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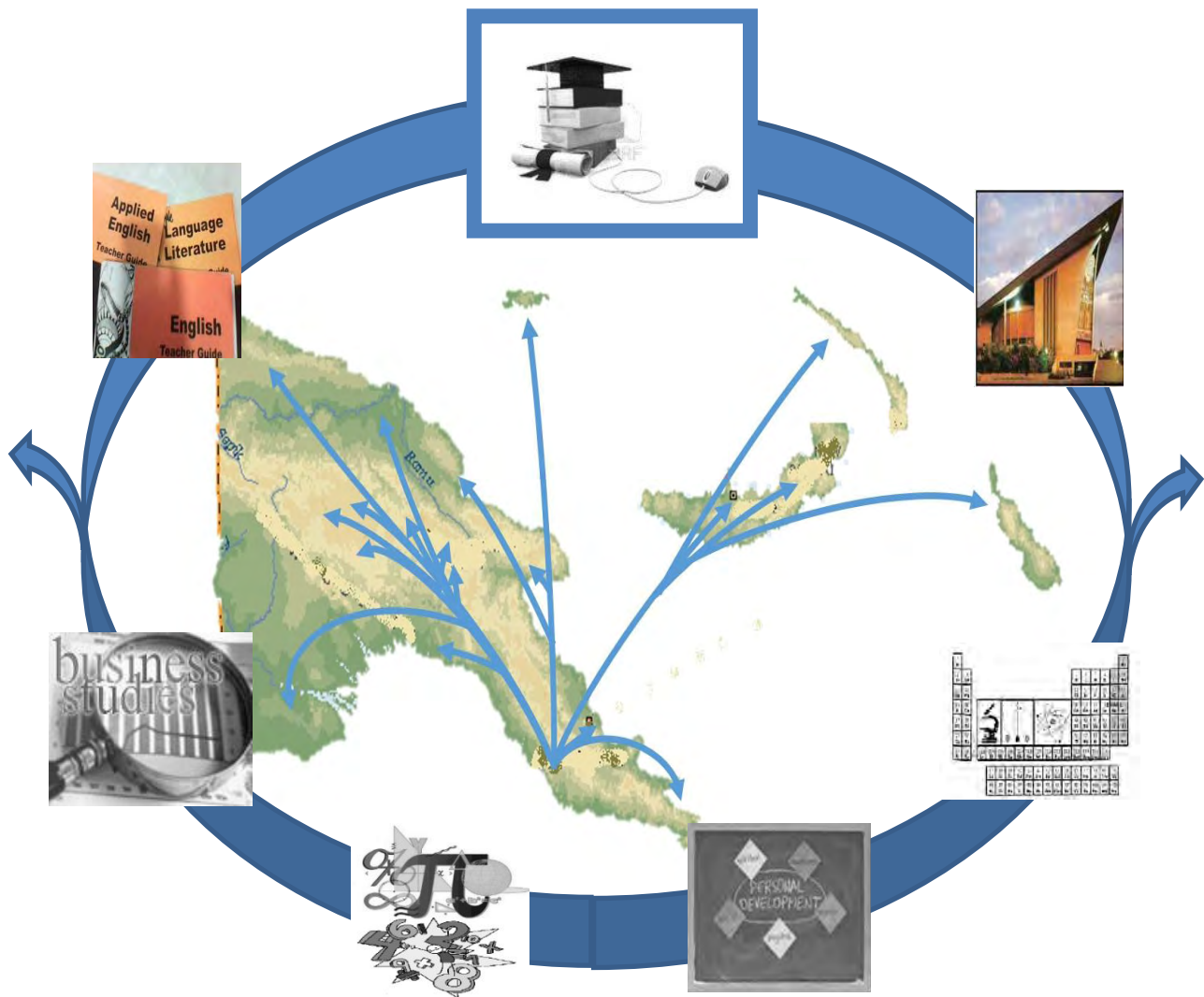
GRADE 11

INFORMATION COMMUNICATION TECHNOLOGY

MODULE 1- COMPUTER FUNDAMENTALS

FODE DISTANCE LEARNING

1

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GRADE 11

INFORMATION COMMUNICATION TECHNOLOGY

UNIT MODULE 1

COMPUTER FUNDAMENTALS

TOPIC 1: COMPUTER CONCEPTS

TOPIC 2: DATA HANDLING AND FILE MANAGEMENT

TOPIC 3: HARDWARE AND SOFTWARE

TOPIC 4: COMPUTER AND SOCIETY

Acknowledgements

We acknowledge the contribution of all Secondary and Upper Primary teachers who in one way or another helped to develop this Course.

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DIANA TEIT AKIS
Principal-FODE

CONTENTS

SECRETARY'S MESSAGE

Achieving a better future by individual students, their families, communities or the nation as a whole, depends on the curriculum and the way it is delivered.

This course is a part of the new Flexible, Open and Distance Education curriculum. The learning outcomes are student-centred and allows for them to be demonstrated and assessed.

It maintains the rationale, goals, aims and principles of the National OBE Curriculum and identifies the knowledge, skills, attitudes and values that students should achieve.

This is a provision of Flexible, Open and Distance Education as an alternative pathway of formal education.

The Course promotes Papua New Guinea values and beliefs which are found in our constitution, Government policies and reports. It is developed in line with the National Education Plan (2005 – 2014) and addresses an increase in the number of school leavers which has been coupled with a limited access to secondary and higher educational institutions.

Flexible, Open and Distance Education is guided by the Department of Education's Mission which is fivefold;

- to facilitate and promote integral development of every individual
- to develop and encourage an education system which satisfies the requirements of Papua New Guinea and its people
- to establish, preserve, and improve standards of education throughout Papua New Guinea
- to make the benefits of such education available as widely as possible to all of the people
- to make education accessible to the physically, mentally and socially handicapped as well as to those who are educationally disadvantaged

The College is enhanced to provide alternative and comparable path ways for students and adults to complete their education, through one system, many path ways and same learning outcomes.

It is our vision that Papua New Guineans harness all appropriate and affordable technologies to pursue this program.

I commend all those teachers, curriculum writers and instructional designers, who have contributed so much in developing this course.

UKE KOMBRA, PhD
Secretary for Education

UNIT 1: COMPUTER FUNDAMENTALS

INTRODUCTION

It is a fact that the modern world is driven by computers. A computer is a machine which can manipulate digitised data for a particular outcome based on a program that provides it a set of instructions. Computers are used for many business productivity and recreational tasks. Computers are also used to access Internet networks for communication and collaboration purposes.

Those who do not understand computers can feel left behind. It does not need to be that way, though. Understanding the basic concepts of computing is a fairly simple process and will help you to get a grasp of the world of the information age.

Unit 1 Computer Fundamentals focuses on teaching the basics of what and how to operate a computer and its impacts to the society. Students gain first-hand information on how to be literate on computer fundamentals. Instruction is basic and does not require experience in technology or computers.

Take note that activities are found at the end of every module lesson and summative exercises after every topic. All answers to activities are found after the summative exercises.

The following icons are used in this module:

 Student Aims

 Student Activity

 Time Frame

 Note

 Practical Student Activity

 Answers to Learning Activities

 Student Aims

On successful completion of this module, students will be able to:

- identify and demonstrate the appropriate use of a range of hardware and software components and peripheral devices
- describe major components of a computer system and explain their functions

 Time Frame

This unit should be completed within 10 weeks.

If you set an average of 3 hours per day, you should be able to complete the unit comfortably by the end of the assigned week.

Try to do all the learning activities and compare your answers with the ones provided at the end of the unit. If you do not get a particular exercise right in the first attempt, you should not get discouraged but instead, go back and attempt it again. If you still do not get it right after several attempts then you should seek help from your friend or even your tutor. Do not pass any question without solving it first.

11.1.1   Computer Concepts

11.1.1.1   The Information Processing Cycle (IPC)

The Information Processing Cycle (IPC) is a necessary process to learn in order to understand how a computer functions. The IPC reflects the steps that data must follow to become a useful set of information. These are the steps that are taken to convert raw facts (data) into information.

The sequence of events in processing information includes (1) input, (2) processing, (3) storage and (4) output. These processes work together and repeat over and over.

