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INFORMATION TECHNOLOGY TEACHER'S GUIDE GRADE 10

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Grade 10

TEACHER'S GUIDE

Federal Democratic Republic of Ethiopia Ministry of Education

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INFORMATION TECHNOLOGY

Grade 10

Teacher's Textbook

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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
2022

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 the file management system.
- Analyze extensions of file types.
- Organize, delete and restore files and folders.
- Summarize file formats.
- Convert a file into different formats.

1.1 Unit Overview

Dear teacher, in grade 9, students learned about file management and related concepts such as files, folders, file drivers and methods of file creation, naming and renaming files and folders, and ways of accessing drives. In this unit, they are going to learn advanced concept of file management such as file types, file extensions, drivers and paths. They will also learn about methods of file conversion, saving and deleting files, file backup and recovery, storage drive, and file import and export mechanisms.

*Dear teacher, this unit is expected to be covered within **12 periods**. The detail of period allotment for each subunit is listed in the table below.*

Suggested Lesson Plan (12 Periods)

No.	Subunits	Number of Periods
1.1	Unit Overview	1
1.2	File Management	
1.3	Storage Drives	1
1.4	File Name Extension	2

1.5	File Directory Structure	1
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1.9	File Backup and Recovery	1
1.10	File Compression	1
1.11	Deleting a File	1
1.12	Restoring Deleted File	1
Total periods required for the unit		12

At the end of the unit students will be able to:

- Perform file management

Instructional Strategies

Teacher talk (lecture), explanation, skills practice, instruction, demonstration, group discussions and problem-solving activities

Required Instructional Resources

- Computer, MS Office software, computer network and Internet connection
- Projector/LCD
- Textbook, pictures, diagram and illustrations

Assessment Strategies

Portfolio, question and answer, exercises (homework, classwork and assignment) and observation.

Esteemed classroom teacher, you can use a variety of learning strategies to teach these topics, including teacher talk (lecture), explanation, illustration, demonstration and discussion. Students should be given enough time to reflect on their individual classwork activities to other students in class.

1.2 File Management

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

- Explain the concept *file*.
- Explain the uses of filing cabinets and drawers in managing files.

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

Dear teacher, explain the concept of file, its importance and the ways files are managed in schools in traditional means.

Instructional Strategies

Group work and teacher talk or lecture. Dear teacher, you should also be aware that enough time should be allotted for students to do, reflect and discuss their class activities.

Required Instructional Resources

Computer or other devices, figures, textbook, whiteboard and whiteboard markers

Assessment Strategies

Portfolio, question and answer, exercises (homework, class work and assignment) and observation

Dear esteemed teacher, to cover these topics, you might utilize varieties of instructional strategies such as gap lectures, illustrations and discussions. In addition, if the indicated instructional resources are unavailable, you may use locally accessible instructional resources in class such as blackboard, chalk and diagrams.

Answers to Activity 1.1

Respected teacher, the purpose of the questions in this activity is to assess students' prior knowledge of files and how to utilize them as well as to link the concept to the current learning topic.

In this activity, you may instruct students to list examples of files such as student records in schools, patient care in hospitals, etc. Students may also provide answers for about *uses of file management* in different ways. The possible answers can be stated as easy access, update and searching when needed.

- Note that there is considerable confusion on the main differences between a disk and a drive, particularly in relation to windows operating systems. Indeed, in many instances, the terms are even used interchangeably.
- You may briefly explain their differences as follows.
- A disk is a physical storage device and a drive is a file system that may exist on many disks.

Additional Tips for Teachers: Visit the following website for more details on file management.

Tip

https://www.glasscubes.com/why-is-file-management-important/

1.3 Storage Drives

In this subunit, students will learn the concept of *computer drive* that is used to read and store information in a computer. Besides, students will learn how to explore drive types and assigned letters in Microsoft Windows environment. In addition, they will explore file storage places such as hard drives (like hard disc and removable storages) and cloud-based storages such as OneDrive and Google drive.

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

- Define computer drive.
- Explore drive types and letters denote them.
- Identify file storage places.

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

Instructional Strategies

Demonstration, class discussion, lecture, question and answer

Required Instructional Resources

Computers, LCD projector, textbook, diagrams, whiteboard and whiteboard marker

Assessment Strategies

Lecture, demonstration, homework, question and answer

Dear classroom teacher, several learning strategies such as lecture, demonstration and group discussion can be used to cover these topics. If the instructional materials mentioned above are unavailable, you can use locally available educational resources such as a chalkboard, chalk and diagrams in class.

You may also arrange students' in groups to discuss the relationship between file cabinets and folders, and the relation between manual and digital file storages and then allow them

to report their groups' answers to class.

Answers to Activity 1.2

In this activity, let students open the desktop computer at the school laboratory and practice step-by-step as it was stated in the textbook.

Respected teacher, please observe the students' performance.

Answers to Activity 1.3

In this activity, students will differentiate between the file name and the file extensions. Moreover, students will identify various application files and their types using their file extensions. For instance, there are application files (word, excel, database, PowerPoint and pdf), audio files (.mp3 and .mp4 formats), pictures (.jpg, and .png formats), executable programs (.exe) and compressed file format (.zip).

- File attributes are characteristics that describe a file (file name, file extension).
- A cloud drive is a Web-based service that provides storage space on a remote server. Cloud drives, which are accessed over the Internet with client-side software, are useful for backing up files. Figure 1.4 on the Student's Textbook shows the cloud drive icon.
- Some users may be confused with a "drive" with a "driver." These are separate terms. If you are looking for help with installing or updating the software related to hardware, the driver is a group of files that enable one or more hardware devices to communicate with the computer's operating system. Without drivers, the computer could not send and receive data correctly to hardware devices such as printer.

Additional Tips for Teachers: Visit the following website for more details on file extensions.

Tip

https://www.glasscubes.com/why-is-file-management-important/

1.4 File Name Extension

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

- Explain file extensions and their applications.
- Identify file extension types.
- Differentiate among file extension formats in different operating systems.

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

Esteemed teacher, explain to your students that file extension varies as per the operating systems. For example, in some operating systems like Unix, which is a command-based OS, the file extension is optional while in some others (such as Windows), it is a requirement. Some operating systems limit the length of the extension; for instance, DOS uses three characters; Windows uses three or four characters while Unix uses unlimited characters.

Instructional Strategies

Group discussion, lecture and demonstration

Required Instructional Resources

Computers, LCD projector, textbook, whiteboard and whiteboard markers

Assessment Strategies

Observation, question and answer, group discussion and reflection

Respected teacher, to deal with these topics, several learning strategies such as lecture, demonstration and group discussion can be employed. You can also use locally accessible educational resources such as chalkboard, chalk and diagrams in class if the aforementioned mentioned instructional resources are unavailable.

1.5 File Directory Structure

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

- Define *file directory structure*.
- Identify root directory and subdirectories.

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

Instructional Strategies

Group discussion, lecture and illustration

Required Instructional Resources

Computers or other devices, LCD projector, diagram, textbook, whiteboard and whiteboard marker

Assessment Strategies

Observation, question and answer, group discussion and reflection

Dear honored teacher, these topics can be covered using varieties of learning methods such as lecture, demonstration and group discussion. If you do not have access to the materials indicated above, you can use locally accessible teaching resources such as a chalkboard, chalk, and diagrams in class.

1.5.1 Directory Path or File Path

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

- Describe file and directory paths.
- Differentiate between absolute path and relative path.

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

Instructional Strategies

Group discussion, Lecture, and Illustration

Required Instructional Resources

Computers or other devices, LCD projector, diagram, textbook, whiteboard and whiteboard marker

Assessment Strategies

Observation, question and answer, group discussion and reflection

Dear honored teacher, these topics can be covered using varieties of learning method, such as lecture, demonstration and group discussion. If you do not have access to the materials indicated above, you can use locally accessible teaching resources such a chalkboard, chalk, and diagrams in class.

Answers to Activity 1.4

Respected teacher, in this activity, students have to practice how to identify file paths including absolute paths and relative paths. Besides, students will provide answers based on the directory structure illustrated in Figure 1.10 of the Student's Textbook. Accordingly, please observe while students discuss and answer each question.

Possible Answers to questions 1 and 2:

1. The set of names required to specify a particular file in a hierarchy of directories is called the path to the file, which you specify as a pathname. Pathnames are used as arguments for commands.

   For example, if the file path is D: sources, the current directory is C:\Documents\ and the last current directory on drive D: was D:\sources\, then the result is D:\sources\sources. These "drive relative" paths are common sources of program and script logic errors.

2. An absolute path is defined as specifying the location of a file or directory from the root directory (/). In other words, we can say that an absolute path is a complete path from the start of the actual file system, from the / directory. **Relative path** is defined as the path related to the present working directly. It starts at your current directory and never starts with a slash (/).

- Paths include the root, the filename or both. That is, paths can be formed by adding either the root, filename or both to a directory.
- An absolute path refers to the complete details needed to locate a file or folder, starting from the root element and ending with the other subdirectories. Absolute paths are used in websites and operating systems for locating files and folders. Absolute path is also known as absolute pathname or full path.

Additional Tips for Teachers: Visit the following website for more details on file directory structure.

Tip

https://www.guru99.com/file-systems-operating-system.html

1.6 File Conversion

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

- Define *file conversion*.
- Identify various file formats.

- Apply file conversion on different file formats.
- Describe the importance of file conversion.

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

Instructional Strategies

Group discussion, lecture and illustration

Required Instructional Resources

Computers or other devices, LCD projector, diagram, textbook, whiteboard and whiteboard marker

Assessment Strategies

Observation, question and answer, group discussion and reflection

Esteemed teacher, these topics can be taught using varieties of learning strategies including lecture, demonstration and group discussion. If you do not have access to the instructional resources listed above, you may use locally available teaching resources such as a chalkboard, chalk, and diagrams in class.

Answers to Activity 1.5

Dearly teacher, make sure that students are able to define file conversion, identify the types of file conversion, and analyze the steps on how to convert drawing and image files in this activity. Summarize the advantages of converting file from one format to another. Finally, identify the file formats that cannot be converted into drawing formats or vector graphics formats.

Possible Answers to the Questions

1. File conversion is changing a file into another type. For example, taking a file used in the Word document (. Docx) and converting it to the Portable Document Format (PDF) file format.
2. File conversion is the process of taking a file of one format and changing it into another. This is especially handy since you may one day work with files that are not compatible with the different programs you need to use.
3. Go to File ➔ Save as and open the Save as type drop-down menu. You can then select JPEG and PNG as well as TIFF, GIF, HEIC and multiple bitmap formats. Save the file to your computer and it will be converted.

- Vector graphics are commonly found today in the SVG, WMF, EPS, PDF, CDR, or AI types of graphic file formats and are intrinsically different from the more common bitmapped graphics format such as JPEG, PNG, APNG, GIF, WebP, BMP and MPEG4. SVG stands for scalable vector graphics. It is the new format that is used to display vector images directly; there is no need to create bitmap versions of images.
- Bitmapped graphics format is a rectangular array of regularly sampled values, known as pixels. Each pixel (picture element) has one or more numbers associated with it, specifying a color in which the pixel should be displayed.
- The difference between bitmap and vector graphics is that bitmap graphics use pixels to represent images while vector graphics use basic geometric shapes to represent the same. In brief, in vector format, the picture quality remains as it is, regardless of the image size.

Additional Tips for Teachers: Visit the following website for more details on file conversion and its methods.

Tip

https://www.howtogeek.com/352668/how-to-convert-a-microsoft-word-document-to-a-pdf/

1.7 File Importing and Exporting

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

- Define file import and export methods.
- Examine the steps of applying how to import and export files.

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

Instructional Strategies

Group discussion, lecture and illustration

Required Instructional Resources

Computers or other devices, LCD projector, diagram, textbook, whiteboard and whiteboard marker

Assessment Strategies

Observation, question and answer, group discussion and reflection.

Respected teacher, these topics can be taught employing varieties of learning strategies including lecture, demonstration and group discussion. If you do not have access to the instructional resources listed above, use locally available teaching resources such as chalkboard, chalk and diagrams in class.

Answers to Activity 1.6

Dear teacher, in this activity, observe while students discuss and answer each activity and give directions on how to import and export files.

Possible Answers to the Questions

1. File import is the process of moving files or data used in one program to another. See Figure 1.12 in the Students' Textbook. When you import, you are bringing information from a file into a program. For example, you could import a CSV file you downloaded from the Internet into an Excel spreadsheet. A file export is a process of moving information from a program into a file. When you are exporting, you are taking information from a program and putting it into a file. For example, you may export a Microsoft Excel spreadsheet to a CSV file.
2. Click on file ➔ Choose Save As option ➔ Choose file location (desktop) ➔ Select the file format from the Save as type box ➔ Provide a filename and click on the Save button. Your file will automatically be saved in the specified location and name with the selected format.

1.8 Saving and Opening Files

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

- List the steps required to open and save files.
- Apply correctly the steps while opening and saving files.

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

Instructional Strategies

Class work, lecture and demonstration

Required Instructional Resources

Computers or other devices, Microsoft Word installed in computers, LCD projector, textbook, whiteboard and whiteboard marker

Assessment Strategies

Observation, question and answer, evaluating steps and group discussion

Dear teacher, to teach these topics, you may use different learning strategies such as lecture, demonstration and group discussion. Moreover, you may use locally available instructional resources such as blackboard, chalk and diagrams in class in case the instructional resources stated above are not available.

Answers to Practical Exercise 1.1

Dear teacher, in this activity, students are expected to practice opening and saving files in Microsoft Windows 10, or other versions of it or other types of operating systems.

- You may guide them and monitor while your students are saving the files in different formats, explaining the advantages of saving the files in different file formats.
- Encourage students to open Microsoft Word and write one page about the Grand Ethiopian Renaissance Dam and save it with the name Ethiopia. Observe the conversion of word file format into PDF.

- Saving a file is critical for editing, preserving and sharing your work. If the program closes or your computer shuts down unexpectedly while you are using Word, you should not worry. By default, Word automatically saves your work every 10 minutes and will reload that save upon reopening the program.
- The benefit of saving files in different formats is that you can save storage space. Zipping large files can save up to 80 percent or more in hard disk space. A smaller file size drastically reduces e-mail transmission time.

Additional Tips for Teachers: Visit the following website for more details on saving and opening files.

Tip

https://www.computerhope.com/issues/ch001833.htm

1.9 File Backup and Recovery

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

- Explain file backup and recovery concept.
- Apply necessary steps for taking a file backup.
- Use the steps for file recovery to restore files.

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

Instructional Strategies

Classwork, lecture and demonstration

Required Instructional Resources

Computers or other devices, LCD projector, diagram, textbook, whiteboard and whiteboard marker

Assessment Strategies

Observation, question and answer, evaluating steps and group discussion

Esteemed teacher, these topics can be delivered using a range of learning methods such as lecture, demonstration and group discussion based on your interest. Use locally accessible teaching materials such as a chalkboard, chalk and diagrams in class if you do not have access to the instructional resources specified above.

Answers to Practical Exercises 1.2 and 1.3

Dear teacher, through these exercises, make sure that your students have developed skills of taking backup and performing file recovery procedures on Microsoft Windows or other platforms. You may instruct and guide students while taking file backup from their computer and saving it into another drive or removable storage such as flash disk, external hard disk or memory stick. The steps are described in the Student's Textbook and stated as follows for your reference.

Select the Start button, then select Control Panel ➔ System and Maintenance ➔ Backup and Restore. Choose Select another backup to restore files from, and then follow the steps in the wizard. If you are prompted for an administrator password or confirmation, type the password or provide confirmation.

- Backup and recovery describe the process of creating and storing copies of data that can be used to protect users against data loss. This is sometimes referred to as operational recovery.

- Data recovery and backup system are vital to ensure that your data are protected at all times. Users at any system are only humans, and a data recovery system warns to ensure that he/she is not going to lose it forever even if someone saves a vital document.

Additional Tips for Teachers: See the following website for more details on file backup and recovery procedures.

Tip

https://www.datto.com/blog/data-backup-and-recovery-methods-the-basics-you-need-to-know

1.10 File Compression

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

- Define file compression and explain its use.
- Apply necessary steps used to compress a file.

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

Instructional Strategies

Classwork, lecture and demonstration

Required Instructional Resources

Computers or other devices, LCD projector, diagram, textbook, whiteboard and whiteboard marker

Assessment Strategies

Observation, question and answer, evaluating steps and group discussion

Answers to Practical Exercise 1.4

Dear teacher, in this practical exercise, you can guide students to zip and unzip files using various tools. Observe how they are doing in their groups and assist them as they perform the exercise.

- File compression is a data compression method in which the logical size of a file is reduced to save disk space for easier and faster transmission over a network or the Internet. It enables the creation of a

version of one or more files with the same data at a size substantially smaller than the original file. Examples of compressed file extensions are RAR, ZIP and TAR.

- When a file is compressed, it uses less storage space, so it can save room in memory or on disk drives and, since it is smaller, it can be sent and received faster over computer networks.

1.11 Deleting a File

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

- Describe steps needed to delete a file.
- Apply steps to delete a file.

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

Instructional Strategies

Class work, lecture and demonstration

Required Instructional Resources

Computers or other devices, Microsoft Word installed in computers, LCD projector, textbook, whiteboard and whiteboard marker

Assessment Strategies

Observation, question and answer, evaluating steps and group discussion

Dear revered teacher, to teach these topics, you can utilize a range of learning techniques such as lecture, demonstration and group discussion. Moreover, if the suggested teaching resources are not available, you can use locally available educational resources such as a chalkboard, chalk and diagrams in class.

Answers to Practical Exercise 1.5

In this practical exercise, students will practice deleting a file/folder in Microsoft Windows or other platforms. You need to instruct and guide them while they are deleting files from their computers. The steps are described in the Student's Textbook and mentioned hereunder.

Right-click on the File/folder you want to delete-> in the options menu choose Delete

Additional Tips for Teachers: Visit the following website for more details on file delete options.

Tip

https://courses.lumenlearning.com/wm-compapp/chapter/deleting-files-and-folde

1.12 Restoring Deleted File

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

- List the steps required to restore deleted file from Recycle Bin.
- Restore deleted file from Recycle Bin.

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

Instructional Strategies

Classwork, lecture and demonstration

Required Instructional Resources

Computers or other devices, Microsoft Word installed in computers, LCD projector, textbook, whiteboard and whiteboard marker

Assessment Strategies

Observation, question and answer, evaluating steps and group discussion

Dear teacher, you may use different learning strategies such as lecture, demonstration and group discussions to teach this content. Again, you will possibly use locally available instructional resources such as blackboard, chalk and diagrams in class when the stated instructional resources are not available.

Answers to Activity 1.7

Respected teacher, students have to practice restoring deleted files and folders in Microsoft Windows in this activity. Please instruct and guide them while they are restoring files from Recycle Bin.

The steps are described in the student text and stated as follows for your reference.

Open Recycle Bin on your Windows computer->Select the deleted files which you want to recover ➔ **Right-click** on the selected files and click the **Restore** ➔ Now, your deleted the files from the Recycle Bin will be restored to their previous location.

Additional Tips for Teachers: Visit the following website for more details on ways of restoring deleted files.

Tip

https://www.lifewire.com/how-to-restore-deleted-files-from-the-recycle-bin

1.13 Unit summary

A file is the basic unit of storage that enables a computer to distinguish one set of information from another. It is the common storage unit in a computer, and all programs and data are written into and read from a file. A folder holds one or more files, and it can be empty until it is filled. A folder can also contain other folders, and there can be many levels of folders within folders.

A **folder** is a virtual location where programs, files, and other **folders** can be located. A folder is also called a *directory*. It is a tool for arranging files on a disk. Files are organized by storing related files in the same directory. In naming a file, the file would have two parts with a period character separating them. The part on the left side of the period character is called the main name while the part on the right side is called *extension*. File extension shows the type of file and the application that the operating system uses when opening it. Any file in the system can be located by following a path from the *root or master directory* down to various branches until the file is reached.

File import is the process of moving files or data from one program to another. **A file export** is the process of moving information from a program to a file. File conversion is the process of taking a file of one format and changing it into another. This is especially handy since you may one day work with files that are not compatible with the different programs you need to use.

Restoring is the process of copying backed-up data from a secondary location and restoring it to its original device or a new device. The purpose of the backup is to create a copy of data that we use to recover in the event of a primary data failure. *Backup and recovery* describe the process of creating and storing copies of data that can be used to protect organizations against data loss. This is sometimes referred to as operational recovery.

File compression is the data compression method in which the logical size of a file is reduced to save disk space for easier and faster transmission over a network or the Internet. It enables creating a version of one or more files with the same data at a size substantially smaller than the original file.

File deletion is the removal of a file from a computer's file system. The Recycle Bin is a location where deleted files or folders are temporarily stored in all versions of Windows operating systems. Data restoration is the process of copying backup data from secondary storage and returning it to its original or a new location. Restoration is performed to return data that has been lost, stolen or damaged to its original condition or move data to a new location.

1.14 Answers to the Unit Review Exercise

Part I: Answer Keys for True/False Questions

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

Part II: Answer Keys for Multiple Choice Questions

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

Part III: Answers for Discussion Questions

1. Operating systems differentiate one file from another using the file extension.
2.
    a. A movie in video CD: This file format has a file extension as .mp3, .mp4 and .MP5.
    b. A word processor file: The answer has a file extension as (.doc or .docx)
    c. A file in a musical CD. This has the extension .mp3.

d. A scanned image has a file extension: includes .PNG, JPG and JPEG.

e. A picture taken with a digital camera. This format has a file identification code such as JPEG, which is a popular format for digital images. Other digital camera image formats are PNG, JPG, TIFF, etc.

f. File sent in compressed format such as .zip

3. The exact rules for file naming vary somewhat from system to system, but all operating systems allow strings of one to eight letters as legal filenames. The file name is chosen by the person creating it, usually to reflect its contents. There are few constraints on the format of the filename. It can comprise the letters A-Z, numbers 0-9 and special characters $ # & + @ !( ) - { } ' ` _ ~ as well as space. The only symbols that cannot be used to identify a file are *, |, <>, \, ^, =, ?, /, [ ], ", " and control characters.

