting commands, let students be in a group in the lab and practice each method of indenting a paragraph and do Practical Exercise 3.1. In this activity, students should write one paragraph about *the effects of trafficking on children* using word application.

After this, you can use brief lecture to introduce what we mean by text alignment and let students practice each method of aligning a text. Following this, let your students be in a group in computer lab and do Practical Exercise 3.2 and Practical Exercise 3.3.

Following this, please use brief lecture to introduce manipulating and multilevel lists in word and let students practice different listing in word. Let students be in a group to do Practical Exercise 3.4.

After this, use brief lecture to discuss the concepts line and paragraph spacing, page break, page number, and headers and footers in word document. Following this, let students work in a group of 2-3 students following each step to practice manipulating line and paragraph spacing, inserting and deleting page break, page number, and headers and footers. Let them do each mini project using the concepts they have practiced. Dear teacher, please allocate time for mini project and evaluate the students' performance out 10 points.

The IT teacher may use ***narrator*** or similar application for processing word for **visually impaired** student/s, if there are any.

Required Instructional Resources

Dear teacher, take students to a computer lab to practice processing word using Microsoft Office Word 2016 application software or any other word processor software. To do this, you need a desktop computer with Microsoft Office Word 2016 or any other word processor.

Assessment Strategies

- Observe students' performance on processing a word document on:
  - Using each method for formatting a paragraph
  - Adding a page number to their word document s
  - Adding headers and footers to their word documents
- Observe and examine while students are presenting their group work to class.
- Evaluate students while they are doing the practical exercise.
- Evaluate mini project under this subunit out of 10 points for each group.

Answer Keys to Practical Exercises

Answer Key to Practical Exercise 3.1

Dear teacher, please encourage your students to write a paragraph entitled *The Effects of Traffic on Children* in their village and use one of the four methods (Tab Key method, Ruler method, Indent Command method or the Paragraph Dialog Box method) to indent the title and the paragraph.

Answer Key to Practical Exercise 3.2

Dear teacher, let students use the "**Grand Ethiopians Renaissance Dam**" document they created previously when they learned about ***Setting Indents*** and follow the steps to create left-aligned text.

Answer Key to Practical Exercise 3.3

Dear teacher, let students use the "Grand Ethiopians Renaissance Dam" document they created for previous practical exercise and follow the step to create centered and justified text.

Answer Key to Practical Exercise 3.4

Dear teacher, let students form a group of 2-3 students and open word processor and create the multilevel list shown in the practical exercise using the method they have learnt in class.

Answer Key to Practical Exercise 3.5

Dear teacher, let students form a group of 2 to 3 students and prepare a document for IT Note on Introduction to computer for grade 7 students or use the document created in Practical Exercise 3.1 about effects of trafficking on child and do all the tasks listed using the methods they have practiced.

Alternative Teaching Approaches

Alternatively, the teacher may use students' or his/her phone to practice word processing, in case there is no computer laboratory in the school.

The IT teachers can use internet, charts, worksheets and models, go for educational field trips or invite subject experts for seminars to enrich the teaching level and in turn help the students in learning organization of files and folders in a computer system.

Additional Class Practical Exercise for Fast/Slow Learners

Additional to Practical Exercise 3.1: Customizing Bullets

Customizing the look of the bullets in your list can help you emphasize certain list items and personalize the design of your list. Word allows you to format bullets in a variety of ways. You can use symbols and different colors, or even upload a picture as a bullet.

To use a symbol as a bullet, follow these steps:

1. Select an existing list you want to format. In our example, select the 12 Principles of Business Ethics in the above document.
2. On the Home tab, click the drop-down arrow next to the Bullets command. Select Define New Bullet from the drop-down menu (See Figure 3.1).

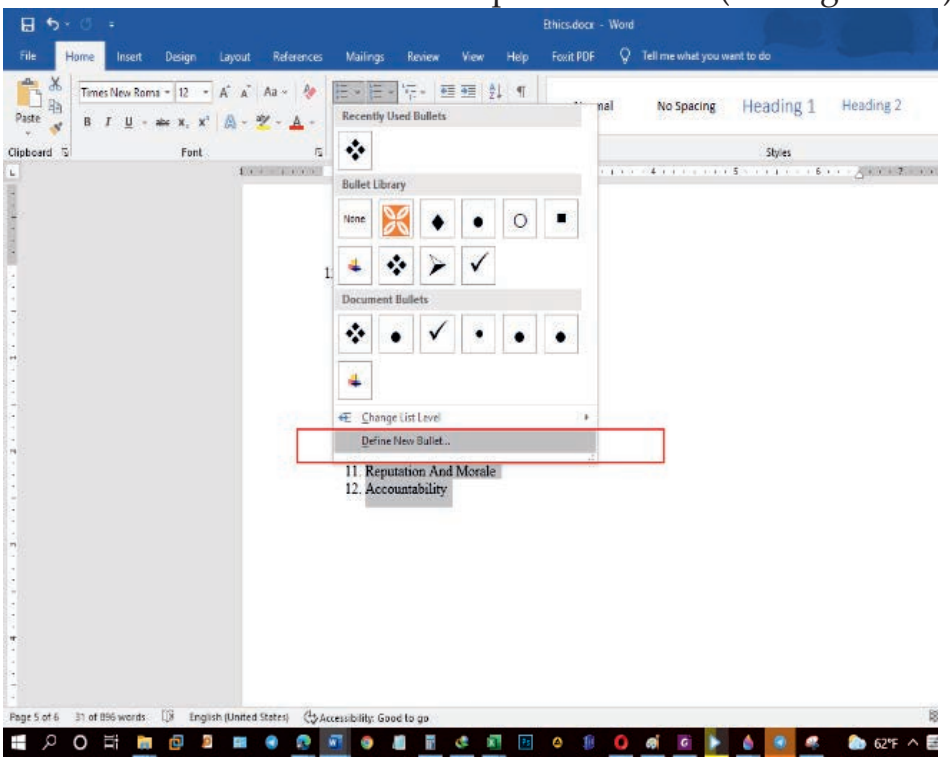


Figure 3.1 Select Define New Bullet

3. The Define New Bullet dialog box will appear. Click the Symbol button (See Figure 3.2).

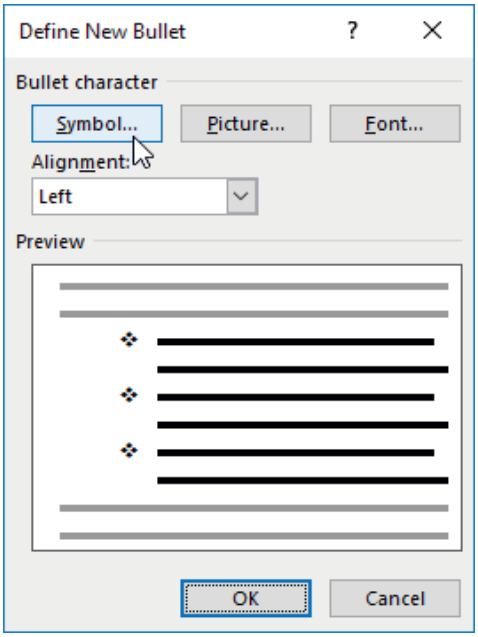


Figure 3.2 Define New Bullet dialog box

4. The Symbol dialog box will appear (See Figure 3.3).
5. Click the Font drop-down box and select a font. The Wingdings and Symbol fonts are good choices because they have many useful symbols.
6. Select the desired symbol, and then click OK.

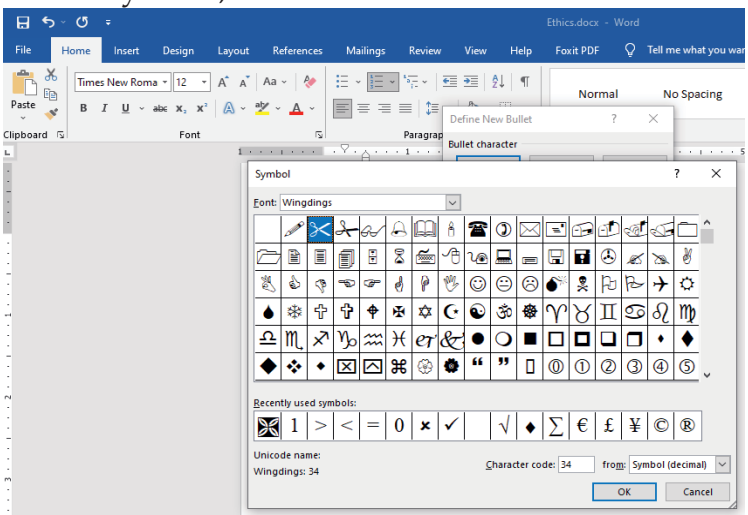


Figure 3.3 Selecting a symbol form Symbol Dialog box

7. The symbol will appear in the list (See Figure 3.4).

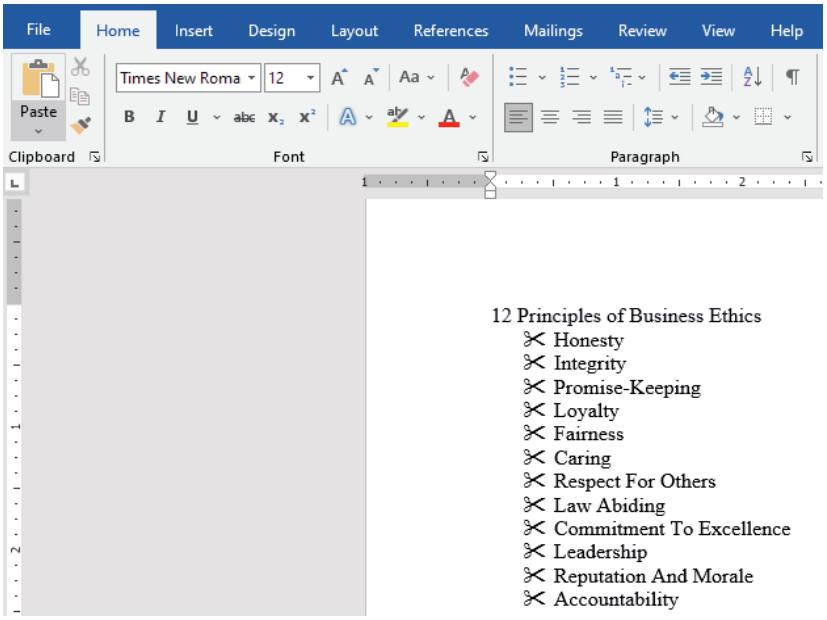


Figure 3.4 Formatted list with New Symbol

Additional to Practical Exercise 3.2: Changing the Bullet Colour

1. Select an existing list you want to format.
2. On the Home tab, click the drop-down arrow next to the Bullets command. Select Define New Bullet from the drop-down menu.
3. The Define New Bullet dialog box will appear. Click the Font button.
4. The Font dialog box will appear. Click the Font Color drop-down box. A menu of font colors will appear.
5. Select the desired color, and then click OK.

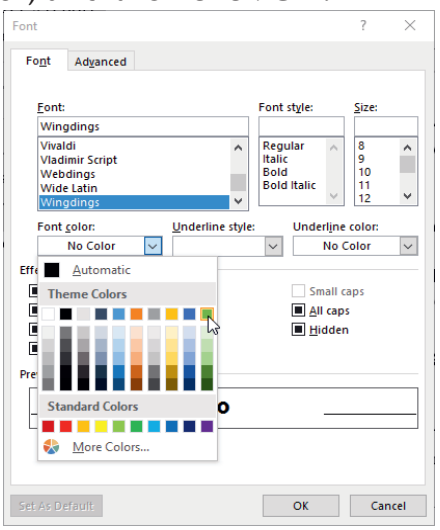


Figure 3.5 Changing the bullet color

Additional Practical Exercise 3.3: Numbering Pages Differently in Various Sections of a Word Document

Most full documents such as book, research paper and project proposal document will not start page numbering from first page. Most of the time, there are three different sections: the cover page section, the acknowledgment and table of contents section, and main body of the document. The cover page will not have a page number; the middle part (acknowledgment and Table of content section) will have Roman number (i, ii, iii, etc.) page number. The last part which is the main content will start with Arabic number from 1.

To use different page numbering schemes in different sections of your Word document, there are two tricks:

1. You must include a Section Break - Next page between each section of your document where the numbering will change, and
2. You must "unlink" each section's footer from the one before it.

To include page break, follow the steps mentioned below.

1. Temporarily turn on the viewing of hidden formatting symbols by clicking the Show/Hide symbol on the "Home" tab in the "Paragraph" box - this will enable you to see the section breaks between sections of your document.
2. If you do not already have a Section Break between these three sections of the document, you will need to add one. Place your cursor at the very end of the text in the first section (after your cover page).
3. Add a Section Break – Next Page by selecting the Page Layout tab on the menu, clicking the arrow next to Breaks, and selecting Next Page under Section Breaks.

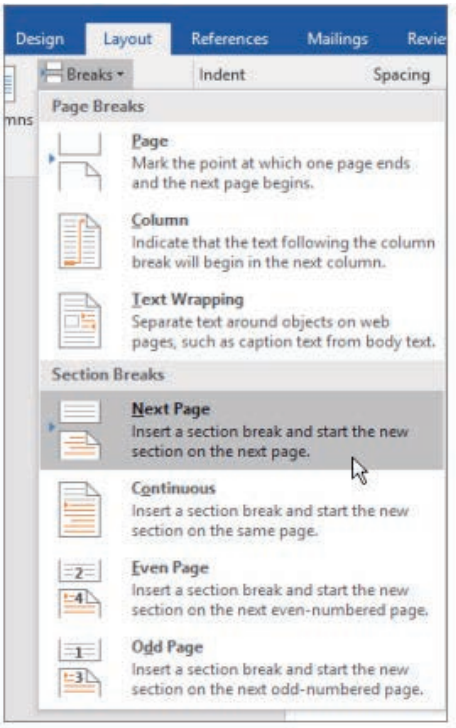


Figure 3.6 Insert page break

4. After doing this, you should see the Section Break (Next Page) code inserted into your document. This tells Word that the next page begins a new section which may have a different header or footer.

5. Go down to the next page below the section break (in this example, the first page of table of contents page), and click on the page number in the footer.

6. You should see a new tab on the menu, labelled Header & Footer Tools: Design. In the Navigation section of this tab, you will see the highlighted button labelled as Link to Previous, which tells Word to link the footer in this section to the previous section and to continue its page numbering scheme. Click the Link to Previous button to ***unselect*** it.

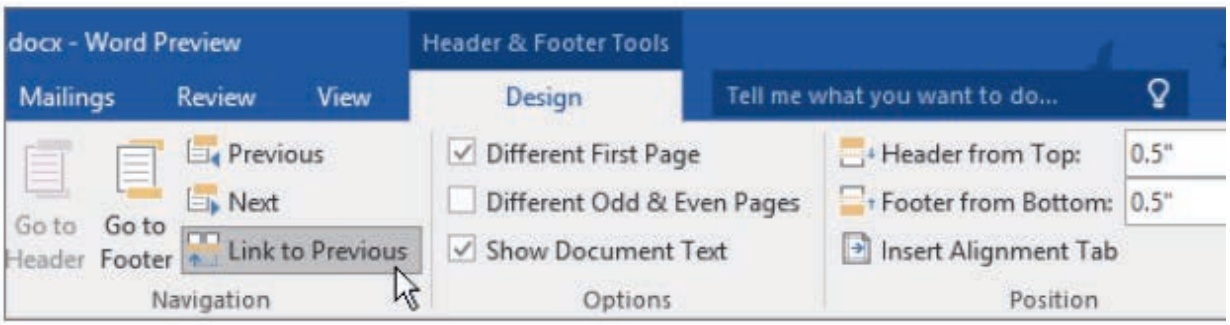


Figure 3.7 Header and Footer tools Design Menu

7. Repeat steps 2 - 6 above for table of contents section.
8. Turn off the viewing of hidden formatting symbols by clicking the Show/ Hide symbol on the Home tab in the Paragraph.
9. After this, you can insert different page numbers for cover page, with no page number, table of contents section with Roman numbers and the main content with Arabic number. Just click on the page you want to add a page number.
10. To choose a format or control the starting number, click on the page in which you want to add a page number, then in the Header & Footer group choose Page Number > Format Page Numbers to open the Page Number Format dialog box (See Figure 3.8).