1.   Input refers to entering data into the computer.

2.   Processing involves performing operations on the data.

3.   Storage includes saving data, programs, or output for future use.

4.   Output covers the presentation of the results.
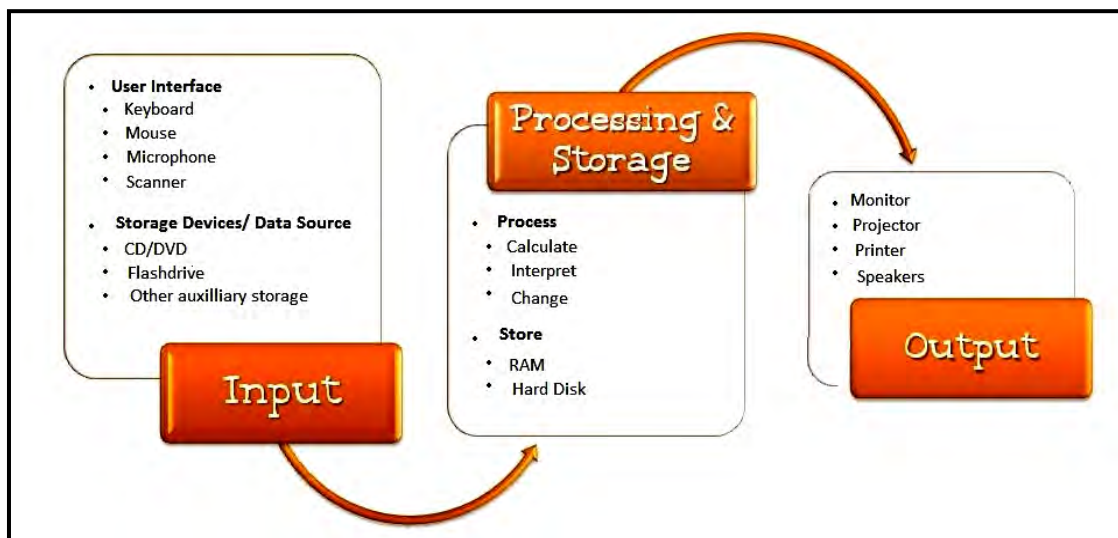
The Information Processing Cycle

Let us briefly discuss each stage.

1.   Input
       This is the first event in the cycle. This stage involves collection of data from the   outside or also from within the system. It is the collection of raw data from the outside world so it can be put into an information system. This means putting the acquired data into the information system.

       Examples:
        a.   The payroll clerk collects workers' timecards so he knows how many hours each person worked that week and types the hours from the timecards into a spreadsheet using MS Excel.

b. Conducting a survey of customers' opinions on a new product and then scanning the survey cards with a card reader.

c. Collecting quotes for a quote book and typing quotes into a word processor like MS   Word.

d. Using a form on an insurance website to collect visitors' opinions.

Keyboards, mice, flatbed scanners, bar code readers, joysticks, digital data tablets (for graphic drawing), electronic cash registers and others are some of the typical input devices.

2. Processing
In this stage the computer processes the tiniest details entered. This processing makes the data entered usable. This is the interpretation of data input in the computer system through a processor commonly known as the Central Processing Unit (CPU). The CPU as the processor is the key component in a digital computer capable of executing a program. It interprets computer programs instructions and processes data. CPUs provide the fundamental digital computer trait of programmability, and are one of the necessary components found in computers of any era, along with memory and input/output facilities.

A CPU that is manufactured as a single integrated circuit is usually known as a microprocessor. Beginning in the mid-1970s, microprocessors of ever-increasing complexity and power gradually supplanted other designs, and today the term "CPU" is usually applied to some type of microprocessor. More of this will be discussed further when you reach the topic on Parts of a Computer.

Typical processing software includes:

a. Word Processors

b. Spreadsheet

c. Payroll Systems

d. Web Browsers

3. Output
Output is the process of transmitting the processed information. If you have to look at the diagram of information processing cycle, the step after processing is the output stage. The processed information is now transmitted to the user. Basically, output is the presentation of any data exiting a computer system. This could be in the form of printed paper, audio or video. In the medical industry this might include CT scans or x- rays. Typical output devices include monitors, printers, speakers and the likes.

4. Storage
Storage is also known as mass storage which refers to various techniques and devices for storing large amounts of data. After the data has been processed, along with the output

to the user, the data is also stored. Different computer storage devices can be used for the same purpose.

The earliest storage devices were punched paper cards. These were used as early as 1804 to control silk-weaving looms. Modern mass storage devices include all types of disk drives and tape drives. Mass storage is measured in kilobytes (1,024 bytes), megabytes (1,024 kilobytes), gigabytes (1,024 megabytes) and terabytes (1,024 gigabytes).

Examples of storage devices include primary storage (RAM/ROM) and secondary storage devices (external hard drives, CD/DVD, memory cards and flash drives). A more thorough discussion on this will be shown in the topic Storage Devices.

The most important advantage of the information processing cycle is that the information is processed quickly. At the same time retrieving the data is an easy task as well. The processed information can further be passed onto the next stage directly in case need be. The necessary data is stored, which helps in avoiding duplication of data as well as time. One has to take note however that from the process, a step might not be taken like for example, after input and process, the user might not save or print his work.

Student Activity 11.1.1.1

Read the paragraph below and answer the questions that follow.

Derick needs to draw up a budget report. He opened his computer and started typing using the word processor. He entered all the necessary figures and information to create the report. After checking his work, he saved it in his flash drive and printed three copies for his superiors.

Identify the input, process, output and storage from the given situation. Fill out the diagram below.
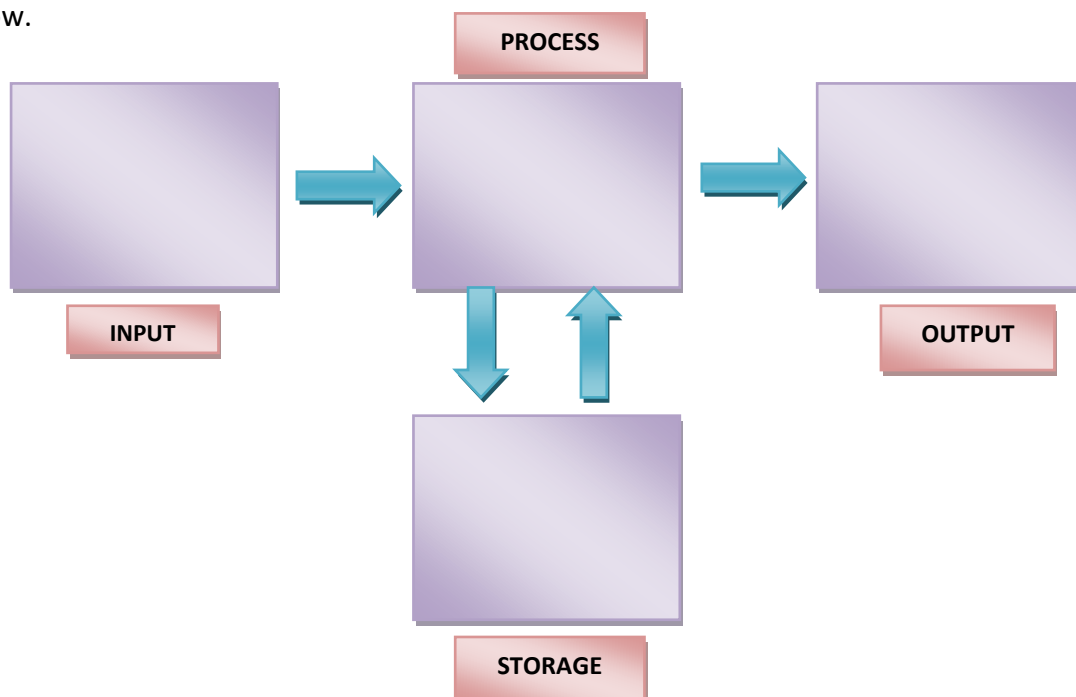
11.1.1.2   Definition and Characteristics of a Computer

"Computer" is a word derived from "Compute" which means to calculate. "Computer" is defined as an electronic computing device, characterised by high speed and accuracy. It can handle data processing, storing, and retrieval following a set of instructions and orders to get the required results.

Computer is a calculating device, which receives input from the user, analyses the input by applying a pre-defined set of instructions to produce output. The discussion on the Information Processing Cycle elaborated this process. For instance, in Air New Guinea plane ticket reservation system, the details of passenger such as name, age, and gender as well as the date of journey are entered as input. The computer then analyses the given data and makes a reservation as the process, then a plane ticket is printed for the passenger as the output.

A computer is also called as a data processor, because it can receive, store, process and retrieve any kind of data. For instance, we can use computers to store all the details of FODE employees, which include personal details, pay details, and leave details. The stored information can be retrieved and used later to analyse the performance of employees and to print pay slips for them.

Computers are everywhere. Every day we come in contact with and use dozens of computers, sometimes without even knowing it. Listed below are some of the applications of computers.