   - Examples of valid file names include *assignment.doc, memo.xls and report.pdf.*
   - Examples of invalid file names include *io*asst.doc, first? name. xls and payroll=list.pdf, exrecise12/2013.*

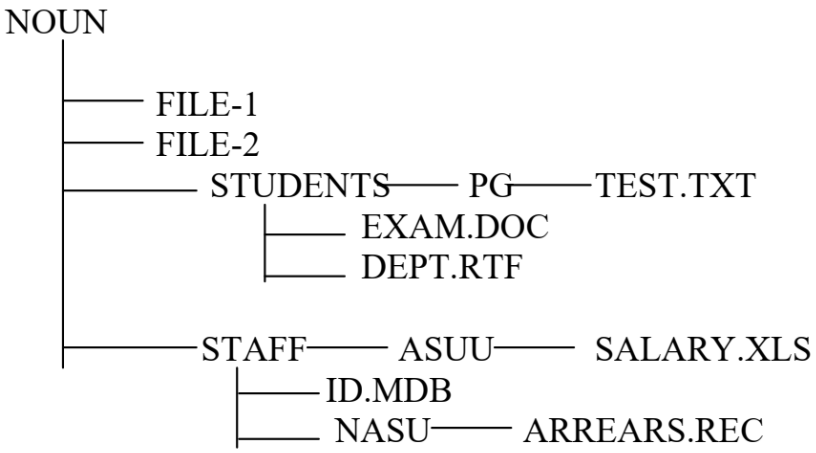
- *An absolute path* is defined as the specified location of a file or directory from the root directory (/). All absolute pathnames to a file or directory are unique and unambiguous. In other words, we can say that an absolute path is a complete path from the start of actual file system from / directory.

  Example of absolute path: /ls /etcls /usr/bin

- *Relative path* is defined as the path related to the present working directly or current directory.

  - Relative to present directory: ls. or ls
  - Relative to parent directory: ..
  - Relative to home of logged in user: ls ~
  - Relative to user admin' home: ~admin

4. The answers to this question are based on following diagram.



a. \NOUN\STUDENTS\EXAM.DOC
NOUN\STUDENTS\PG\TEST.TXT
\NOUN\STAFF\ASUU\SALARY.XLS

b. student\ dept.rtf and Staff\ id.mdf

5. Ethiopia's spreadsheet file has no file extension ***(.xls or .xlsx).*** Hence, Window does not know what program to use to open it.

6. The teacher should ask Ethiopia to resend the file with the file extension (Budget2021.xlsx). The other possible solution would be asking Ethiopia the application program she has used to create the file and the teacher can open the file with the specified program.

7. Budget2021.htm or Budget2021.html

8. A computer drive, which is also called a disk drive, is a device that stores digital information from your computer

9. Local disk (C:/), local disk (D:/), CD/DVD drive (E:/) and Removable drive (F:/)

10. To save a file you have created in Microsoft Word as PDF file, follow the following steps.

    Click on **File** menu ➜ Highlight and click on **Save As** option ➜ Type appropriate name on the File name box ➜ Choose the file type as PDF from the file extension option ➜ Click on Save button.

11.

    a. A **file path** is the list that begins with a drive letter that tells you which

folders to open so that you can find a file or another folder.

b. A **drive** is a piece of hardware that is used to **read** and **store** information on the computer and that is usually not as easily removed as a disk.

c. A **folder** is a virtual location where programs, files and other **folders** can be located.

12.

a. Absolute file path

b. root directory

13. This PC ➜ Documents ➜ Received Files ➜ Communication.pdf

14. The answers of this question are stated in the following table.

#	Drive Letter	Folder	Sub-folder	File Name	Extension
A	C:	Games	Solitaire	Solitaire	.exe
B	E:	Assignment	IT	hardware	.docx
C	C:	Program Files(x86)	-	Calculator	.exe

UNIT 2 COMPUTER NETWORK

UNIT OUTCOMES

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

- Explain transmission media.
- Describe telecommunications network.
- Explain mobile and cellular communications.
- Analyze satellite networks.
- Discuss data communication.
- Conceptualize the use of Internet protocols (IP).

2.1 Unit Overview

As it was defined and discussed in the grade 9, unit 2, the computer network is the connection of two or more computers or communication devices connected by transmission **media** and guided by a set of rules for communication purposes that allow users to communicate with each other and share applications and data.

This unit focuses on network media, telecommunications networks, mobile communications, cellular networks, satellite networks, data communications and Internet protocol (IP).

*Dear teacher, this unit is expected to be covered within **10 periods**. The periods allotted to each subunit is listed in the table below.*

Suggested Lesson Plan (10 Periods)

No.	Subunits	Number of Periods
2.1	Unit Overview	
2.2	Network Media/Transmission Media	4
	2.2.1 Guided Media: Wired	2
	2.2.2 Unguided Media: Wireless	2

2.3	Telecommunications Network	1
2.4	Mobile Communications	1
2.5	Cellular Networks	1
2.6	Satellite Networks	1
2.7	Data Communications	1
2.8	Internet Protocols	1
Total periods required for the unit		10

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

- Setup basic computer network
- Explain impact of network in society

Instructional Strategies

Lecture, explanation, skills practice, instruction, group work and demonstration, group discussion and problem-solving activities. Dear Teacher students should be given enough time to demonstrate their groups work to the class.

Required Instructional Resources

Computer, computer network, Internet connection, projector/LCD, textbook, pictures diagrams and illustrations, network toolkits, Network cables, RJ45 connectors and Cisco Packet tracer software

Assessment Strategies

Portfolio, question and answer, exercises (homework, classwork and assignment) and observation.

Dear esteemed teacher, to cover the topics of this subsection, you may use different learning strategies such as lecture method, explanation demonstration and group discussion.

2.2 Network Media/Transmission Media

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

- Define transmission media.
- Describe two forms of transmission media.
- Explain guided media and their types.
- Describe unguided media and their types.

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

Instructional Strategies

Lecture, group work and demonstration.

Required Instructional Resources

Computers, network cables, textbook, figures, whiteboard and whiteboard marker

Assessment Strategies

Portfolio, question and answer, class work and homework, and observation

Dear respected teacher, you can teach these topics using a variety of methods, including lecture, teacher talk, demonstration, and group discussion. You can also use locally accessible instructional resources in class, such as a chalkboard, chalk, and diagrams, if the indicated teaching resources are not available.

Answers to Activity 2.1

Dear beloved teacher, the aims of the activity questions are to check students' prior knowledge about computer network and its uses and to relate the concept to the current topic of learning. While students doing the activity questions, you may observe and guide each group, give some directions. In the activity questions, you may instruct students to make small groups for the activity. Accordingly, students will discuss on the activity questions and present their answers to the class.

Possible Answers to activity questions:

1. Both guided and unguided media.
2. **A signal** is an electrical or electromagnetic current that is used for carrying data from one device or network to another. A signal in network medium is characterized by its transmission speed, bandwidth, and distance.
3. The signal encoding that must occur for the message to be transmitted is different for each media type
    - On metallic wires, the data is encoded into ***electrical impulses*** that match specific patterns
    - Fiber optic transmissions rely on ***pulses of light,*** within either infrared or visible light ranges
    - In wireless transmission, patterns of ***electromagnetic waves*** depict the various bit values.
4. Criteria for choosing a network media

- The distance the media can successfully carry a signal.
- The environment in which the media is to be installed.
- The amount of data and the speed at which it must be transmitted.
- The cost of the media and installation

5. Dear teacher, based on the activities question 3, observe students performing the activity and assist them how to arrange these media.

Additional Tips for Teachers : See the following website for more details on computer network

Tip

https://community.fs.com/blog/the-difference-betwto_properly_een-fiber-optic-cable-twisted-pair-and-cable.html

Practical exercise 2.1

Dear teacher, the aims of the practical exercise questions are to help students develop practical skill on network cabling procedures. You are expected to have resources for this lab activity. Dear teacher in case of resource in availability you may use digital resources such as recorded videos that might help students understand the concept.

Resources required: UTP cable, RJ-45 connectors, crimper and network cable tester

Figure 2.1 Network cable tester

- A **cable tester** is an electronic device used to verify the electrical connections in a signal cable or other wired assembly. Basic cable testers are

continuity testers that verify the existence of a conductive path between the ends of the cble, and verify the correct wiring of connectors on the cable.

Figure 2.2 Cable crimper

- **Cable crimper** allows for the joining of cable, wire, and other ductile materials. Cable crimping dies are used to make reliable and controllable electrical connections when two wires need to be temporarily or permanently joined together**.**
- **Straight-through cable** is a type of CAT5 with RJ-45 connectors at each end, and each has the same pinout. It is in accordance with either the T568A or T568B standards. It uses the same color code throughout the LAN for consistency. This type of twisted-pair cable is used in LAN to connect a computer or a network hub such as a router. It is one of the most common types of network cable.

Answers to Activity 2.2

Dear beloved teacher, the aims of the activity questions are to check students' understanding of network signal and transmission types. In the activity questions, you may instruct students to make small groups and let them discuss UTP and STP cables. Let each group compare and contrast the similarities and differences of these two media types and report to the class.

Answer:

Definition of signal: A signal is an electrical or electromagnetic current (copper wire) or light pulses (fiber optic cable) that is used for carrying data from one device or network to another. It is the key component behind all virtual communication, computing, and networking.

- Advantages of UTP cable: it is cheap, Installation of the unshielded twisted pair is easy, and it can be used for high-speed LAN. In contrast, the disadvantage of UTP cable is that its cable can only be used for shorter distances because of attenuation or interference.

- A shielded twisted pair (STP) is a cable that contains the mesh surrounding the wire that allows a higher transmission rate than UTP. Its advantage is that it has a higher capacity and higher transmission speed than UTP.

NOTE

The most commonly used form of twisted pair is unshielded twisted pair (UTP). It consists of color-coded copper wires but does not include any foil or braiding as an insulator to protect against interference. The quality of UTP may vary from telephone-grade wire to extremely high-speed cable. The cable has four pairs of wires inside the jacket. Each pair is twisted with a different number of twists per inch to help eliminate interference from adjacent pairs and other electrical devices. Figure 2.3 shows the different categories of UTP cables.

UTP Category	Data Rate	Max. Length	Cable Type	Application
CAT1	Up to 1Mbps	-	Twisted Pair	Old Telephone Cable
CAT2	Up to 4Mbps	-	Twisted Pair	Token Ring Networks
CAT3	Up to 10Mbps	100m	Twisted Pair	Token Rink & 10BASE-T Ethernet
CAT4	Up to 16Mbps	100m	Twisted Pair	Token Ring Networks
CAT5	Up to 100Mbps	100m	Twisted Pair	Ethernet, FastEthernet, Token Ring
CAT5e	Up to 1 Gbps	100m	Twisted Pair	Ethernet, FastEthernet, Gigabit Ethernet
CAT6	Up to 10Gbps	100m	Twisted Pair	GigabitEthernet, 10G Ethernet (55 meters)
CAT6a	Up to 10Gbps	100m	Twisted Pair	GigabitEthernet, 10G Ethernet (55 meters)

Figure 2.3 categories of UTP cables

Additional Tips for Teachers: See the following website for more details on transmission media and their categories.

Tip

https://ecomputernotes.com/computernetworkingnotes/communication- networks/what-is-transmission-media-and-types-of-transmission-media

Practical Exercise 2.2.

Dear teacher, in this practical exercise students, will work in groups to configure or observe coaxial cable connections and identify technologies used to provide home internet connections.

Figure 2.4 Coaxial cable with RJ connector

- **RJ 11(Registered Jack-11)** A telephone interface that uses a cable of twisted wire pairs and a modular jack with two, four or six contacts. RJ-11 is the common connector for plugging a telephone into the wall and the handset into the telephone.

Figure 2.5 DSL wireless router for home Internet services

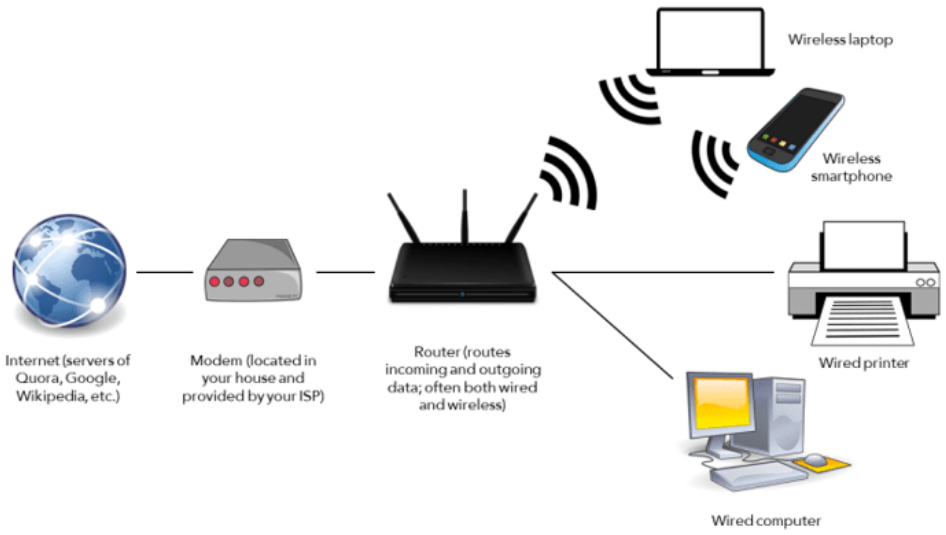


Figure 2.6 Wi-Fi Internet service connection at home

Dear teacher, students can watch video demonstration to complete the activity questions when the above resources are not available.

Answer to Activity 2.3

Dear teacher, you may consider the understated concepts to explain questions in the activity.

- An Internet service provider (ISP) is **a company that provides web access to both businesses and consumers**. ISPs may also provide other services such as email services, domain registration, web hosting, and browser services. In Ethiopia, the only ISP is the Ethiopian Telecommunication Cooperation (Tele).
- To connect the Addis Ababa office to Bahir Dar a Fiber optic cable is needed via the telecom network.
- Network cables must be protected, properly organized and managed. Damage in network cable causes internet and service interruption. Hence, schools may not be able to run their educational resources, application services, and internet connection to their teachers and students.
- UTP cables are **mostly used for LAN networks because of their low cost, easy installation and high transmission speed**. They can be used for voice, low-speed data, high-speed data, and audio.

Following are the advantages of fiber optic cable over copper:

- **Greater Bandwidth:** The fiber optic cable provides more bandwidth as compared copper. Therefore, the fiber optic carries more data as compared to copper cable.
- **Faster speed:** Fiber optic cable carries the data in the form of light. This allows the fiber optic cable to carry the signals at a higher speed.
- **Longer distances:** The fiber optic cable carries the data at a longer distance as compared to copper cable.
- **Better reliability**: The fiber optic cable is more reliable than the copper cable as it is immune to any temperature changes while it can cause obstruct in the connectivity of copper cable.
- **Thinner and Sturdier:** Fiber optic cable is thinner and lighter in weight so it can withstand more pull pressure than copper cable.

Additional Tips for Teachers: See the following website for more details on transmission media and their categories.

Tip

https://www.techtarget.com/whatis/definition/ISP-Internet-service-provider

Practical Exercise 2.3

Dear teacher, in this activity students are expected to visit their school network infrastructure and observe how network devices are connected to UTP and Fiber optic cables and demonstrate their observation to class.

Observe while students completing this activity, you may use video or figures when the required infrastructure is not available in the school.

Additional Tips for Teachers: See the following video link for more details on fiber and UTP connection.

Tip

https://www.youtube.com/watch?v=qQYiwmamq38

Answer for Activity 2.4

Dear teacher, you may consider the under stated concepts to explain questions stated under activity 2.4. you are expected to arrange students in a group so that they will discuss the activity questions and come up with their answers in class. The possible answers could be:

1. **Unguided Media** is a type of network media that transport electromagnetic waves without using a physical conductor. This type of communication is often referred to as **wireless communication**.
2. **Microwave: A microwave** is a line-of-sight wireless communication technology that uses high-frequency beams of radio waves to provide high-speed wireless connections that can send and receive voice, video, and data information.

- Microwaves are ***unidirectional***. waves ranging in frequencies between 1 and 300 GHz are called microwaves.
- Microwaves, due to their unidirectional properties, are very useful when unicast (one-to-one) communication is needed between the sender and the receiver.
- They are used in **cellular phones, satellite networks,** and **wireless LANs**

3. The advantages of microwave technology in today's communication system are:
   - Supports larger bandwidth and hence more information is transmitted, more antenna gain is possible, higher data rates are transmitted as the bandwidth is more, antenna size gets reduced, as the frequencies are higher, low power consumption as the signals are of higher frequencies.

Additional Tips for Teachers: See the following website for more details on transmission media and their categories.

Tip

https://www.javatpoint.com/unguided-transmission-media

Answers for Activity 2.5

Dear teacher, in this activity students are expected to identify the application areas of radio waves, microwaves, and infrared technologies, omnidirectional waves and unidirectional waves, and state the advantages of wireless media over guided media. Let students form groups, discuss and complete the activity questions and present to class.

The possible answers for the questions could be:

1. The application areas are described as follows:
   - Radio waves are used for communication such as broadcasting television and radio, communications and satellite transmissions.
   - Microwaves are used for cooking food, communications and for satellite communications.

- Infrared (IR) light is used by electrical heaters, cookers for cooking food, short-range communications like remote controls, optical fibers, security systems and thermal imaging cameras which detect people in the dark.

2. Various answers may be provided based on student's discussion and presentation.
3. Omni directional in which wave travel in different direction. On the other hand, we can say also that waves go in all directions like a circle.so **omni-directional devices broadcast and receive their singles from all the direction. unidirectional waves: unidirectional in which wave travel in one direction**.
4. Wireless network has the following advantages over wired network.
   - **Mobility and collaboration**: stay connected while moving throughout your work site. Access up-to-the-minute communications and all documents and apps on the network, anywhere, anytime.
   - **Accessibility:** provide network access across your organization, even in areas that have been challenging to reach with the wired network, so your entire team can stay in touch.
   - **Expandability:** grow your network efficiently, adding new users and locations without needing to run cables and wires.
   - **Guest access:** offer secure network access to guest users, including customers and business partners, while keeping your network resources protected.

Additional Tips for Teachers: See the following website for more details on advantages of wireless systems.

Tip

https://www.cisco.com/c/en/us/solutions/small-business/resource-center/networking/why-go-wireless.html#~advantages

2.3 Telecommunications Network

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

- Define telecommunication system.
- Describe elements of telecommunication system
- Identify functions of each element.

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

Instructional Strategies

Lecture, Group work, and Demonstration.

Dear cherished Teacher, while teaching this topic you may use the following learning strategies. Instruct students to define telecommunication and related terms. You may also let students identify the elements and functions of a telecom system. Arrange students' in group to discuss how telecommunication systems affect their daily life, instruct students to make group visit to telecom office in their locality and report what they have observed to their class.

Required Instructional Resources

Computers, Network cables, Textbook, Figures, Whiteboard and Whiteboard Marker.

Assessment Strategies

Portfolio, Question and answer, Class work and homework, and Observation.

Dear precious teacher, in this topic you can apply the following assessment strategies: In group work you many evaluate students' explanation on telecommunication and related terms, assess students' ability to list and explain functions of telecom systems, measure the extent to which concepts they have learnt in class relates to the real functions and applications of telecom system in their visit to local telecom office.

Answers to Activity 2.6

Dear class room teacher, the aims of the activity questions are to check students' understanding on the concept of telecommunication. In the activity questions, you may instruct students to make small groups and do activity questions. You may observe, guide, provide clues on how they discuss on the questions and provide answers. Finally, let each group present the results of their discussion to the class.

Possible answers for the current activity questions are:

1. Telecommunication refers to all types of long-distance communication that use common carriers, **telephone, radio and television**. similarly, A telecommunications system is a collection of nodes and links to enable telecommunication. Telecommunication is communication at a distance using electrical signals or electromagnetic waves.

   Examples of telecommunications systems are the telephone network, the radio broadcasting system, computer networks and the Internet. ETV, FM radio, telephone and mobile phones etc. A Communication system has following components:

   - **Message**: It is the information or data to be communicated. It can consist of text, numbers, pictures, sound or video or any combination of these.
   - **Sender**: It is the device/computer that generates and sends that message.
   - **Receiver**: It is the device or computer that receives the message. The location of receiver computer is generally different from the sender computer. The distance between sender and receiver depends upon the types of network used in between.
   - **Medium**: It is the channel or physical path through which the message is carried from sender to the receiver. The medium can be wired like twisted pair wire, coaxial cable, fiber-optic cable or wireless like laser, radio waves, and microwaves.
   - **Protocol**: It is a set of rules that govern the communication between the devices. Both sender and receiver follow same protocols to communicate with each other.

2. MODEM: A modulator-demodulator or modem is a computer hardware device that converts data from a digital format into a format suitable for an analog transmission medium such as telephone or radio.

3. While using internet, modem receives information from your ISP through the phone lines, optical fiber, or coaxial cable in your home or school (depending on your service provider) and converts it into a digital signal.

4. It takes the signals that come from your Internet Service Provider, or ISP, and translates them into an Internet connection for your Wi-Fi router to broad-

cast. **Multiplexing** is the process of combining multiple signals into one signal, over a shared medium.

5. The latest telecommunication systems take business communications way beyond basic voice calls. By running telecommunication systems on the same network as video and data systems, companies can develop applications that enable employees to work more productively, collaborate more easily and improve service to customers. The increasing sophistication of mobile phones means companies can provide employees with the equivalent of office communications and services when they are traveling or working from home.

Additional Tips for Teachers: See the following website for more details on telecommunication system components.

Tip

https://study.com/academy/lesson/the-components-of-a-telecommunications-system.html

2.4 Mobile Communication

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

- Define mobile communication.
- Differentiate Bluetooth technology form wireless LAN.