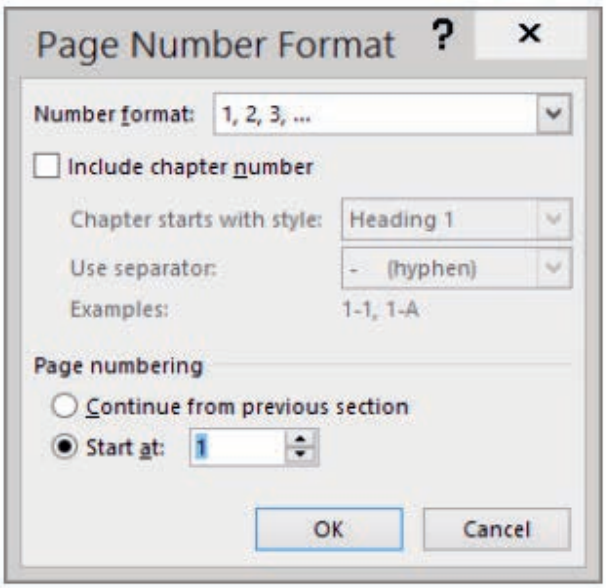


Figure 3.8 Page number format

3.3 Manipulating Data in Spreadsheet

In this subunit, students will learn about how to manipulate data using Microsoft Excel 2016. The topics to be learnt are:

- Using Mathematical Operators
- Using Cell Reference in Formulas
- Using Relative Cell Reference in a Formula
- Copying a Formula with the Fill Handle
- Using Absolute Cell Reference in a Formula
- Competencies

At the end of this section, students will have a skill of manipulating data in spreadsheet such as table to use mathematical operators, use absolute and relative cell reference in formulas, and copy formulas to other cells in Excel sheet using Microsoft Office Excel 2016.

This topic is expected to be covered in **4 periods**.

Instructional Strategies

Dear teacher, start the lesson by asking brainstorming question listed under this subunit. After students raise some points, you may summarize the main points as follows.

Spreadsheet is a piece of paper or a computer program used for accounting and recording data using rows and columns into which information can be entered. Microsoft Excel and LibreOffice Excel are programs in which you enter data into columns are an example of a spreadsheet program.

After you have summarized the brainstorming discussion, open Microsoft Excel 2016 application software or any other version and revise some interface elements. After this, use brief lecturing to introduce the basic concepts on mathematical operator, absolute and relative reference, and copying formula step by step. After you introduce each concept, let the students follow the steps to practice using mathematical operators, using cell absolute and relative references, and copying formula to other cell being in a group in computer lab.

Finally, let students be in a group to do mini project under this section. Dear teacher, please evaluate this project out of 10 points.

The IT teacher may use ***narrator*** or similar application for manipulating data in Excel for **visually impaired** student.

Required Instructional Resources

Dear teacher, take students to a computer lab to practice data manipulation using Microsoft Office Excel 2016 application software or any other available spreadsheet software. To do this, you need a desktop computer with Microsoft Office Excel 2016 or any other available spreadsheet software installed.

Assessment Strategies

- Observe students' performance when they use different methodologies for manipulating data using Microsoft Excel:
    - When they apply formula to the data that contain mathematical operator

- When they use formulas that contain cell reference, relative cell reference, and absolute cell reference
- When they copy any kind of formula using fill handle.

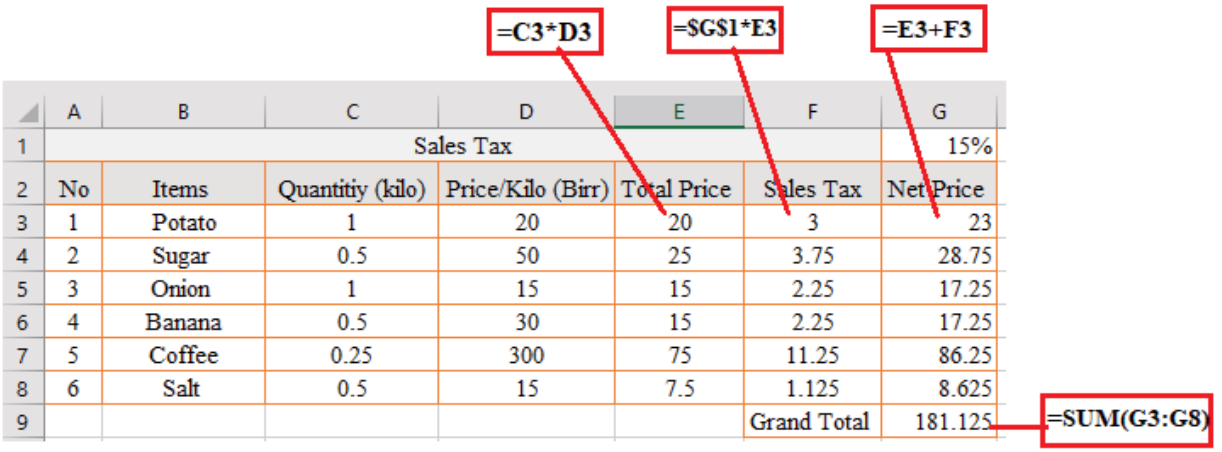
- Observe and examine while students are presenting their group work to class.
- Evaluate mini project *Using Excel for processing tabular data* out of 10 points.
- Eventually, summarize the main points.

Practical Exercise 3.6

Student Ebsa is a grade 9 student. His mother ordered him to buy 1 kilo potato, ½ kilo sugar, 1 kilo onion, ½ kilo banana, ¼ kilo coffee bean and ½ kilo salt from small market around his village. The price information is provided in the following Excel sheet (See Table 3.5). We want to create a formula that will multiply each item's price by the quantity.

1. The formula to calculate the total price for each item in cell E3 is =C3 * D3. To copy it to the other cell, move the cursor to the corner of cell E3 after typing the formula, and when the cursor arrow is changed to dark + sign, drag it to the other cell to copy it to the other cell (See Figure 3.9).
2. To calculate sales tax under column F, type a formula **=G1 * E3** in cell **F3**; copy the formula using fill handle till **F8** (See Figure 3.9)
3. To calculate the net price for each item in column **G**, type the formula **=E3 + F3** in cell **G3** and copy the formula using fill handle till **G8** (See Figure 3.9).
4. Finally, calculate the grand total that sums up all net price in cell G9 so that student Ebsa will pay.

To calculate the grand total, type the formula **=Sum(G3:G8)** or **=G3+G4+G5+G6+G7+G8** in the cell **G9** (See Figure 3.9).



	A	B	C	D	E	F	G
1			Sales Tax				15%
2	No	Items	Quantitiy (kilo)	Price/Kilo (Birr)	Total Price	Sales Tax	Net Price
3	1	Potato	1	20	20	3	23
4	2	Sugar	0.5	50	25	3.75	28.75
5	3	Onion	1	15	15	2.25	17.25
6	4	Banana	0.5	30	15	2.25	17.25
7	5	Coffee	0.25	300	75	11.25	86.25
8	6	Salt	0.5	15	7.5	1.125	8.625
9						Grand Total	181.125

Figure 3.9 Calculating tax and net price summary

Alternative Teaching Approaches

Alternatively, the teacher may use students' phone to practice data manipulation on Excel sheet installed on the phone or smartphone, in case if there is no computer laboratory in the school.

The IT teachers can use internet, charts, worksheets and models, go for educational field trips or invite subject experts for seminars to enrich the teaching level and in turn help the students in learning data manipulation using excel application software.

3.4 Creating Presentations

Under this subunit, the students will learn about how to use Microsoft Office PowerPoint 2016 or any other available presentation software for preparing presentation slides. The topics to be learnt are:

- Opening PowerPoint application
- Adding PowerPoint Slides
- Slide Layouts
- Applying a Theme
- Changing Slide Backgrounds
- Formatting Bulleted Lists
- Adding Content
    - Inserting Tables in PPT

- Inserting Charts in PPT
- Inserting SmartArt Graphics in PPT
- Inserting Pictures in PPT
- Inserting Online Pictures in PPT
- Inserting Videos/Media in PPT

- Viewing Presentations
  - Normal View
  - Slide Sorter View
  - Notes Page View
  - Slide Show Tab
- Changing the Order of Slides in a Presentation

Competencies

At the end of this section, students will have a skill of creating attractive presentation using Microsoft PowerPoint application software.

Dear teacher, this topic is expected to be covered in **4 periods**.

Instructional Strategies

Dear teacher, start the lesson by asking brainstorming question listed under this subunit. After students raise some points, you can summarize the main points as follows.

Presentation software is defined as computer programs designed to allow the user to present information in an engaging way such as with text, pictures, sound and video. PowerPoint is an example of presentation software.

After you have summarized the brainstorming discussion, open Microsoft PowerPoint 2016 application software or any other available presentation software and revise some points about presentation software such as the basic interface elements, opening the application and adding new slide.

After revising, you may use lecture to describe how to change slide layout, apply theme, change slide background colour, format bulleted lists, add different contents using icons on the slides and view presentation slides.

Following this, let student follow the steps to practice each methodology for creating, changing slide layout, applying theme, changing slide background and adding contents such as texts, tables, charts, smart art graphics, pictures, videos and different contents to the slide and slides. After this, let student do Practical Exercise 3.5.

Finally, let students be in a group to do mini project (*preparing a presentation on Ethiopia Tourism Resource)* under this section. Dear teacher, please evaluate this project out of 10 points.

IT teachers may use ***narrator*** or similar application for creating presentation slide for those students who are **visually impaired**.

Required Instructional Resources

Dear teacher, take students to computer lab to practice creating attractive presentations using Microsoft Office PowerPoint 2016 application software or any other presentation software available. To do this, you need a desktop computer with Microsoft Office PowerPoint 2016 installed or any other presentation software available.

Assessment Strategies

- Observe and evaluate students' performance when they use different methodologies for creating presentation having different contents using Microsoft Office PowerPoint.

Answer to Practical Exercise 3.7

Dear teacher, divide the class in to four groups and distribute the four titles for the four groups, one for each. Let the students prepare presentation using available presentation software using the method they have practiced under this section and let them present it in class. Please guide students to acknowledge or site the source of information in their presentation.

Answer to Mini Project

Dear teacher, let your students sit in group of 2 - 3 students to prepare presentation on Ethiopian Tourism Resources under this project. Evaluate the students' project work when they present their work to the class.

Alternative Teaching Approaches

Alternatively, the teacher may use students' phone to practice creating presentation on PowerPoint application installed on the phone or smartphone, in case if there is no computer laboratory in the school.

The IT teachers can use internet, charts, worksheets and models, go for educational field trips or invite subject experts for seminars to enrich the teaching level and in turn help the students in learning creating presentation using PowerPoint application software.

3.5 Unit Summary

In this unit, the students extend their use of application software that they started in lower grades (grade 7 and 8). Application software is a type of software used directly by a user. Some examples of mostly used application software are word processing, presentation software, spreadsheet software, desktop publishing software and database management software. The main points covered under this unit are summarized as follows.

- Word processing application software is used to process, create, edit, format, copy, save and print document including, but not limited to, reports, letters, memos, newsletters and brochures.
- A file created using Microsoft Office Word is known as a document.
- Formatting a paragraph means changing the appearance of the paragraph which includes indenting setting alignment, making a paragraph bulleted list, numbered list and multilevel list, and inserting space between line and paragraph.
- To format a paragraph, you can use a command found in paragraph section of **Home** tab.
- Page break is a location in a document where one page ends and a new page begins. There are two types of page break namely, manual page break and automatic page break.
- Automatic page break is done automatically by the software program when it reaches to the end of the page.
- A manual page break is done when the part of a paragraph extends more than a page and the document editor wants it to be in the same page.
- Page numbering is used to identify each page in a document, and a document can have more than one page numbering styles, especially if it has more than a section such as cover page, contents table and body of the document sections.
- Headers and footers contain additional information about the document and will appear by default in each of the document at the top and bottom part of the document respectively.
- To manipulate tabular data and calculation, the best application software

is Microsoft Office Excel.

- MS Excel file created for managing data in tabular form is called worksheet.
- Excel differentiates data and formula by equal sign, i.e. if a data has equal sign then the data is a formula.
- Excel formula can contain relative or absolute cell reference which identifies a cell's location absolutely without change and change relatively according to the locations of the formula respectively.
- Presentation software is a tool used to create visual presentation.
- A presentation package helps both the speaker with either access to his/her ideas or the participant's with visual information.
- After launching the PowerPoint application, we can create a PowerPoint using new option of file tab, using Open option of file tab or using Recent that displays a list of your recently created presentations.

3.6 Answers to the Unit Review Exercise

Part I: Answers to True/False Items

1. True
2. False
3. False
4. True
5. False
6. False
7. True
8. False
9. True
10. True

Part II: Answers to Multiple Choice Items

1. D	3. D	5. B	7. A	9. D	11. A	13. C	15. C
2. B	4. C	6. B	8. C	10. D	12. C	14. B	

Part III: Answers to Fill in the Blank Items

1. MS PowerPoint
2. Title Slide
3. Slides
4. Header and Footers
5. Fill handle
6. Collection of slides

Part IV: Answers to Matching Items

1. B	3. H	5. D	7. G	9. J
2. C	4. K	6. A	8. L	10.N

Part V: Answers to Short Answer Items

1. The Following tools are the most commonly used and the most basic MS Office tools:
    a. Microsoft Word
    b. Microsoft Excel
    c. Microsoft Access
    d. Microsoft PowerPoint
    e. Microsoft Outlook
    f. Microsoft Publisher
2. A word processor is a computer application used to create, modify and print word documents.
3. The insertion point is the blinking vertical line that indicates where the next character typed will be placed. By pressing the arrow (down, up, right and left arrows on the keyboard), we can move the insertion point in the document.

4. Click on Cell A11→Type =A9+A10→Press Enter→The values will be displayed in the A11 cell.
5. A Book like Grade 9 IT student text book should be aligned justified.
6. The four ways of viewing a presentation are:
    a. Normal view: displays single slides as it appears in the presentations
    b. Slide shorter view: shows thumbnails of your slides
    c. Note page view: allows the speaker to create notes to use it during a presentation. Note: the note created is not visible for audience.
    d. Reading view/slide show view: displays the slides as an audience will see them.
7. The icons that represent the six standard graphical elements that you might want to insert are:
    a. Table
    b. Chart
    c. SmartArt
    d. Pictures
    e. Online Pictures
    f. Video
8. To add a theme to a presentation, go to the Design tab in the ribbon. There are several themes immediately available. To use one of the built-in themes, just click on its thumbnail.
9. The slide layout in PowerPoint is the arrangement of all the items that make up your slide; these are title, graphics or text boxes to change the layout of a given slide, right click the slide you want to change the layout, select layout from right click options and select the desired layout.
10. A formula that constitutes mathematical operation and mixture of relative and absolute cell reference can be: ((A1 + A4)-B5) *F2

In this formula,
A1, A4 and B5 are relative cell references; + , – and * are addition, subtraction and multiplication mathematical operations, and F2 is absolute cell reference that does not change when it is moved or copied to other cells.

UNIT 4 IMAGE PROCESSING AND MULTIMEDIA

UNIT OUTCOMES

At the end of this unit, learners will be able to:

- Describe image processing
- Edit images captured from different sources such as digital camera.
- Use image software to create, import and save image files.
- Use image software to resize, cut and edit images.

UNIT OVERVIEW

In History, people use various ways to communicate and convey ideas. Multimedia is a form of communication that combines different content forms such as text, audio, images, animations or video into a single interactive presentation. The use of multimedia to communicate ideas began with ***newspapers***, which is the first mass communication medium, using ***text***, ***graphics*** and ***images***. Following this, ***radio*** and ***television*** become major media for audio and video broadcasting respectively. Image processing is a method to perform some operations on an image in order to get an enhanced image or extract some useful information from it. You can use different application software such as Adobe Photoshop from commercial and Gimp from free to process images.

In this chapter we will discuss the basics of image processing such as image capturing, cropping, resizing, correction and sharpening. We end with a practical section, introducing Adobe Photoshop facilities for basic image processing such as cropping, resizing, correction and sharpening.

Dear teacher, this unit is expected to be covered in **11 periods**.