1.   To prepare documents and perform other data processing jobs in offices and homes

2.   To maintain accounts and transfer funds in banks

3.   To prepare salary slips in an office

4.   To reserve tickets in the transportation sector, e.g., Railways, Airlines etc.

5.   To regulate traffic lights on roads

6.   To control machines in factories

7.   To control robotics and modern automobiles

8.   To design buildings, roads etc.

9.   To control electronic appliances such as Air Conditioners, TVs, VCRs, etc.

10.   To forecast weather

11.   To control and simulate defense equipment

12.   To perform scientific and industrial research.

Since computers play a main role in everyday life it has become a need for people just like television, telephone or other electronic devices at home. These machines solve the human problems very quickly as well as very accurately. A computer has the following characteristics:

1.   Quick performance.

2.   Quick data input and information retrieval.

3.   Ability to store data.

4.   Accurate results, which depend on the accuracy of data input.

5.   Reducing human role, particularly in mechanically run factories.

6.   Quick processing of arithmetic and logic operations.

7.   Continuous and persistent workability.

8.   A lot of available software and applicable programs that facilitate computer accessibility without need to study computer science.

9.   Prompt decision making to find proper and at most, solutions for specific questions.

10.   Communicability through computer networks with other computers to exchange data and information.

These characteristics further elaborate what was learned in Grade 10 Design and Technology-Computing Unit 1 Lesson 1.

Student Activity 11.1.1.2

Go through newspapers or web articles discussing how computers are purposeful for an organisation, community or a society. Write a five (5) sentence reaction citing the article and the characteristics of the computer that enabled it to be a vital instrument of progress.

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11.1.1.3   Computer Generations

Computers evolved through the years to become what they are today. The Grade 9 and 10 Design and Technology- Computing has provided a detailed discussion on this topic. Now, let us have a basic review to highlight the important details on this topic.

Computer development relied upon the following basic factors:

Increasing computer speed

- Decreasing computer size

- Decreasing computer cost

- Enhancing result accuracy

- Increasing storage capacity

- Facilitating computer accessibility

We can summarise its development into five (5) generations. Study each generation to point out how computers have improved through the years.

The First Generation development of computers can be reviewed as follows:

- It emerged in the 1940s and mid-1950s.

- It consisted of vacuum tube based logical and electronic circuits.

- The machines used magnetic drums for internal storage and magnetic tape for external storage.

- The machines were relatively slow.

- The computers were huge in size.

- The machines experienced system failure due to high temperature produced by vacuums.

- The computers had very limited memory capacity.

- It used machine language in programming.

- It used punched cards to store data.

- It included ENIAC, EDVAC, and EDSAC as the First Computers, then UNIVAC.
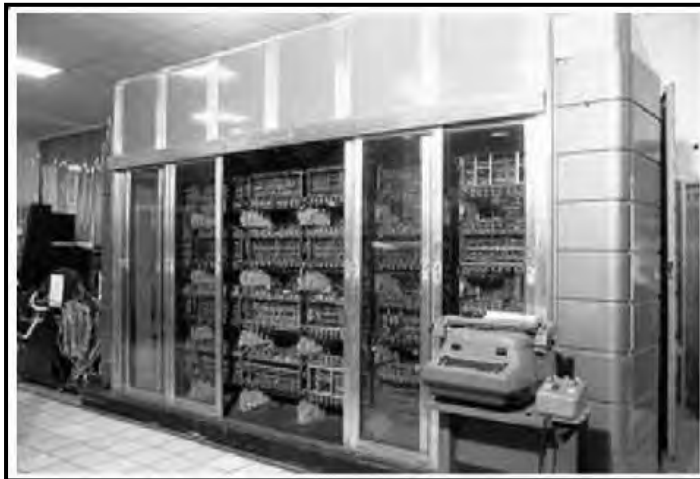
An example of a First Generation Computer

The Second Generation highlights the following developments:

- It emerged in mid-1950 and 1960s.

- It was built on Transistors and small sized circuits with high operating efficiency.

- The machines were using magnetic circuits for memory.

- The machines were using Hard disk for every storing and retrieval of data.

- The machines were using new high level languages such as FORTRAN
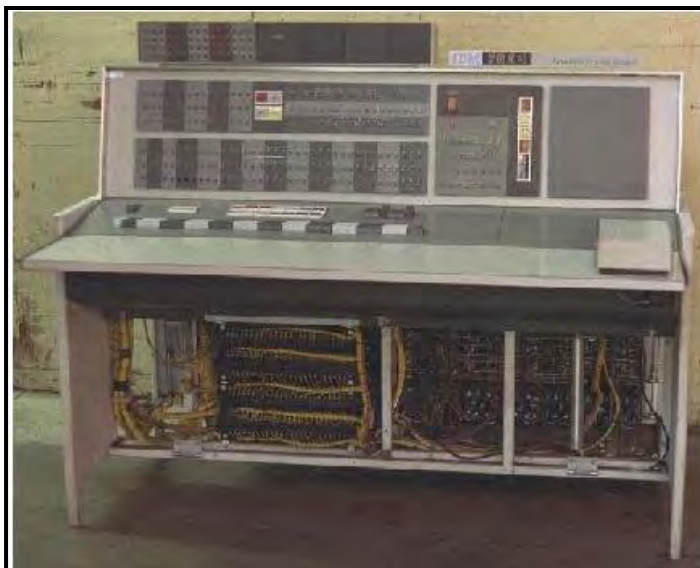
An example of a Second Generation Computer

The Third Generation presents the following developments:

- It emerged in 1960s.

- It used small scale integrated circuits, followed by medium scale integrated circuits, resulting in small size and high memory capacity and accurate performance.

- The machines distinguished high performance speed.

- It resulted in emergence of microcomputers and multiprocessors.

- It developed operating systems to improve effectiveness and performance, such as multiprogramming system.

- The era of emergence of new and high level languages such as Basic and Pascal.

- The period of improvement of input and output devices.

An example of a Third Generation Computer

The Fourth Generation presents the following developments:

- It emerged in 1970s and 1980s.

- The machines used semiconductors to develop large scale integrated circuit and very large scale integrated circuits called microprocessors.

- The computers had very high speed performance.

- The period of emergence of Personal Computers and microcomputers.

- The time of emergence of new operating systems such as Real time systems.

- The beginning of the use of Floppy disks.

An example of a Fourth Generation Computer

The Fifth Generation has the following computer developments

• It emerged in 2013 - 2014.

• Artificial Intelligence started.

• Natural language - Natural language processing (NLP) is a field of computer science, artificial intelligence, and linguistics concerned with the interactions between computers and human (natural) languages.

As such, NLP is related to the area of human–computer interaction. Many challenges in NLP involve natural language understanding, that is, enabling computers to derive meaning from human or natural language input, and others involve natural language generation.

An automated online assistant providing customer service on a web page, an example of an application where natural language processing is a major component.[1]

- Parallel processing- Parallel processing is the simultaneous use of more than one CPU   or processor core to execute a program or multiple computational threads. Ideally, parallel processing makes programs run faster because there are more engines (CPUs or cores) running it.

A cabinet from Blue Gene/L, ranked as the fourth fastest supercomputer in the world according to the 11/2008 TOP500 rankings. Blue Gene/L is a massively parallel processor.

- Voice recognition- Also known as Speech Recognition is the translation of spoken words into text. Speech recognition applications include voice user interfaces such as voice dialing (e.g. "Call home"), call routing (e.g. "I would like to make a collect call"), domestic appliance control, search (e.g. find a podcast where particular words were spoken), simple data entry (e.g., entering a credit card number), preparation of structured documents (e.g. a radiology report), speech-to-text processing (e.g., word processors or emails), and aircraft (usually termed Direct Voice Input).

- Quantum processing –Quantum computers are different from digital computers based on transistors. Whereas digital computers require data to be encoded into binary digits (bits), each of which is always in one of two definite states (0 or 1), quantum computation uses qubits (quantum bits). Large-scale quantum computers will be able to solve certain problems much quicker than any classical computer.

An example of a Fifth Generation Computer

The five generations on how computers had evolved presented a clear picture that all machines even the most accurate and well used one has taken its time to be what it is today.

Student Activity 11.1.1.3

Create a timeline to include significant events on the development of computers. You can refer to Unit 1 of Grade 9 and Grade 10 Design and Technology- Computing to include other significant details. Use the timeline template on the next page.

Timeline Instructions

Choose the six to ten most important events on the development of the computers that you have researched. prsent them as a timeline.

Start with the first event and put the year and the event in the first box below. Look at the example to see how it will look like. Repeat for the rest of the events.

Example

1642

Blaise Pascal invented the Mechanical Calculator called the Pascaline.