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

Instructional Strategies

Lecture, Group discussion, and demonstration.

Required Instructional Resources

Computer or Other Devices, Network and Internet, Connection, LCD Projector, Diagrams and Figures, Textbook, Whiteboard and Whiteboard Marker.

Assessment Strategies

Portfolio, Question and answer, Exercises (Homework, Class work, Assignment), Observation and examine.

Beloved teacher, you can teach these topics using a variety of methods, including lecture, teacher talk, demonstration, and group discussion. Besides, you can use locally accessible educational materials such as a blackboard, chalk, and diagrams in class if the mentioned instructional resources are not available.

Answers to Activity 2.7

Dear teacher, under this activity you are expected to let students discuss in group the use of Bluetooth technology for communication. Please, instruct students to share massages using Bluetooth from their mobile if available.

Dear teacher, you may describe Bluetooth as:

- Bluetooth is a wireless technology that **allows devices to communicate with each other without cables or wires**. Bluetooth relies on short-range radio frequency, and any device that incorporates the technology can communicate as long as it is within the required distance. It is used to connect different devices such as the headphones, speakers, printers, laptops and smartphones.

Some of the advantages of Bluetooth are

- **Availability**: Today Bluetooth is an exclusive feature available in most devices such as smart phones and tablets. These numerous kinds of devices with Bluetooth indicate its universal availability.
- **Wireless:** hat it does not require any form of wires for it to transmit data.
- **Efficiency**: its energy efficiency which drives to low power consumption.

Bluetooth and Wi-Fi are both wireless technologies for connecting your devices, but they are quite different. While Wi-Fi is mainly used to connect your devices to the internet, Bluetooth is only used to connect your devices to each other.

Additional Tips for Teachers: See the following website for more details on mobile communication.

Tip

https://www.elprocus.com/how-does-bluetooth-work/

Answers to Activity 2.8

Dear teacher, the aims of the activity questions are to assess the level students' level of understanding about the fundamental components of wireless LAN, its benefits, and distinguish it from LAN.

- Wireless LANs consist of components similar to traditional Ethernet-wired LANs. In fact, wireless LAN protocols are similar to Ethernet and comply with the same form factors. The big difference, however, is that wireless LANs don't require wires.
- An access point is a wireless network device that **acts as a portal for devices to connect to a local area network**. Access points are used for extending the wireless coverage of an existing network and for increasing the number of users that can connect to it.
- The goal behind a multiple access point (overlapping access points) network is to deliver strong, fast internet throughout your entire office or property without having problems with areas blocked by solid walls or that are too far from the main wireless router to get a good connection.

Additional Tips for Teachers: See the following website for more details on Mobile communication concepts.

Tip

https://www.javatpoint.com/mobile-communication-introduction

2.5 Cellular Networks

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

- Explain the concept of cellular communication.
- Describe the services provide by cellular network.

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

Instructional Strategies

Lecture note, Group work and reflection, and Demonstration.

Required Instructional Resources

Computer or Other Devices, Network and Internet Connection, Textbook, Diagrams and Figures, Whiteboard and Whiteboard Marker.

Assessment Strategies

Portfolio, Question and answer, Exercises (Homework, Class work, Assignment), and Observation.

Dear lovely teacher, you can instruct these topics in a variety of ways, including lecture, teacher talk, demonstration, and group discussion, beloved instructor. In addition, if the above-mentioned teaching resources are unavailable, you can use locally accessible educational materials such as a chalkboard, chalk, and diagrams in class.

Answers to Activity 2.9

Dear remarkable teacher, during this activity you can instruct students to discuss in group the role of cellular network around their schools, let students to visit nearby telecom office to observe and report the services of cellular network.

- A **cellular network** or **mobile network** is a communication network where the link to and from end nodes is wireless. The network is distributed over land areas called "cells", each served by at least one fixed-location transceiver. These base stations provide the cell with the network coverage which can be used for transmission of **voice, data, and other types of content**. A cell typically uses a different set of frequencies from neighboring cells, to avoid interference and provide guaranteed service quality within each cell.

Additional Tips for Teachers: See the following website for more details on Mobile communication concepts.

Tip

https://www.electronics-notes.com/articles/connectivity/cellular-mobile-phone/network-architecture.php

Answer for Activity 2.10

Dear remarkable teacher, during this activity you can instruct students to discuss in group the basic characteristics and advantages of 1G,2G and 3G cellular. let

students to visit nearby telecom office to observe and report the services of cellular network. Dear teacher, let students summarize the basic characteristics and advantages of 1G, 2G, and 3G cellular networks.

1G, 2G, 3G, 4G and 5G are the five generations of mobile networks where G stands for Generation, and the number denotes the generation number. 5G is the latest generation, whereas 1G networks are now obsolete. The cellular technologies GSM, UMTS, LTE and NR enable 2G, 3G, 4G and 5G, respectively.

As mobile networks became an integral part of our lives, the technologies started to mature with the aim to allow customers to enjoy the same experience abroad as they would in their home country.

Additional Tips for Teachers: See the following website for more details on Mobile communication concepts.

Tip

https://rantcell.com/comparison-of-2g-3g-4g-5g.html
http://net-informations.com/q/diff/generations.html

2.6 Satellite Networks

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

- Explain the concept of satellite network.
- Describe benefits of satellite network.

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

Instructional Strategies

Lecture note, Group work and reflection, and Demonstration.

Required Instructional Resources

Computer or Other Devices, Network and Internet Connection, Textbook, Diagrams and Figures, Whiteboard and Whiteboard Marker.

Assessment Strategies

Portfolio, Question and answer, Exercises (Homework, Class work, Assignment), and Observation.

Dear lovely teacher, you can instruct these topics in a variety of ways, including lecture, demonstration, and group discussion, in addition, if the above-mentioned teaching resources are unavailable, you can use locally accessible educational materials such as a chalkboard, chalk, and diagrams in class.

Answers for Activity 2.11

Dear teacher in this activity students discuss the role of satellites systems in education, identify components of a satellite, compare satellite system with wireless technology.

The possible answers are:

1. EDUSAT, a satellite completely dedicated for educational sector, can **provide connectivity to schools, colleges and other nonformal education institutions to deliver e-learning**, covering a large geographical area to reach the masses residing in the remote areas as well.
2. The main components of a satellite consist of the communications system, which includes the antennas and transponders that receive and retransmit signals, the power system, which includes the solar panels that provide power, and the propulsion system, which includes the rockets that propel the satellite.
3. The main advantages of satellite are, its coverage over geographical area is quite large mainly for sparsely populated areas. It has high bandwidth. Wireless and mobile communication applications can be easily established by satellite communication independent of location. It is used in wide variety of applications such as global mobile communication, private business networks, long distance telephone transmission, weather forecasting, radio/TV signal broadcasting, gathering intelligence in military, navigation of ships and air crafts, connecting remote areas, television distribution etc.
4. In Ethiopia, rural and pastoral communities benefit more from satellite transmission system.

Additional Tips for Teachers: See the following website for more details on satellite system and its applications and advantages.

Tip

https://www.javatpoint.com/satellite-systems-introduction

Answers to Activity 2.12

Dear class room teacher, the aims of the activity questions are to check students' understanding on the concept of satellite systems and their classifications. In the activity questions, you may instruct students to make small groups and do activity questions. You may observe, guide, provide clues on how they discuss on the questions and provide answers. Finally, let each group present the results of their discussion to the class.

The possible answers for this activity questions are:

1. A satellite is an artificial object which is placed intentionally into an orbit of any natural satellite. Satellites are used for many purposes i.e. weather forecasting, digital transmission, scientific research and development etc. In a communication context, a satellite is a specialized wireless transmitter/receiver that is launched by a rocket and placed in orbit around the earth. A satellite can be natural, like the moon, or artificial (human made). So, we can say that a satellite is an object that moves in a curved path around a planet.
2. ETRSS-1 is the first Low-Earth-satellite launched by Ethiopia. It is an **Earth Observation Satellite**.

Additional Tips for Teachers: See the following website for more details on satellite system and their types.

Tip

https://www.javatpoint.com/types-of-satellite-systems

2.7 Data Communication

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

- Define data communication.

- Describe components of communication.

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

Instructional Strategies

Lecture note, Group work and reflection, and Demonstration.

Required Instructional Resources

Computer or Other Devices, Network and Internet Connection, Textbook, Diagrams and Figures, Whiteboard and Whiteboard Marker.

Assessment Strategies

Portfolio, Question and answer, Exercises (Homework, Class work, Assignment), and Observation.

Dear lovely teacher, you can instruct these topics in a variety of ways, including lecture, demonstration, and group discussion. In addition, if the above-mentioned teaching resources are unavailable, you can use locally accessible educational materials such as a chalkboard, chalk, and diagrams in class.

Answers for Activity 2.13

Dear remarkable teacher, during this activity you can instruct students to discuss in group the concept of data communication, its characteristics and its main components.

The suggested answers and explanations to the activity questions are described as follows.

- **Data communication** refers to the exchange of data between a source and a receiver via form of transmission media such as a wire cable.
- The effectiveness depends on four fundamental characteristics of data communications
    - **Delivery**: The data must be delivered in correct order with correct destination.
    - **Accuracy**: The data must be delivered accurately.
    - **Timeliness**: The data must be delivered in a timely manner. Late delivered Data is useless.
    - **4. Jitter**: It is the uneven delay in the packet arrival time that cause uneven quality

- A data Communication system has following components:
  - **Message**: It is the information or data to be communicated. It can consist of text, numbers, pictures, sound or video or any combination of these.
  - **Sender**: It is the device/computer that generates and sends that message.
  - **Receiver**: It is the device or computer that receives the message. The location of receiver computer is generally different from the sender computer. The distance between sender and receiver depends upon the types of network used in between.
  - **Medium**: It is the channel or physical path through which the message is carried from sender to the receiver. The medium can be wired like twisted pair wire, coaxial cable, fiber-optic cable or wireless like laser, radio waves, and microwaves.
  - **Protocol**: It is a set of rules that govern the communication between the devices. Both sender and receiver follow same protocols to communicate with each other.

Additional Tips for Teachers: See the following website for more details on data communication concepts.

Tip

https://ecomputernotes.com/computernetworkingnotes/communication-networks/what-is-data-communication

2.8 Internet Protocol

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

- Explain features and characteristics of Internet Protocol.
- Describe IP functions.
- State IP address and class of IP address.

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

Instructional Strategies

Lecture note, Group work and reflection, and Demonstration.

Required Instructional Resources

Computer or Other Devices, Network and Internet Connection, Textbook, Diagrams and Figures, Whiteboard and Whiteboard Marker.

Assessment Strategies

Portfolio, Question and answer, Exercises (Homework, Class work, Assignment), and Observation.

Esteemed teacher, *to deal with these topics you may use different learning strategies such as lecture, illustration and discussion. Besides, you may use locally available instructional resources such as blackboard, chalk, and diagrams in class when the stated instructional resources are not available.*

Answer for Activity 2.14

Dear teacher in this activity, students will identify the two nations of IP addresses, Discus the role of IP addresses in today's communication network, and understand the difference between IPv4 and IPv6. The possible answers for the activity questions are:

1. you can write and use IP addresses in two notations: **binary notation and decimal-dotted notation**. In binary notation, all the individual bits of each byte are expressed as a binary number. In decimal notation, all four binary bytes are converted and expressed to their decimal equivalent numbers.
2. The IP address uniquely identifies every device on the internet; without one, there's no way to contact them. IP addresses **allow computing devices such as PCs and tablets to communicate with destinations.**
3. IP address (Internet Protocol address) is an address assigned to each device connected to the Internet. It is a 32 bit binary address that uniquely and universally defines the connection of a host or a router. IP address is unique in the sense that **no two devices connected to the Internet can have the same IP address**.
4. The main difference between IPV4 and IPV6 is that IPv4 is a 32bit operating scheme that supports 4 billion IP addresses whereas IPv6 is a 128bit operating scheme supporting up to 340 undecillion addresses, hence an immense upgrade from IPv4.

Additional Tips for Teachers

See the following website for more details on definition of IP and classes of IP address.

Tip

https://www.paessler.com/it-explained/ip-address

2.9 Unit Summary

A transmission medium can be broadly defined as anything that can carry information from a source to a destination. For example, the transmission medium for two people having a dinner conversation is the air. The air can also be used to convey the message in a smoke signal or semaphore. For a written message, the transmission medium might be a mail carrier, a truck, or an airplane.

A guided medium provides a physical conduit from one device to another. The twisted-pair cable consists of two insulated copper wires twisted together. Twisted-pair cable is used for voice and data communications. Coaxial cable consists of a central conductor and a shield. Coaxial cable is used in cable TV networks and traditional Ethernet LANs.

Fiber-optic cables are composed of a glass or plastic inner core surrounded by cladding, all encased in an outside jacket. Fiber-optic transmission is becoming increasingly popular due to its noise resistance, low attenuation, and high bandwidth capabilities. Fiber-optic cable is used in backbone networks, cable TV networks, and Fast Ethernet networks.

Unguided media (free space) transport electromagnetic waves without the use of a physical conductor. Wireless data are transmitted through ground propagation, sky propagation, and line-of-sight propagation. Wireless waves can be classified as radio waves, microwaves, or infrared waves.

Radio waves are omnidirectional; microwaves are unidirectional. Microwaves are used for cellular phone, satellite, and wireless LAN communications. Infrared waves are used for short-range communications such as those between a PC and a peripheral device. They can also be used for indoor LANs.

The nature and characteristics of a wireless network are different from those of a wired network. There are some issues in a wireless network that are negligible in a wired network. Wireless communication is one of the fastest-growing technologies and the demand for connecting devices without the use of cables is increasing everywhere. Wireless networks, as the name implies, interconnect devices without using wires – instead they use the air, Radio Frequency **(RF**) as the main transmission medium.

Bluetooth technology is a short-range wireless communications technology to replace the cables connecting electronic devices, allowing a person to have a phone conversation via a headset, use a wireless mouse and synchronize information from a mobile phone to a PC, all using the same core system.

Telecommunications are the means of electronic transmission of information over distances. The information may be in the form of voice telephone calls, data, text, images, or video. Telecommunications links form a channel through which information is transmitted from a sending device to a receiving device.

In data communication terminology, a transmission medium is a physical path between the transmitter and the receiver that is, it is the channel through which data is sent from one place to another. Transmission Media is broadly classified into the following types: guided and unguided.

WLANs are flexible data communication systems that can be used for applications in which mobility is required. In the indoor business environment, although mobility is not an absolute requirement, WLANs provide more flexibility than that achieved by the wired LAN.

Cellular network provides communication between two devices. One or both may be mobile. A cellular service area is divided into cells. Advanced Mobile Phone System (AMPS) is a first-generation cellular phone system. Digital AMPS (D-AMPS) is a second-generation cellular phone system that is a digital version of AMPS.

Global System for Mobile Communication (GSM) is a second-generation cellular phone system used in Ethiopia. The third-generation cellular phone system provides universal personal communication. The fourth generation is the new generation of cellular phones that are becoming popular.

Satellite Networks are defined as the orientation of various elements that establish communication through various nodes from one point of the earth to another point. Any satellite network can provide both types of transmission technologies

i.e., point to point as well as broadcasting connections. A satellite network uses satellites to provide communication between any points on Earth.

An IP address is a unique address that identifies a device on the internet or a local network. IP stands for "Internet Protocol," which is the set of rules governing the format of data sent via the internet or local network.

2.10 Answers to the Unit Review Exercise

Part I: True false Items

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

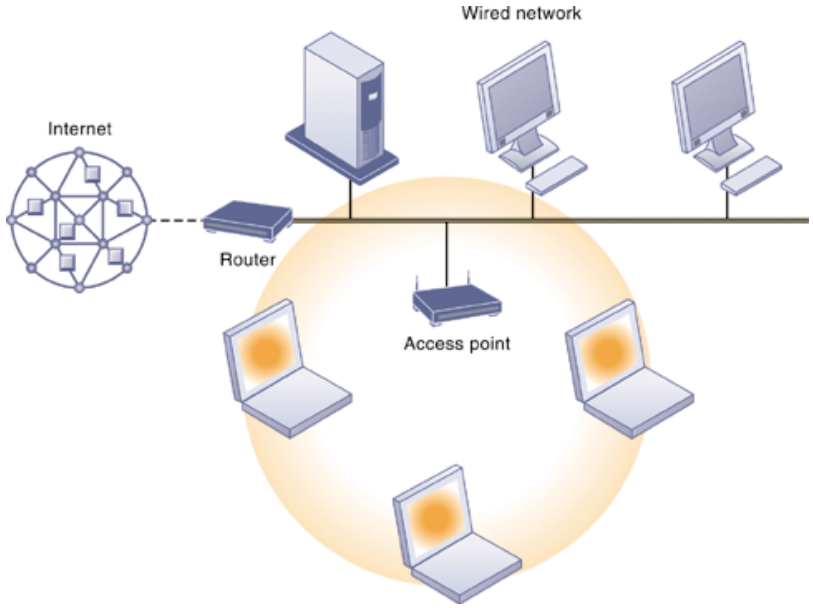
Part II: Multiple choice questions

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

Part III: Discussion questions

1. The two major categories of the transmission media are **guided** and **unguided media**.

2. Guided media have physical boundaries, while unguided media are unbounded.
3. The three major categories of guided media are **twisted-pair, coaxial, and fiber-optic cables.**
4. Twisting ensures that both wires are equally, but inversely, affected by external influences such as noise.
5. We can mention three advantages of optical fiber cable over twisted-pair and coaxial cables: **noise resistance, less signal attenuation, and higher bandwidth.**
6. The medium of a wired LAN **is guided** (**cable or wire**); the medium of a wireless LAN is **unguided (air**).
7. The role of Access point in WLAN are:
    - Provide infrastructure access to mobile users
    - Cover a fixed area
    - Wired into LAN
    - Provide Bridging functions



8. The basic components of WLAN are described in the following table:

Component	*Description*
Station	Any device that implements the 802.11 MAC and PHY layer protocols.
Access point	A station that provides an addressable interface between a set of stations, known as a basic service set (BSS), and the distribution system.
Distribution system	A network component, commonly a wired Ethernet, that connects access points and their associated BSSs to form an extended service set (ESS).

9. A Bluetooth network is normally a wireless small network that is more suited to communication in a personal environment; a wireless local area can cover a larger geographical area such as a building or an office.
10. WiMax defines a wireless WAN. The fixed WiMax uses a star-topology to create a wireless WAN between a base station (BS) and some fixed subscribed stations (FSubs).

    The mobile WiMAX also uses a star-topology to create a wireless WAN between a base station (BS) and some mobile subscriber stations (MSubs).
11. A mobile switching center coordinates communications between a base station and a telephone central office.
12. A mobile switching center connects cells, records call information, and is responsible for billing.
13. In a **hard handoff**, a mobile station communicates with only one base station. In a s**oft handoff,** a mobile station communicates with two base stations at the same time.
14. GSM (Global System for Mobile communication) is a digital mobile network that is widely used by mobile phone users in Europe and other parts of the world. **Example in Ethiopia.**
15. GSM is a European standard that provides a common **second-generation** technology for all of Europe.
16. The three orbit types are **equatorial, inclined, and polar.**
17. Transmission from the earth to the satellite is called the uplink. Transmission from the satellite to the earth is called the downlink.

18. A GEO satellite has an equatorial orbit since the satellite needs to remain fixed at a certain spot above the earth.

19. GPS is a satellite system that provides land and sea navigation data for vehicles and ships. The system is also used for clock synchronization.

20. Omnidirectional waves are propagated in all directions; unidirectional waves are propagated in one direction.

21. We change each 8-bit section to the corresponding decimal value and insert dots between the bytes.

    v. 94.176.117.21

    w. 137.142.208.49

    x. 87.132.55.15

22. The class can be defined by looking at the first byte (see figures below)

    w. Since the first byte is between 128 and 191, the class is B.

    x. Since the first byte is between 192 and 223, the class is C.

    y. Since the first byte is between 240 and 255, the class is E.

Address Class	First Octet Range	Number of Possible Networks	Number of Hosts per Network
Class A	0 to 127	128 (2 are reserved)	16,777,214
Class B	128 to 191	16,348	65,534
Class C	192 to 223	2,097,152	254

Class D Addresses

- A Class D address begins with binary 1110 in the first octet.
- First octet range 224 to 239.
- Class D address can be used to represent a group of hosts called a host group, or multicast group.

Class E Addresses

- First octet of an IP address begins with 1111
- First octet range 240 to 255.
- Class E addresses are reserved for experimental purposes and should not be used for addressing hosts or multicast groups.

23. The class can be defined by checking the first few bits (see figures above). We need to stop checking if we find a 0 bit or four bits have already been checked.

    a. Since the first bit is 0, the Class is A.

    b. Since the first four bits are 1110, the class is D.

    c. Since the first three bits are 110, the class is C.

UNIT 3 APPLICATION SOFTWARE

UNIT OUTCOMES

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

- Create tables.
- Organize and insert pictures, clip arts and shapes.
- Explain how page numbers are formatted.
- Analyze mathematical operators on data to perform addition and others.
- Summarize functions such as filter, sort and rank.
- Apply different effects to a cell and its contents.
- Prepare and present a slide show.
- Create a slide master.

3.1 Unit Overview

In grade 9, unit 3, the students learned basic concepts of word processing and spreadsheet. In this unit, they are expected to have knowledge of advanced topics such as creating table, formatting table, insert pictures, clip arts and shapes and formatting page numbers in word processor. Under spreadsheet, advanced topics such as understanding and displaying formulas, working with data, working with charts and applying different effects to a cell (formatting cells) are included. Finally the unit deals with other advanced topics such as using animation and transitions, and creating a slide master in PowerPoint.