Suggested Lesson Plan

No.	Subunits	Number of Periods Alloted
4.1	Image	2
4.2	Multimedia Production Planning Strategies	2
4.3	Using Image Processing Software	
	4.3.1 Installation of Adobe Photoshop Software	1
	4.3.2 Launching a Photoshop Editor	
	4.3.3 Anatomy of Photoshop Main Interface	1
	4.3.4 Adobe Photoshop Toolbox	
	4.3.5 Cropping Image Using Adobe Photoshop	1
	4.3.6 Resize an image Using Photoshop	
	4.3.7 Correcting of Image Tone and color Using Photoshop	2
	4.3.8 Sharpening Image	2
	Total	11

Minimum Learning Competency (MLC)

- Create multimedia products

4.1 Image

In this subunit, you will teach about image and digital image processing, which is one part of multimedia components. The topics to be learnt are:

- Digital Image
- Digital Image Processing

These topics are expected to be covered in **2 periods**.

At the end of this section, students will be able to:

- Define image.
- Define digital image.
- Define image processing.

Instructional Strategies

Dear teacher, start the lesson by asking students a brainstorming question listed or before moving on to defining image, digital image and image processing.

After students have raised some points, you can summarize the students' ideas as follows.

Images can strengthen communications in several different ways—they can capture attention, evoke emotions and easily convey large amounts of information in a relatively short amount of time. "A picture is worth thousand words" means that complex and sometimes multiple ideas can be conveyed by a single still image, which conveys its meaning or essence more effectively than a mere verbal description. The basic colours are red, blue and green; other colours are obtained by mixing these three colours. A logo is a symbol made up of text and images that identifies a business. Depending on the type, a logo usually consists of a symbol or brand mark and a logotype, along with a tagline. For example, logo of MoE includes text and images.

After summarizing the brainstorming discussion points, use brief lecture for teaching what is image, digital image and image processing. After this, let 2 - 5 students form a group and do Activity 4.1 and at the end summarize the main points.

Required Instructional Resources

Dear teacher, you can take a smart phone, scanner or digital camera to class, and let students make groups and discus how to create images, how to input image data into a computer for further refinement and how images are stored in a computer for later use and so on.

Assessment Strategies

- Evaluate students while they are doing the activities of this subunit.

Alternative Teaching Approaches, Enrichment Material

The IT teachers can use internet, charts, worksheets and models, go for educational field trips or invite subject experts for seminars to enrich the teaching level and in turn help the students in learning the definitions of image, digital image and image processing.

4.2 Multimedia Production Planning Strategies

In this subunit, you teach about story board planning strategies for creating multimedia products. The topics to be learnt are:

- Developing storyboard

At the end of this section, students will be able to:

- Develop a storyboard for creating multimedia product.

This topic is expected to be covered in **2 periods**.

Instructional Strategies

Dear teacher, start the lesson by asking students a brainstorming question listed or before moving on to teaching students how they can create a storyboard. After students have raised some points, you can summarize their ideas in to one follows. Planning for the production of a multimedia application involves the following steps:

1. Defining the goals and objectives of the proposed multimedia title
2. Describing the content of the title
3. Developing the application script
4. Translating the application script into an outline
5. Translating the outline into a logic flow chart
6. Developing the storyboard.

After summarising the brainstorming discussions, you can use brief lecture to introduce how to create story board in multimedia production planning strategy. After this, let 2 - 5 students form a group and do Practical Exercise 4.1 and, at the end, summarize the main points.

Required Instructional Resources

Dear grade 9 IT teacher, you can use chart board, PowerPoint or A3 paper and parker to show them how to draw storyboard for sample multimedia product.

Assessment Strategies

- Evaluate students while they are doing the activity of this subunit.

Answer to Practical Exercise 4.1

Dear teacher, follow and guide students while they are doing a story board for specified video. In Figure 4.1, six scenes or screens are shown as a sample.

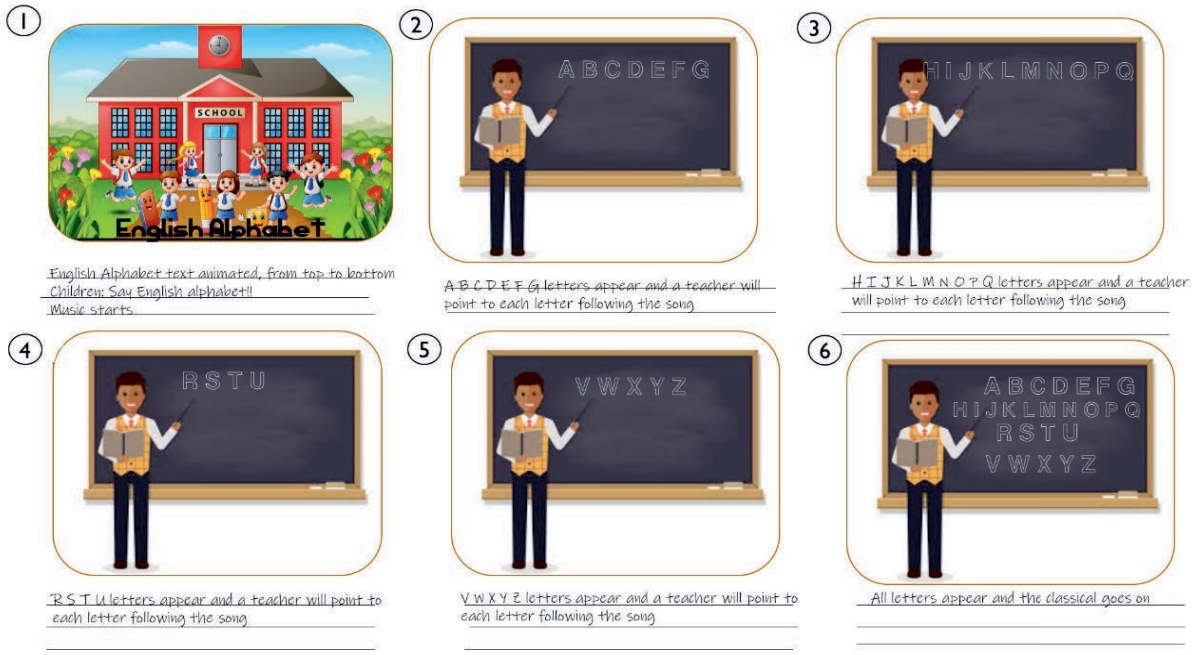


Figure 4.1 Sample story board for learning English alphabets

Alternative Teaching Approaches

Alternatively, the IT teacher may use software such as Storyboarder, PowerPoint, StudioBinder, FrameForge Storyboard Studio, Moviestorm, PowerProduction Software, Storyboard Pro, Storyboard Composer and etc. to design story board. In addition to this, the teacher may use mobile software to show them story boarding using mobile, in case, if there is no computer laboratory.

The IT teachers can use internet, charts, worksheets and models, go for educational field trips or invite subject experts for seminars to enrich the teaching level and in turn help the students in learning planning strategies for multimedia production.

4.3 Using Image Processing Software

In this subunit, the students will learn about how to process an image using Adobe Photoshop 2021. The topics to be learnt are:

- Launching Adobe Photoshop
- Anatomy of Photoshop Main Interface
- Adobe Photoshop Toolbox
- Cropping Image Using Adobe Photoshop
    - Using Crop Tool

- Using Specific Size
- Using Marquee tool

- Resizing an Image Using Photoshop
- Correcting Image Tone and colour Using Photoshop
  - Red Eye Removal
  - Adding Flash
  - Hot Spot Removal
  - Colour Adjustment
    - Colour Adjustment Using Levels and Curves
    - Using Saturation
    - Using Auto-adjustment Tools

- Sharpening Image
  - Using Unsharp Mask
  - Using Smart Sharpen
  - Using High Pass

Dear teacher, this topic is expected to be covered in **7 periods**.

Competencies

At the end of this section, students should have a skill of using Photoshop application for editing image such as cropping, resizing, correcting and sharpening images.

Instructional Strategies

Dear teacher, start the lesson by asking students a brainstorming question. After students raise some points, you can summarize the main point as follows.

There is a lot of mobile application software that enables us to edit the image we took using our mobile. Some examples of these are gallery, AI gallery, etc., which come with the mobile installed and enable us to edit our image.

For this lesson, use Photoshop CC 2021 application software for this lesson or you can use free image processing software such as ***Gimp***. Take students to computer lab and let them follow the steps to open the above specified application software in their group. Dear teacher, after this, show them the basic interface elements of Photoshop application (Use Figure 4.6 and Table 4.1) and use brief lecture to discuss the general function of each tool box (Use Figure 4.7 and Table 4.2, a - f).

After overviewing the Photoshop interface elements and Photoshop toolbox elements, let your students practice each method of cropping, resizing, correcting

and sharpening a given image while doing practical exercises 4.2 to 4.5. Each group must finish each activity before moving to the next activity.

Required Instructional Resources

Dear teacher, you may take students to a computer lab to practice cropping, resizing, colour tone adjusting and sharpening using Adobe Photoshop software or any other image processing software available. You can use any image other than specified in the textbook to practice, either from the Internet or the photos that students captured in Activity 4.1.

Assessment Strategies

- Observe students' performance on processing images.
    - Using each method for cropping, resizing, correcting colour and tone, and sharpening.
- Observe and examine while students present their group work to class.
- The teacher will summarize the main points.

Answer to Practical Exercise 4.2

Dear teacher, let your students use images captured in Activity 4.1 and use cropping methodologies they have learnt under this lesson to crop unnecessary part of the image captured.

Answer to Practical Exercise 4.3

Dear teacher, let the students use images that have flash problems from images used in Activity 4.1 or use another image to adjust flash effect on the image.

Answer to Practical Exercise 4.4

Dear teacher, let your students use images with colour problems among the images you used in Activity 4.1 or use another image to adjust image colour problem.

Answer to Practical Exercise 4.5

Dear teacher, let your students use images with clarity problems among the ones they used in Activity 4.1 or use another image to adjust image clarity.

Answer to Mini Project

Dear teacher, help students while they are using image editing software or Microsoft Publisher to create business card. Figure 4.2 shows sample of business card.



Figure 4.2 Sample business card

Alternative Teaching Approaches

Alternatively, teachers may use students' or his/her phone to practice image editing using any application installed on the phone.

The IT teachers can use internet, charts, worksheets and models, go for educational field trips or visit subject experts for seminars to enrich the teaching level and in turn help the students in learning using Photoshop application for image editing and processing.

4.4 Unit Summary

In this unit, the students have to learn image processing and multimedia. Multimedia comes from two words: multi, which means multiple, and Media, which is a way of conveying message. Hence, multimedia means multiple way of representing or conveying information. Multimedia can contain text, image, still images, videos, etc. Image processing is a method to perform some operations on an image in order to get an enhanced image or extract some useful information from it. This chapter had basic operation on an image such as image capturing, cropping, resizing, correcting and sharpening are with Adobe Photoshop software. The basic concepts under this unit are bulleted below.

- One of the components of multimedia used to convey information is image, which represents something or someone visually.

- Every information is stored and processed in a computer in 0s and 1s format. Therefore, an image is stored in a computer as 0's and 1's called digits.
- A pixel is a single dot on the screen in digital image, and it is picture element that collectively makes up a picture as a whole.
- Story boarding is a multimedia production planning strategy in which, as the name indicates, is used to tell one multimedia sequence of story from the beginning to end diagrammatically.
- Adobe Photoshop is one of the popular tools that are used to process a digital image.
- To crop unnecessary part of an image using Adobe Photoshop, you can use crop tool and marque tool or you can specify the width and height specifically.
- There is always perfect no camera shooting that produces perfect image, so we need to correct colour and tone of images.
- When we use flash to capture a photo at dark place, we may get an image having red eye, and this has to be corrected.
- When we do not use flash, every detail of the image will not be visible and becomes dark; this also has to be corrected.
- Every image has a mix of **shadows**, **highlights** and **midtones**. Shadows are the darkest parts of the image, highlights are the brightest parts and midtones are everything in between.
- Colour adjustment can be done using levels, curves, saturation or auto-adjustment tools.
- Image sharpening is the process of making a picture or image crisper and clearer to see. For example, the eye of the image may not be visible; the detail part of the image may not be visible, etc.
- To sharpen images, we can use Unsharp Mask, Smart Sharpen or High Pass.

4.5 Answers to the Unit Review Exercise

Part I: Answers to True/False Items

1. False
2. True
3. True
4. True
5. True
6. True
7. True

Part II: Answers to multiple Choice Items

1. A	3. A	5. B	7. D	9. D
2. B	4. B	6. B	8. C	10.B

Part III: Answers to Fill in the Blank Items

1. Multimedia
2. Toolbox
3. Panels
4. Double click
5. Saturation
6. Levels, curves, saturation, auto adjustment

Part IV: Answers to Short Answer Items

1. It is software developed by Adobe to create and edit images and logos. It can be done by Adobe Photoshop adjustment and modification.
2. To resize the image in Photoshop, you have to go into menu bar; under menu bar, you will find Image Size option. Clicking on that option, you will open a dialog box, by which you can adjust the size of the image.
3. The Rectangular Marquee tool is used when there is a need to draw a selection in a square or rectangle shape. It is also referred to as a Photoshop selection

tool, which draws the shape selection based on simple geometric shapes.

4. The red-eye tool is used to remove the redness in the eyes. Click on the red area of an eye, with the help of this red-eye tool, and make a correction. If it does not match with pupil size or found too light or dark, then undo the change and change the size accordingly. When the adjustments seem fine for you, do the changes with a red-eye tool to remove a red area of the eye.
5. With lasso tools, precise area of an image can be selected; just by tracing the selection outlines, the areas are selected.
    a. Simple Lasso Tool
    b. Polygonal Lasso Tool
    c. Magnetic Lasso Tool
6. Healing tool is used in Photoshop to hide the unwanted spots or pictures that appeared in your original picture and makes picture look like real without any changes. The tool uses complicated algorithm to calculate what would be the area of your picture based on the surrounding pixels.

UNIT 5 INFORMATION AND COMPUTER

UNIT OUTCOMES

At the end of this unit, learners will be able to:

- Explain computer and information security.
- Explain confidentiality, availability and integrity of information system.
- Discuss computer security threats.
- Explain basic security threats and prevention strategies.
- Evaluate confidentiality, availability and integrity of a school-based information system.

UNIT OVERVIEW

As students learned in unit 2, computer network and Internet have transformed our life in many good ways. Unfortunately, these vast network and associated technologies have also brought increasing number of security threats. This unit introduces what computer security attacks you could encounter in your life in the connected world, what type of impacts these security attacks could cause and what action you can take to avoid or minimize the impact of the attacks.

Suggested Lesson Plan

This unit is expected to be covered in **10 periods**.

No.	Subunits	Number of Periods Alloted
5.1	Definition of Security	2
5.2	Principles of Computer Security	2
5.3	Computer Security Threats	3
5.4	Potential Losses Encountered due to Security Attacks	2

5.5	How to Secure Yourself and Your Computer Systems	1
	Total	10

Minimum Learning Competency (MLC)

- Describe computer and information security.
- Identify threats of ICT environments.

5.1 Definition of Security

In this subunit, you will teach about definitions of security and computer security. This topic is expected to be covered in **2 periods**.
At the end of this section, students will be able to:

- Define security and computer security.

Instructional Strategies

Dear teacher, start the lesson by asking students a brainstorming question given in the Student's Textbook before moving on to defining security. After students have raised some points, you can summarize the students' ideas as follows.
Network treats include malware, phishing, brute force and denial of service. Mobile security threats are attacks that are intended to compromise or steal data from mobile devices like smartphones and tablets. These treats can be spyware or malware that steal personal and business information without people's realization of its happening. Information security threats can be many like software attacks, theft of intellectual property, identity theft, theft of equipment or information, sabotage and information extortion. Network allows you to share resources over a distance. Besides its advantages, it exposes you to different security problems such as malware.
After summarizing the brainstorming discussion, use brief lecture to introduce what security and types of computer security are. After this, let 2 - 5 students form a group and do Activity 5.1. At the end, summarize the main points.

Required Instructional Resources

Dear teacher, you can show your students different security mechanisms in a computer laboratory and in other similar places in the school where there are security systems.

Assessment Strategies

- Observe and facilitate students' group discussion.
- Observe and examine while students are presenting their group work to class.
- Evaluate students when they are doing the activities of this subunit.