11.1.1.4   Classifications of Computers

Computers can be classified according to these three categories: the ability of storage and performance efficiency, the operating method and the purposes. Study each classification as they can be further classified for more relevant details.

1.   The ability of storage and performance efficiency:

a.   Super Computer
Super computers are the most powerful computers. They are used for problems requiring complex calculations.

Because of their size and expense, supercomputers are relatively rare. Supercomputers are used by universities, government agencies and large businesses.

Super Computer

b.   Mainframe Computers
Mainframe computers can support hundreds or thousands of users, handling massive amounts of input, output and storage.

Mainframe computers are used in large organisations where many users need access to shared data and programs. Mainframes are also used as e-commerce servers, handling transactions over the Internet.

Mainframe

c.   Minicomputers

Minicomputers are smaller than mainframes but larger than microcomputers. Minicomputers usually have multiple terminals. Minicomputers may be used as network servers and Internet servers.

Minicomputer

d.   Microcomputers

Microcomputers are more commonly known as personal computers. The term "PC" is applied to IBM-PCs or compatible computers. Full-size desktop computers are the most common type of PC. Notebook (laptop) computers are used by people who need the power of a desktop system, but also portability. Handheld PCs (such as PDAs) lack the power of a desktop or notebook PC, but offer features for users who need limited functions and small size.

Microcomputer

Laptop

2.   The operating method

a.   Digital computers are electronic devices that process discrete data and calculations using digits represented by number forms in high speed. In this sense, Binary system is used to represent the values of variables and quantities. This kind is the commonest and the most accurate since it can be programmed and used in a rarity of fields.

b. Analogue computers are electronic devices that work on wave's principle. They are used specifically to measure continuous flow of data which can be expressed in tangible quantities such as atmospheric pressure, temperature, and voltage. They are used in scientific and engineering fields to give round results.

c. Hybrid Computers are devices that incorporate the qualities of the previous two types (digital and analogue). They are used in scientific fields in processing necessary data from both kinds. They are characterised by their digital processing ability to store data, high accuracy, and the ability to create arithmetic functions (correlations). Their disadvantages are; high cost, inevitable errors, and overlapped programming.

3. The purposes

a. General Purpose Computers are designed for multipurpose functions such as processing salaries and wages, and storage operation in factories and establishments, analyse sales for they are flexible to assure efficiency, in commercial, scientific, medical, and engineering fields.

b. Special Purpose Computers are designed for specific functions such as early alarm device and computers used in industrial operations, which may be microcomputers or minicomputers.

The classification of computers according to its ability of storage and performance efficiency, its operating method and its purposes tend to provide a better picture on how we can classify these machines in a manner that creates more informative and basic information for users.

Student Activity 11.1.1.4

Pick one workplace to visit. Make sure that this workplace (office, school, store and the likes) has computers. Find out the type or types of computer that this workplace has. Are they mainframe computers, mini-computers, workstations or personal computers? What processes or actions are the computers used for? Write a brief description of the type of computer in that place and the main use. If the workplace has more than one type of computer, find out why? What different tasks are the different computers intended to do?

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11.1.1.5   Parts of a Computer

Grade 10 Design and Technology Unit 1 Lesson 3 focused on Computer Hardware. A comprehensive discussion on the parts of the computer was presented. Take note that the computer has the external hardware (also called peripherals like the monitors, keyboards, mice, printers, and scanners), the internal hardware (motherboards, hard drives, and Random Access Memory or RAM) and the software. Furthermore, a computer system is composed of not only hardware and software but data and users as well. Let us discuss each part of a computer system.

1.   Hardware
     A computer's hardware consists of electronic devices; the parts you can see and touch. The term "device" refers to any piece of hardware used by the computer, such as a keyboard, monitor, modem, mouse and printer. The internal hardware can be seen in the picture below.

Hardware inside the computer

2.   Software
     Software which is also called programs consists of organised sets of instructions for controlling the computer. Some programs exist for the computer's use. Software helps the computer manage its own tasks and devices. Other programs exist for the user, and enable the   computer to perform tasks for you, such as creating documents.

Different kinds of Software

3.   Data
     Data consists of raw facts, which the computer can manipulate and process into information that is useful to people. Computerised data is digital, meaning that it has been reduced to digits, or numbers.

     The computer stores and reads all data as numbers. Although computers use data in digital form, they convert data into forms that people can understand, such as text, numerals, sounds, and images.
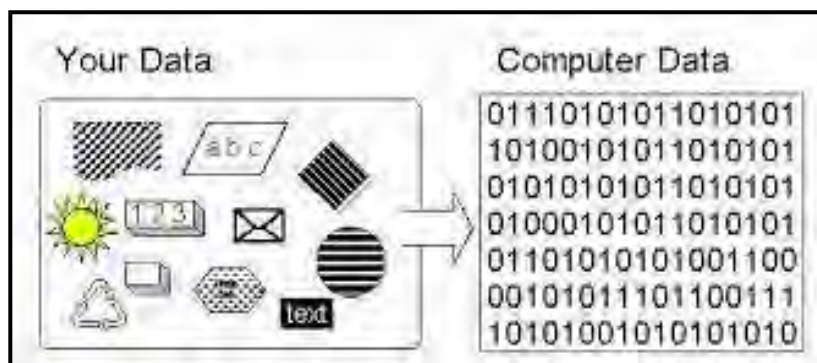
A representation of how the raw data is converted into computer data

     The diagram below reflects the explanation above on how the electronic data processing works.
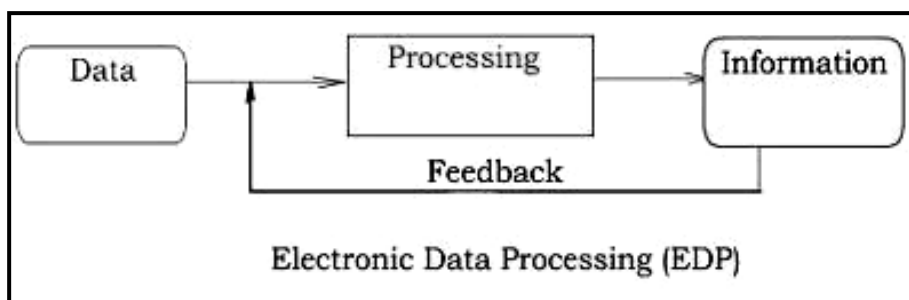
A representation of how Electronic Data Processing works

4.   Users
     People are the computer's operators, or users either the programmer who designs the program in programming languages, the end user who uses applicable programs in managing daily terms, or the administrator who manages computer networks. Some types of computers can operate without much intervention from people, but personal computers are designed specifically for people to use.

Student Activity 11.1.1.5

Match the computer parts with the corresponding picture. Write the letter representing the computer part on the space provided on the top left corner of each picture.

A	Monitor	D	Printer
B	Mouse	E	Software
C	User	F	Data
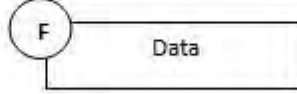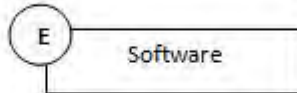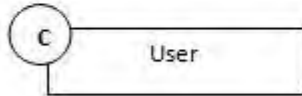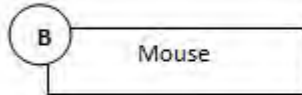
11.1.1.6   Care and Appropriate Use of Computer

Computer maintenance is essential for proper computer operation and for extending the life of your computer. Computers are expensive, and with all big purchases you probably want to protect your investment. Luckily, it is not difficult to keep your computer healthy and in good working order.

If your computer seems to be running slower than usual, crashes unexpectedly, or is otherwise unstable, you may be in need of some basic computer maintenance. This topic discusses the following basic maintenance issues:

1. Maintaining Current Anti-Virus Software - The most important step in maintaining your computer's performance is keeping your anti-virus software up-to-date and frequently scanning your computer for viruses. It is recommended that you update your anti-virus software at least once a week to help ensure the safety of your computer. A regular virus scan is essential for the safety of your computer. Furthermore, it is likewise recommended that you schedule your anti-virus software to run a virus scan once a day.

Common Anti-Virus Software

2. Maintaining Current Malware Protection Software – Malware is any type of software that is designed to damage your computer or gain unauthorised access to your personal information. It includes viruses, worms, Trojan horses, spyware, and other types.

    Most malware are distributed over the Internet, often bundled with other software.   It is also important to stay smart when you are browsing the Web or using email. If a website or email attachment looks suspicious, trust your instincts. Keep in mind that your anti-virus program may not catch everything, so it is best to avoid downloading   anything that might contain malware.