*Dear teacher, this unit is expected to be covered within **17 periods**. The detail of allotted period for each subunit is listed in the table below.*

Suggested Lesson Plan (17 Periods)

No.	Subunits	Number of Periods
3.1	Unit Overview	
3.2	Word Processing	7
	■ Create table	
	■ insert pictures, clip arts and shapes	
	■ Format page number	
	■ Insert table of contents	
3.3	Spread sheet	7
	■ Understand simple and complex formulas	
	■ Use built-in functions	
	■ Perform functions such as Filter, sort, Rank	
	■ Insert charts	
	■ Apply different effects to a cell	
3.4	Powerpoint Presentation	3
Total periods required for the unit		17

At the end of this unit students will be able to:

- Produce a document using word processor.
- Manipulate data using spread sheet.
- Create power point presentation.

3.2 Word Processing

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

- Create table.
- Insert pictures, clip arts and shapes.
- Format page numbers.
- Insert table of contents.

This topic is expected to be covered in **7 periods**.

Instructional Strategies

Group discussion, lecture, questions and answers.

Required Instructional Resources

Computer, LCD projector, textbook, whiteboard and whiteboard marker

Assessment Strategies

Observation, question and answer, class work

Dear teacher, to cover the contents of this subtopic, you may use different learning strategies such as lecture, demonstration and group discussion. Besides, you may use locally available instructional resources such as blackboard, chalk and diagrams in class when the instructional resources stated above are not available.

Practical Exercise 3.1

Esteemed teacher, the aim of the practical exercise is to help students develop practical skill on drawing tables in Microsoft Word document. In this exercise, you may instruct students to open Microsoft Word document and guide them while applying steps described on the Student's Textbook.

Resources Required: To complete the practical exercise, computers with MS Office are required. Dear teacher, if lab facilities not available or incomplete, you may use videos or other appropriate methods.

Dear teacher, while engaging students in this lab activity, you may observe, guide and provide assistance on the procedure they follow to do the assigned task. Finally, you will provide feedback on each student's performance and summarize the steps for the whole class.

To save the teaching time and evaluate the students' progress on the entire unit, you are recommended to let each student create a word file by his/her name or group name on specific location so that he/she will work the required activities on the same file. This method will help you continuously evaluate your students' progress and provide assistance as well.

Additional Tips for Teachers: Visit the following website for more details on how to create tables, graphs and shapes in MS Word.

Tip

https://www.howtogeek.com/school/microsoft-word-document-formatting-essentials

Practical Exercise 3.2

Dear teacher, this practical exercise enables students to acquire skills required to auto-insert text into MS Word program. Students should be assisted while working the exercise in computer laboratory.

Additional Tips for Teachers: Consult the following website for more details on how to insert auto formatted text in MS word.

Tip

https://www.howtogeek.com/school/microsoft-word-document-formatting-essentialsals

Practical Exercise 3.3

Dear teacher, in this practical exercise questions student will acquire skill required to auto insert text into MS word program. Students should be assisted while working the activity in computer laboratory. Students should be instructed about the lab exercise on how to create table, insert and delete new columns.

Additional Tips for Teachers: Visit the following website for more details on how to insert auto-formatted text in MS Word.

Tip

https://www.howtogeek.com/school/microsoft-word-document-formatting-essentials

Dear teacher, in this practical exercise questions student will acquire skill required to auto insert text into MS word program. Students should be assisted while working the activity in computer laboratory. Students should be instructed about the lab exercise on how to create table, insert and delete new columns.

Practical Exercise 3.4

Dear teacher, in this practical exercise students attempt to open MS Word and write two paragraphs about eagle and its life style and insert picture of eagle from gallery or online library.

Dear teacher, you are expected to guide students while they are doing this activity in groups.

Additional Tips for Teachers: Visit the following website for further information on how to write and format paragraphs in MS Word.

Tip

http://infobitt.blogspot.com/2010/08/paragraph-formatting.html

Practical Exercise 3.5

Dear teacher, in this practical exercise, students open files they have saved in practical exercise 3.4 and insert page number, header and footer and then hide the first page number and save it to keep changes they have made on the file.

Dear teacher, you are expected to guide students while they are doing this activity in group.

Additional Tips for Teachers: See the following website for more details on how to insert page number, header and footer in MS Word document.

Tip

http://infobitt.blogspot.com/2010/08/paragraph-formatting.html

Dear teacher, please observe when the students complete the activities.

3.3 Spread Sheet

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

- Differentiate simple and complex formulas.
- Use built in functions.
- Apply functions such as filter, sort and rank in problem solving.
- Format cells and their contents.

This topic is expected to be covered in **7 periods**.

Instructional Strategies

Lecture or teacher talk, practical work, group discussion, and questions and answers

Required Instructional Resources

Computers with Office application installed, LCD projector, textbook, whiteboard and whiteboard marker

Assessment Strategies

Observation (check while student work on Excel), question and answer, class work, lab activity on MS Excel, question and answer, and portfolio

Dear teacher, to cover the contents of this subunit, you may use different learning strategies such as lecture, demonstration and group discussion. Besides, you may use locally available instructional resources such as blackboard, chalk and diagrams in class when the instructional resources stated above are not available.

Dear teacher, this subunit teaches students how to use basic and advanced features of MS Excel such as working with cells and formulas, using embedded functions and inserting charts into his/her data. In the Student's Textbook, there are various practical activities which students are expected to perform individually or in pairs. Accordingly, to achieve the subunits of learning objectives, instructional methods you choose to apply are critical. Therefore, you should provide the steps students should follow in each activity, observe while they are doing each activity and encourage them to learn more by proving quick response to their work.

Practical Exercise 3.6

Lab Resources Required: To complete this practical exercise, the following lab resources are required.

Dear teacher, in this practical exercise, student open blank MS worksheet and learn how to enter data and calculate sum, average, count, maximum and minimum.

Dear teacher, you are expected to guide students while they are doing this activity in group.

Additional Tips for Teachers: See the following website for more details on how to insert page number, header and footer in MS Word document.

Tip

https://www.javatpoint.com/excel-how-to-enter-data

Practical Exercise 3.7

Dear teacher, in this practical exercise, students open an existing file saved in Practical Exercise 3.6 and practice ***freezing row*** and ***column*** in place and applying the ***split command*** to split their worksheet into multiple panes.

Dear teacher, you are expected to guide the students while they are doing the exercise in group.

Additional Tips for Teachers: See the following website for more details on how to freeze row and column, and split worksheet into multiple panes.

Tip

https://www.javatpoint.com/excel-how-to-enter-data

Practical Exercise 3.8

In this practical exercise, student need to open an existing file saved in Practical Exercise 3.7 and practice ***inserting chart, changing chart layout and writing chart title***.

Dear teacher, you are expected to guide students while they are doing this exercise in group.

Additional Tips for Teachers: See the following website for more details on how to insert chart into an Excel worksheet.

Tip

https://www.javatpoint.com/excel-how-to-enter-data

Practical Exercise 3.9

In this practical exercise, student open an existing file saved in Practical Exercise 3.8 and and practice how to apply ***formatting to worksheet*** **data (**change font, font size, text color and alignment**).**

Dear teacher, you are expected to guide students while they are doing this activity in group.

Additional Tips for Teachers: See the following website for more details on how to apply formatting.

Tip

https://www.javatpoint.com/excel-how-to-enter-data

3.4 PowerPoint Presentation

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

- Apply animation and transition features on ppt slide.
- Create master slide.

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

Instructional Strategies

Lecture, practical work, group discussion, and questions and answers

Required Instructional Resources

Computers with Office application installed, LCD projector, textbook, whiteboard and whiteboard marker

Assessment Strategies

Observation (check while student work on MS PowerPoint), question and answer class work, lab activity on MS PPT and reflections

Dear teacher, to cover the topics mentioned above, you may use different learning strategies such as lecture, demonstration and group discussion. Besides, you may use locally available instructional resources such as blackboard, chalk and diagrams in class when the instructional resources stated above are not available.

Dear close teacher, in the lab session, you may let students open exiting PowerPoint presentation, insert transitions and animations, create master slide with their school logo, if school logo does not exist, let them use any picture they saved into their computers. You may observe, coach and provide hit while they are doing the activity in computer lab.

Additional Tips for Teachers: See the following website or other related websites for more details on how to use basic features of PowerPoint presentation in their slides.

Tip

https://www.slidecow.com/powerpoint-tutorials/

Answers to Activity 3.1

Students will discuss in groups about the advantages of master slide and expected to create a slide master by inserting their school logo or any picture on top of the slide master, change background stile and save the file given in the activity.
Additional Tips for Teachers: See the following website for more details on PowerPoint master slide and applying different formats.

Tip

https://www.slidecow.com/powerpoint-tutorials/

3.5 Unit Summary

Word Processing refers to the act of using a computer to create, edit save and print documents. In order to perform word processing, specialized software (known as word processor) is needed. One example of a word processor is Microsoft Word; there are also other word processing applications that are widely used.

The Insert table dialog box enables you to create large tables by specifying up to 63 columns and thousands of rows. Note that you can click the spin box arrows in the Insert table dialog box or type in the number of columns and rows you need in a table.

Word offers several tools for resizing rows and columns. You can resize a column or a row using the mouse or using the commands on the ribbon. You can use commands in the cell size group on the table tools - layout tab to adjust height and width or use the ruler to adjust the column width. In addition, the Table properties dialog box enables you to set the measurements at a precise height for rows or an ideal width for columns, cells and tables.

A spreadsheet is a computer application for organization, analysis and storage of data in tabular form. Spreadsheets were developed as computerized analogs of paper accounting worksheets. The program operates on data entered in cells of a table. Each cell may contain either numeric or text data or the results of formulas that automatically calculate and display a value based on the contents of other cells. A spreadsheet may also refer to a program that displays data (text and numbers) in a table called a worksheet.

The real strength of spreadsheet is its capability to perform common and complex calculations. The formula is one of the essential elements of spreadsheet which enables you to add, subtract, multiply and divide numbers. When you enter a formula in a cell, the formula is stored internally and the results are displayed in the cell. You can view the underlying formula in the formula bar when the cell is active as you double-click the cell to edit it or use the formulas tab.

A **function** is a **predefined formula** that performs calculations using specific values in a particular order. Excel includes many common functions that can be useful for finding the **sum, average, count, maximum value** and **minimum value for a range of cells** quickly. To use functions correctly, you will need to understand the different parts of the function and how to create arguments to calculate values and cells.

There are two types of cell references: **relative** and **absolute**. Relative and absolute references behave differently when copied and filled into other cells. Relative references **change** when a formula is copied to another cell. Absolute references, on the other hand, remain **constant**, no matter where they are copied.

Creating a chart in spreadsheet is quick and easy. It provides a variety of **chart types** that you can be chosen from when you create a chart. Excel offers **pie, line, bar and column charts**, to name a few. Showing data in a chart can make it clearer, more interesting and easier to read. Charts can also help you evaluate your data and make comparisons between different values. One of the most powerful tools in Excel is the ability to apply specific formatting for text and numbers. In-

stead of displaying all cell contents in the same way, you can use formatting to change the appearance of dates, times, decimals, percentages (%), currency ($) and much more.

PowerPoint is a graphical presentation program used to organize and present information. PowerPoint presentations consist of several individual pages or *slides*. Slides may contain text, graphics, sound, movies and other objects that can be freely arranged.

Presentations can be printed, displayed live on a computer or navigated through at the command of the presenter. For larger audiences, the presentation is often projected onto a large screen. Handouts, speaker notes or outlines can also be produced from the slides.

Presentations are greatly improved by adding animation. PowerPoint gives you a wide selection of built-in animations, both when moving between one slide and the next, and within each slide. Instead of simply moving abruptly from one slide to another during a presentation, slide transitions allow slides to dissolve into each other, using a variety of different special effects. These can make your on-screen presentation **look even better and more professional**.

Slide masters are very important as they control the layout of your whole presentation. They allow you to create your slide template which is applied to every slide. This is useful if you want to put your logo, picture or even just your name in the same place on each slide.

3.6 Answers to the Unit Review Exercise

Part I: True/False Items

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

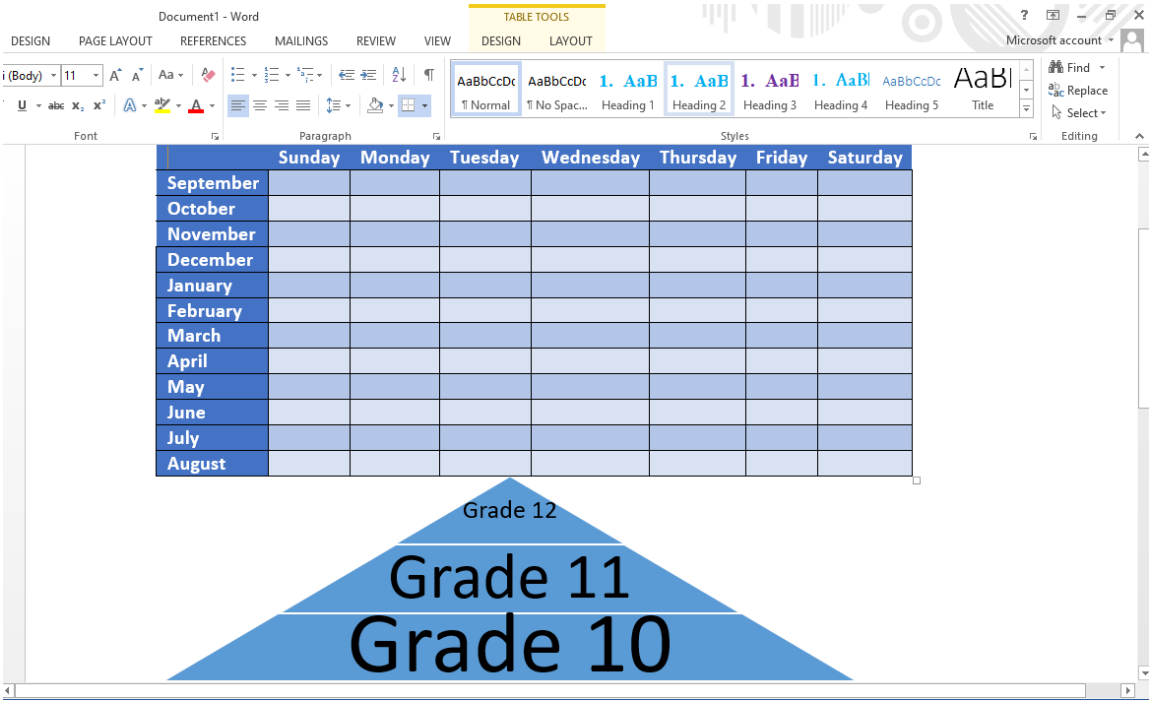
Part II: Multiple Choice Questions

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

Part III: Discussion Questions

1. ***Importance of Word Processing:*** Word processing is by far the most widely used computer application because it is used for communication, our most common activity. Word processing is used to write, edit and format memos, letters, reports, manuscripts, contracts and every imaginable type of documents. No matter what the information is, or what form it takes, the chances are it was initially composed and written using a word processing program. A word processor is the software which provides a graphical user interface with better capabilities than a text editor does. The main advantage of a word processor is that it provides WYSIWYG (What You See Is What You Get) interface which helps you make changes quickly and easily. The main features of today's word processing packages are:
    - Creating documents
    - Editing documents
    - Formatting documents with the help of templates and wizards

2. The following table demonstrates question No.2.



	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
September							
October							
November							
December							
January							
February							
March							
April							
May							
June							
July							
August							

3. Basic and powerful features of Microsoft Excel are:

a. Add Header and Footer

- MS Excel allows us to keep the header and footer in our spreadsheet document.

b. Find and Replace Command

- MS Excel allows us to find the needed data (text and numbers) in the workbook and replace the existing data with a new one.

c. Password Protection

- It allows the users to protect their workbooks by using passwords from unauthorized access to their information.

d. Data Filtering

- Filtering is a quick and easy way to find and work with a subset of data in a range. A filtered range displays only the rows that meet the criteria you specify for a column. MS Excel provides two commands for filtering ranges:
    - AutoFilter; which includes filter by selection, for simple criteria

- Advanced Filter; for more complex criteria

e. Data Sorting

- Data sorting is the process of arranging data in some logical order. MS Excel allows us to sort data either in ascending or descending order.

f. Built-in Formulae

- MS Excel has got many built-in formulae for sum, average, minimum, etc. We can use those formulae as per our needs.

g. Create Different Charts (Pivot Table Report)

- MS Excel allows us to create different charts such as bar graph, pie-charts, line graphs, etc. This helps us to analyze and compare data very easily.

h. Automatically Edits the Result

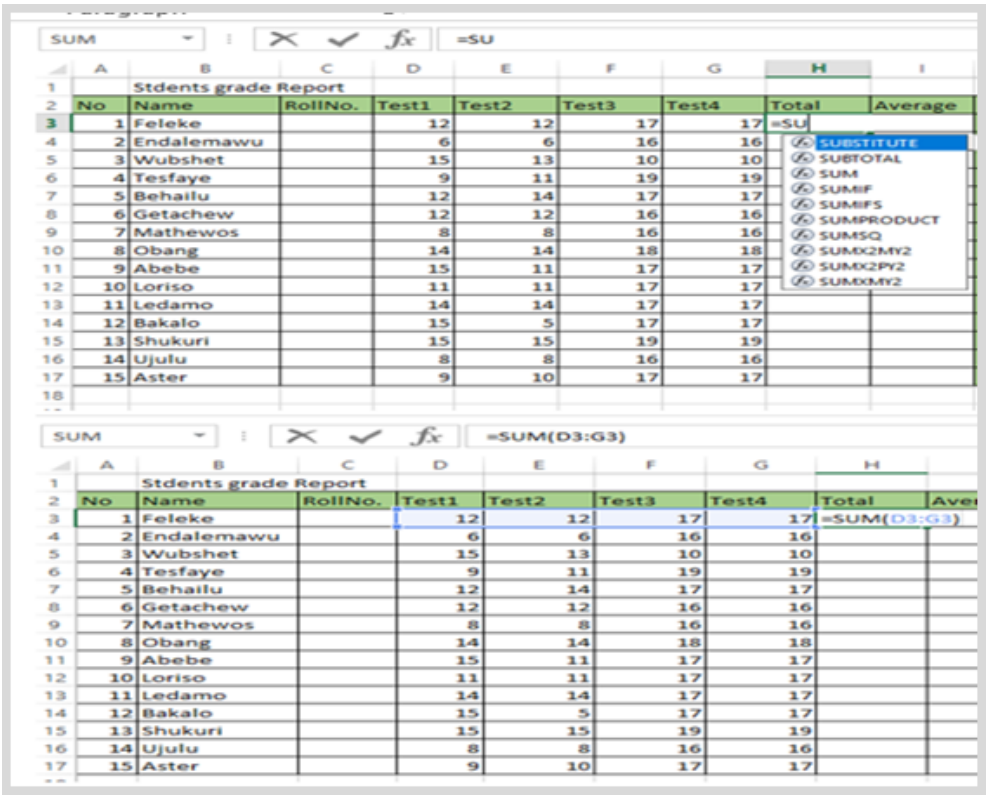
- MS Excel automatically edits the result if any changes are made in any of the cells.

i. Formula Auditing

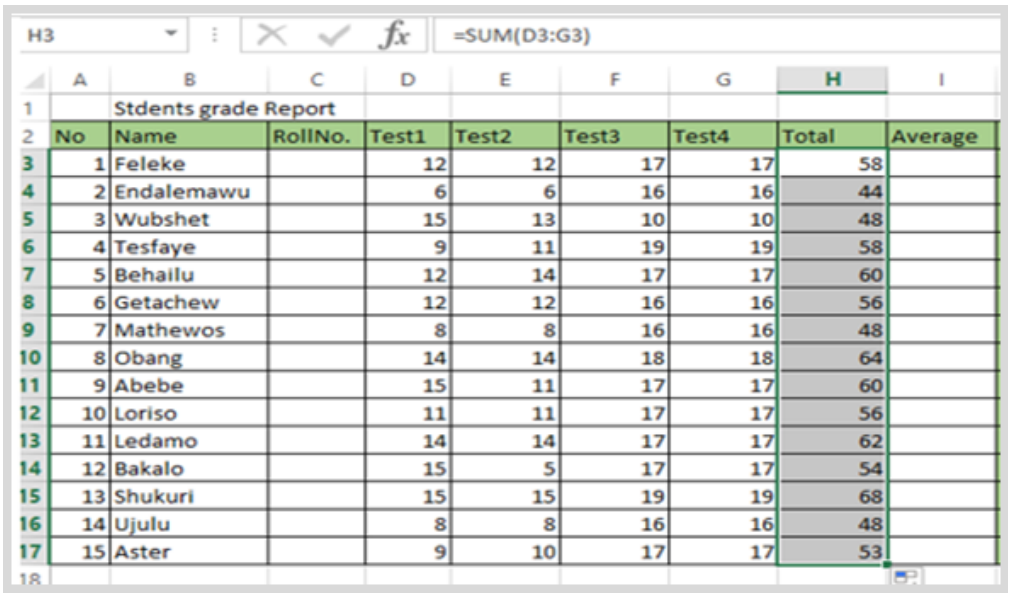
- Using formula auditing, we can graphically display or trace the relationships between cells and formulas with blue arrows. We can trace the precedents (the cells that provide data to a specific cell) or the dependents (the cells that depend on the value in a specific cell).

4.

a. To calculate total, click on the cell H3 and choose the function Sum among the dropdown functions and write cell ranges D3:G3 and press enter on keyboard as shown below.