Answers to Activity 5.1

1. Sharing address, photo, phone number, birthday and other personal information can mean a person is at a greater risk of identity theft, stalking and harassment. Pictures posted online may be copied, altered and shared with many people without one's knowledge or consent, unless privacy settings are used to limit who can have access to the pictures.

The benefits of using social media include:

- **Connectivity**: Social media allow students to get connected with peoples all around the world. Using this feature, students will be able to make new friends, share thoughts and stay connected with their family.
- **Collaboration**: Some students feel awkward to express their doubts in front of other peer students. For those students who are shy in nature, social media provides the opportunity to collaborate with one and another easily. In fact, many students feel comfortable in using social media to deal with their school projects and homework than expressing them inside the classroom.
- **Information:** When using social media, students are provided with plenty of helpful information.
- **Learning:** Social media have lots of uses in education. Particularly, it is a useful tool in a situation like a pandemic. It provides the opportunity for students to learn from their home. Even there are lots of teachers who are readily willing to help students in social media.
- **Entertainment:** Obviously, social media are popular forms of entertainment. There are various entertainment options available in social media. Students can use social media to relieve stress they encounter during studies. These and comments people get to their posts make them happy. What is more, some students use social media to play online games.

Disadvantages of Social Media for Students

- **Addiction:** Excessive use of social media after a certain stage will lead to addiction. Eventually the addiction level may reach to a point where it causes distraction from studies. After starting use of social media, many students are unable to pay their attention during lessons. Such students always waste time scrolling their newsfeeds and publishing posts.
- **Socialization:** While it is true that social media helps to build distant friendships, the same could negatively impact the relationships of their close ones. Students who use social media excessively may lose relationships with their beloved persons. They might be highly addicted to social media, so they forget to spend time with their friends and family.
- **Cyberbullying**: As social media let people be anonymous, it could be used as a platform for cyberbullying. Attackers tend to create fake accounts in social media so that they can tease and hurt other people. Students, particularly teenagers, are often targeted by the bullies through hurtful messages. Often due to this, students could face anxiety, depression, stress and other mental problems.
- **Inappropriate Content**: Not all the contents available on social media may be appropriate for students. Students, especially underage children are exposed to inappropriate content both intentionally and unintentionally. This includes pornography as well. All of a sudden, it can be shown while playing a game or scrolling a newsfeed. Eventually the students might get mentally disturbed. It is the responsibility of parents to monitor how their child is using social media.
- **Health Concerns**: Most social media users including students often face many health problems due to excessive use of social media. Students who are addicted to social media spend day and night sitting in front of computer or holding a smart phone. Since it does not involve much physical movements, the result of this can be obesity. Even some students sacrifice their sleep for using social media. This can bring many sleeping disorders that can lead to other dangerous consequences.

2. Sharing passwords can make one more vulnerable to getting his/her accounts hacked and personal information misused.

Alternative Teaching Approaches

The IT teachers can use internet, charts, worksheets and models, go for educational field trips or subject experts can be called for seminars to enrich the teaching level and in turn help the students in learning computer and information security.

5.2 Principles of Computer Security

In this subunit, students will learn the three principles of computer security, namely confidentiality, availability and integrity.

At the end of this section, students will be able to:

- Explain and use the three principles of computer security

This topic is expected to be covered in **2 periods**.

Instructional Strategies

Dear teacher, start this section of the unit by asking students a brainstorming question listed before moving on to defining security. After students have raised some points, you can summarize their ideas as follows.

The internet service of computer laboratory should be secured, high bandwidth that supports quality of service (QoS), filter insecure traffic and able to share resources securely.

After summarizing the main points, use brief lecture with examples to discuss the three principles of computer security with the students. After this, let students be in a small group to perform Activity 52.

Required Instructional Resources

Respected teacher, you can show them each principle of security using different test cases.

Answer to Activity 5.2

- Student mark shall not be altered by third party like school director, student, etc. or disclosed to other persons except your homeroom teacher and you only allow.
- Information also should be received by the correct receiver on time when it is required. The ICT service intended for disabled students should be provided for them on time when they require it.

Assessment Strategies

- Observe and facilitate students' group discussion.

- Observe and examine while students are presenting their group work to class.
- Evaluate students while they are doing the activity of this subunit.

Alternative Teaching Approaches

IT teachers can use internet, charts, worksheets and models, go for educational field trips or invite subject experts for seminars to enrich the teaching level and in turn help the students in learning computer and information security.

5.3 Computer Security Threats

In this subunit, students will learn about different threats of computer security. The subtopics to be learnt are:

- Natural Threats
- Artificial Threats

These topics are expected to be covered in **3 periods**.
At the end of this section, students will be able to:

- Identify different types of security treats

Instructional Strategies

Dear teacher, start this section of the unit by asking students a brainstorming question listed before moving on to defining security. After students have raised some points, you can summarize their ideas as follows.
Being connected can expose you to different security treats such as malicious software over the internet.
After summarizing the brainstorming discussion, use brief lecture with example to discuss the different types of security treats. After this, let 2 - 5 students form a group and do Activity 5.3 and, at the end, you may summarize the main points.

Required Instructional Resources

Dear teacher, you can show them different security treats in a computer laboratory and in anther similar places in your school.

Assessment Strategies

- Observe and facilitate students' group discussion.
- Observe and examine while students are presenting their group work to class.
- Evaluate students while doing the activity under these sub units.

Answer to Activity 5.3

Actions that should be taken in case of a fire outbreak in the computer laboratory or server include:

- Switch off main electrical supply
- Vacate the room
- Inform master in charge (laboratory coordinator or your teacher)
- Call for help
- Try to extinguish using the appropriate fire extinguisher (not water)

In addition, you can follow these tips for preventing fire within your computer laboratory:

- Keep your computer room free of storage - storing combustible materials in your computer room can increase the chance and spread of a fire. Keep minimal supplies in the area and store boxes, packaging and manuals elsewhere.
- Inspect power cords - frayed or damaged power cords increase the risk of fire, as a spark could easily ignite the room. Check for damage and have repairs done immediately.
- Maintain and clean computer systems - allowing dust and debris to settle on your equipment only adds to flammable materials. Think of dust as kindling.
- Train and display fire emergency plans - ensuring you know how to respond to a fire (whether proper use of a fire extinguisher or immediately evacuating to safety) can save lives and help prevent further damage.
- Schedule regular inspection of your fire protection systems

Additional: Computers will not survive fires. If the flames do not cause your system's case and circuit boards to burn, the heat might melt your hard drive and all solder holding electronic components in place.

A power surge can have a number of consequences for your computer, including damaged motherboard, damaged hard drive and slow performance.

Answers to Activity 5.4

1. Student can avoid cyber risks by taking steps in advance including:
   - Limit the personal information students share online. Change privacy settings and do not use location features.

- Keep software applications and operating systems up-to-date.
- Create strong passwords by using upper and lower case letters, numbers and special characters. Use a password manager and two methods of verification.
- Manage social media setting: Keep your personal and private information locked down. Social engineering cybercriminals can often get your personal information with just a few data points, so the less you share publicly, the better.
- Use strong home/school network: It is a good idea to start with a strong encryption password as well as a virtual private network. Always change password (may be Wi-Fi) regularly.
- Watch for suspicious activity that asks you to do something right away, offers something that sounds too good to be true or needs your personal information. Think before you click. When in doubt, do NOT click.
- Do not share PINs or passwords. Use devices that use biometric scans when possible (e.g. fingerprint scanner or facial recognition).
- Check your account statements and credit reports regularly.
- Be cautious about sharing personal financial information such as your bank account number, social security number or credit card number. Only share personal information on secure sites that begin with https://. Do not use sites with invalid certificates.
- Use a virtual private network (VPN) that creates a more secure connection.
- Use antivirus and antimalware solutions, and firewalls to block threats.
- Back up your files regularly in an encrypted file or encrypted file storage device.
- Do not click on links in texts or emails from people you do not know. Scammers can create fake links to websites.
- Remember that the government will not call, text or contact you via social media about owing money.
- Keep in mind that scammers may try to take advantage of financial fears by calling with work-from-home-opportunities, debt consolidation offers and student loan repayment plans . etc.

2. Parents or school teachers teach you how to secure your personal file while using Internet at home or at school. They will tell you what to do after being victim of cyber security. They will tell you the type of necessary and unnecessary sites to browse.

3. Possible Internet use policy in a computer laboratory includes:
    - Use computers, network and Internet services only for educational purposes.
    - Use Internet to get educational online materials, not for entertainment and to watch pornography, etc.
    - A student is not allowed to reveal his/her full name, address, telephone number, social security number or other personal information on the Internet while using a school computer.
    - Students should never agree to meet people they have contacted through the Internet without parental permission.
    - Students should inform their teacher if they access information or messages that are dangerous, inappropriate or make them uncomfortable in any way.
    - A student who identifies a security problem must notify his/her teacher or building administrator immediately. The student shall not demonstrate the problem to others or access unauthorized material.
    - Use strong password for your online accounts that has capital letters, small letters, numbers and special characters. The password should be greater than 8 characters.
    - Students should not share passwords, use other users' passwords, access or use other users' accounts or attempt to circumvent network security systems.
    - You are not allowed to plagiarize works you find on the internet. etc

Alternative Teaching Approaches

IT teachers can use internet, charts, worksheets and models, go for educational field trips or invite subject experts for seminars to enrich the teaching level and in turn help the students in learning computer security treats.

5.4 Potential Losses Encountered Due to Security Attacks

In this subunit, you will teach about impacts of security attacks on personal, social, economic, and political aspects.

At the end of this section, students will be able to:

- Identify impacts of security attacks on personal, social, economic and political aspects.

This topic is expected to be covered in **2 periods**.

Instructional Strategies

Dear teacher, start the lesson by asking students a brainstorming question listed or let students make a group of 2 - 5 students and discuss on the brainstorming question before moving on to defining security. After students have raised some points, you can summarize their ideas as follows.

Computer security treats have personal, social, economic and political impacts. Cyber attacks can lead to the loss of money or the theft of personal, financial and medical information. These attacks can damage one's reputation and safety. When a company faces a cyber-attack, it decreases trust and faith among people and people may be afraid to invest further in the organization. The organization in victim of cyber security loses its sensitive business information which affects its growth. In addition to this, security attack affects national security of a country.

After summarizing the brainstorming discussion, use brief lecture to teach impacts of security attacks. After this, let 2 - 5 students form a group and do Activity 5.5 and, at the end, summarize the main points.

Required Instructional Resources

Dear grade 9 IT teacher, you can show your students different cases to show impacts of computer security on personal, social, economic and political aspects.

Assessment Strategies

- Observe and facilitate students' group discussion.
- Observe and examine while students are presenting their group work to class.
- Evaluate students while they are doing the activity of this subunit.

Answers to Activity 5.5

1. Treats can be natural or artificial.

2.

a. ICT enables her to order and pay for her purchase from where ever she is.

b.

- She has faced unauthorized access to her bank account.
- She has also lost her bank account information confidentiality.

c. Halima might handle her bank account information carelessly, share her information to someone else or put her information in public place. She may also access less trusted or fake online shop website. Additionally, her system (computer or mobile may be affected by adwares and viruses that sniff personal information and send it to third parties.

d.

- Halima should put her bank account information securely in secured place.
- Use antivirus and adware cleaner for her system (computer or mobile).
- Check the trustworthiness of online shops and services before making purchase and payment.

Alternative Teaching Approaches

IT teachers can use internet, charts, worksheets and models, go for educational field trips or invite subject experts for seminars to enrich the teaching level and help the students in learning security attack impacts on personal, social, economic and political aspects.

5.5 How to Secure Yourself and Your Computer Systems

In this subunit, you will teach about security mechanism used to secure oneself and computer systems.

At the end of this section, students will be able to:

- Identify security mechanisms to secure computer systems.

This topic is expected to be covered in **1 period**.

Instructional Strategies

Dear teacher, use brief lecture to teach computer security mechanisms.

Required Instructional Resources

Dear IT teacher, use security mechanisms (such as installing and updating

antivirus software, using email application, updating operating system security features, etc.) and show students how to implement it in to computer laboratory and let them practice how to implement security mechanisms to computer systems in their computer laboratory.

Assessment Strategies

- Observe and facilitate students' group discussion.
- Observe and examine while students are presenting their group work to class.
- Evaluate students while doing the activity of this subunit.

Alternative Teaching Approaches

IT teachers can use internet, charts, worksheets and models, go for educational field trips or invite subject experts for seminars to enrich the teaching level and in turn help the students in learning computer security mechanisms.

5.6 Unit Summary

- Although network allows us to share resources easily, one of the disadvantages of being connected is vulnerability to different security threats.
- Computer security is the protection of computer systems (including hardware, software, firmware and information being processed, stored, and communicated) and information from harm, theft and unauthorized use.
- Information security is the protection of information and information systems from unauthorized access, use, disclosure, disruption, modification or destruction in order to provide confidentiality, integrity and availability.
- Confidentiality ensures that information is available only to the intended audience.
- Integrity protects information from being modified by unauthorized parties.
- Availability ensures that information should be consistently and readily accessible for authorized parties timely.
- Computer security threats can be caused by natural, in which natural

hazards such as earthquakes, flooding or lightning storms leads to fires, extreme temperatures and even electric shocks to your computer, causing potential physical damage and loss of data.

- Computer security can also be artificial or manmade, in which hackers and crackers will affect the information and computer system.
- The broad majority of computer security threats come from the manner that computer users practices (90%) and, thus safe use of computer systems and the Internet help us avoid the major security risks associated.
- Threats on the Internet can come from hackers, cyberbullies and predators using the Internet and computer networks. Internal malicious actors (like students and teachers) and your trusted persons can make cyberattacks by mistake.
- The major types of cyberattacks are denial of services (DoDs), malware attacks, man-in-the-middle, phishing, eavesdropping, SQL injection, password attack and social engineering.
- You can minimize the risks of cybersecurity risks by building your awareness level and applying good internet and computer use practices as well as by implementing technical protective measures.

5.7 Answers to the Unit Review Exercise

Part I: Answers to True/False Items

1. False
2. True
3. False
4. False
5. True

Part II: Answers to Multiple Choice Items

1. A	3. A	5. B	7. C	9. D	11. D	13. C	15. A	17.D	19.A
2. A	4. C	6. A	8. D	10. A	12. B	14. B	16.A	18.D	20.B

UNIT 6 FUNDAMENTALS OF PROGRAMMING

UNIT OUTCOMES

At the end of this unit, learners will be able to:

- Describe problem solving techniques.
- Compare and contrast steps of problem solving techniques.
- Use top-down and bottom-up problem solving techniques.
- Evaluate simple algorithms represented in flowcharts and pseudocodes.

UNIT OVERVIEW

This unit is about introducing the basic concepts of computational problem, the problem-solving steps, flowcharts and block programming. Finally, top-down and bottom-up problem-solving approaches are covered.

This unit is expected to be covered in **13 periods**.

Suggested Lesson Plan

No.	Subunits	Number of Periods Alloted
6.1	Defining a Problem and Computational Problem	2
6.2	Steps in problem solving	2
6.3	Working with flowcharts and block programing	6
6.4	Problem Solving Approaches	3
	Total	13

Minimum Learning Competency (MLC)

- Develop problem solving skills.

- Develop and evaluate flowcharts.

6.1 Defining a Problem and Computational Problem

In this subunit, you will help your students grasp what a problem is with emphasis on a computational problem, which is a problem solved using a computer program.

At the end of this section, students will be able to:

- Define what problem and computational problem are.
- Differentiate computational problem from non-computational one.

This subunit is expected to be covered in **2 periods**.

Instructional Strategies

Dear teacher, start the lesson by asking students a brainstorming question before moving to next section. After students have raised some points from their previous experience of using application software, you can summarize students' ideas as follows.

Computer application software is developed for solving a problem. For example, Word processing software is used to manipulate text documents such as memos, books and reports. World processor application is used to write faster and easier than writing by hand. Using word processor, it is possible to store documents on computer and print it, which is impossible to do on a typewriter. It also provides different features which include more formatting choices, checking spelling and grammar, cutting and pasting, inserting image, etc. Therefore, different application software is developed in order to solve a problem using a computer.

After summarizing the brainstorming discussion, use brief lecture to describe types of problems and how computer software can solve a given problem. After doing this, let 2 - 5 students form a group and do Activity 6.1 and, at the end, summarize the main points.

Required Instructional Resources

Dear teacher, you can use dictionaries to help students know different meanings of the term *problem*. You can also use student textbooks of different subjects (like mathematics, physics, etc.) to show them about computational problems and the steps involved in solving them.