    It is then recommended to install, update and regularly run malware protection software like Anti-Malware from Malwarebytes and Spybot-Search and Destroy.

Malware Protection Software

3. Installing Operating System Updates - It is also important to install the latest operating system updates, as recommended by the developer of your operating system. Windows users can install critical updates by opening Internet Explorer and then choosing Tools and Windows Update from the menu.

4. Disk Cleanup - The Disk Cleanup searches your computer for files that you do not need, such as files in the recycle bin and temporary Internet files. After scanning your computer for unnecessary files, Disk Cleanup presents you with different file categories, such as Downloaded Program Files and Temporary Internet Files, which you can select for the task to delete. Disk Cleanup removes these files from your computer, giving you more free space and keeping your computer from running slower because it is storing information you do not need.

    Windows also includes a Disk Cleanup program in the Control Panel. It scans the computer for temporary files and other files that can be deleted. You can then delete the files to free up space on your hard drive.
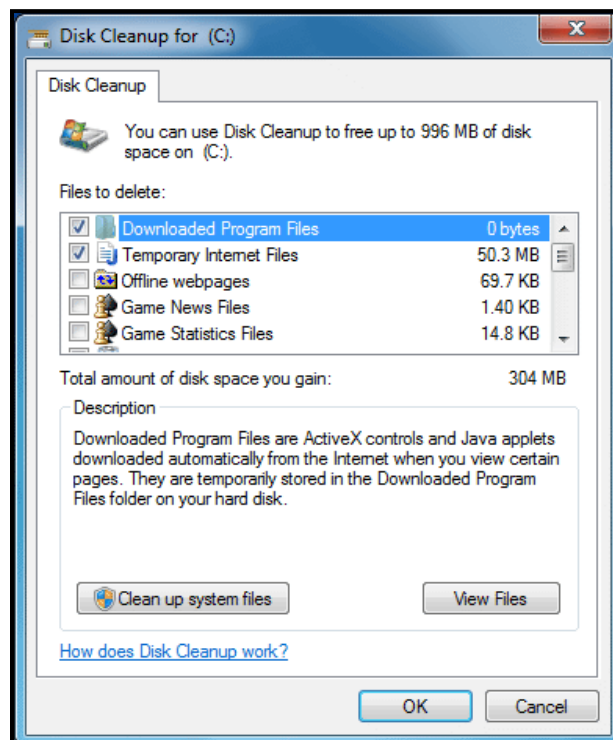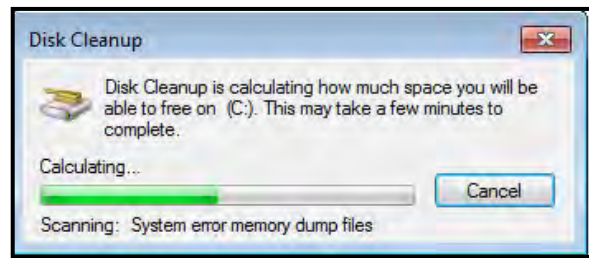
Windows Disk Cleanup

5.   Disk Defragmenter - When your computer saves files, it splits them up and stores them in different physical places on your hard drive. To a degree, this storage method speeds file access time because, for large files, your computer can access different parts   at   the same time in order to bring up the entire file faster. Overtime, however, files can get overly fragmented and access time slows down. Disk Defragmenter goes through your computer to find these fragmented files and then compresses them, storing   the   files physically closer together on the hard drive. When Disk Defragmenter is finished, your computer's file access time will improve.

Windows includes a Disk Defragmenter program in the Control Panel. It scans the files on your hard drive and rearranges them so it can read them faster. If your computer is running slowly, running Disk Defragmenter can help to speed it up.
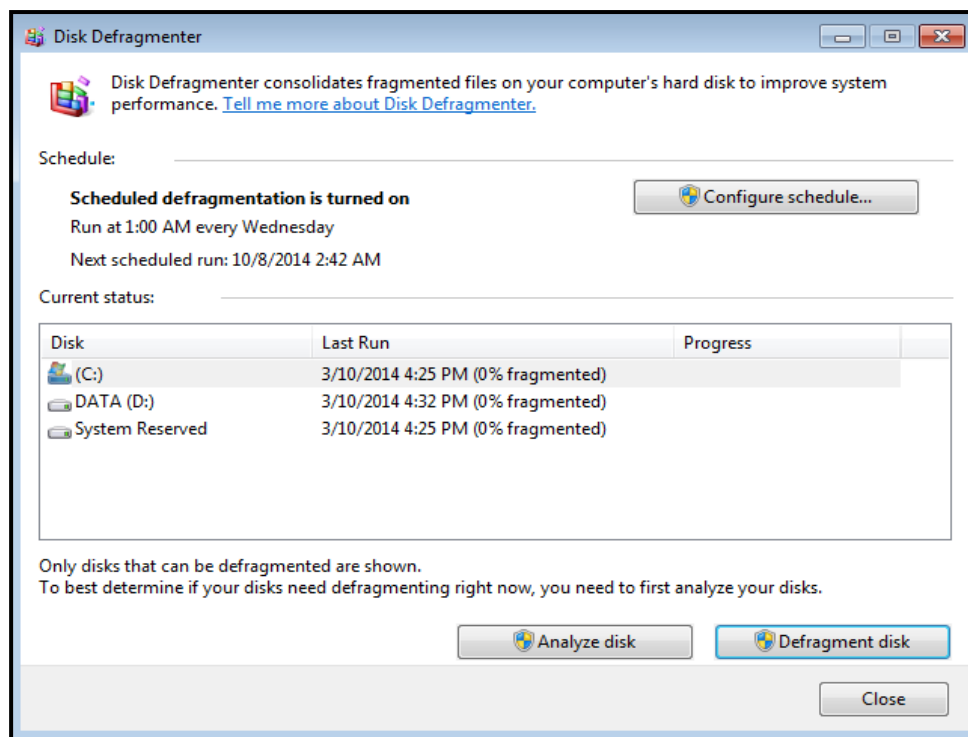
Windows Disk Defragmenter

6.   Data Back-ups – Backing up your data is an efficient way to manage all your important computer files. By using different storage devices, your files can be safeguarded and in one way, you can free some memory in your computer for greater space which means faster processing for your machine. You can refer back to the Grade 10 Design and

Technology-Computing Unit 1 Lesson 11 for a discussion on storage devices and Lesson 18 on how to create back-up for files.

Maintaining a computer involves keeping it physically clean. Maintaining a computer involves three things: keeping it physically clean, protecting it from malware, and backing up important files.

Go through the discussions below on how to make your machine physically clean.

Cleaning the keyboard
A dirty keyboard is not nice to see and can cause your keyboard not to work properly. Dust, food, liquid, and other particles can get stuck underneath the keys, which can prevent them from working properly. Always check your owner's manual to see if the manufacturer has provided instructions for your specific keyboard. If so, you must follow them. If not, then the following steps are basic cleaning tips that can help you keep your keyboard clean:

1.   Unplug the keyboard from the USB or PS/2 port. If the keyboard is plugged into the PS/2 port, you will need to shut down the computer before unplugging it.

2.   Turn the keyboard upside down, and gently shake it to remove dirt and dust.

3.   Use a can of compressed air to clean between the keys.

Using a can of compressed air to clean the keyboard

4.   Moisten a cotton cloth or paper towel with rubbing alcohol, and use it to clean the tops of the keys. Do not pour alcohol (or any other liquid) directly onto the keys.

Using a cotton cloth to clean the keyboard

5.   Reconnect the keyboard to the computer once it is dry. If you are connecting it to a PS/2 port, you will need to connect it before turning the computer on.

Dealing with liquids

When liquid is spilt on the keyboard, quickly shut down the computer, disconnect from the computer and turn the keyboard upside down to allow the liquid to drain.

If the liquid is sticky, you will need to hold the keyboard on its side under running water to rinse the sticky liquid away. Then turn the keyboard upside down to drain for two days before reconnecting it. The keyboard may not be repairable at this point, but rinsing the sticky liquid off it is the only chance for it to be usable again. The best way to avoid this situation is to keep drinks away from the computer area.

Cleaning the mouse

There are two main types of mice: optical and mechanical. Each is cleaned in basically the same way, although the mechanical mouse requires a bit more work.

1.   An optical mouse requires no internal cleaning since there are no rotating parts. However, they can get sticky over time as dust collects near the light emitter. This can cause erratic cursor movement or prevent the mouse from working.

Optical Mouse

2.   Mechanical mouse is especially at risk to dust and particles that can accumulate inside it. This can make it difficult to track or move properly. If the mouse pointer does not move smoothly, then the mouse may need to be cleaned.