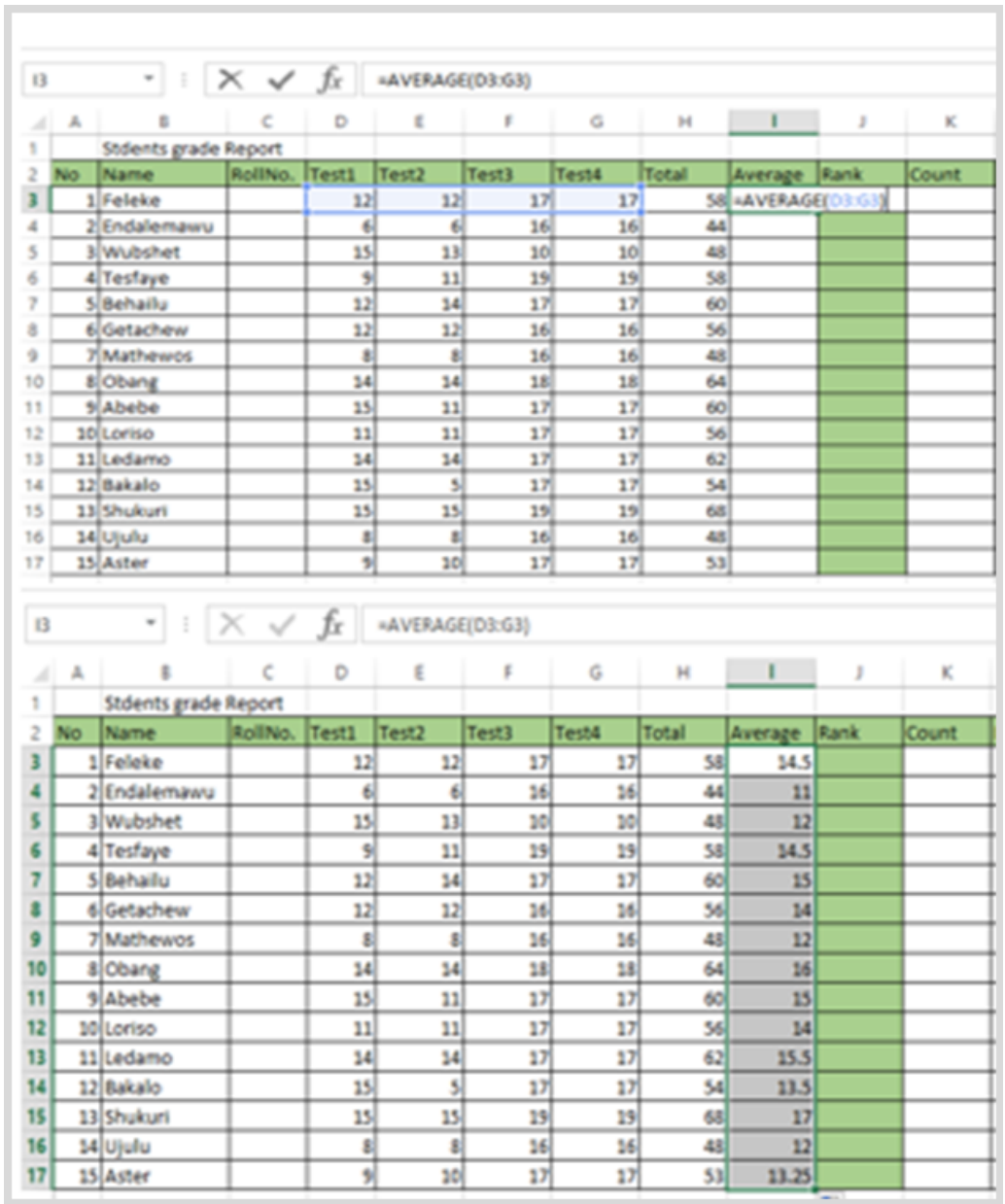


Finally, fill handle and drag until G15; the result will be displayed as shown below.



No	Name	RollNo.	Test1	Test2	Test3	Test4	Total	Average
1	Feleke		12	12	17	17	58	
2	Endalemawu		6	6	16	16	44	
3	Wubshet		15	13	10	10	48	
4	Tesfaye		9	11	19	19	58	
5	Behailu		12	14	17	17	60	
6	Getachew		12	12	16	16	56	
7	Mathewos		8	8	16	16	48	
8	Obang		14	14	18	18	64	
9	Abebe		15	11	17	17	60	
10	Loriso		11	11	17	17	56	
11	Ledamo		14	14	17	17	62	
12	Bakalo		15	5	17	17	54	
13	Shukuri		15	15	19	19	68	
14	Ujulu		8	8	16	16	48	
15	Aster		9	10	17	17	53	

b. To calculate average, follow the same method as you did for sum above. See the result as the following.

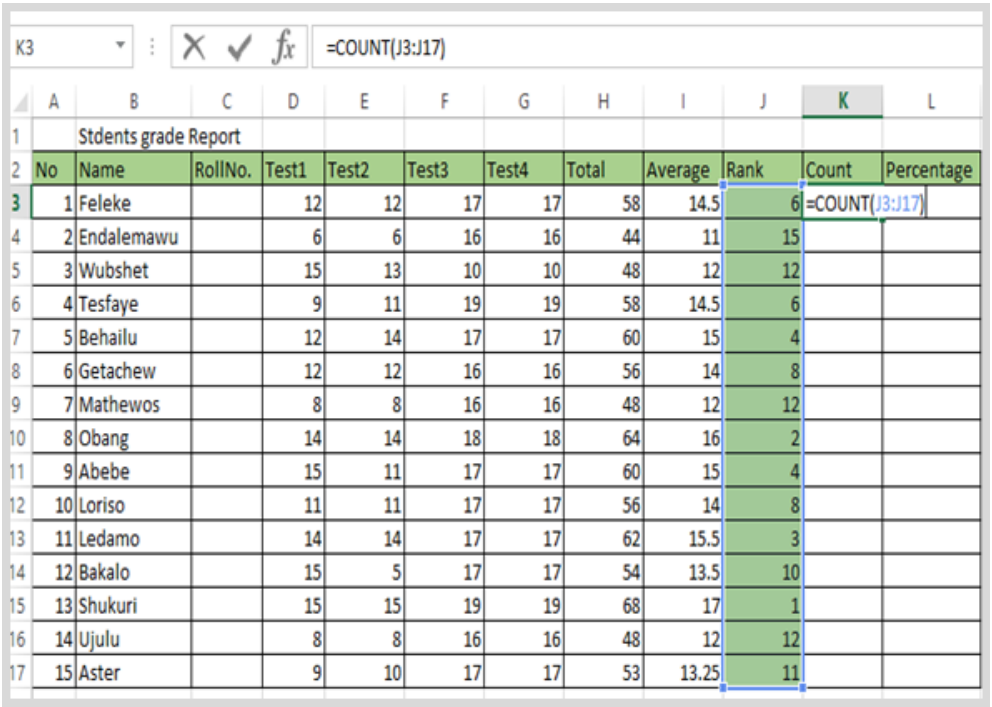


	A	B	C	D	E	F	G	H	I	J	K
1		Stdents grade Report									
2	No	Name	RollNo.	Test1	Test2	Test3	Test4	Total	Average	Rank	Count
3	1	Feleke		12	12	17	17	58	=AVERAGE(D3:G3)		
4	2	Endalemawu		6	6	16	16	44			
5	3	Wubshet		15	13	10	10	48			
6	4	Tesfaye		9	11	19	19	58			
7	5	Behailu		12	14	17	17	60			
8	6	Getachew		12	12	16	16	56			
9	7	Mathewos		8	8	16	16	48			
10	8	Obang		14	14	18	18	64			
11	9	Abebe		15	11	17	17	60			
12	10	Loriso		11	11	17	17	56			
13	11	Ledamo		14	14	17	17	62			
14	12	Bakalo		15	5	17	17	54			
15	13	Shukuri		15	15	19	19	68			
16	14	Ujulu		8	8	16	16	48			
17	15	Aster		9	10	17	17	53			

	A	B	C	D	E	F	G	H	I	J	K
1		Stdents grade Report									
2	No	Name	RollNo.	Test1	Test2	Test3	Test4	Total	Average	Rank	Count
3	1	Feleke		12	12	17	17	58	14.5		
4	2	Endalemawu		6	6	16	16	44	11		
5	3	Wubshet		15	13	10	10	48	12		
6	4	Tesfaye		9	11	19	19	58	14.5		
7	5	Behailu		12	14	17	17	60	15		
8	6	Getachew		12	12	16	16	56	14		
9	7	Mathewos		8	8	16	16	48	12		
10	8	Obang		14	14	18	18	64	16		
11	9	Abebe		15	11	17	17	60	15		
12	10	Loriso		11	11	17	17	56	14		
13	11	Ledamo		14	14	17	17	62	15.5		
14	12	Bakalo		15	5	17	17	54	13.5		
15	13	Shukuri		15	15	19	19	68	17		
16	14	Ujulu		8	8	16	16	48	12		
17	15	Aster		9	10	17	17	53	13.25		

c. COUNT

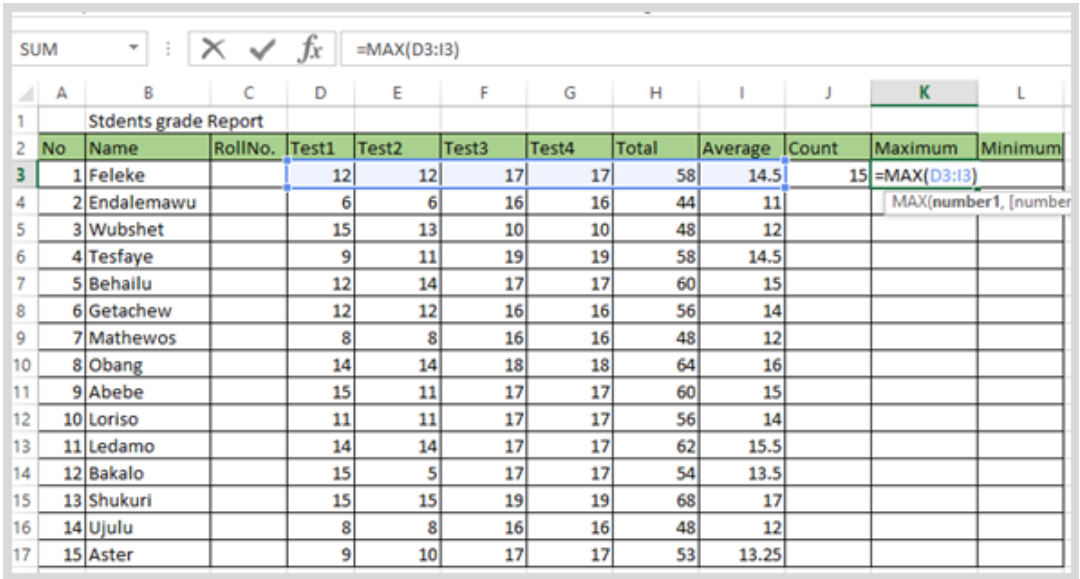
- Formula: = COUNT(J3:J17)
- The count formula counts the number of cells in a range that have numbers in them.
- It only counts the cells where there are numbers.



K3 | =COUNT(J3:J17)

	A	B	C	D	E	F	G	H	I	J	K	L
1		Stdents grade Report										
2	No	Name	RollNo.	Test1	Test2	Test3	Test4	Total	Average	Rank	Count	Percentage
3	1	Feleke		12	12	17	17	58	14.5	6	=COUNT(J3:J17)	
4	2	Endalemawu		6	6	16	16	44	11	15		
5	3	Wubshet		15	13	10	10	48	12	12		
6	4	Tesfaye		9	11	19	19	58	14.5	6		
7	5	Behailu		12	14	17	17	60	15	4		
8	6	Getachew		12	12	16	16	56	14	8		
9	7	Mathewos		8	8	16	16	48	12	12		
10	8	Obang		14	14	18	18	64	16	2		
11	9	Abebe		15	11	17	17	60	15	4		
12	10	Loriso		11	11	17	17	56	14	8		
13	11	Ledamo		14	14	17	17	62	15.5	3		
14	12	Bakalo		15	5	17	17	54	13.5	10		
15	13	Shukuri		15	15	19	19	68	17	1		
16	14	Ujulu		8	8	16	16	48	12	12		
17	15	Aster		9	10	17	17	53	13.25	11		

d. To calculate maximum, follow steps shown above and see tables below.

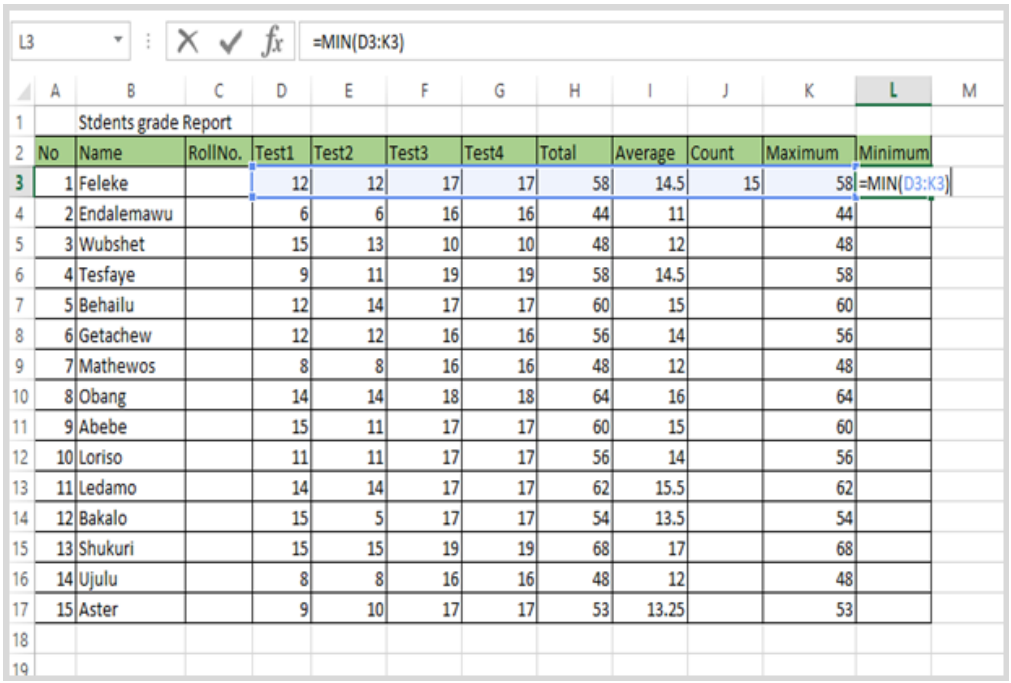


SUM | =MAX(D3:I3)

	A	B	C	D	E	F	G	H	I	J	K	L
1		Stdents grade Report										
2	No	Name	RollNo.	Test1	Test2	Test3	Test4	Total	Average	Count	Maximum	Minimum
3	1	Feleke		12	12	17	17	58	14.5	15	=MAX(D3:I3)	
4	2	Endalemawu		6	6	16	16	44	11			
5	3	Wubshet		15	13	10	10	48	12			
6	4	Tesfaye		9	11	19	19	58	14.5			
7	5	Behailu		12	14	17	17	60	15			
8	6	Getachew		12	12	16	16	56	14			
9	7	Mathewos		8	8	16	16	48	12			
10	8	Obang		14	14	18	18	64	16			
11	9	Abebe		15	11	17	17	60	15			
12	10	Loriso		11	11	17	17	56	14			
13	11	Ledamo		14	14	17	17	62	15.5			
14	12	Bakalo		15	5	17	17	54	13.5			
15	13	Shukuri		15	15	19	19	68	17			
16	14	Ujulu		8	8	16	16	48	12			
17	15	Aster		9	10	17	17	53	13.25			

MAX(**number1**, [number

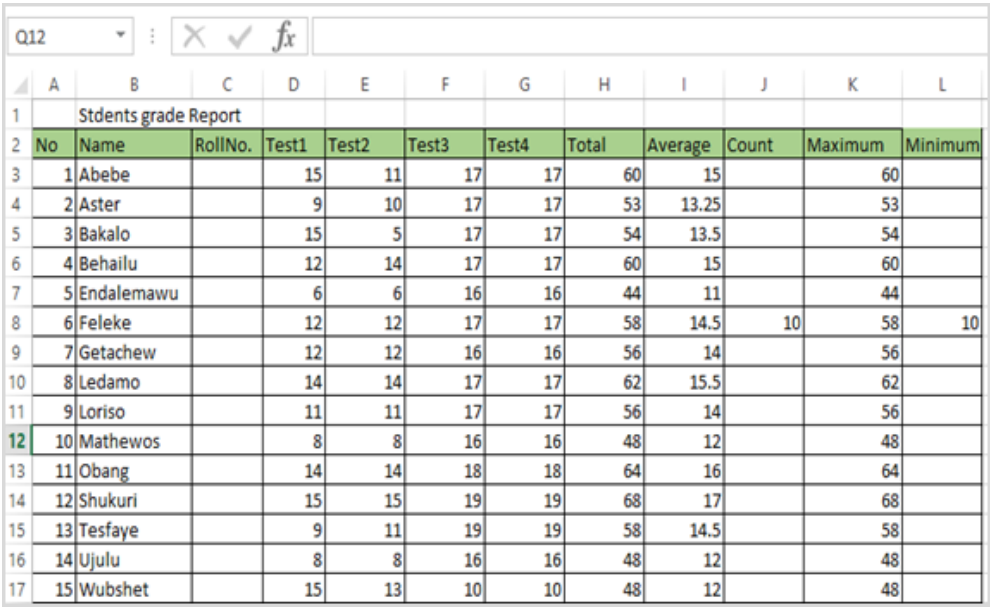
e. To calculate minimum, see the following table.



L3 =MIN(D3:K3)

	A	B	C	D	E	F	G	H	I	J	K	L	M
1		Stdents grade Report											
2	No	Name	RollNo.	Test1	Test2	Test3	Test4	Total	Average	Count	Maximum	Minimum	
3	1	Feleke		12	12	17	17	58	14.5	15	58	=MIN(D3:K3)	
4	2	Endalemawu		6	6	16	16	44	11		44		
5	3	Wubshet		15	13	10	10	48	12		48		
6	4	Tesfaye		9	11	19	19	58	14.5		58		
7	5	Behailu		12	14	17	17	60	15		60		
8	6	Getachew		12	12	16	16	56	14		56		
9	7	Mathewos		8	8	16	16	48	12		48		
10	8	Obang		14	14	18	18	64	16		64		
11	9	Abebe		15	11	17	17	60	15		60		
12	10	Loriso		11	11	17	17	56	14		56		
13	11	Ledamo		14	14	17	17	62	15.5		62		
14	12	Bakalo		15	5	17	17	54	13.5		54		
15	13	Shukuri		15	15	19	19	68	17		68		
16	14	Ujulu		8	8	16	16	48	12		48		
17	15	Aster		9	10	17	17	53	13.25		53		
18													
19													

f. Based on question 4, students' names are sorted from A-Z, as shown below (See **column B)**.



Q12

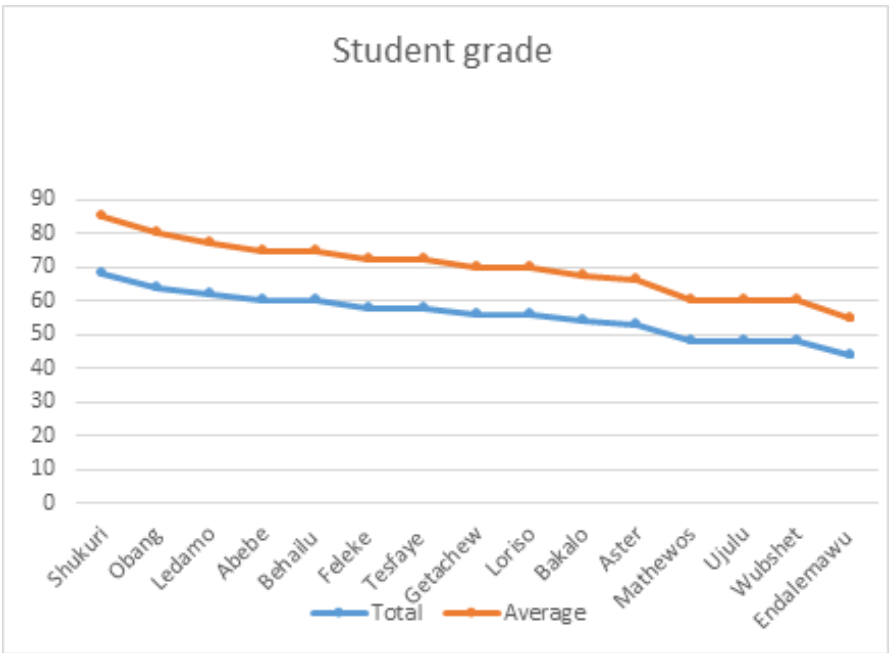
	A	B	C	D	E	F	G	H	I	J	K	L
1		Stdents grade Report										
2	No	Name	RollNo.	Test1	Test2	Test3	Test4	Total	Average	Count	Maximum	Minimum
3	1	Abebe		15	11	17	17	60	15		60	
4	2	Aster		9	10	17	17	53	13.25		53	
5	3	Bakalo		15	5	17	17	54	13.5		54	
6	4	Behailu		12	14	17	17	60	15		60	
7	5	Endalemawu		6	6	16	16	44	11		44	
8	6	Feleke		12	12	17	17	58	14.5	10	58	10
9	7	Getachew		12	12	16	16	56	14		56	
10	8	Ledamo		14	14	17	17	62	15.5		62	
11	9	Loriso		11	11	17	17	56	14		56	
12	10	Mathewos		8	8	16	16	48	12		48	
13	11	Obang		14	14	18	18	64	16		64	
14	12	Shukuri		15	15	19	19	68	17		68	
15	13	Tesfaye		9	11	19	19	58	14.5		58	
16	14	Ujulu		8	8	16	16	48	12		48	
17	15	Wubshet		15	13	10	10	48	12		48	

g. Total grade from largest to smallest (See column H below).