Assessment Strategies

- Observe students while they are doing the activity of this subunit focusing on students' effort in understanding the problems and planning for their solutions.

Answer to Activity 6.1

1. This is a question asking students' opinions. Therefore, students may answer 'Yes' or 'No'. The argument is important. Give hint to students about natural degradations or hazards that local communities consider themselves affected by. Climate change could affect our society socially, culturally and naturally. For example, climate change can be related to extended dry seasons and heavy rainfalls causing droughts and floods that affect both rural and urban dwellers. Floods destroy infrastructures and transportation systems. Drought can bring hunger and famines. Drought also affects water bodies and forests through, for example, drying out lakes and rivers or wildfires. Increase in temperature has also direct effect on human health and could be factor for emergence of new diseases or expansion of disease causing vectors to highlands. Overall, the impact ranges from the environment, infrastructure, transportation systems, energy, food and water supplies. There are so many methods of mitigation for minimizing the impact of climate change. These include reducing industry gas emissions, planting trees, using renewable energy and the like.
2. Ethiopia is among the countries that are highly affected by road traffic accident. Globally, road accident is also the main reason of death among young people of ages between 15 - 29 years. The main reasons for traffic accident in Ethiopia include poor road network, absence of knowledge on road traffic safety and use of roads for other means of movements such as cattle, donkey carts and the like. The age and status of vehicles are also additional factors for road traffic accident. The situation could vary between urban centres and rural parts of the country. Allow students to discuss such issues of significance to their villages or towns as a problem. Guide the students to suggest solutions with a focus on knowledge related to walking safety such as:
    - Following the rules of the road and obeying signs and signals.
    - Walking on sidewalks whenever they are available.

- If there is no sidewalk, walking facing traffic and as far from traffic as possible.
- Crossing streets at crosswalks or intersections. Looking for cars in all directions including those turning left or right.
- If a crosswalk or intersection is not available, locating a well-lit area where you have the best view of traffic. Waiting for a gap in traffic that allows enough time to cross safely, continue watching for traffic as you cross.
- Watching for cars entering or exiting driveways or backing up in parking lots.

3. The existing peace and conflict literature presents the following as major causes of intercommunity conflicts:
    - *Economic and political*: Grievances that emerge from economic decline, poverty, land fragmentation in countryside and unemployment may reinforce tendencies to resort to violent means.
    - *Ethnic*: Conflicting interest of contending ethnicities for factors related to land and resource control, cultural differences or administrative issues.
    - *Religious*: Conflicts occurring due to lack of appreciation of religious pluralism and peaceful co-existence amongst different religious groups.

Even though such conflicts may look religious or ethnic-based, the root causes are happening due to conflict for resources (e.g. pasturelands and water resources) and lack of tolerance to difference of beliefs, values and culture. Tolerance towards individual and communal differences and building trust and respect among conflicting group is essential. This needs citizens who are open-hearted and open-minded for dialogue, mediation and community-based activities that promote peace building, reconciliation and living together in unity in diversity.

Alternative Teaching Approaches

IT teachers can use internet, charts, worksheets and models to show the magnitude of the problems raised. Inviting a traffic control police, survival of a traffic accident incident, head of an emergency service provider from a nearby health centre or an environment protection officer to speak to the students and have forum for practical learning.

6.2 Steps of Problem Solving

In this subunit, students will learn the 4 steps used to solve a given problem in computer programming.

At the end of this section, students will be able to:

- Use the four steps of solving a given problem.

This topic is expected to be covered in **2 periods**.

Instructional Strategies

Dear teacher, start the lesson by asking students a brainstorming question before moving on to next section. After students have raised some points, you can summarize students' ideas and use brief lecture with examples to discuss the four problem solving steps. After this, let 2-5 students form a group and do Practical Exercise 6.1 and, at the end, summarize the main points.

Required Instructional Resources

Dear class room teacher, you can show your students problem solving steps using different examples in a computer lab using sample problems such as adding two numbers. Students can also learn problem-solving techniques without computers as student activities.

Assessment Strategies

- Observe students' group discussion with a focus on the steps they follow in solving the given problems.
- Evaluate students when doing the activity of this subunit.

Answers to Practical Exercise 6.1

1. Student outcomes are knowledge, skills and expertise that students should master to succeed in work and life in the 21st century. You can get more condensed information about it from the *P21's Frameworks for 21st Century Learning* website at http://www.battelleforkids.org/networks/p21/frameworks-resources. The 21st century skills are 12 abilities that today's students need to succeed in their careers during the Information age categorized into three. The first category is *learning skills* and includes *critical thinking*, *creativity*, *collaboration* and *communication* (referred to as the four C's). Learning skills teach students about the mental processes required to adapt and improve upon a modern work environment. The second category is *literacy skills*. They involve *information literacy*, *media literacy* and *technology literacy* skills, in short

referred to as IMT. Literacy skills focus on how students can discern facts, and publish outlets and the technology behind them. There is a strong focus on determining trustworthy sources and factual information to separate it from the misinformation that floods the Internet. The third category is *life skills* and they involve skills related to flexibility, leadership, initiative, productivity and social skills (FLIPS). Life skills take a look at intangible elements of a student's everyday life. These intangibles focus on both personal and professional qualities. You can get information about these from https://www.aeseducation.com/blog/what-are-21st-century-skills.

Among the 4Cs of learning skills is *critical thinking*. Critical thinking is all about finding solutions to problems. So critical thinking is another face of problem solving. While critical thinking is related to effective reasoning, thinking systematically, identifying and evaluating alternative solutions and targeting problem solving, applying critical thinking skills to solve different kinds of non-familiar problems.

2. Two trusted sources that refers to George Polya's *How to Solve It* are listed below:

    1. Unit 7 of a Model *Helping Students Do Math* by Ohio Partnership for Excellence in Paraprofessional Preparation. URL: https://www.opepp.org/course/module-helping-students-do-math/
    2. A chapter on *Problem Solving Strategies* of a book titled, *Mathematics for Elementary Teachers*. URL: http://pressbooks-dev.oer.hawaii.edu/math111/chapter/problem-solving-strategies/

In 1945, Pólya published the short book *How to Solve It*, which gave a four-steps method for solving mathematical problems:

1. First, you have to understand the problem.
2. After understanding the problem, then make a plan.
3. Carry out the plan.
4. Look back on your work. How could it be better?

These four steps are discussed in Table 6.1 of the Student's Textbook.

Alternative Teaching Approaches

IT teachers can use Internet, charts, worksheets and models, go for educational field trips or invite subject experts for seminars to enrich the teaching level and in turn help the students in learning the four steps of solving a problem.

6.3 Working with Flowcharts and Block Programming

In this subunit, you will teach about how to build flowcharts and building a block programming.

At the end of this section, students will be able to:

- Work with flowchart and block programming.

This subunit is expected to be covered in **6 periods**.

Instructional Strategies

Dear teacher, start the lesson by asking students the brainstorming questions. Here, it is very important that students develop their individual and teamwork skills in understanding a given problem and presenting the solution in a flowchart. You are kindly advised to do the following to help student learn better in flowchart drawing.

1. Begin the class with a brainstorming question in which students make a group of 2-5 students and discuss the brainstorming questions selected for the lesson. Let the students discuss and reflect on the brainstorming questions.
2. Then, introduce the lesson drawing flowcharts for a case problem. Give students similar questions and let them practice drawing flowcharts on paper (preferably, as individual works). It needs to follow by a pair or small group discussion on the individual work. You need to go around the class to support challenged groups and ensure active participation. A classroom level reflection is desirable.
3. Then, students need to have a laboratory session. The session may start with demonstration using slide projection and students should sit in a group of two or three students and work on practical exercises. Ensure engagement and equal participation in applying such methods as pair programming (https://devopedia.org/pair-programming) and think-pair-shares (https://www.color-incolorado.org/article/increase-student-interaction-think-pair-shares-and-circle-chats).

4. Dear teacher, this unit can be inspirational for students to become innovators in computer science and information technology. Allow fast learners develop scratch game such as catch games for catching falling objects or design educational games such as arithmetic by adding, subtracting, dividing or multiplying numbers floating down the screen for kids. You can get an example from https://resources.scratch.mit.edu/source/cards-old-scratch2/InDesign-files/catch/Catch%20Game%20-%20Scratch%20Cards%20Files.pdf.

Alternative Teaching Approaches, Enrichment Material

Your school might not have enough computers for your students. You also could have visually impaired students in the classroom. Dear teacher, be mindful that all students need to be problem solver and build their computational thinking skills irrespective of their ability or disability. You can have alternative mechanisms to teach students about problem solving without computer. You can teach algorithm design and programming through engaging students in role-plays and fun activities. You can get learning resources from programming unplugged: learning programming without computers (https://teachinglondoncomputing.org/free-workshops/programming-unplugged-programming-without-computers/). How can a visually impaired student participate in programming? Dear teacher, problem solving and algorithm design involve critical thinking skills and visually impaired students can engage in discussion related to problem understanding. They can also engage in the solution planning stage (algorithm design) through speaking out the steps aurally or writing them using braille. Inform such students that there are progressive works to develop *physical programming language* to help blind students write codes using robotic technologies. See for example, https://www.akshaybaweja.com/projects/physical-programming-language.html.

Required Instructional Resources

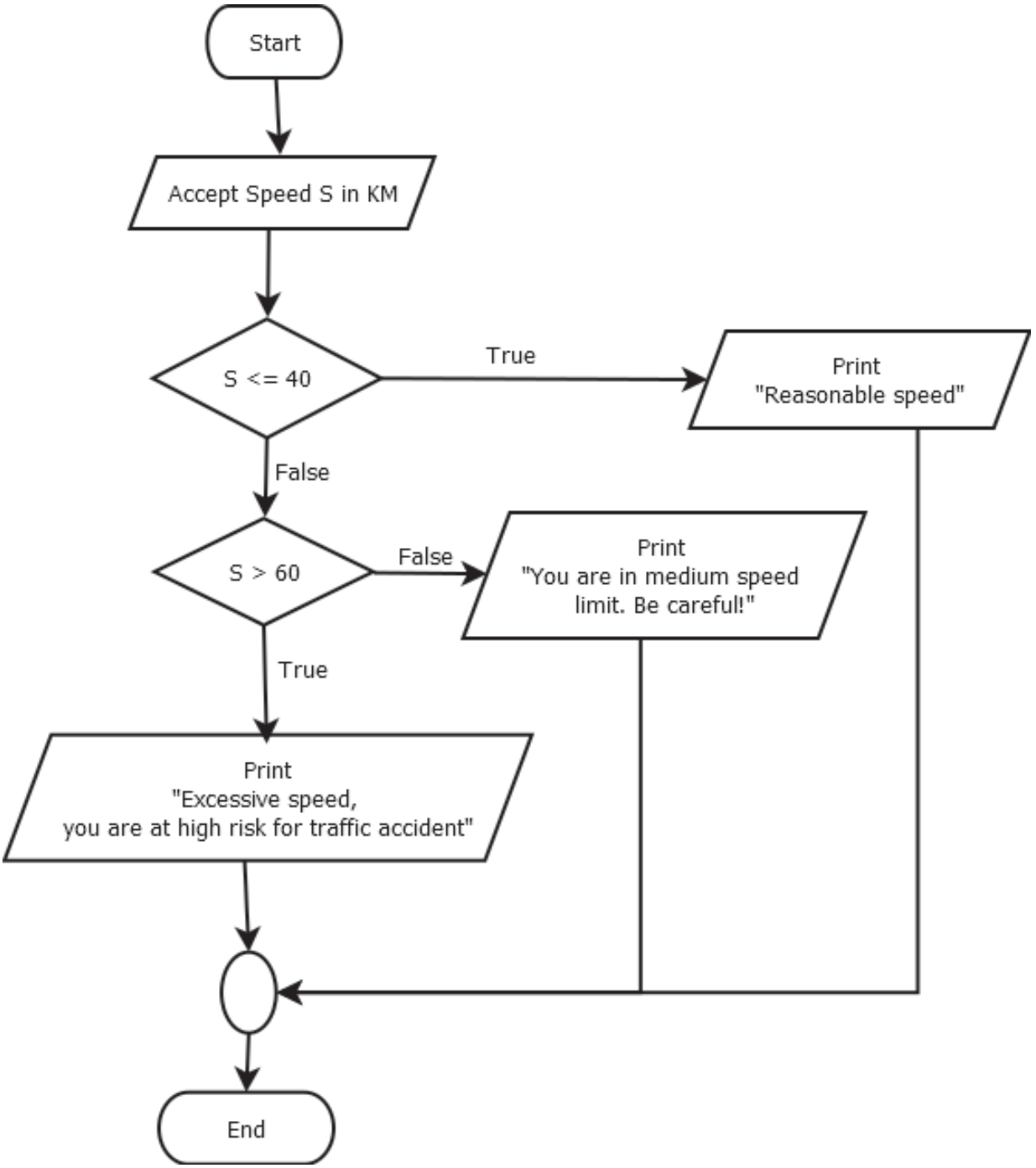
Students learn better when they get practical exposure on seeing how their algorithms are evaluated by computers or other electronic devices. There are educational tools designed for this purposes. Flowgorithm (http://www.flowgorithm.org/) and Raptor (https://raptor.martincarlisle.com/) are the two freely available tools that you can use and let students draw flowchart, run it as it were a program and see the steps of the students' execution. Students can also auto-generate pseudocode, which is the required level for grade 9 instruction.

Assessment Strategies

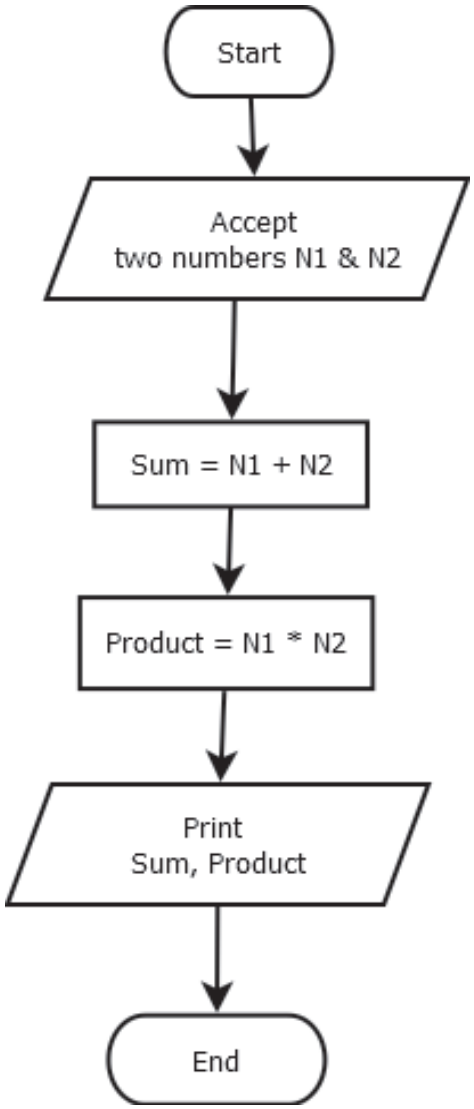
In the process of creating a flowchart, observe when students are describing a sequence of events, stages, phases or actions that lead to an outcome. Make sure that students change roles due to process, i.e. when one of the students draw the diagram, the other group member discusses on the reason for inclusion of a particular symbol and the outcome it will produce.

Answer to Practical Exercise 6.2

1. The flowchart is shown below. It is drawn using the Start/End, Action/Process and Input/Output, decision and connector flowchart symbols. Arrows are used to show flow of evaluation. The flowchart begins by accepting speed **S** in km and it has two breakaways in the evaluation. The first decision symbol evaluates whether S is less than or equal to 40km. If this is TRUE, it prints "Reasonable Speed" and the evaluation ends (or the arrow goes to the "End" through the connector symbol. Otherwise (or if the S is less than or equal to 40, it is FALSE), the evaluation continues to another breakaway checks of whether S is greater than 60. If this is TRUE, "Excessive speed, you are at high risk for traffic accident". On the other hand, if it is FALSE, "You are in medium speed limit. Be careful!" is printed. The evaluation ends in either of the cases at last.