Mechanical Mouse

Before you clean your mouse, check the owner's manual to see if the manufacturer has provided instructions for the specific mouse. If so, follow those instructions. If not, then the following steps are basic cleaning tips that will help keep your mouse clean.

1.   Unplug the mouse from the USB or PS/2 port. If the mouse is plugged into the PS/2 port, then shut down the computer before unplugging it.

Universal Serial Bus (USB) and Personal System/2 (PS/2)

2.   Moisten a cotton cloth with rubbing alcohol. Use the cotton cloth to clean the top and bottom of the mouse.

3.   For a mechanical mouse, remove the tracking ball by turning the ball-covering in a counterclockwise motion. Then clean the tracking ball and the inside of the mouse with a cotton cloth moistened with rubbing alcohol.

Cleaning the mechanical mouse

4.   All the parts must be dry before reassembling and reconnecting the mouse. If the mouse is connected to a PS/2 port then connect it before turning the computer on.

If you just want to give the mouse a quick cleaning, place it on a clean, white sheet of paper and move the mouse back and forth. Some of the dust and particles should rub off onto the paper.

Cleaning the monitor

The computer screen over time of use may become difficult to read because of dirt, fingerprints, and dust. However, it is easy to clean the screen when needed. While there are monitor-cleaning kits that can be bought, they may damage the monitor if they are designed for a different type of monitor. For example, a monitor cleaner that is designed for glass screens

may not work with some non-glass Liquid Crystal Display (LCD) screens. The safest method is to simply use a soft, clean cloth moistened with water.

Also, do not use glass cleaner to clean a monitor. Many screens have anti-glare coatings that can be damaged by glass cleaner. Follow the steps below on how to safely clean the monitor.

1.   Turn off the computer.

2.   Unplug the monitor from the power. If you are using a laptop, unplug the laptop.

3.   Use a soft, clean cloth moistened with water to wipe the screen clean.

How to clean the computer monitor

Do not spray any liquids directly onto the screen. The liquid could leak into the monitor and damage the internal components.

Keep it cool
Airflow must not be restricted around the computer. A computer can generate a lot of heat, so the casing has fans that keep it from overheating. Avoid stacking papers, books, or other items around the computer.

Many computer desks have an enclosed compartment for the computer case. The computer must be positioned where the case is not against the back side of the desk. If the compartment has a door, then leave it open to improve airflow.

Battery Care
Taking particular care of the computer laptop battery can help ensure the longest possible life. Check the owner's manual for specific instructions on optimising battery life, its safe storage and disposal.

Other Considerations:

1.   Take special care as to how the notebook computer is stored in a locker and backpack. Never leave the computer on standby when storing it. This can cause overheating and will eventually cause problems with the processor and main system board.

2.   Do not move the computer more than a few feet while it is turned on, any sudden movement can cause damage to the hard drive.

3.   The computer screen should only be cleaned with a soft cloth or an approved computer cleaner recommended by the computer manufacturer.

Taking proper care of and maintaining the computer will not only protect the user's investment on the machine but will also guarantee an efficient way of accomplishing all computer related tasks on time. With these basic computer care and maintenance tips, the user will get his money's worth and the machine will serve well its purpose.

Student Activity 11.1.1.6

Write a check mark (✔) if the practice is appropriate for computer care and maintenance and write an x mark (x) if the practice is inappropriate. Write on the space provided.

_____ 1. Use magnets round a computer.

_____ 2. Store in extremely hot or cold locations.

_____ 3. Scheduled automated updates.

_____ 4. Run a full virus scan.

_____ 5. Run a disk scan to check for hard drive issues.

_____ 6. Run a defragmentation program.

_____ 7. Run a clean up to delete unneeded files.

_____ 8. Renew your software update and anti-virus subscriptions.

_____ 9. Register your software products.

_____ 10. Read the maintenance section of your manual.

_____ 11. Install anti-virus software.

_____ 12. Install a surge suppressor/emergency shutdown power strip.

_____ 13. Empty the recycle bin.

_____ 14. Delete or uninstall unneeded or unused programs.

_____ 15. Clear your browsing history.

_____ 16. Clean your peripherals.

_____ 17. Clean your monitor.

_____ 18. Clean your keyboard.

_____ 19. Check for updates.

_____ 20. Back up your files to a remote location.

_____ 21. Spill liquids on the disk.

_____ 22. Remove the disk while in use.

_____ 23. Eat around the computer.

_____ 24. Drink around the computer.

_____ 25. Shutdown when not in use.

Summative Learning Activitiy 11.1.1

A.   **Write a five (5) sentence paragraph explanation of the Information Processing Cycle using the given diagram below.**

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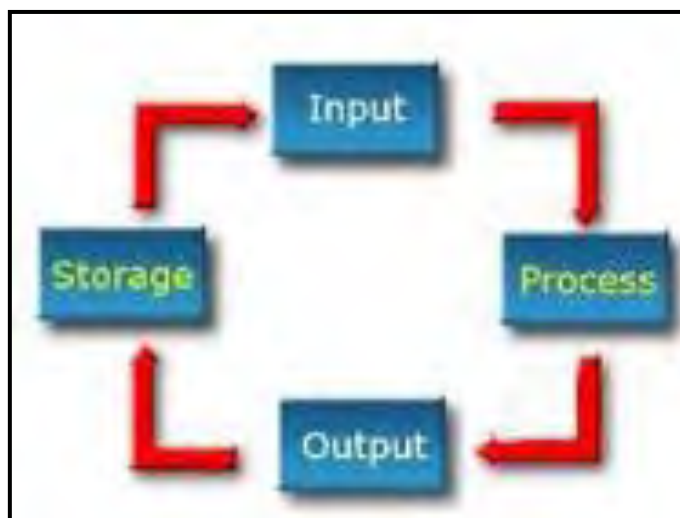
B.   **Study the article clip taken from the internet. Write a paragraph reaction to mention specific examples on how computers are also used in Papua New Guinea.**

Cite the characteristics of computers that enabled it to be of great help to the society.

Computers and Society

Canadian life is mediated by the computer at almost every step. Large numbers of Canadian families have computers in the home, and computers now govern the tasks and pace of office work. With the widespread use of networked computers facilitated by the INTERNET, and in particular the World Wide Web in the 1990s, Canadians can now do just about anything with their computers, from buying books and banking to booking airline tickets and hotel rooms halfway around the world. Even those who do not own a computer come into contact with the benefits of computer technology daily, whether it be at an automated banking machine, at the grocery store checkout or in the library looking up a book online.

While computer use has affected almost every sector of society, the technological advancements in the areas of banking, health care and education have had the most immediate effect on the general public.

http://www.thecanadianencyclopedia.ca/en/article/computers-and-society/

_____

_____

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_____

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C.   **Look at the timeline below and provide the characteristics of each computer in every generation.**

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_____

_____
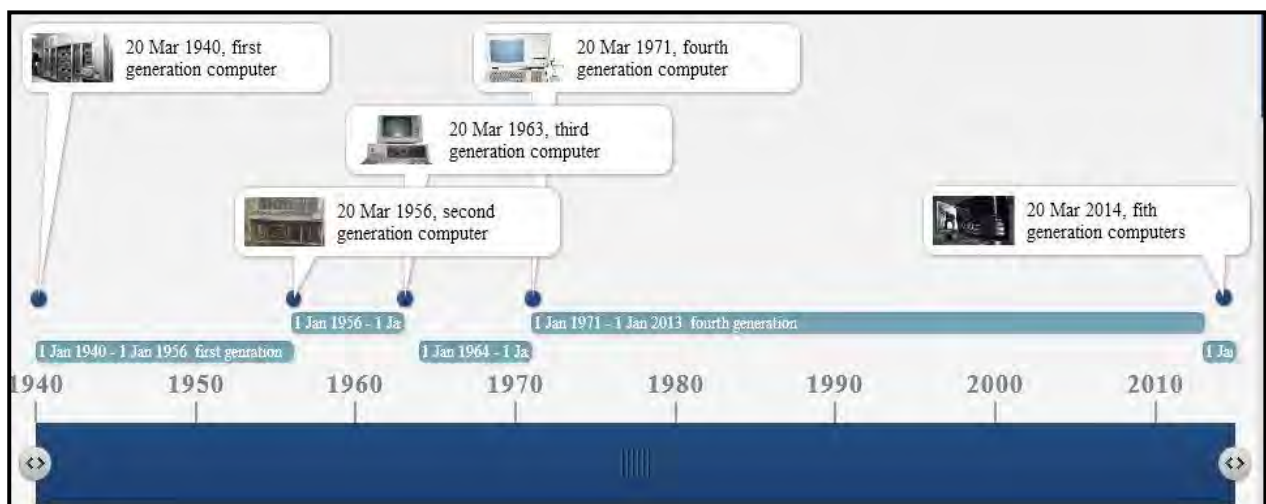
D.   Read the tips below and write Do or Don't in the blank space to indicate whether the practice is appropriate or not.