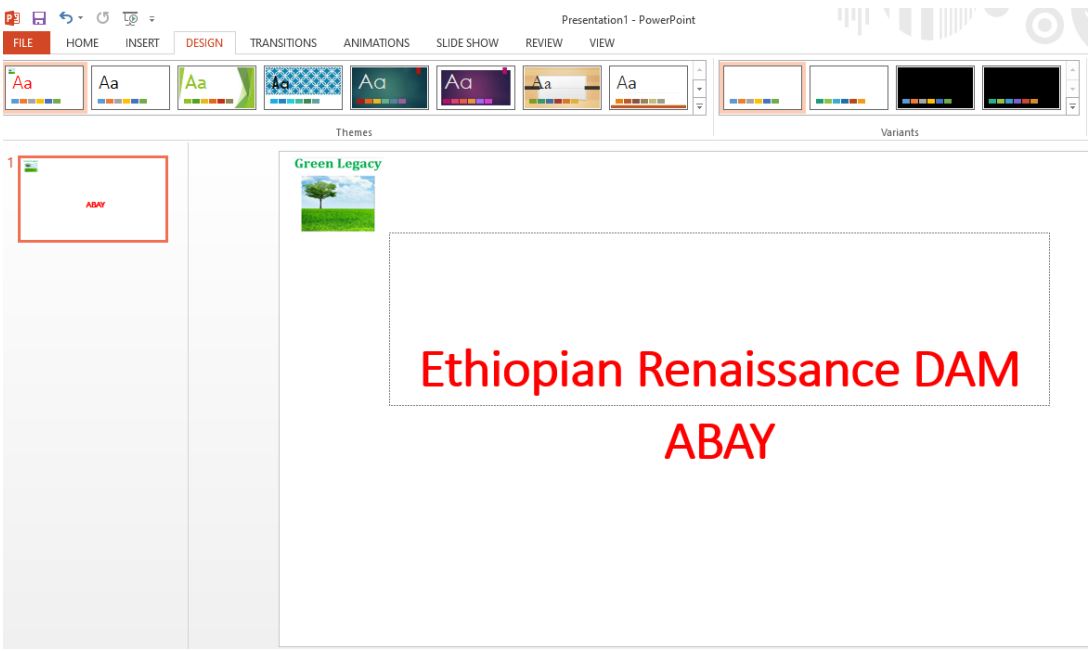
L8

	A	B	C	D	E	F	G	H	I	J
1		Stdents grade Report								
2	No	Name	RollNo.	Test1	Test2	Test3	Test4	Total	Average	Count
3	1	Shukuri		15	15	19	19	68	17	
4	2	Obang		14	14	18	18	64	16	
5	3	Ledamo		14	14	17	17	62	15.5	
6	1	Abebe		15	11	17	17	60	15	
7	2	Behailu		12	14	17	17	60	15	
8	3	Feleke		12	12	17	17	58	14.5	
9	4	Tesfaye		9	11	19	19	58	14.5	
10	5	Getachew		12	12	16	16	56	14	
11	6	Loriso		11	11	17	17	56	14	
12	7	Bakalo		15	5	17	17	54	13.5	
13	8	Aster		9	10	17	17	53	13.25	
14	9	Mathewos		8	8	16	16	48	12	
15	10	Ujulu		8	8	16	16	48	12	
16	11	Wubshet		15	13	10	10	48	12	
17	12	Endalemawu		6	6	16	16	44	11	

h. You can choose any chart type. See the following for example.



5. The following are some of the advantages of PowerPoint presentation
    a. A Picture is worthier than thousand words
    b. Attracting visual and read-write learners
    c. Greener presentations
    d. More focused presentations
6. The following figure demonstrates the master slide with logo green legacy



UNIT 4

IMAGE PROCESSING AND MULTIMEDIA

UNIT OUTCOMES

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

- Explain Multimedia and their components.
- Describe multimedia authoring and its tools.
- Summarize multimedia editing.
- Edit and publish multimedia files.
- Explain computer animation.

4.1 Unit Overview

In grade 9, unit four, the students learned image processing. It is a method to perform some operations on an image, get an enhanced image or contract some useful information from it. It is a type of signal processing in which input is an image and output may be an image or features associated with that image. In this unit, the students have also to master the basics of multimedia, components of multimedia, multimedia file formats, the application area of multimedia, multimedia authoring and its tools, multimedia production, multimedia editing, and computer animation and its strategies.

*Dear teacher, this unit is expected to be covered within **8 periods**. The number of period allotted for each subunit detailed is listed in the table below.*

Suggested Lesson Plan (10 Periods)

No.	Subunits	Number of Periods
4.1	Unit Overview	
4.2	Basics of Multimedia	1
	4.2.1 Components of Multimedia	
	4.2.2 Applications of Multimedia	

4.3	Multimedia File Formats	1
	4.3.1 Text format	
	4.3.2 Image format	
	4.3.3 Digital Audio File Format	
4.4	Multimedia Production	2
4.5	Multimedia Authoring and Authoring Tools	2
	4.5.1 Features of Multimedia Authoring	
	4.5.2 Multimedia Authoring Tools Classification	
	4.5.3 Multimedia Production	
	4.5.4 Multimedia Authoring Metaphor	
4.6	Multidemia Editing Networks	3
Total periods required for the unit		8

At the end of this unit students will be able to:

- Apply multimedia technologies in their daily life.

4.2 Basics of Multimedia

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

- Define multimedia.
- Identify elements of multimedia.
- Format page number.
- Describe applications of multimedia.

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

Instructional Strategies

Demonstration, lecture, group discussion, and questions and answers

Required Instructional Resources

Computers and multimedia authoring software tools, LCD projector, textbook, whiteboard and whiteboard marker

Assessment Strategies

Question and answer, class work, observation, question and answer, and portfolio

Dear nice teacher, to cover the contents mentioned above, you may use different learning strategies such as lecture, demonstration and group discussion. Besides, you may use locally available instructional resources such as blackboard, chalk, and diagrams in class when the instructional resources stated above are not available.

Tips for Lab Activities

Dear teacher, the aim of the activity is to help students develop practical skill on multimedia authoring tools and their applications. In this activity, you may demonstrate what multimedia application software looks like and some products of multimedia production such as Mail, Yahoo Messenger, Video Conferencing and Multimedia Message Service MMS as an example to students.

- While students are engaged in this lab activity, you may observe, guide and provide assistance on the procedures they should follow to do the assigned task. Finally, you will provide feedback on each student's performance and summarize the steps to the whole class.
- To save the teaching time and evaluate the students' progress on the entire unit, you are recommended to let each student create a word file by his/her name or group name on specific location so that he/she will work the required activities on the same file. This method will help you continuously evaluate the students' progress and provide assistance as well.

Answers to Activity 4.1

1. Using multimedia in the classroom **helps the teacher to engage the students and helps the students be more involved and retain more information from the lesson**. Students today are constantly bombarded with technology and are accustomed to receiving knowledge and information immediately in our fast-paced society. Multimedia activities **encourage students to work in groups, express their knowledge in multiple ways, solve problems, revise their own work and construct knowledge**.
2. **Multimedia in Bank**- Bank is another public place where multimedia is finding more and more application in recent times. People go to bank to open saving/current accounts, deposit funds, withdraw money, know various financial schemes of the bank, obtain loans, etc. Today on-line and internet banking have become very popular. These use multimedia extensively.

Multimedia is, thus, helping banks give service to their **customers and also in educating them about bank's attractive finance schemes.**

3. **Multimedia** is used in health sectors for managing patients and diseases' data, for real time monitoring of conditions of patients in critical illness or accident in hospitals. The conditions are displayed continuously on a computer screen and can alert the doctor/nurse on duty if any changes are observed on the screen.
4. Multimedia applications for business include **training, marketing, advertising and product demos**. Presentations are very beneficial in many areas of life and work. These are essential in sales, training, teaching and entertaining.
5. **Virtual meetings** are **real-time interactions that take place over the Internet using integrated audio and video, chat tools and application sharing**. They offer a way to engage students in fully interactive, online learning experiences such as lectures, discussions and tutoring. **Virtual learning** is a learning experience that is enhanced through utilizing computers and/or the Internet both outside and inside the facilities of the educational organization. The instruction most commonly takes place in an online environment.

Additional Tips for Teachers: See the following website for more details on basic concepts of multimedia.

Tip

https://www.wisdomjobs.com/e-university/multimedia-tutorial-270/multimedia-authoring-12721.html

Answers to Activity 4.2

Dear teacher, through this activity, you are expected to let students discuss in group the components of multimedia, animation, graphics and business impact of multimedia. Some of the possible answers of the questions are described below.

1. The various components of multimedia are **text, audio, graphics, video and animation**. All these components work together to represent information in an effective and easy manner.

2. Multimedia components applied in TV or YouTube are image, audio, text, video, etc.
3. Some of the local devices of multimedia are TV, printer, keyboard, mouse and digital camera; webcam is a simple digital camera capable of taking video or still images for transmission over the Internet.
4. Animations **allow topics to be stored in memory easily for a long period of time**. Using narratives, sound and nerve-calming music add more power to learning. Every learner can connect to the topic and the brain will respond with much ease to learning complex topics. Animated material will stimulate the senses.
5. An image can tell thousand words, so incorporating some of the text-heavy content into an info-graphic is much **more aesthetically pleasing for the reader**, meaning they are more likely to read it and absorb what is being said.
6. Multimedia devices such as mobile phones, laptops, tablet PC and the like play an important role for business growth. Plenty of websites (forms of multimedia) are available on the Internet to reach loyal and potential customers and grow business. Besides, many business companies are taking the advantages of the world wide web to boost their sales of products.

Tip

https://theintactone.com/2019/05/05/cam-u4-topic-1-multimedia-applications-in-business/
l

4.3 Multimedia File Formats

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

- Identify different multimedia file formats.

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

Instructional Strategies

Group discussion, lecture and illustration

Required Instructional Resources:

Computers, LCD projector, textbook, whiteboard and whiteboard marker

Assessment Strategies

Observation, question and answer, class work and portfolio

Dear teacher, to cover the contents of this subunit, you may use different learning strategies such as lecture, demonstration and group discussion. Besides, you may use locally available instructional resources such as blackboard, chalk and diagrams in class in case the instructional resources stated above are not available.

Answer to Activity 4.3

Dear teacher, you are expected to let students discuss multimedia file formats in group. Some of the possible answers of the questions are described below.

1. A file format is a structure of how information is stored or encoded in a computer file. Multimedia file formats are used for the production and delivery of multimedia data.
2. An **audio file format** is a file format used for storing digital audio data on a computer system whereas digital video files are collections of images, audio and other data.

Additional Tips for Teachers: See the following website or other similar websites for more details on multimedia file formats.

Tip

https://www.wisdomjobs.com/e-university/multimedia-tutorial-270/popular-file-formats-12733.html

4.4 Multimedia Production

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

- Explain multimedia production.
- Apply steps in multimedia production.

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

Instructional Strategies

Group discussion, lecture, and question and answer

Required Instructional Resources

Computer, LCD projector, textbook, diagrams, whiteboard and whiteboard marker

Assessment Strategies

Question and answer, class work and observation, question and answer, and portfolio

Dear respected teacher, to cover these topics you may us different learning strategies such as lecture, demonstration and group discussion. Besides, you may use locally available instructional resources such as blackboard, chalk and diagrams in class when the stated instructional resources are not available.

Tips for Lab Activities

Dear teacher, while engaging students in this lab activity, you may observe, guide, provide assistant on the procedure they follow while producing multimedia applications. Finally, you will provide feedback on each student performance and summarize the steps for the whole class.

Dear teacher, to save the teaching time and to evaluate the students' progress on the entire unit, you are recommended to let each student create a word file by his/her name or group name on specific location, so that he/she will work the required activities on the same file. This method will help you continuously evaluate the student progress and provide assistant as well.

Answers to Activity 4.4

Dear teacher, under this activity you are expected to let students discuss the influence of multimedia products in our daily life in group. Besides students conceptualize the stages involved in multimedia production. Some of the possible answers for the activity questions are described as:

1. Today's world is heavily dependent upon multimedia in daily life. It includes interactive components such as voice command, text entry, mouse manipulation, touch screen, video capture or live interaction of the user. In this fast-paced world, multimedia plays a subtle but important role.
2. The basic stages of multimedia project development are project conceptualization, planning and closing, design and production, testing and delivery.
3. People involved in multimedia production are production managers, content specialists, text editors, multimedia architects (or program authoring

specialist)s, scriptwriters, computer graphic artists, audio/video specialists and computer programmers.

Additional Tips for Teachers: See the following website for more details on multimedia production.

Tip

https://smallbusiness.chron.com/six-stages-production-multimedia-32412.html

4.5 Multimedia Authoring and Multimedia Tools

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

- Describe features of multimedia authoring.
- Categorize multimedia authoring tools.

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

Instructional Strategies

Group discussion, lecture, and question and answer

Required Instructional Resources

Computer, LCD projector, textbook, diagrams, whiteboard and whiteboard marker

Assessment Strategies

Question and answer, class work and observation, question and answer, and portfolio

Dear respected teacher, to cover these topics you may use different learning strategies such as lecture, demonstration and group discussion. Besides, you may use locally available instructional resources such as blackboard, chalk and diagrams in class when the stated instructional resources are not available.

Answers to Activity 4.5

Dear teacher, under this activity you are expected to let students discuss in group about multimedia authoring, authoring tools and advantages of multimedia authoring and authoring tools. Some of the possible answers for the questions are given below.

1. **Multimedia authoring** is a process of assembling different types of media contents like text, audio, image, animation and video as a single stream of information with the help of various software tools available in the market.
2. **Multimedia authoring tools** give an integrated environment for joining the different elements of a multimedia production together. It gives the framework for organizing and editing the components of a multimedia project.
    - It enables the developer to create interactive presentation by combining text, audio, video, graphics and animation.

Additional Tips for Teachers: See the following websites for more details on multimedia authoring and multimedia tools.

Tip

https://www.itma.vt.edu/courses/appliedid/lesson_0.php
https://answerstoall.com/users-questions/what-are-the-benefits-of-using-the-multimedia-authoring/
https://www.tutorialspoint.com/multimedia/multimedia_authoring.htm

Answers to Activity 4.6

1. In a computer's graphical user interface (GUI), an icon (pronounced EYE-kahn) is an image that represents an application, a capability or some other concept or specific entity with meaning for the user. An icon is usually selectable but can also be a non-selectable image such as a company's logo.
    - An icon is a small image, usually a symbol, used **to graphically represent a software program, file or function on a computer screen**. Icons make it easier to recognize and locate items on your computer or features within a program.

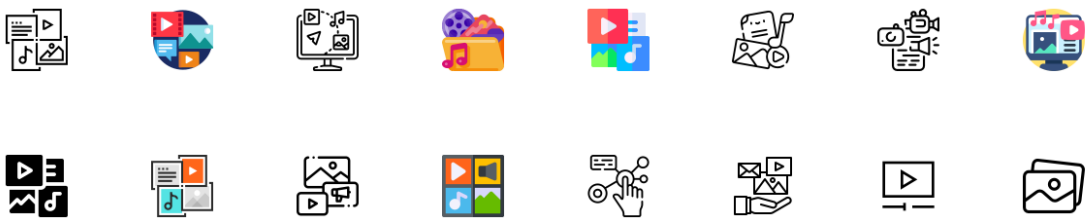


Figure 4.1 Multimedia icons

2. Multimedia authoring applications are **software packages that allow users to present interactive information through different media**. They usually allow the integration of diverse elements such as text, audio, video and animated graphics as well as the distribution of these elements in a variety of formats.
    - Some of the most widely used consumer-grade video editing software applications include **iMovie by Apple, PowerDirector by Cyberlink, Roxio Creator by Roxio and Windows Movie Maker by Microsoft**. Software aimed more at professionals including Premiere Pro by Adobe, Final Cut Pro by Apple and Lightworks by EditShare.
3. Interactive media, also called interactive multimedia, is any computer-delivered electronic system that allows the user to control, combine and manipulate different types of media such as text, sound, video, computer graphics and animation.

Additional Tips for Teachers: See the following websites for more details on multimedia authoring and multimedia tools.

Tip

https://www.itma.vt.edu/courses/appliedid/lesson_0.php
https://www.investopedia.com/terms/i/interactive-media.asp

4.6 Multimedia Editing

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

- Explore multimedia editing methods and editing software.
- Practice uses of programming language.

- Apply techniques for computer animations and graphs.

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

Instructional Strategies

Demonstration, group discussion, lecture and problem solving

Required Instructional Resources

Computers, LCD projector, Internet connection, textbook, whiteboard and whiteboard marker

Assessment Strategies

Question and answer, observation, question and answer, class work

Dear special teacher, to cover these topics you may us different learning strategies such as lecture, demonstration and group discussion and multimedia projects. Besides, you may use locally available instructional resources such as blackboard, chalk and diagrams in class when the stated instructional resources are not available.

Dear favorite teacher, you may provide students a multimedia project that involves activities that contain different components and features. Students will be provided with the necessary instructions to perform the project. Students will submit the completed project and will present to class.

Answer to Practical Exercise 4.1

Dear teacher, in this practical exercise student will record educational events in their school/locality or may take sample educational video from the web and practice editing using any multimedia authoring tools (such as Lightworks, Adobe premiere Rush, HitFilm Express, iMovie, OpenShot, Shotcut, etc.).
Dear teacher, you are expected to guide students while they are doing this activity in group.

Additional Tips for Teachers

See the following website for more details on multimedia editing techniques.

Tip

https://www.mediacollege.com/video/editing/

Practical Exercise 4.2

Dear teacher, in this practical exercise student will students will use video file they have used in Practical Exercise 4.1 and practice the exercise (Trim video clip, set duration and freeze frame) and demonstrate their work to the class.

Dear teacher, you are expected to guide students while they are doing this activity in group.

Additional Tips for Teachers: See the following website for more details on multimedia editing techniques.

Tip

https://www.mediacollege.com/video/editing/

Answers to Activity 4.7

Dear teacher, under this activity you are expected to let students discuss the difference between multimedia and hypermedia, forms of computer animation and animation software in group. Some of the possible answers of the questions are the following.

- While **multimedia simply refers to multiple forms of media, hypermedia is used in a much broader sense to refer to media with links to other media**. Multimedia is anything you can see and hear whereas hypermedia is something you can see and interact with at the same time.
- Animation is a method of photographing successive drawings, models, to create an illusion of movement in a sequence. Some of the animation software includes 2D animation, 3D animation, Motion Graphics and Motion stop.
- Animation software **enables users to generate moving graphics from visual files**. Depending on the particular program, users can animate some variation of 2D, 3D, hand-drawn or computer-generated graphics, often with the option to add music or additional effects.
- Let the teacher instruct students to draw a picture, animate and save it.
- Using interactive animations improves the skills of students as well as teachers. It engages the students in the entire learning process. It helps

their imagination and they learn concepts with ease. Instructors can use different methods of teaching to the traditional classroom lecture. Emphasis is on learning with is less time and effort.

Additional Tips for Teachers: See the following website for more details on multimedia editing techniques.

Tip

https://www.tutorialspoint.com/computer_graphics/computer_animation.htm

4.7 Unit Summary

Multimedia authoring involves collating, structuring and presenting information in the form of a digital multimedia, which can incorporate text, audio and still and moving images. Multimedia Authoring Tool is a program that helps you write hypertext or multimedia applications. Authoring tools usually enable you to create a final application merely by linking together objects such as a paragraph of text, an illustration or a song.

Most authoring systems also support a scripting language for more sophisticated applications. Authoring tools require less technical knowledge to master and are used exclusively for applications that present a mixture of textual, graphical and audio data. Authoring tools are classified into three: card-based, time-based and icon-based. Similarly, multimedia files can be presented in several formats such as text, image, digital audio and digital video file formats.

Multimedia editing is a broad term that covers the creation and manipulation of digital audio-visual files such as image, audio and video files. It can also include elements such as animation and graphics. Computer animation is the art of creating moving images via the use of computers. It is a subfield of computer graphics and animation. Computer animation is essentially a digital successor to the art of stopping motion animation of 3D models and frame-by-frame animation of 2D illustrations.

4.8 Answers to the Unit Review Exercise

Part I: True/False Items

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

Part II: Multiple Choice Questions

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

Part III: Answers to Discussion Questions

1. Multimedia is a representation of information in an attractive and interactive manner with the use of a combination of text, audio, video, graphics and animation. In other words, we can say that multimedia is a computerized method of presenting information combining textual data, audio, visuals (video), graphics and animations, for example E-Mail, Yahoo Messenger, Video Conferencing and Multimedia Message Service (MMS).

- Fundamental components of multimedia include:
    - Text
    - Graphics
    - Audio
    - Video
    - Animation

2. The following are the basic stages of multimedia project development.

- Project Conceptualization
    - Every project begins with a concept. A multimedia project concept is actually the definition of the project. To define the project, it is required for the development team and the clients to do various meetings and discussions to identify the actual problem. It may be upgrading the existing one or the entirely new one. It must satisfy the existing requirements of the customer.
- Planning and Costing
    - In this stage, the analysis of the idea is done, which is to be translated into a multimedia project. This idea can be further refined by outlining its messages and objectives. Before starting to develop the multimedia project, it is necessary to plan what writing skills, graphic art, music, video and other multimedia skills will be required. It is also necessary to estimate the time needed to prepare all elements of multimedia and prepare a budget accordingly. After preparing a budget, a prototype of the concept can be developed.
- Design and Production

  Once the project is taken up for development, the laborious project development cycle starts. Under this stage, the various sub-stages are to be carried out.
    - Data gathering
    - Navigation of map structure design
    - Media content design

- Interface designing
- Storyboarding
- Integration (multimedia authoring)

- Testing
  - In every project, the testing stage ensures that the product to be free from bugs. Apart from bug elimination, another aspect of testing is to ensure that the multimedia application meets the objectives of the project. It is also necessary to test whether the multimedia project works properly on the planned delivery platforms and meets the needs of the clients.
- Delivery

  The final stage of the multimedia application development is to pack the project and deliver the complete project to the end-user. This stage has several steps such as:
  - Implementation
  - Maintenance
  - Shipping and marketing

3. The multimedia editor is primarily responsible for **managing our website including generating, editing and uploading content and enhancing its digital presence and outreach**. The role also requires working across the medium of print and video as and when required, and managing corporate social media profiles.
   - Multimedia editing is **a broad term that covers the creation and manipulation of digital audio-visual files such as image, audio and video files**. It can also include elements such as animation and graphics.
4. Screen elements of Macromedia Flash MX are shown in Figure 4.2 below.