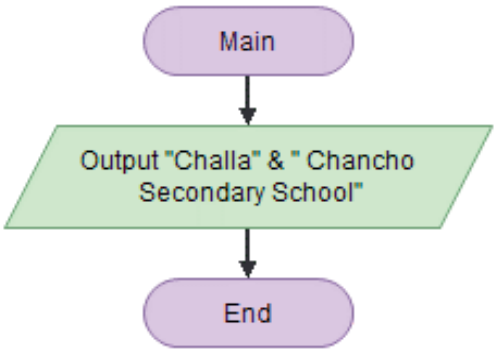


2. The flowchart is shown below at the left. The pseudocode equivalent is shown at the right. Note that the flowchart is drawn using the Start/End, Action/ Process and Input/Output flowchart symbols. Arrows are used to show flow of evaluation, which is sequential from top-down.

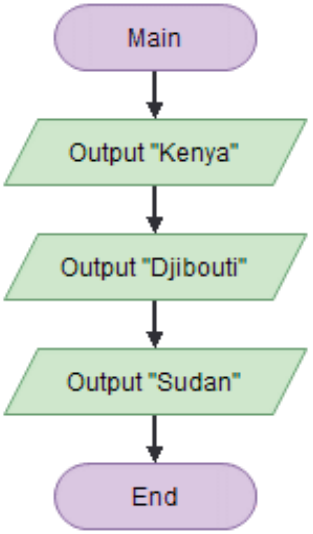
Flowchart	Pseudocode
	Start Input N1, N2 Sum = N1 + N2 Product = N1 * N2 Output Sum, Product End

Answers to Practical Exercise 6.3

1. Here, the main emphasis is to connect two or more strings and display using the ampersand (&) operator. To is used to connect two outputs into a single output. In connecting texts or strings in double quotation, it is good to use white spaces appropriately for readability of the displayed output. The flow-chart and the auto-generated pseudocode are sown in the table below.

Flowchart	Auto-generated pseudocode
	Function Main Output “Challa” & “ Chancho Secondary School” End

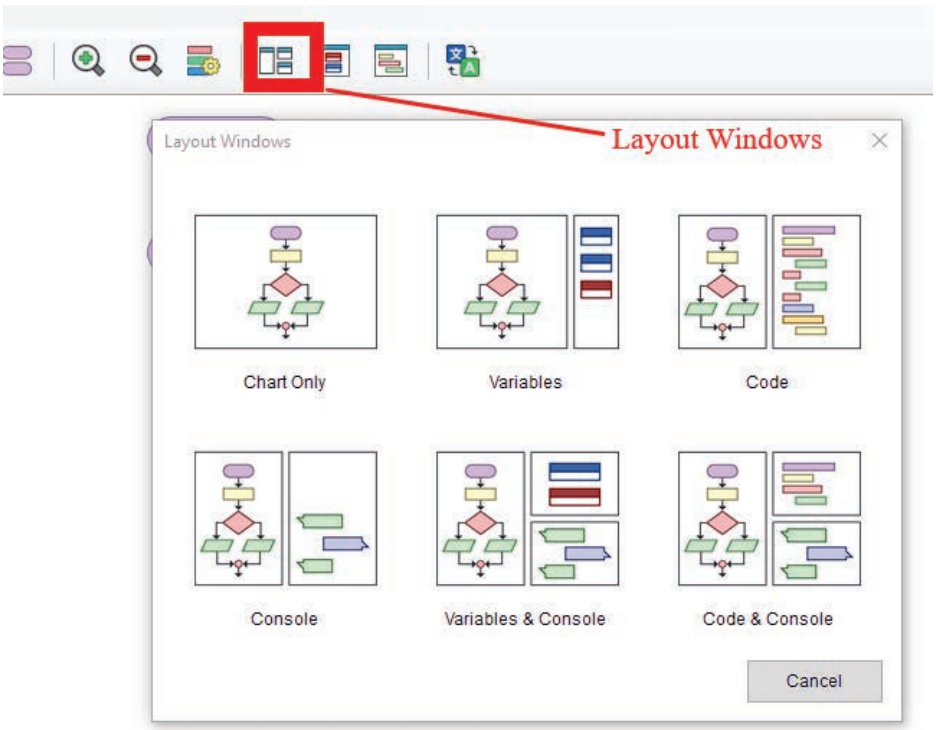
2. Here, the attention is using output statements in sequence to print in different lines.

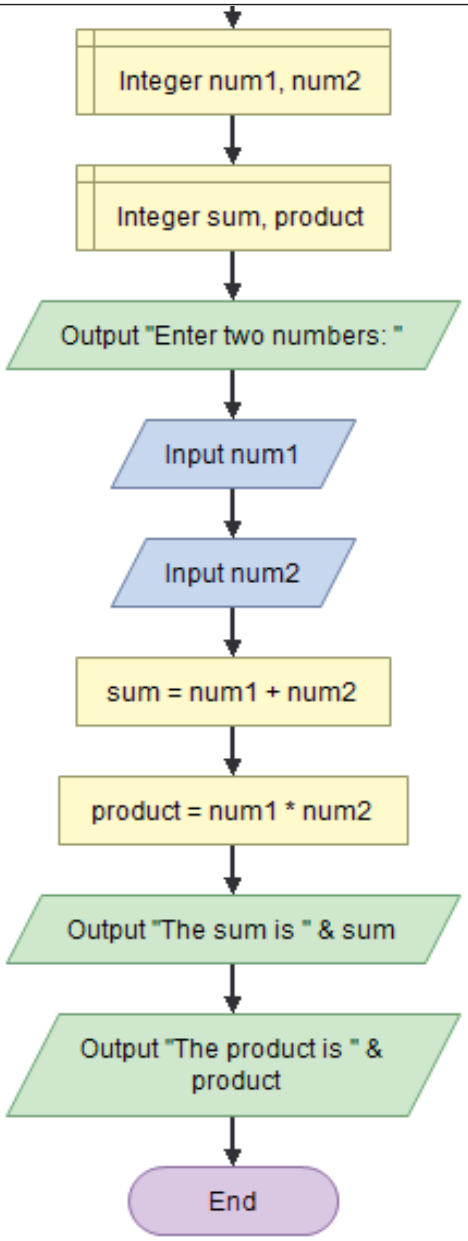
Flowchart	Auto-generated pseudocode
	Function Main Output “Kenya” Output “Djibouti” Output “Sudan” End

3. This exercise is similar to question number 2 of Practical Exercise 6.2. The difference is that now the students will use flowgorithm to draw the flowchart since flowgorithm helps us to evaluate the flowchart step by step, including additional concept of variable declaration and variable assignments. Students will be exposed to these concepts in grade 10. However, since we use them in our flowcharts, it is good to introduce about variable without going detail in their

technical definition such as data type, memory size they take or permissible identifiers. We suggest the use of variable in their notions in Mathematics, i.e. as a quantity that may change within the context of a mathematical problem or experiment. Inform the students that variables should be named or *declared* before they are used in the flowchart for example in process or assignment. The flowchart and auto-generated pseudocodes are shown below.

You can open Layout Windows by clicking the taskbar icon shown in the diagram below. Select the Variable Layout to help students see what happens during the evaluation of the flowchart by the computer.

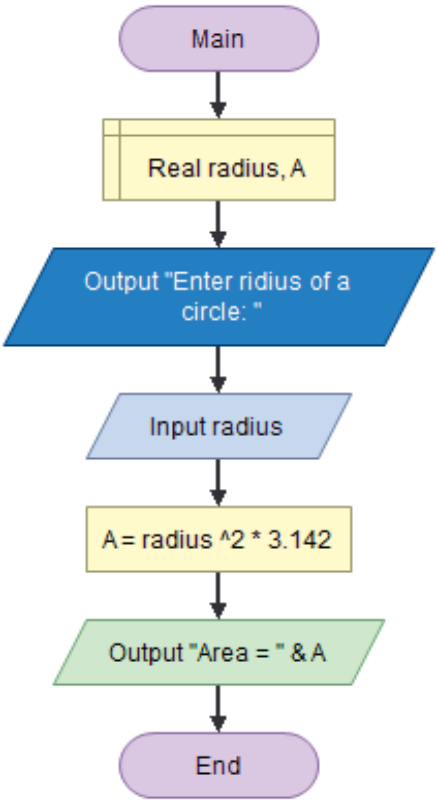


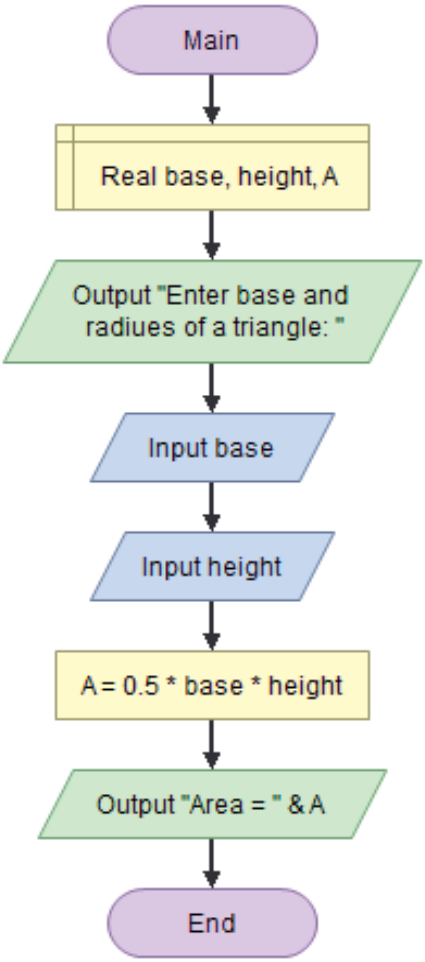
Flowchart	Auto-generated Pseudocode
	Function Main Declare Integer num1, num2 Declare Integer sum, product Output "Enter two numbers: " Input num1 Input num2 Assign sum = num1 + num2 Assign product = num1 * num2 Output "The sum is " & sum Output "The product is " & product End

4. See the pseudocode auto-generated in the right side of the table above for Question No. 3.

5.

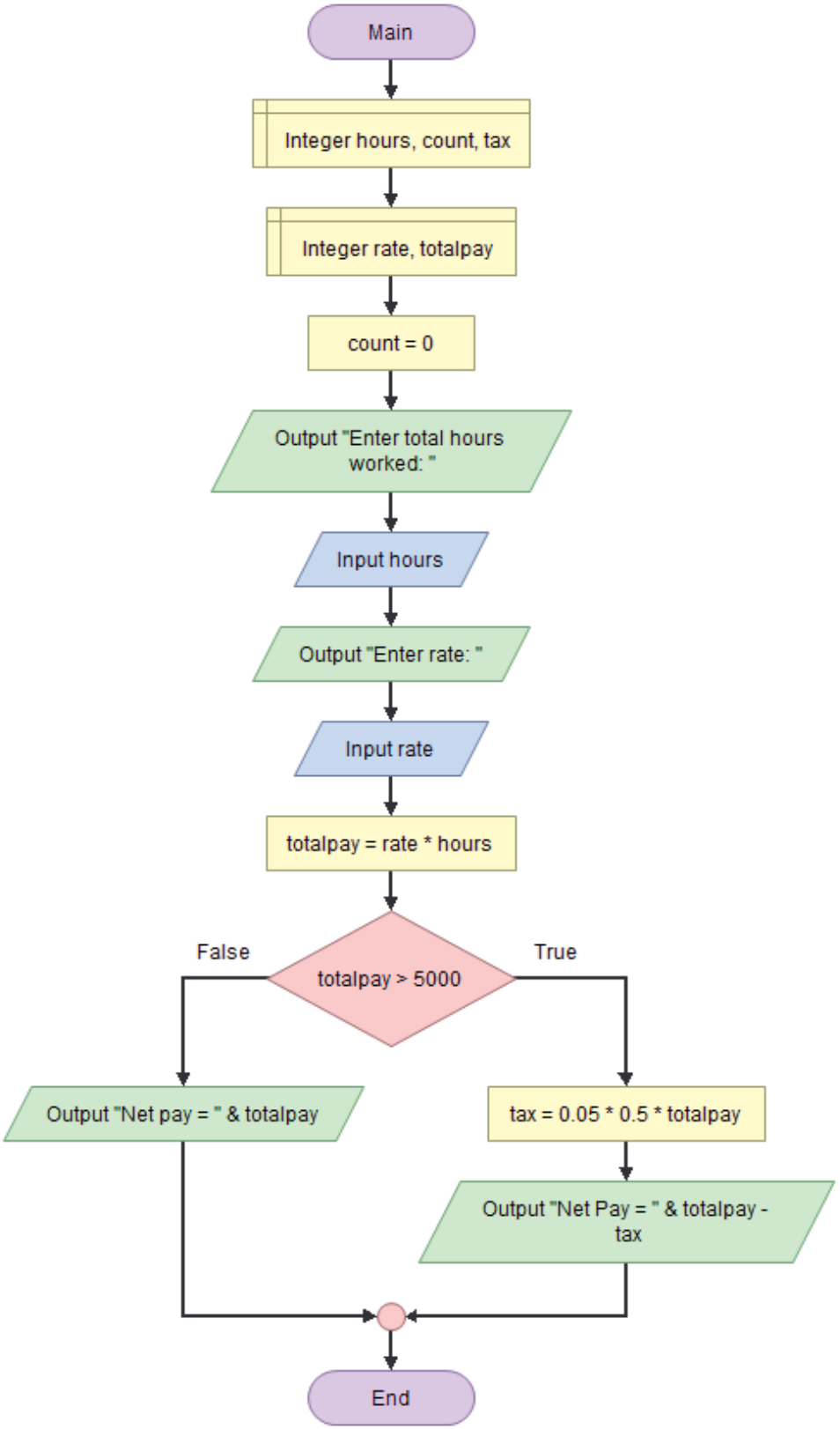
Area of a Circle	Area of a Triangle





6. Dear teacher, ask the students what are the given (e.g. tax is calculated if salary is more than 5000 Birr and the tax is calculated for half of the total salary with a rate of 5% (0.05). Ask also what we need to get from the user to do the job. In this case, we have two inputs: hours worked and hourly rate. Finally, ask the students what is required: total tax to be paid and the net-wage a person gets after tax. The flowchart is shown in the table below.

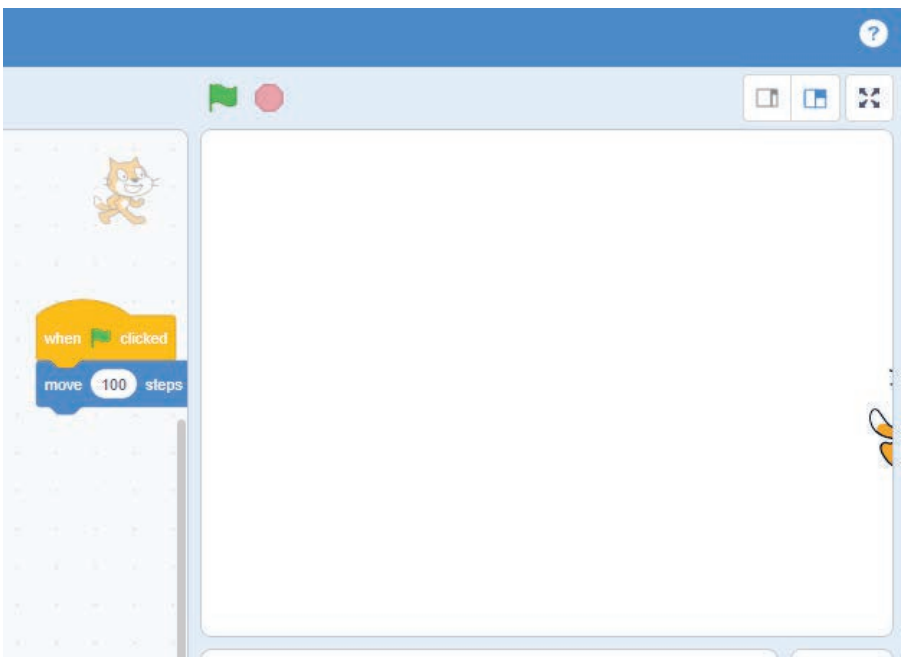
Wage Calculator Flowchart



Answer to Practical Exercise 6.4: Developing Sequential Block Programs

1. Dear teacher, this is an exercise to allow students to work with *Scratch*. You can download Scratch from https://scratch.mit.edu/download. Allow the students explore different tabs (codes, costume and sounds) and parts of Scratch windows (block palette, script area, and the stage). Then, let the students add a block from palette categories, e.g. *When Flag click* from the Event category onto the *Script Area* and add some more blocks from *Motion*, e.g. *Move 10 steps*. Let the students discuss and observe their discussion with an addition of each block. Inform the students that each block added onto the script is an instruction that is to be taken usually by the *actor* or the *sprint*, the cat by default.