1.   _____ back up files stored on your USB or other portable storage device to your computer's hard drive.

2.   _____ remember to store your portable devices in a safe place.

3.   _____ assume that USB and other portable storage devices will keep your important files safe and protected.

4.   _____ shut down your computer properly by clicking on Start and Shut Down (Turn Off) (for Windows) or Open Apple and Shut Down (for Macintosh).

5.   _____ press the switch on the power strip to turn it off.

6.   _____ store your software/product license keys in a safe place.

7.   _____ perform regular routine maintenance on your computer to protect it from viruses and malware.

8.   _____use safe practices when viewing your e-mail and when browsing the Internet.

9.   _____ assume that your computer will be protected from viruses. Viruses and malware can be spread to your computer simply by connecting it to the Internet.

10.   _____ take your laptop/tablet computer with you when leaving your car.

11.   _____ leave your laptop/tablet in direct sunlight or expose it to extreme temperatures.

12.   _____ remember to charge your laptop/tablet before leaving home to ensure maximum battery usage during the day.

13.   _____ stretch power cords or cables across hallways or walking areas where someone can trip or step on them, causing damage to your equipment or injury to others.

14.   _____ carry your laptop/tablet computer securely, preferably in a protective case.

15.   _____ pick up or carry your laptop/tablet computer by the screen (even if it is just across the room or to the next table).

16.   _____ carefully open your tablet screen and rotate to change to writing mode.

17.   _____ try to rotate the screen all the way around.

18. _____ be selective about where you leave your computer or device. When loading a backpack, make sure heavy objects are not put on top of your computer.

19. _____ leave your laptop/tablet on chairs, floors, or other locations where someone may sit or walk on it.

20. _____ place your laptop under heavy books or other objects in a backpack.

21. _____ use a covered drinking cup and be extra careful when eating or drinking near your computer.

22. _____ spill food or drink onto your laptop, keyboard, mouse, or any electrical device.

23. _____ use unknown USBs or external hard drives.

24. _____overcharge your laptop or tablet.

25. _____ try fixing large errors that are beyond your understanding.

✓ **Answers to Student Activity**

Student Activity 11.1.1.1

PROCESS

INPUT	PROCESS	OUTPUT
• Computer • Keyboard and mouse • Figures and information	• Word processor	• Printed copies from printer

INPUT

OUTPUT

• Flash drive

STORAGE
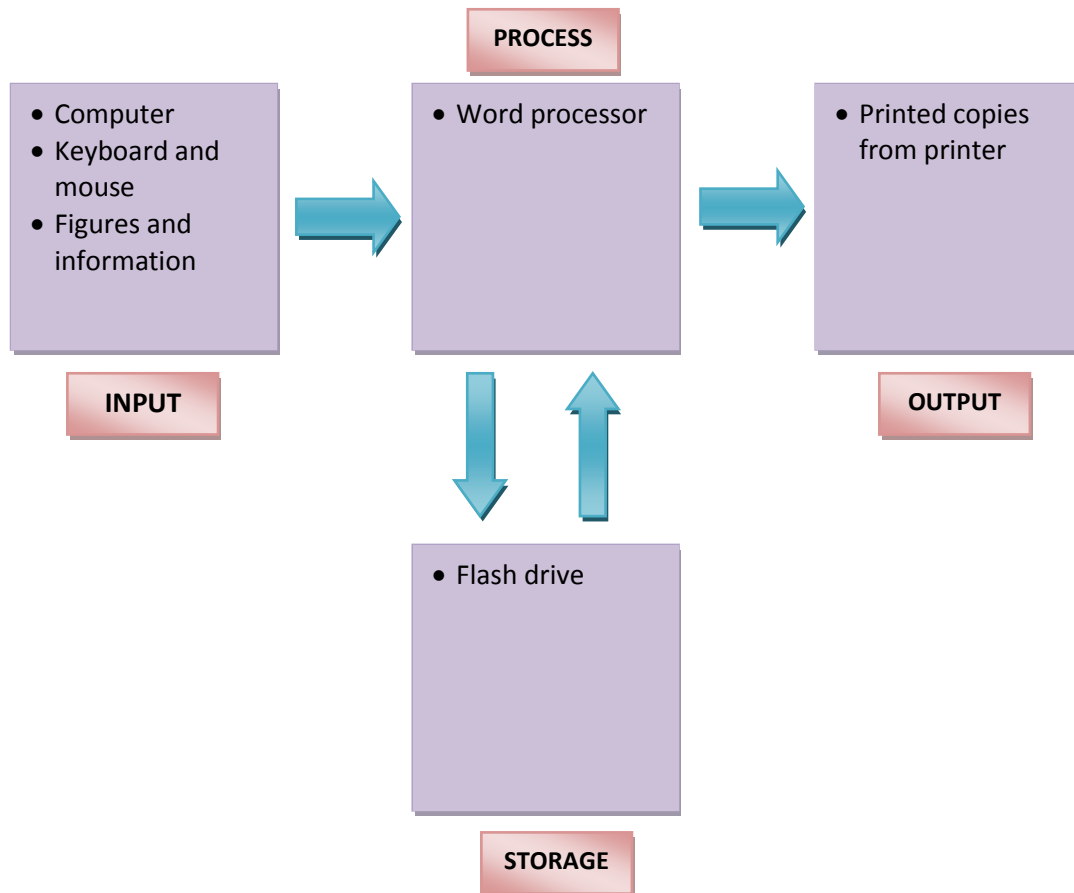
Student Activity 11.1.1.2   41

Here is a sample newspaper or web article discussing how computers are purposeful.

Tablet computers in '70% of schools'

By Sean Coughlan
BBC News education correspondent

Tablet computers have become more popular within education

Almost 70% of primary and secondary schools in the UK now use tablet computers, according to research.

But the study says there is no clear evidence of academic improvement for pupils using tablet devices.

The study, commissioned by education technology charity Tablets for Schools, looked at a representative sample of 671 state and independent schools.

Many pupils reported that they took an internet-connected device to bed to continue social media conversations.

The rapid growth of tablet computers in the classroom was one of the ways in which the study found that young people are immersed in technology at school and home.

One tablet per pupil

Tablets are now being used, at least to some extent, in 68% of primary and 69% of secondary schools, according to the study headed by Barbie Clarke of the Family, Kids and Youth research group.

But researchers found examples of much more intensive use. In 9% of schools, there was an individual tablet device for every pupil.

The computers are very important to education these days. The following characteristics of the computer make it easier to facilitate quality teaching and learning.

1. Quick performance.

2. Quick data input and information retrieval.

3. Ability to store data.

4. Accurate results, which depend on the accuracy of data input.

5. Reducing human role, in particular in mechanically run factories.

6. Quick processing of arithmetic's and logic operations.

7. Continuous and persistent workability.

8. Availability of a lot of software and applicable programs that facilitate computer accessibility without need to study computer science.

9. Prompt decision making to find proper and at most solutions for specifics question.

10. Communicability through computer networks with other computers to exchange data and information.

Student Activity 11.1.1.3

Answers can be similar to the timeline below.
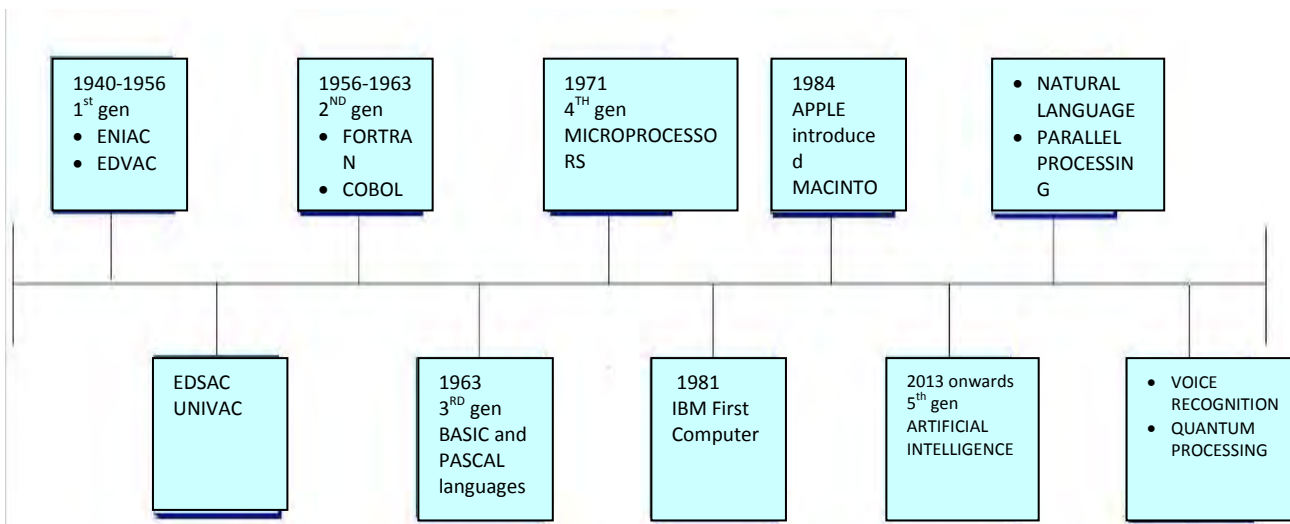
Student Activity 11.1.1.4

Here is an example of a description of available types of computers in a workplace or school.