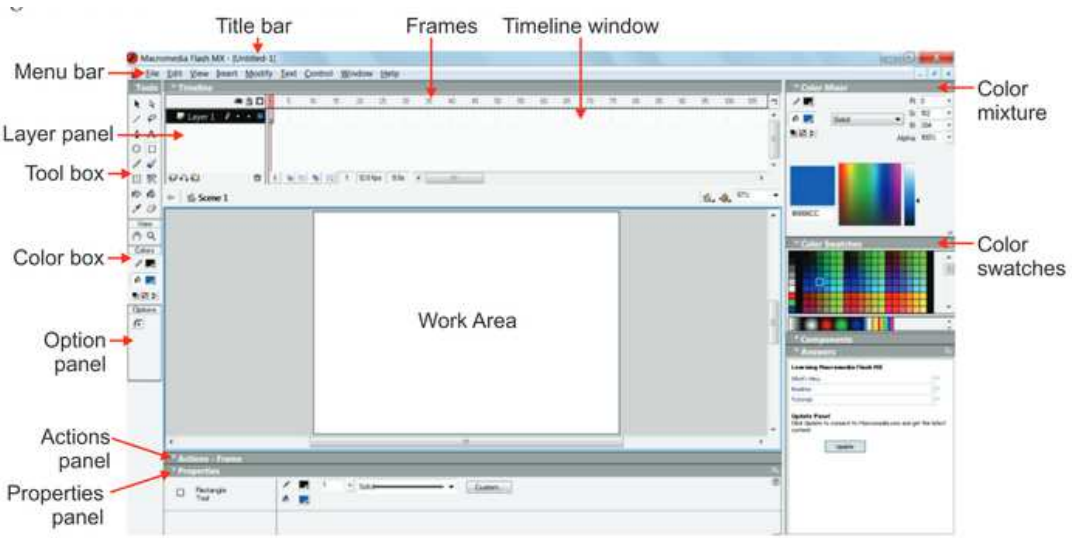


Figure 4.2 Screen elements of Macromedia Flash MX

Screen Element	*Description*
Menu bar	It contains various menus for commands.
Work area	It consists of Flash stage (White area in the middle of Work area) and Workspace (grey area).
Timeline window	It controls when things happen during playback of movie. For example, playback time, frame rate etc.
Layer panel	It controls the layers (The transparent overlays on the stage where different objects can be placed). It is an integral part of the timeline.
Toolbox	It contains all the tools you need for drawing or selecting objects.
Panels	Flash makes extensive use of panels (The different parts of the screen). For example, option panel, action panel, properties panel etc.

Figure 4.3 Description of screen elements of Macromedia Flash MX

5. To import audio, use one of the following methods.
   - To import an audio file to library, select File ➔ Import ➔ Import To Library and select the audio file that you want to import.
   - To import an audio file to stage, select File ➔ Import ➔ Import To Stage and select the audio file that you want to import.

6. Film editing techniques are used by film editors to tell stories using video content through importing film footage, organizing shots by scenes, and taking and assembling the pieces to create a compelling story.

UNIT 5

INFORMATION AND COMPUTER SECURITY

UNIT OUTCOMES

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

- Explain information security.
- Apply steps to install antivirus software.
- Create and change user account in their computers.
- Explain privacy and security.
- Analyze cyber security.

5.1 Unit Overview

In grade 9 the students learned about basic concepts of information and computer security. This unit introduces the basic concepts of privacy and security related to data. Besides, students will be taught about computer security related threats and their types as well as threat prevention strategies. Lastly, the students will learn about cyber security concepts and prevention tips.

*Dear teacher, this unit is expected to be covered within **10 periods**. The detail of allotted period for each subunit is listed in the table below.*

Suggested Lesson Plan (10 Periods)

No.	Subunits	Number of Periods
5.1	Unit Overview	
5.2	Information and Computer Security	2
	5.2.1 Information Security	
	5.2.2 Computer Security	
5.3	Impact of Information and Computer Security on Society	1

5.4	Privacy and Security	2
	5.4.1 Data Security	
	5.4.2 Data Privacy	
5.5	Computer Security Threats	2
	5.5.1 Types of Computer Security Threats	
5.6	Threat Prevention Strategies	2
	5.6.1 Technical Prevention Strategies	
	5.6.2 Non-technical Prevention Strategies	
5.7	Cyber Security	1
Total periods required for the unit		10

At the end of the unit students will be able to:

- Apply security measures of computer and information

5.2 Information and Computer Security

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

- Define information and computer security.
- Discuss the importance of securing their computer and data.

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

Instructional Strategies

Group discussion, lecture (teacher talk), and question and answer

Required Instructional Resources

Computers, diagrams, LCD projector, textbook, whiteboard and whiteboard marker

Assessment Strategies

Observation, question and answer, evaluation as class work

Dear teacher, to cover these topics you may us different learning strategies such as lecture, demonstration and group discussion and multimedia projects. Besides, you may use locally available instructional resources such as blackboard, chalk and diagrams in class when the stated instructional resources are not available.

You may arrange students in groups of three's and let them discuss the fundamental concepts of computer and information security. You may observe and examine students while they are explaining the concepts to class.

Answers to Activity 5.1

Possible answers of the questions are the following.

1. Some examples of the problems of unsecured information and network: School computers become targets of spam or malware attack, school's vital information might be accessed by unauthorized users, network connection becomes slow, and data might be altered, deleted or become unaccusable.
2. Computer networks connect devices.
3. Schools are unable to access their digital resources including educational (teaching) materials and software.
4. Advantages of protecting IT resources in schools

Additional Tips for Teachers: See the following website for more details on information security and its importance.

Tip

https://www.tutorialspoint.com/computer_security/computer_security_overview.htm

5.3 Impact of Information and Computer Security on Society

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

- Analyze information and computer security concepts.
- Assess sources of computer security risks.

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

Instructional Strategies

Teacher talk, group discussion, and questions and answer

Required Instructional Resources

Computer,LCD projector,textbook,diagrams,whiteboard and whiteboard marker

Assessment Strategies

- Observation (Check while students discuss in groups)
- Question and answer
- Class work
- Portfolio

Activity 5.2

In this activity questions student will investigate how information and computer security influence their community, the consequences of their violation and the importance of securing their computers and other devices through group discussion.

Dear teacher during the group discussion you should assist and encourage each of them to actively participate and reflect their views about each question.

Additional Tips for Teachers: See the following website for more details about privacy and security concepts.

Tip

https://www.javatpoint.com/security-vs-privacy

5.4 Privacy and Security

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

- Define and explain data privacy.
- Discuss data security.
- Relate data privacy with data security.

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

Instructional Strategies

Teacher talk, group discussion, and questions and answer

Required Instructional Resources

Computer, LCD projector, textbook, diagrams, whiteboard and whiteboard marker

Assessment Strategies

- Observation (Check while students discuss in groups)
- Question and answer
- Class work
- portfolio

Activity 5.3

Dear teacher, in this activity, students compare and contrast privacy and security, observe school computer laboratories and analyze computer security mechanism in place, related data security with that of computer security and report their discussion points to class.

Dear teacher during the group discussion you should assist and encourage each of them to actively participate and reflect their views.

Additional Tips for Teachers: See the following website for more details about privacy and security concepts.

Tip

https://www.javatpoint.com/security-vs-privacy

5.5 Computer Security Threats

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

- Define computer security threats.
- Explain types of computer security threats.

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

Instructional Strategies

Group discussion, lecture, and question and answer

Required Instructional Resources

Computer, LCD projector, textbook, whiteboard and whiteboard marker

Assessment Strategies

Observation, question and answer, class work, question and answer

Dear teacher, to cover these topics you may use different learning strategies such as lecture, demonstration, group discussion and lab activities. Besides, you may use locally available instructional resources such as blackboard, chalk and diagrams in class when the stated instructional resources are not available.

Respected teacher, you may make a group of three students and let them discuss types of computer security threats and present their task to the class. You will assist them while they are installing antivirus program on their computers. While they are doing this, you will observe and evaluate each student's role and participation in the group activities.

Activity 5.4

Dear teacher, in this activity students have to describe the term malware, analyze computer security threats by providing examples, and assess to what level school and personnel computers are affected by these threats and then report their discussion points to class.

Dear teacher during the group discussion you should assist and encourage each of them to actively participate and reflect their views freely.

Additional Tips for Teachers: See the following website for more details about computer security threats.

Tip

https://www.webroot.com/us/en/resources/tips-articles/computer-security-threats

5.6 Threat Prevention Strategies

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

- Define threat prevention strategies.
- Identify technical threat prevention strategies.
- Discuss non-technical threat prevention strategies.

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

Instructional Strategies

Lecture, group discussion, and question and answer

Required Instructional Resources

Computer, LCD projector, textbook, whiteboard and whiteboard marker

Assessment Strategies

Visualization, question and answer, class work and lab practice

Dear teacher, to cover these topics you may us different learning strategies such as lecture, demonstration and group discussion. Besides, you may use locally available instructional resources such as blackboard, chalk and diagrams in class when the stated instructional resources are not available.

Answer to Activity 5.5

Dear teacher, in this activity student should explain data backup mechanisms and advantages of taking back, describe cloud or online backup procedures and discuss their advantages, and describe window-based backup on their school computers or personal devices.

Dear teacher during the group discussion you should assist and encourage each of them to actively participate and reflect their views.

Activity 5.6

Dear teacher, this activity is intended to let students explain advantages of installing antivirus program, identify ways of protecting their devices from malware, define encryption of data and encryption mechanism, describe steps followed to install antivirus and identify the types accounts managed on computer.

Dear teacher during the group discussion you should assist and encourage each of them to actively participate and reflect their views.

Answers to Activity 5.7

Dear teacher, in this activity, students are expected to compare nontechnical for computer and data, describe mechanism used to protect data and programs, prevention strategies, define encryption of data and encryption mechanism, data or program copy inhibition mechanisms applied to their computers.

Possible answers to Activity 5.7

1. Some of non-technical prevention strategies for your computer and data are non-technical security and privacy controls include such actions and things as administrative policies, procedures and standards for the full range of information security and privacy domains assigned responsibilities.
2. Ways of protecting programs and data are:

a. Encrypt your data.
b. Backup your data.
c. The cloud provides a viable backup option.
d. Anti-malware protection is a must.
e. Make your old computer's hard drives unreadable.
f. Install up-to-dated operating system.
g. Automate your software updates.

3. Respected teacher, observe while students are visiting computers in your school and summarize antiviruses. Encourage your students to report their observations to class.

4. Copy protection components could be:

a. Encryption. Encryption is used to encode (encrypt) content so that it is only usable if the recipient has the correct key.
b. DRM controls.
- Digital rights management (DRM) is the use of technology to control and manage access to copyrighted material. Another DRM meaning is taking control of digital content away from the person who possesses it and handing it to a computer program.

c. Licensing
d. Watermarks
e. Other security mechanisms

Dear teacher, during the group discussion, please assist and encourage the students.

Additional Tips for Teachers: Visit the following website for more details on threat prevention strategies.

Tip

https://digitalguardian.com/blog/what-data-encryption

5.7 Cyber Security

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

- Define cyber security.
- Describe the relationships between cyber security and information security.
- State common ways of cybercrime prevention tips.

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

Instructional Strategies

Group discussion, lecture, questions and answers, and assignment

Required Instructional Resources

Computers, LCD projector, textbook, whiteboard and whiteboard marker

Assessment Strategies

Observation, question and answer, class work and portfolio

Honorable teacher, to cover these topics you may us different learning strategies such as lecture, demonstration and group discussion and multimedia projects. Besides, you may use locally available instructional resources such as blackboard, chalk and diagrams in class when the stated instructional resources are not available.

Dear teacher, you may provide students a multimedia project that involves activities that contain different components and features. You might give them the required instructions to the project. Finally, you might let them to present their work to class.

Answers to Activity 5.8

Dear teacher, in this activity, students should analyze the reasons for cyberattack, describe the impacts of cyberattack on a society, compare cyberattack and cybercrime, analyze cyber security threats across the globe, state categories of cyber security and analyze the cyber security prevention mechanisms.

Possible answers to Activity 5.8

1. Most often, cyber-attacks happen because criminals want your:
   - Business financial details
   - Customers' financial details (e.g. credit card data)
   - Sensitive personal data

- Customers' or staff email addresses and login credentials
- Customer databases
- Clients list
- IT infrastructure
- IT services (e.g. the ability to accept online payments)
- Intellectual property (e.g. trade secrets or product designs)

2. On an individual level, a cyber-attack can lead to a variety of consequences, ranging from theft of personal information to extortion of money or loss of valuable data such as family photos. Society and systems depend on critical infrastructures such as power plants, hospitals and financial service companies.
3. Cybersecurity is ultimately about protecting government and corporate networks, seeking to make it difficult for hackers to find and exploit vulnerabilities. Cybercrime, on the other hand, tends to focus more on protecting individuals and families as they navigate online life.
4. Respected teacher, observe while your students analyze cyber security threats across the globe in general and Ethiopia in particular. Assist them from online materials too.
5. The most common types of cyber security are:
   - Network security: Network security is the process of safeguarding your data from unauthorized entry through your computer networks.
   - Information security.
   - End-user behavior.
   - Infrastructure security.

Dear teacher, during the group discussion you should coach and provide directions on how to complete each question in group.

Additional Tips for Teachers: See the following website for more details on cyber security types, impacts on society and prevention mechanisms.

Tip

https://tutorials.one/cybersecurity/#Defining_Cybersecurity

5.8 Unit Summary

Computer security is the control put in place to provide confidentiality, integrity and availability for all components of computer systems. These components include data, software, hardware and firmware. Information security is applied to computing devices such as computers and smartphones as well as computer networks such as private and public networks, including the whole Internet.

Privacy is concerned with safeguarding and respecting people's rights to manage their data in a broader sense. Data privacy or information privacy is concerned with proper handling, processing, storage and usage of personal information. It is all about the rights of individuals concerning their personal information.

Lack of confidentiality is an unauthorized disclosure of data or unauthorized access to a computer system or program. A failure of integrity results from unauthorized modification of data or damage to a computer system or program. Lack of availability of computing resources results in what is called denial of service. An act or event that has the potential to cause a failure of computer security is called a threat.

A user account is a collection of settings and permissions, specific to a user that determines what a user can and cannot do on the computer. These settings protect the user's files, programs and folders from being accessed by other non-authorized people.

Antivirus software is the computer software used to prevent, detect and remove malware, including computer viruses, worms and Trojan horses. Some examples of antivirus software are Avast, McAfee, Norton, and Kaspersky.

Cyber security is the practice of defending computers, servers, mobile devices, electronic systems, networks and data from malicious attacks. It is also known as information technology security or electronic information security. The term applies in a variety of contexts, from business to mobile computing, and can be divided into a few common categories.

Cybercrime is any criminal activity that involves computer, networked device or network. While most cybercrimes are carried out to generate profit for the cybercriminals, some cybercrimes are carried out against computers or devices directly to damage or disable them.

5.9 Answers to the Unit Review Exercise

Part I: True/False Items

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

Part II: Multiple Choice Questions

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

Part III: Discussion Questions

1. Some possible definitions of computer security are the following
    - Computer security is about information security as applied to comput-

ing devices such as computers and smart phones as well as computer networks such as private and public networks, including the whole Internet.

- Computer security is a method for ensuring data that have been stored in computer systems could not be read or compromised by any individuals without authorization.

2. The list of threats as related to information security include types of computer security threats like Trojan horse, computer virus, computer worms, adware, spyware, ransomware and hackers.
3. Making a backup helps you recover your data, in case of any data loss, using external hard drive, CD, Flash memory or an online data backup site such as Cloud. Events like floods and earthquakes can strike without warning and may cause significant data loss.
4. A firewall system prevents unauthorized access to a private network from network traffic. A firewall system forms a barrier between trusted and untrusted websites from threats like hackers and worms.
5. Explain information security, is simply referred to as InfoSec, which is the practice of defending information from unauthorized access, use, disclosure, disruption, modification, perusal, inspection, recording or destruction.
6. Data privacy **or** information privacy is concerned with proper handling, processing, storage and usage of personal information. It is all about the rights of individuals **with respect to their personal information.**
7. Data security is concerned with measure that an organization is taking in order to prevent any third part from unauthorized access.

UNIT 6 FUNDAMENTALS OF PROGRAMING

UNIT OUTCOMES

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

- Explain concepts of algorithms.
- Describe the representation of algorithms.
- Discuss Integrated Development Environment (IDE).

6.1 Unit Overview

As it was defined and discussed in grade 9, problem-solving steps are used to solve day-to-day problems and make strategies to handle different situations which keep arising in day-to-day life. One method of solving problems in computer science is using algorithms. This unit covers basics of algorithm, definition of algorithm, characteristics of algorithm, algorithm representation and introduction to integrated development environment (IDE).

*Dear teacher, this unit is expected to be covered within **15 periods**. The detail of the period allotment for each subunit is listed in the table below.*

Suggested Lesson Plan (15 Periods)

No.	Subunits	Number of Periods
6.1	Unit Overview	
6.2	Basics of Algorithm	2
	6.2.1 Problem Solving Steps	1
	6.2.2 Program and Algorithm	1
6.3	Definition of Algorithm	1
6.4	Characteristics of Algorithms	3
	6.4.1 Advantages of Algorithm	1
	6.4.2 Disadvantages of Algorithm	1

	6.4.3 Examples of Algorithms	1
6.5	Algorithm Representation	5
	6.5.1 Flowchart	1
	6.5.2 Basic Flowchart Symbol	2
	6.5.3 Pseudo-code	1
	6.5.4 Writing Instruction in Programming Language	1
6.6	Introduction to Integrated Development Environment (IDE)	4
	6.6.1 Definition of IDE	1
	6.6.2 Benefits of Using IDE	1
	6.6.3 Types of IDE	1
	6.6.4 IDE for Specific Application	1
Total periods required for the unit		15

At the end of the unit students will be able to:

- Develop program design skills.

6.2 Basics of Algorithm

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

- Apply problem-solving steps.
- Distinguish between programs and algorithms.

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

Instructional Strategies

Group discussion, lecture, questions and answers,

Required Instructional Resources

Computer, LCD projector, flowcharts, textbook, whiteboard and whiteboard marker

Assessment Strategies

Observation, question and answer and class work

Dear teacher, to cover these topics you may use different learning strategies such as lecture, demonstration and group discussion. Besides, you may use locally available instructional resources such as blackboard, chalk and diagrams in class when the stated instructional resources are not available.

Answers to Activity 6.1

Esteemed teacher, the aim of this activity is to help students develop problem-solving skills by describing the steps of problem-solving. Mastery of these skills is foundation for learning the subsequent topics in this unit. In the activity, you may instruct students to do the questions in groups. You might observe, coach and assist them during their engagement.

- While engaging students in this lab activity, you may observe, guide, and provide assistance on the procedures they should follow to do the assigned task. Finally, you need to provide feedback based on each student's performance and summarize the steps for the whole class.
- To save the teaching time and evaluate the students' progress on the entire unit, you are recommended to let each student create a Word file by his/her name or group name on specific location so that he/she will work the required activities on the same file. This method will help you continuously evaluate your students' progress and provide assistance as well.

Additional Tips for Teachers: Visit the following website for further information about problem solving.

Tip

https://www.tutorialspoint.com/creative_problem_solving/index.htm

6.3 Definition of Algorithms

In this subunit, students learn about the concept of algorithm. In this section, define algorithms and its relationship with real-world problem-solving steps.
At the end of this subunit, students will be able to:

- Define algorithms with examples.
- Describe steps followed to solve real world problems.

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

Instructional Strategies

Group discussion, lecture and questions and answers.

Required Instructional Resources

Computer, LCD projector, textbook, whiteboard and whiteboard marker

Assessment Strategies

Observation, question and answer, class work and lab exercise

Dear teacher, to cover these topics, you may us different learning strategies such as lecture, demonstration and group discussion. Besides, you may use locally available instructional resources such as blackboard, chalk and diagrams in class when the stated instructional resources are not available.

To save the teaching time and to evaluate your students' progress on the entire unit, you are recommended to let each student create a Word file by his/her name or group name on specific location so that he/she will work the required activities on the same file. This method will help you continuously evaluate the students' progress and provide assistance as well.

6.4 Characteristics of Algorithm

In this subunit, students will learn the characteristics, advantages and disadvantages of algorithms. As one would not follow any written instructions to cook the recipe, but only the standard one. Similarly, not all written instructions for programming are algorithms. Therefore, it is very crucial to understand the key characteristics that are required to make an instruction to be a good algorithm with their advantages and disadvantages as well.

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

- Describe characteristics of an algorithm.
- Explain advantages of an algorithm.
- State disadvantages of an algorithm.
- Illustrate algorithms with examples.

This topic is expected to be covered in **3 period**s.

Instructional Strategies

Group discussion, lecture, questions and answers.

Required Instructional Resources

Computer, LCD projector, textbook, whiteboard and whiteboard marker.

Assessment Strategies

Observation, question and answer and class work

Dear teacher, to cover these topics you may use different learning strategies such as lecture, demonstration and group discussion. Besides, you may use locally available instructional resources such as blackboard, chalk and diagrams in class when the instructional resources stated above are not available.

Answers to Activity 6.2

1. Observe students choosing or identifying the problems that can be solved stepwise, encourage or assist them to follow the following steps.
   - Define the problem. What are you trying to solve?
   - Brainstorm ideas. What are some ways to solve the problem?
   - Decide on a solution. What are you going to do?
   - Implement the solution. What are you doing?
   - Review the results. What did you do?
2. Observe and assist students relating to the steps they have identified to the components of an algorithm. Precisely, three main stages involved in creating an algorithm are: **data input**, **data processing** and **results output**.