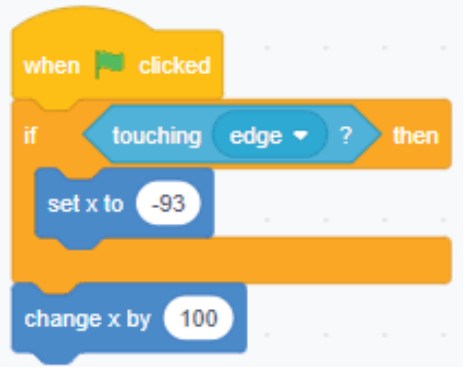
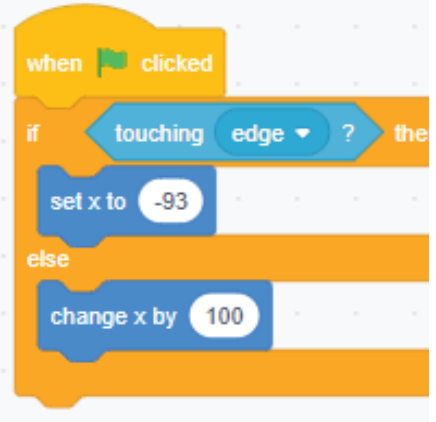
2. The sprint will move right wide and reach out of the stage. As shown in the figure below, the sprint cannot make any move after that. This will lead us to the next question.



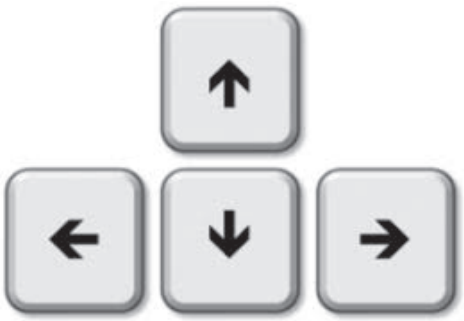
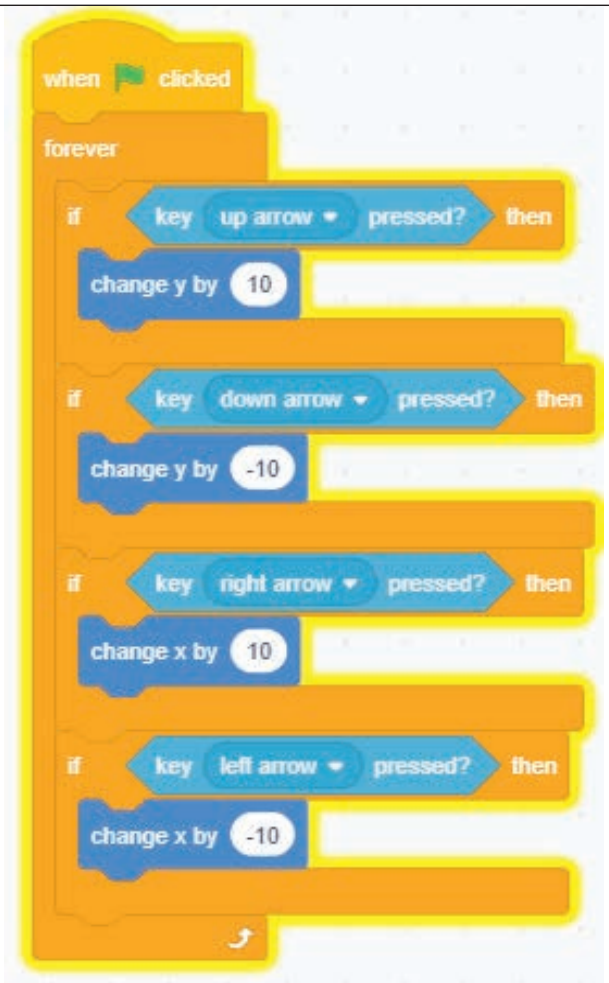
3. Dear teacher: this answer is given to question numbers 3 and 4. It helps students to familiarize with blocks in the control, motion, sensing and event categories.

   Solution A uses *if on edge bounce* block from motion palette to bounce when the sprint touches the edges at both ends of the x-axis. Solution B uses the *if* block to take the x-axis of the print to position -93 when the edge is touched. The *touching edge* is a block that is found in *sensing* category. Solution C is similar

to Solution B. Ask students about the difference between the two. Solution B is unidirectional (i.e. it has nothing to do when the condition is FALSE whereas Solution C is bidirectional.

Solution A	Solution B	Solution C
		

4. Dear teacher, there are a number of keyboards only games are designed and played online. An example is a catch game - a game where you catch things falling from the sky. This activity can be a good starting point for faster learners to start their own game design. It uses a *forever* loop, a loop that remains active until the application closes. Inside the loop, we use a keyboard event, i.e. when *key …. pressed* block to do a movement of the sprint in x and y direction. See the *key space pressed* block from the *Sensing* category, which is a keyboard event of pressing anyone of the keys from the keyboard. Out activity uses only the up, down, left and right arrows. Clicking one of these keys causes a 10-step move towards the specific direction. The script below used a sequence of *if* control pallets for the purpose.

Arrow Keys	Scratch Script
	

5. Dear esteemed teacher, this activity helps students to practice iterations for a fixed number of rounds. The *repeat N* loop block from the Control category helps to do such iteration. Here, the cat sprint plays "meow" sound for 10 times. To hear the meow sound distinctively, a *wait N second* block is used from the Control category.

Fixed round looping


6. Dear teacher, this activity helps students to practice iterations that run until certain conditions are met. In this script, the concept of *variable* and *operator* are used. For example, we create a variable *count*, to do which use the *make a variable* pallet in the *variable* category. In the *repeat until, we added* the equality operator from the *operator* category. You can drag the variable *count* from the variable control as the left value of the *equality* condition and adjusted the right value to the required value, which is *5* in the script below. The value of *count* variable is set to 0 before the loop and inside the *play sound Meow until done* block is added from the Sound category. The variable is changed by 1 using *change count by 1* block from a variable category. The iteration stops when *count* becomes 5.

Repeat until loop



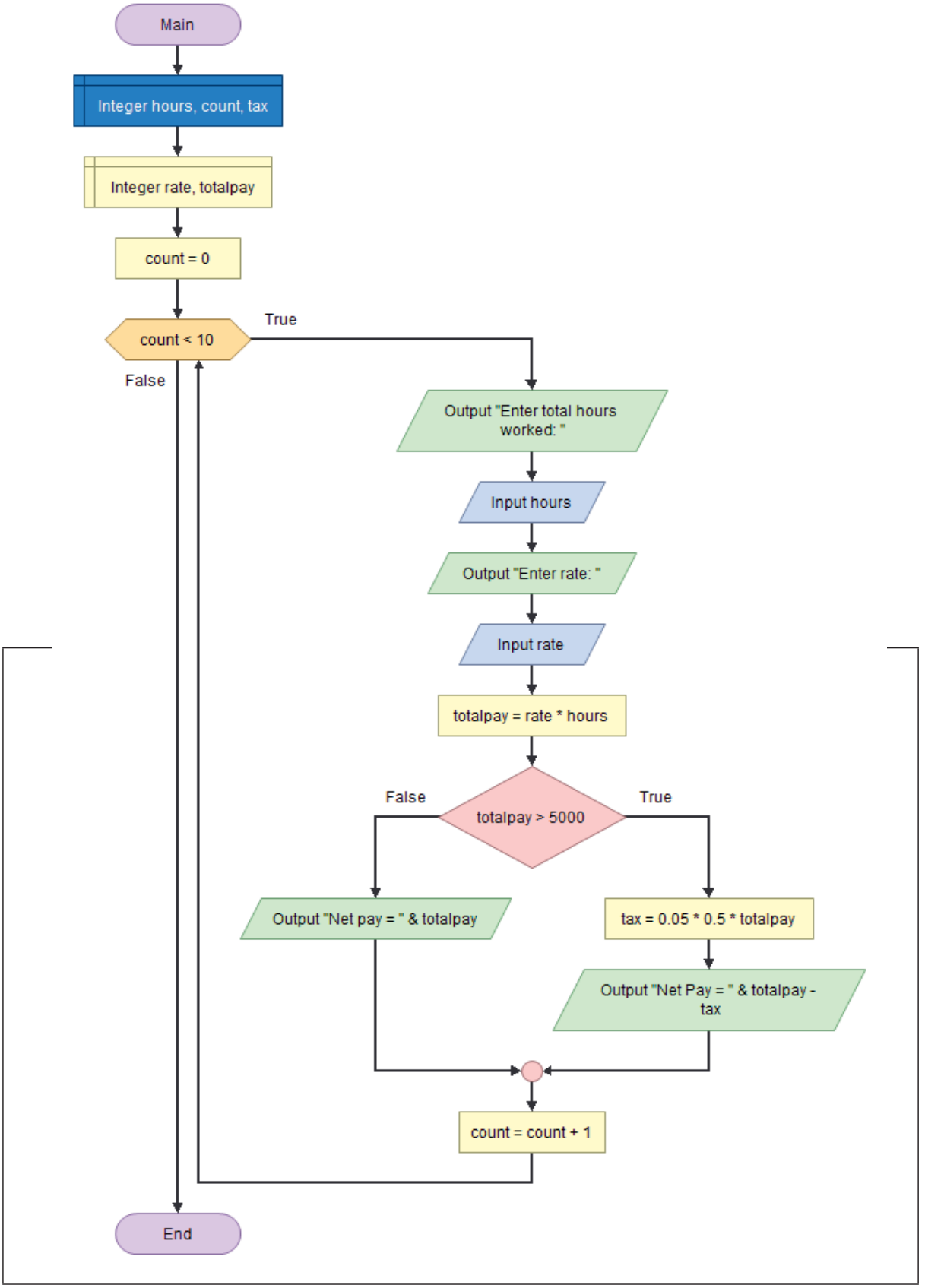
1. Dear teacher, students are exposed to decision, and looping structures in section 6.3 of the Student's Textbook. The students also developed flowcharts and Scratch scripts applying different control structures in the previous practical exercises. The difference between the above control structures is the following:
    - *if <condition> then …..:* this control structure performs the body part (*then ……*) when the *<condition>* is TRUE. It has nothing to do when the *<condition>*is FALSE.
    - *if <condition> then …. else …..:* in this case there is something to do when the *if <condition>*returns FALSE. So, it is a two way conditional statement.

- The *forever*, *repeat N…*, *repeat until<condition>*, are loop control structures. Flowgorithm and many programming languages have also the *while*, *for* and *do* structures to control loops. Their prime differences are the following:
    - *Forever* has no predetermined condition to stop. The loop does not stop unless otherwise the application is closed or the loop is interrupted forcefully by a code inside.
    - *Repeat N:* is count-controlled loop. The count increases by one each time when one cycle of the loop completes. When count reaches N, the loop automatically stops.
    - *Repeat until <condition>:* unlike the *repeat N*, the number of iteration to make is not pre-determined. The *condition* can be set while the flowchart is evaluated by accepting it from an input statement. Thus, *repeat until <condition>*loop structure is used when the loop stopping condition or number of iteration required to finish a task cannot be determined during the design.

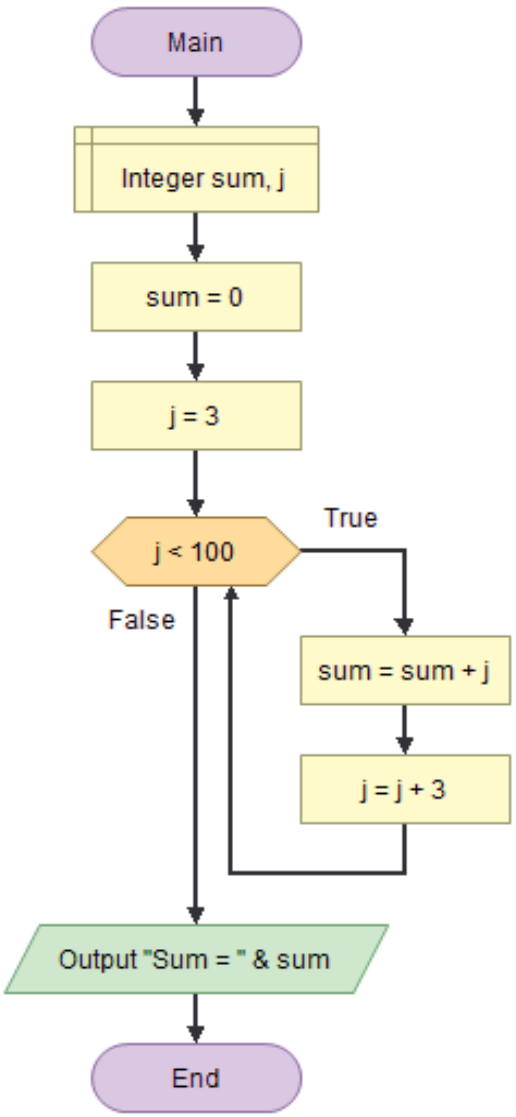
Answers to Practical Exercise 6.5

1. Dear teacher, this is an extension of question No. 6 of Practical Exercise 6.5. Students worked on drawing a flowchart to calculate net-wage of a single labourer. Here you make it work for 10 persons by adding a looping structure. This helps to iterate through some block of flowchart for a limited number of times, which is 10 times for this question. The flowchart is shown below. As it is shown, the looping used an iterator variable *count* that is 0 at the beginning. The loop has a condition that asks *Is count < 10.* As long as this condition holds *TRUE*, the evaluation iterates inside the loop (See the cyclic arrows). However, there is a modifier for the iterator variable *count*, which adds 1 on its existing value by the statement: *count = count + 1.* The iteration stops when *count* equals 10 as 10 < 10 becomes False. The hours worked, the hourly rates, tax calculation and display the net-wage are computer inside the loop.

Flowchart to calculate net-wage of 10 laborers

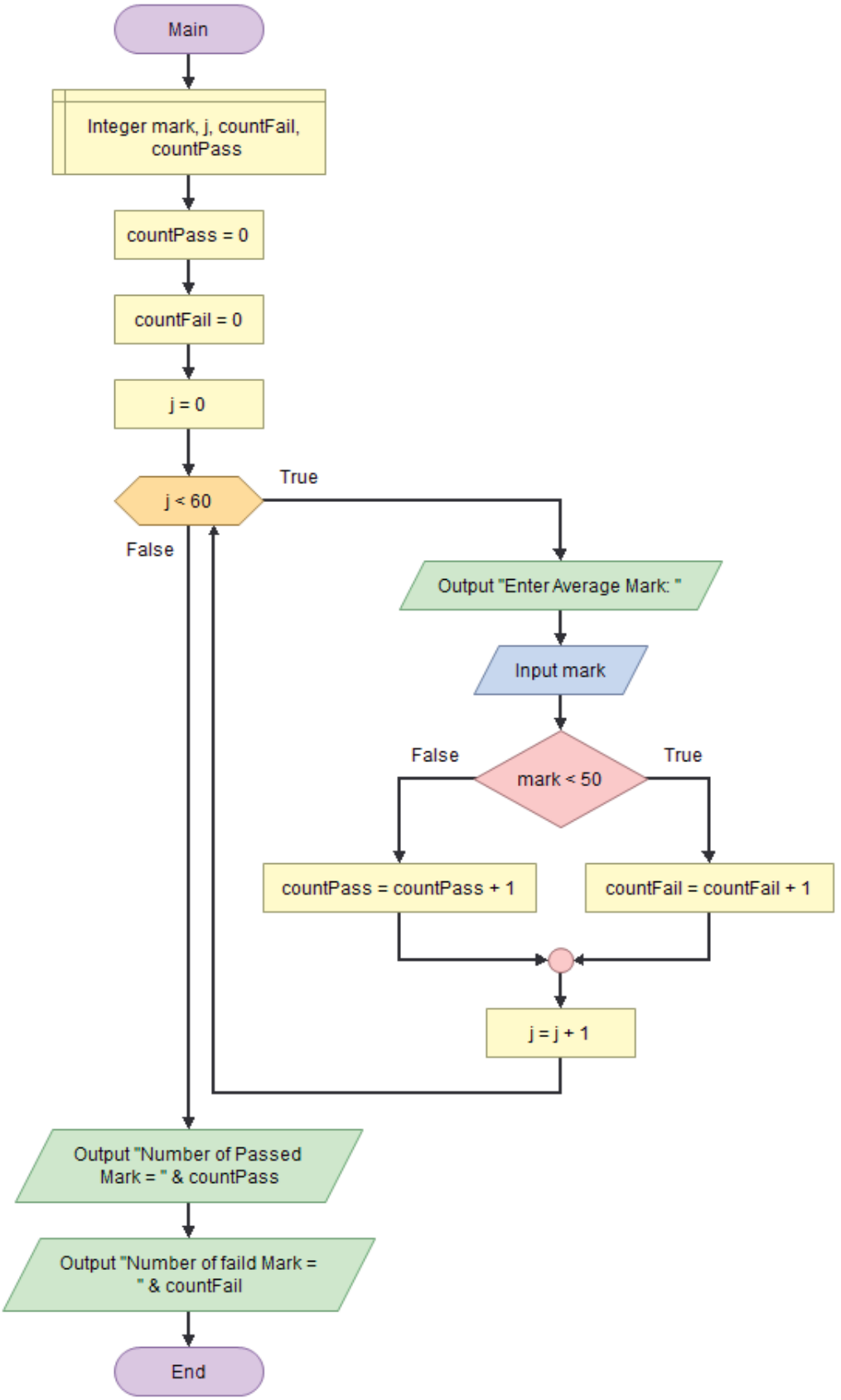


2. Dear teacher, this question demands students to add 3 + 6+ 9 +…. until the multiple of 3, *j* is 99. This can be done by having a variable sum that has an initial value of 0, the identity property of addition. So, the loop can go until j < 100 holds TRUE. The flowchart and auto-generated flowchart is shown below in the table.

Flowchart	Auto-generated Pseudocode
	Function Main Declare Integer sum, j Assign sum = 0 Assign j = 3 While j < 100 Assign sum = sum + j Assign j = j + 3 End Output "Sum = " & sum End

3. Dear teacher, this a looping flowchart to count failed and passed marks by accepting 60 marks one by one. Therefore, we need an iterator variable say j. For each iteration, we accept a mark from 100 and add 1 to CountFail if mark < 50. Otherwise we add to CountPass. The flowchart is presented below.

Flowchart


Main
Integer mark, j, countFail, countPass
countPass = 0
countFail = 0
j = 0
j < 60
True
False
Output "Enter Average Mark: "
Input mark
mark < 50
False
True
countPass = countPass + 1
countFail = countFail + 1
j = j + 1
Output "Number of Passed Mark = " & countPass
Output "Number of faild Mark = " & countFail
End

6.4 Problem Solving Approaches

In this subunit, students will learn about the two approaches for developing an algorithm, which are top-down and bottom-up approaches, for different problems. The topics to be learnt are:

- Top-down Problem-solving Approaches
- Bottom-up Problem-solving Approaches

At the end of this section, students will be able to:

- Use top-down and bottom-up problem solving approaches.
- Develop flowchart with subroutines or models.

These topics are expected to be covered in **3 periods**.

Instructional Strategies

Dear teacher, use brief lecture with examples to discuss the two problem solving approaches and their advantages and disadvantages. After this, let 2-5 student form a group and do Activity 6.4 and at the end summarize the main points.

Required Instructional Resources

Dear teacher, you can show them problem solving approaches using different examples in a computer lab using sample problem.

Assessment Strategies

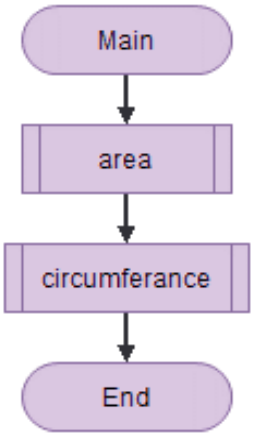
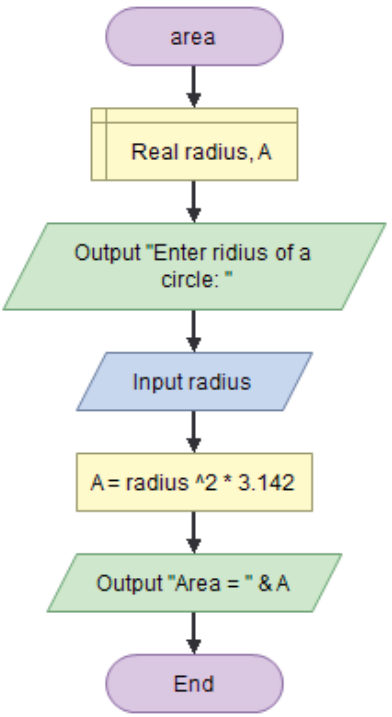
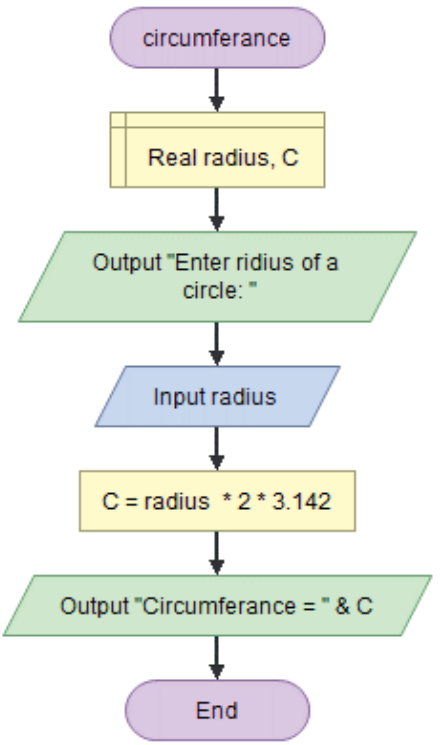
- Observe students' group discussion.
- Evaluate students while they are doing the activity of this subunit.

Answers to Practical Exercise 6.6

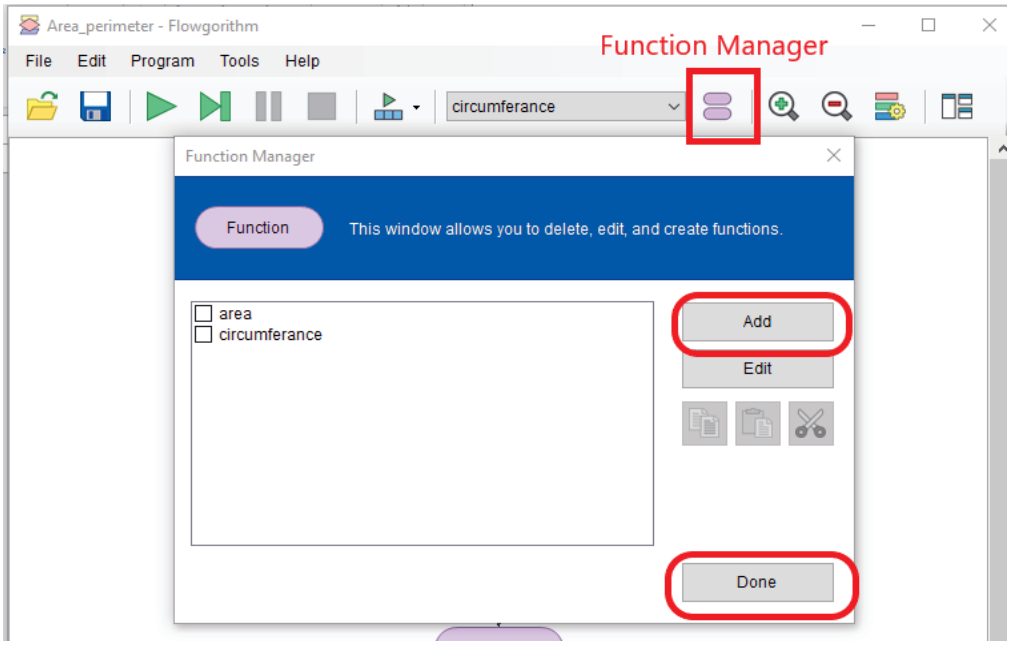
1. Dear teacher, the purpose of this exercise is to help students apply top-down approach. Consider that a student is developing a program for concepts related to a circle. The related concepts are origin, radius, diameter, area, arc, sector, chord, circumference and tangent. Most of these concepts have formulas to calculate their values. If we are going to develop a complete education tool related to a circle, then the time required is larger and we could need different persons to work on specific tasks to integrate later as a complete system. Here comes the concept of modularization, splitting the bigger task or problem into a smaller one, developing algorithm and program for the smaller one and then combining into a larger system. In the Flowgorithm flowchart, we have three modules: *main, area* and *circumference.* The *main* module is an interface and helps to integrate the other modules into a bigger whole. The *area* module

receives *radius* and calculates the area of a circle. The *circumference* module receives *radius* and calculates the circumference of a circle.

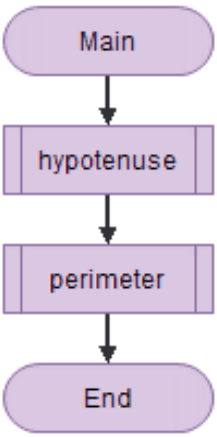
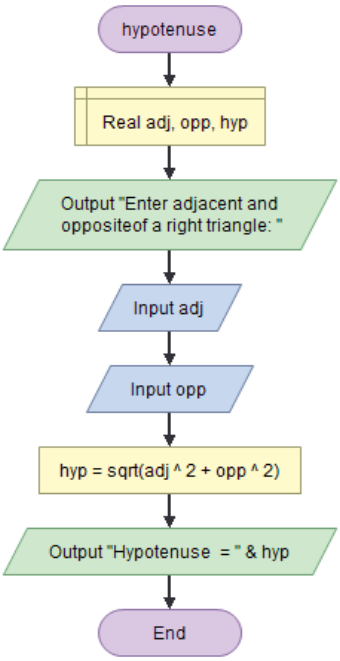
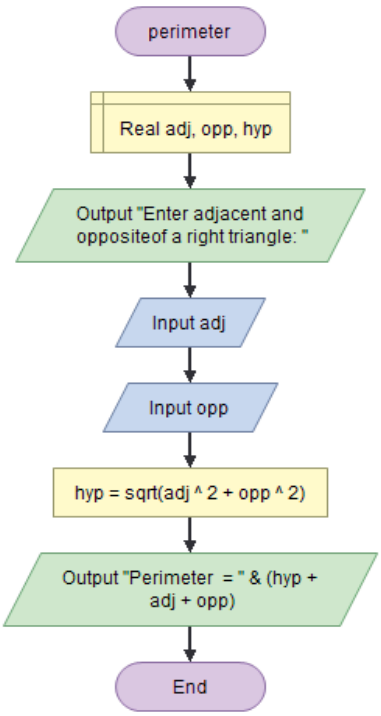
As you see, the *main* module has two submodule calls. First, it calls the *area* module and then the *circumference* module sequentially.

Main Module	Area Module	Circumference Module
		

To add a module to your Flowgorithm flowchart, select *Add* from a pop-up window when you click the *Function Manager …* toolbar button.



2. Dear teacher, you can do this in the same way as you did in question number 1. The modules are shown below. Note that function calling is not within the scope of grade 9, so parameter passing and value that modules return are not discussed here. The modules used the intrinsic function *sqrt*. Let students see different functions from http://www.flowgorithm.org/documentation/intrinsic-functions.html.

Main Module	Hypotenuse Module	Circumference Module
		

Answers to Practical Exercise 6.7

Dear teacher, the two questions in this practical exercise are not meant for teaching instead they are designed for a group project. It is better if you do the following to help the students learn from this end of year student project.

1. Develop a project guide that includes a YouTube or Wiki video for the students to watch and some instruction on building a story for the game. The following guide on *catch game cards* can be a good support here. https://resources.scratch.mit.edu/source/cards-old-scratch2/InDesign-files/catch/Catch%20Game%20-%20Scratch%20Cards%20Files.pdf. The YouTube video on storytelling about UN Sustainable Development Goal 3 at https://www.youtube.com/watch?v=TKjSGzViZL0 is a good example for the second exercise.
2. It is good if you give students 3 to 5 days for the project and arrange a laboratory hour for them during their free hours.
3. Students learn better when they know how they are going be evaluated. Therefore, it is good if you develop a *rubric* for the project. You can get a model from https://scratched.gse.harvard.edu/resources/rubric-assessing-scratch-projects-draft-0.html.
4. As an end of the year project, let the students develop a report on word processing software. They can report about how they understand the problem given, what design or storyboard they developed and the work division among the team members. The sprints and stages that they used as well as the script that they developed need to be listed and explained. Let them record screenshots of their video game or story and include it in their report. The report should also include their reflection after their project accomplishment. They need also to prepare a slide presentation of their report together with demonstration of their game for you and their classmates.

The two questions are:

1. Design Scratch Games. There are many online games that you can play online. You can also design your own games with scratch. Do you know kids video games such as catch game, Pong, Flappy Bird, PacMan and Mario Bros? You can also develop your own! What is needed? Games have actors – sprites, for example, apple and a bowl for Catch game. You need also scripts, which are actions that a sprite takes during the play. For example, the bowl makes

horizontal move to collect the falling apples. You also need stages that change as needed in the game. Read about one of the games and develop a scratch script for the game. Note that you need to apply a careful planning and implementation and teamwork activities.

2. Telling story in scratch. Ethiopia is a historical country with rich cultural diversity and many attractions. What touristic attractions and cultural stories your community has to tell to the world? We have also many issues to tell your young brothers and sisters, and kids to correct bad habits and unhealthy practices in the country. For example, drug addiction, improper walkway usage in cities and towns, abuses towards child and female students are all common problems in Ethiopia. Scratch helps you build stories and put them online to share your stories with kids or global audiences. Oh, what a golden opportunity! Watch online videos on how to make a story in scratch and build your own story. What you need is determining your characters, scenes and writing dialogues. Using wait and broadcast makes your story interactive. Remember, this also needs a problem solving strategy that involves proper planning and task division and teamwork.

Alternative Teaching Approaches

The Scratch's website at https://scratch.mit.edu/ has many educational resources. It has links to previous Scratch projects to explore and activity guides (in the *idea*) as well as tutorials. Hence, these create ample opportunities to develop block programming skills of students. Dear teacher, let your students be with a good Internet connection and original game and story design to create their project online at https://scratch.mit.edu/ and share their games and stories.

6.5 Unit Summary

- A program is a sequence of instructions that can be executed by a computer to solve some problems or perform a specified task.
- A program development shall pass through a stage or steps to decrease the complexity of the problem.
- The first step in developing a program is try to understand the problem at hand that to be solved using computer program.
- After clearly identifying the objectives of the problem, the second step

is developing an algorithm that can be done using pseudo code and or flowchart.

- Pseudo code is English like statement that represents the algorithm and flowchart in diagrammatic representation of the algorithm.
- Since, most of the time, it is difficult and time consuming to draw than writing something, pseudo code is preferable than flowchart.
- Problem can be solved using top-down and bottom-up problem-solving approaches.

6.6 Answers to the Unit Review Exercise

Part I: Answers to True/False Items

1. True
2. True
3. False
4. False
5. False

Part II: Answers to Multiple Choice Items

1. C	3. A	5. C	7. A
2. B	4. D	6. C	

Part III: Answers to Short Answer Items

1. The bottom-up approach first identifies the small chunks of the problem and solves it moving its way to the top while the top-down approach divides the bigger problem into smaller parts and solves it. Bottom-up approach is better as it focuses on the fundamentals first and then moves on to the original problem as a whole.
2. The top-down approach translates into an approach where a bigger problem is solved by breaking it down into smaller parts.
3. A top-down approach is better when management perspective is considered. The decision-making is comparatively faster and the teams are working on smaller problems and, hence, not trying to solve the entire problem at once which might make them overlook certain aspects of the problem.

4. There are 4 steps that you should follow in order to solve a problem:
    a. Understand the problem
    b. Develop an algorithm
    c. Write the program
    d. Test the program.
5. A computational thinking is the skill of formulating and solving problems by breaking them down into simple steps as well as through synthesizing simple steps into bigger solutions.