   The order is specific and cannot be changed. Consider a computer program that finds the average value of three numbers.
3. The main characteristics of an algorithm are:
   - ***Clear and unambiguous***: The algorithm should be unambiguous. Each of its steps should be clear in all aspects and must lead to only one meaning.
   - ***Well-defined inputs:*** If an algorithm says to take inputs, they should be well-defined.
   - ***Well-defined outputs***: The algorithm must clearly define what output will be yielded and it should be well-defined as well.

- ***Finiteness:*** The algorithm must be finite, i.e. it should not end up in infinite loops or similar.
- ***Feasible:*** The algorithm must be simple, generic and practical so that it can be executed upon the available resources. It must not contain some future technology or anything.
- ***Language independent:*** The algorithm designed must be language-independent, i.e. it must be just plain series of instructions that can be implemented in any language, and yet the output will be the same, as expected. The following figure shows the characteristics of an algorithm.

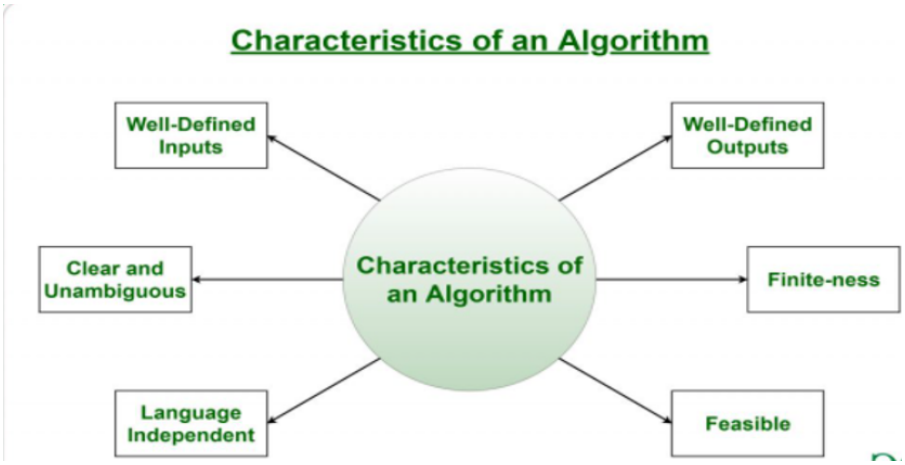


Figure 6.1 Characteristics of an algorithm

Additional Tips for Teachers: Visit the following website for more details on the concepts of algorithms.

Tip

1. https://www.howtogeek.com/school/microsoft-word-document-formatting-essentials
2. https://www.codesansar.com/computer-basics/algorithms.htm

6.5 Algorithm Representation

In this sub unit, students will learn about representation of algorithms. Algorithms can be developed using many techniques and tools such as using flow chart, verbal description of algorithms and pseudocode methods. Besides, students will learn symbols and develop skills needed for designing algorithms using flowchart.

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

- Describe ways of describing algorithms.
- Construct algorithm using flowchart.
- Order and state algorithm steps using pseudocode.
- Specify the relationship between written instructions and programming language.

This topic is expected to be covered in **5 periods**.

Instructional Strategies

Group discussion, lecture, questions and answer

Required Instructional Resources:

Computer, LCD projector, textbook, whiteboard and whiteboard marker

Assessment Strategies

Observation, question and answer, class work and, question and answer

Dear teacher, you may use different learning strategies such as lecture, demonstration and group discussion to cover the contents of this subsection. Besides, you may use locally available instructional resources such as blackboard, chalk and diagrams in class when the instructional resources stated above are not available.

The main objective of Activity 6.3 and Activity 6.4 is to establish clear understanding of how algorithms are represented. Hence, observe the students' groups and individual works in order to assist them and clearly explain the concepts and representation of an algorithm. Use the following key notes for better explanation.

*A flowchart is **a picture of the separate steps of a process in sequential order**. It is a generic tool that can be adapted for a wide variety of purposes, and can be used to describe various processes such as manufacturing process, administrative or service process or project plan.*

Pseudocode is ***an artificial and informal language that helps programmers develop algorithms****. Pseudocode is a text-based detailed (algorithmic) design tool. The rules of Pseudocode are reasonably straightforward. All statements showing "dependency" are to be indented. These include while, do, for, if and switch.*

Flowcharts are ***easier to understand and compare algorithms and pseudo-code****. It helps us to understand logic of a given problem. It is very easy to draw flowchart in any word processing software like MS Word. Using only very few symbols, complex problem can be represented in flowchart.*

Answers to Activity 6.3

1. Flowcharts are used in designing and documenting simple processes or programs. Like other types of diagram, they help us visualize what is going on and thereby help us understand the process, and perhaps also find less-obvious features within the process like flaws and bottlenecks. Figure 6.2 shows flowchart.

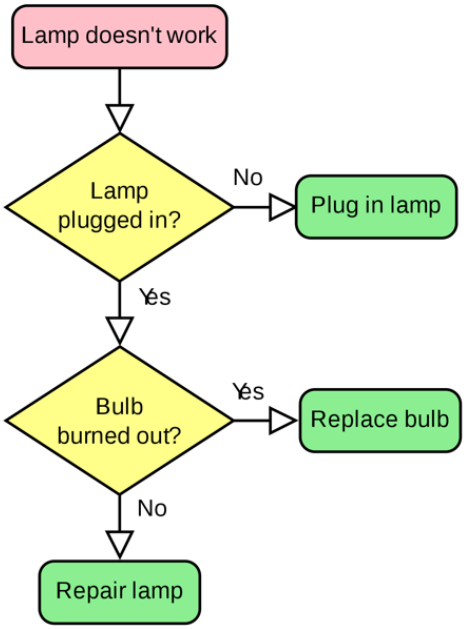


Figure 6.2 Flowchart

2. Flowcharts use special shapes to represent different types of actions or steps in a process. Lines and arrows show the sequence of the steps and the relationships among them. These are known as flowchart symbols. Figure 6.3 below shows flowchart symbols.

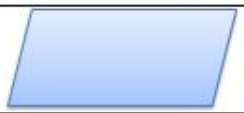
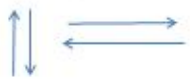
Symbol	Symbol Name	Description
	start/stop Terminal	This symbol is used to represent start and stop of the flow chart.
	Input/output	This symbol is used to represent the input and output of the flow chart.
	Processing	This symbol is used to represent the processing like arithmetic operations ,data assignments and movements etc.
	Decision	This symbol is used to check whether condition is true(yes) or false(no).
	Flow Lines(arrows)	This symbol is used to connect the symbols.it indicates the direction of the flow.
	Connector	This symbol is used to connect the flow lines.

Figure 6.3 Flowchart symbols

3. As it was demonstrated in Figure 6.3, decision shape is represented as a diamond. This object is always used in a process flow to ask a question and the answer to the question determines the arrows coming out of the diamond.

Additional Tips for Teachers: Visit the following and other related websites for more details on describing algorithms on the Internet.

Tip

https://www.devopsschool.com/blog/complete-tutorials-of-introduction-to-algorithm/

Answers to Activity 6.4

1. The benefits of pseudocode are:

   a. It allows the designer to focus on main logic without being distracted by programming languages' syntax. Since it is language-independent, it can be translated into any computer language code. It allows the designer to express logic in plain natural language.

   b. Pseudocode is a great method for uncovering unclear decisions and hidden side effects, and defining all inputs, outputs and interactions needed to effectively solve a problem. The art of successfully executing great ideas involves becoming better at problem solving, listening and communicating.

2. In geometry, the area enclosed by a circle of radius r is πr2. Here the Greek letter π represents a constant, approximately equal to 3.14159, which is equal to the ratio of the circumference of any circle to its diameter. The formulas for the perimeter p and area A of a circle are given by:

   Perimeter p = 2 πr

   Area A = πr^2

```
1
2 BEGIN
3  NUMBER r, perimeter
4  INPUT r
5  perimeter=3.14*2*r
6  OUTPUT perimeter
7 END
8
```

Figure 6.4 Pseudocode: Perimeter

```
1
2 BEGIN
3  NUMBER r, area
4  INPUT r
5  area=3.14*r*r
6  OUTPUT area
7 END
8
```

Figure 6.5 Pseudocode: Area

1. Respected teacher, observe students' demonstration while relating the pseudocode method to flowchart design and explain the following concepts to assist them.

   a. Pseudocode is an informal high-level description of the operating principle of an algorithm while a flowchart is a diagrammatic representation that illustrates a solution model to a given problem. Thus, this is the main difference between pseudocode and flowchart.

   b. Flowcharts provide an easy method of communication about the logic and offer a good starting point for the project because they are easier to create than pseudocode in the beginning stages. Pseudocode provides a beneficial bridge to the project code because it closely follows the logic that the code will. Figure 6.6 demonstrates the sum of the first 10 natural numbers.

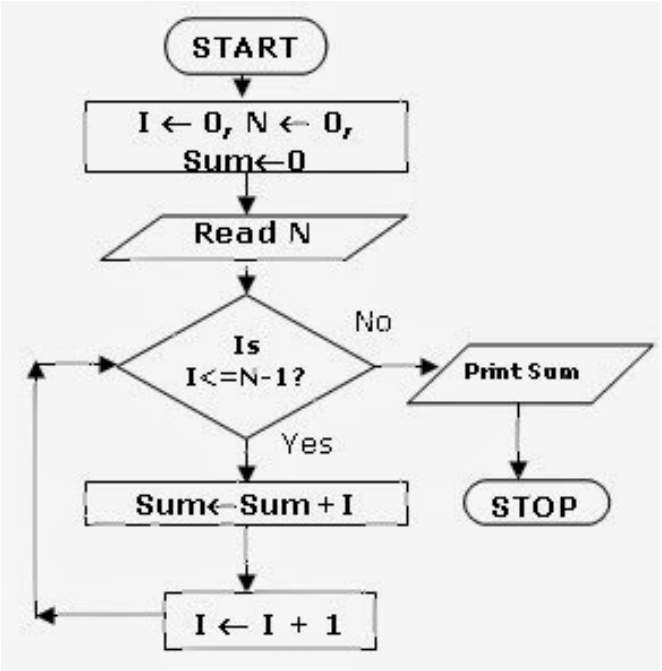


Figure 6.6 The sum of the first 10 natural numbers

6.6 Integrated Development Environment (IDE)

In this sub unit, students will learn concepts related to Integrated Development Environment (IDE). They are expected to gain the knowledge of IDE through definition of IDE, benefits of using IDE, types of IDE and IDE for specific applications.

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

- Define the concept IDE.
- Explain the benefits of using IDE.
- Identify and discuss each type of IDE.

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

Instructional Strategies

Group discussion, lecture, and questions and answers.

Required Instructional Resources

Computer, LCD projector, textbook, whiteboard and whiteboard marker

Assessment Strategies

Observation, question and answer, class work, question and answer

Dear teacher, to cover the contents of this subsection, you may use different learning strategies such as lecture, demonstration and group discussion. Besides, you may use locally available instructional resources such as blackboard, chalk and diagrams in class when the instructional resources stated above are not available.

Answers to Activity 6.5

1. An IDE (Integrated Development Environment) enables programmers to consolidate the different aspects of writing a computer program. IDEs increase programmer productivity by combining common activities of writing software into a single application: editing source code, building executables and debugging.
2. Editors of codes are tools that differentiate the keywords of any language you code in, offer some suggestions and make programming easy for developers. A text editor is specialized for writing software. A source code editor may be a stand-alone program or part of an integrated development environment (IDE). IDEs make writing and reading the source code easier by differentiating the elements and routines so programmers can more easily look at their code.
3. People are often confused with a code editor and a text editor. A text editor simply allows you to write and edit text, but it does not have anything built-in to help you to code whereas a code editor is not only a text editor but also helps you write code. A text editor is simply a computer program and a tool

used for editing plain text. An IDE, on the other hand, is a full-fledged software environment that consolidates basic developer tools required to build and test software.

Additional Tips for Teachers: Visit the following website for further reading on IDEs.

Tip

https://www.howtogeek.com/school/microsoft-word-document-formatting-essentials

6.7 Unit Summary

Flowcharts, decision tables, pseudocodes and algorithms are essential ingredients to write good programs. If they are done properly, they lead to reduction of errors in programs. They help us minimize the time spent in debugging. In addition, they make logical errors easier to trace and discover. A Flowchart is a graphical representation of the major steps of work in the process. It displays the essential steps of the program in separate boxes and shows the directions of information flow using arrows. Pseudocode is a program design aid that serves the function of a flowchart in expressing the detailed logic of a program.

An algorithm is a precise method of solving a problem. It consists of a sequence of unambiguous, step-by-step instructions. A program is an algorithm that has been converted into program code so that it can be executed by a computer. A well-written algorithm should be free from logical errors and easy to code in any high-level language. Some of the most widely used definitions of an algorithm are described under.

An IDE enables programmers to consolidate the different aspects of writing a computer program. It increases programmer productivity by combining common activities of writing software into a single application: editing source code, building executables and debugging. The overall goal and main benefit of an integrated development environment are improved developer productivity. IDEs boost productivity by reducing setup time, increasing the speed of development tasks, keeping developers up to date and standardizing the development process.

Eclipse supports C++, Python, PHP, Java and many more. This free and open-source editor is the model for many development frameworks. The eclipse began as a Java development environment and has expanded through plugins. **NetBeans** supports Java, JavaScript, PHP, Python, Ruby, C, C++ and so on. This option is also free and open source. All the functions of the IDE are provided by modules that each provide a well-defined function.

6.8 Answers to the Unit Review Exercises

Part one: Answers for True/False Items

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

Part II: Answers to Multiple Choice Items

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

Part III: Answers to Short Answer Questions

1. An algorithm is a precise method of solving a problem. It consists of a sequence of ambiguous, step-by-step instructions.

An algorithm is also set of instructions for solving a problem or accomplishing a task. One common example of an algorithm is a recipe, which consists of specific instructions for preparing a dish or meal. Every computerized device uses algorithms to perform its functions.

2. A **flowchart** is a type of diagram that represents a workflow or process. A flowchart can also be defined as a diagrammatic representation of an algorithm, a step-by-step approach to solve a task
3. What is pseudocode? Pseudocode is a program design aid that serves the function of a flowchart in expressing the detailed logic of a program. Sometimes a program flowchart might be inadequate for expressing the control flow and logic of a program. Using pseudocode, program algorithm can be expressed as English-language statements.
4. What are the symbols of flowchart diagram?

   Answer: Oval, line, parallelogram, rectangle and diamond

Symbol	Name	Function
	Start/end	An oval represents a start or end point.
	Arrows	A line is a connector that shows relationships between the representative shapes.
	Input/Output	A parallelogram represents input or ouptut.
	Process	A rectangle represents a process.
	Decision	A diamond indicates a decision.

5. Write an algorithm for areas of triangles.

Solutions

a. Algorithm to Find Area of Right Angle Triangle

This algorithm is used to find area of a right angle triangle. To calculate area, we use only the base and height of a triangle.

Step 1. Start

Step 2. Input base, height.

Step 3. Calculate area = 1/2*base*height.

Step 4. Print "Area of Triangle=" area.

Step 5. End.

b. Algorithm to Find Area of Any Triangle

This algorithm is used to find area of any triangle. To calculate area, we use dimensions of all three sides of the triangle.

Step 1. Start.

Step 2. Input side1, side2, side3.

Step 3. Calculate s = (side1 + side2 + side3) / 2.

Step 4. Calculate area = sqrt {s * (s - side1) * (s - side2) * (s - side3)}.

Step 5. Print "Area of Triangle=" area.

Step 6. End.

6. Differentiate between algorithm and flowchart. A flowchart is **a graphical representation of an algorithm**. Programmers often use it as a program-planning tool to solve a problem whereas algorithm is a step-by-step procedure to solve the problem.

7. Write an algorithm to find greatest of given three numbers.

Answers:

a. Algorithm description

Step 1. Start the program.

Step 2. Declare variable a, b, c, largestValue.

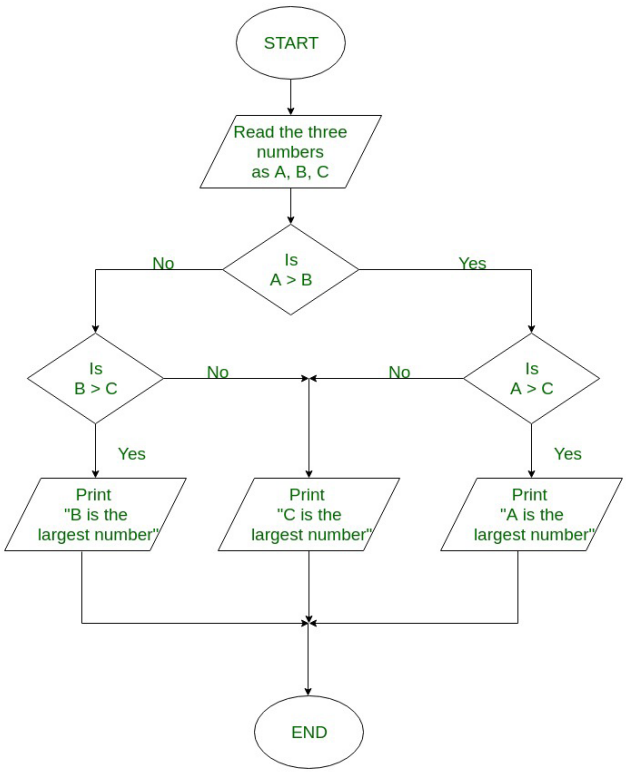
Step 3. If **a > b** go to step 4 Otherwise go to step 5

Step 4. If **a > c** SET largestValue = a Otherwise largestValue = c

Step 5. If **b > c** SET largestValue = b Otherwise largestValue = c

Step 6. End.

b. Flow chart diagram



8. Write an algorithm to check whether a given integer value is prime or not.

Solution:

A number that is only divisible by 1 and itself is named as a prime number. For Example, 3, 5, 7 and 11 are prime numbers. **Note:** 2 is the only even prime number.

Algorithm that checks a given number is PRIME or NOT:

1. Start
2. Declare a variable.
3. Initialize the variable.
4. Use for loop that iterates from 2 to N.
5. Declare the count and initialize it to 0.
6. If the number is divisible by any of the numbers in between the loop, then increase the count.
7. If the count is not equal to 0, then it is not a prime number.
8. If the count is equal to 0, then it is a prime number.
9. Stop.

9. Draw the flowchart to find roots of quadratic equation, **$ax^2 + bx + c = 0$.**

Solution

Let us first describe what a quadratic equation is. Quadratic equations are the polynomial equations of degree 2 in one variable of type: $f(x) = ax^2 + bx + c$ where a, b, c, $\in$ R and $a \neq 0$. It is the general form of a quadratic equation where 'a' is called the leading coefficient and 'c' is called the absolute term of f (x). A quadratic equation will always have two roots. The nature of roots may be either real or imaginary.

The general form of quadratic equation is $ax^2 + bx + c$. The roots of a quadratic equation are given by the quadratic formula:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

The term $b^2 - 4ac$ is known as the discriminant of a quadratic equation. It tells the nature of the roots.

If discriminant > 0

$$root1 = \frac{-b + \sqrt{b^2 - 4ac}}{2a}$$

$$root2 = \frac{-b - \sqrt{b^2 - 4ac}}{2a}$$

If discriminant = 0

$$root1 = root2 = \frac{-b}{2a}$$

If discriminant < 0

$$root1 = \frac{-b}{2a} + \frac{i\sqrt{-(b^2 - 4ac)}}{2a}$$

$$root2 = \frac{-b}{2a} - \frac{i\sqrt{-(b^2 - 4ac)}}{2a}$$

We are going to use the above logic to solve this problem. Let us look at the algorithm and flowchart to have a better understanding.

Description of the algorithm

Algorithms to find all the roots of a quadratic equation

Step 1. Start

Step 2. Read the coefficients of the equation, a, b and c from the user.

Step 3. Calculate discriminant = (b * b) – (4 * a * c).

Step 4. If discriminant > 0:

4.1: Calculate root1 = (-b + sqrt(discriminant)) / (2 * a)

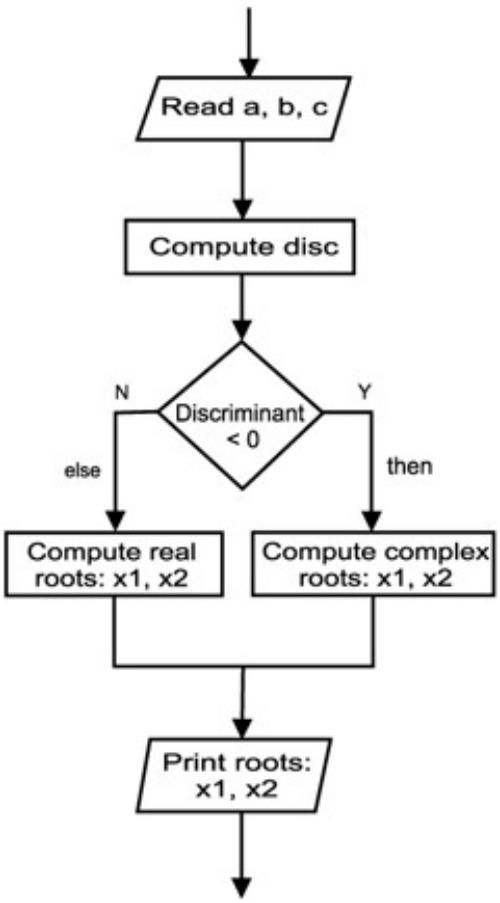
4.2: Calculate root2 = (-b - sqrt(discriminant)) / (2 * a)

4.3: Display "Roots are real and different"

4.4: Display root1 and root2

Step 5: Else if discriminant =0

Flowchart



10. Write an algorithm to read values for three variables. U, V, and W and find the value for RESULT from formula: RESULT= (U+V2)/ W. Draw also the flow-chart.

Solution

a. Algorithm

i) Input values for U, V and W.
ii) Compute the value for result.
iii) Print/display the result.
iv) Stop

b. Flowchart

See the following flowchart.