> FODE Headquarters uses laptops and desktop computers. The users of these machines are located in different offices belonging to different divisions which form the FODE Headquarters unit. The different divisions use the computers in variety of ways. First the Accounts section uses the computers for salary and wages as well as the daily accounting routines which maintains the financial side of the school. Secondly, the Curriculum section uses the computers for their daily curriculum works in updating, modifying, writing and editing curriculum course materials and assessments. The computers are all connected to the network which enables the users to print to the network printer and connect to the Internet with email privileges. The Registry section uses the computers to input and store student data and monitor student progress for all the Provincial Centres.

Student Activity 11

Student Activity 11.1.1.6   43

✖ 1. Use magnets round a computer.

✖ 2. Store in extremely hot or cold locations.

✔ 3. Scheduled automated updates.

✔ 4. Run a full virus scan.

✔ 5. Run a disk scan to check for hard drive issues.

✔ 6. Run a defragmentation program.

✔ 7. Run a clean up to delete unneeded files.

✔ 8. Renew your software update and anti-virus subscriptions.

✔ 9. Register your software products.

✔ 10. Read the maintenance section of your manual.

✔ 11. Install anti-virus software.

✔ 12. Install a surge suppressor/emergency shutdown power strip.

✔ 13. Empty the recycle bin.

✔ 14. Delete or uninstall unneeded or unused programs.

✔ 15. Clear your browsing history.

✔ 16. Clean your peripherals.

✔ 17. Clean your monitor.

✔ 18. Clean your keyboard.

✔ 19. Check for updates.

✔ 20. Back up your files to a remote location.

✖ 21. Spill liquids on the disk.

✖ 22. Remove the disk while in use.

✖ 23. Eat around the computer.

✖ 24. Drink around the computer.

✔ 25. Shutdown when not in use.

✔ **Answers to Summative Activity 11.1.1**

A. The information processing cycle refers to the order of events that go into processing information, including input, processing, storage and output. Input devices are used by users to input data like any electronic device connected to a computer and produces input signals. Data or instruction being input into the computer system is then processed by the CPU which controls all activities within the system and the results of the processed data are then sent to an output device as usable data. Output is the result of data processing activity when it is presented external to the system. Computer storage is important to help users store programs and data to be used at a later time.

B. Here is a sample reaction to how computers are used in Papua New Guinea. Answers may be similar to this.

Government services such as libraries, archives, galleries and schools in the developed countries are in the forefront providing information to the community from the Internet. These are services for the ordinary citizens who cannot afford a computer or the network costs. For example, school children in public schools in Australia use the internet to collect information which helps them learn, they also communicate with school children in the United States and other countries who have access to the Internet. University Libraries are equipped with microcomputers that are connected to the Internet. This gives the students access to valuable and useful information, which supplements printed information. Similarly, Government public services in Papua New Guinea can deliver the same services for its citizens. The National Library of Papua New Guinea, The National Museum and Art Gallery, and The National Research Institute of Papua Guinea, The Medical Research Institute, The University Libraries, to name a few, can deliver useful and valuable information to the community. The University libraries in Papua New Guinea so far have done well in terms of using computers to deliver information to their clients. The framework is in place, which makes it easier for the introduction of the Internet. The schools can greatly learn from the Internet. Children from PNG can share and learn from children in other parts of the world. Internet is a good prospect for distance education in the country too. The country is geographically diversified and the transport system is poor. Internet can deliver lessons to remote places. The Internet can foster the spread of literacy and education to parts of Papua New Guinea where it is impossible with other forms of technology. For example, the people in Oksapmin can receive news from their station manager through his

computer without waiting for it to come from Tabubil or Mt. Hagen by plane. They also can receive from the Health Department, important information on such things as family planning, aids, malaria etc. Other government departments can provide valuable information to the local community where it was taught impossible in the past. (This may take a long time to be realised).

Nathan Kwasam
SPCenCIID, University of Papua New Guinea

C.   The following can be the answers.

First Generation

It emerged in 1940s and mid-1950s.

- It consisted of vacuum tube based logical and electronic circuits.

- The machines used magnetic drums for internal storage and magnetic tape for   external storage.

- The machines were relatively slow.

- The computers were huge sized.

- The machines experience system failure due high temperature produce by vacuums.

- The computers had very limited memory capacity.

- It used machine language in programming.

- It used punched cards to store data.

The Second Generation

It emerged in mid-1950 and 1960s.

- It had built on Transistors and small sized circuits with high operating efficiency.

- The machines were using magnetic circuits for memory.

- The machines were using Hardisk for every storing and retrieval of data.

The Third generation

It emerged in 1960s.

- It had used small scale integrated circuits, followed by medium scale integrated, resulting in small size and high memory capacity and accurate performance.

- The machines had distinguished high performance speed.

- It resulted in emergence of microcomputers and multiprocessors.

- It developed operating systems to improve effectiveness and performance, such as multiprogramming system.

- The era of emergence of new high level languages such as Basic and Pascal.

- The period of improvement of input and output devices.

The Fourth generation

It emerged in 1970s and 1980s.

- The machines used semiconductors to develop large scale integrated circuit and very large scale integrated circuits called microprocessors.

- The computers had very high speed performance.

- The period of emergence of Personal Computers and microcomputers.

- The time of emergence of new operating systems such as Real time systems.

- The beginning of the use of Floppy disks.

The Fifth Generation

It emerged in 2013 - 2014.

- Artificial Intelligence started.

- Natural language - Natural language processing (NLP) is a field of computer science, artificial intelligence, and linguistics concerned with the interactions between computers and human (natural) languages.

- Parallel processing- Parallel processing is the simultaneous use of more than one CPU or processor core to execute a program or multiple computational threads. Ideally, parallel processing makes programs run faster because there are more engines (CPUs or cores) running it.

- Voice recognition- Also known as Speech Recognition is the translation of spoken words into text. Speech recognition applications include voice user interfaces such as voice dialing (e.g. "Call home"), call routing (e.g. "I would like to make a collect call"), domestic appliance control, search (e.g. find a podcast where particular words were spoken), simple data entry (e.g., entering a credit card number), preparation of structured documents (e.g. a radiology report), speech-to-text processing (e.g., word processors or emails), and aircraft (usually termed Direct Voice Input).

- Quantum processing –Quantum computers are different from digital computers based on transistors. Whereas digital computers require data to be encoded into binary digits (bits), each of which is always in one of two definite states (0 or 1), quantum computation uses qubits (quantum bits). Large-scale quantum computers will be able to solve certain problems much quicker than any classical computer.

D.

1. Do

2. Do

3. Don't

4. Do

5. Do

6. Do

7. Do

8. Do

9. Don't

10. Do

11. Don't

12. Do

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19. Don't

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21. Do

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23. Don't

24. Don't

25. Don't

11.1.2   Data Handling and File Management

11.1.2.1   Data and Information

There is a subtle difference between data and information. Data are the facts or details from which information is derived. Individual pieces of data are rarely useful alone. For data to become information, data needs to be put into context.

	Data	Information
Meaning	Data is raw, unorganised facts that need to be processed. Data can be something simple and seemingly random and useless until it is organised.	When data is processed, organised, structured or presented in a given context so as to make it useful, it is called information.
Example	Each student's test score is one piece of data.	The average score of a class or of the entire school is information that can be derived from the given data.
Etymology	"Data" comes from a singular Latin word, datum, which originally meant "something given." Its early usage dates back to the 1600s. Over time "data" has become the plural of datum.	"Information" is an older word that dates back to the 1300s and has Old French and Middle English origins. It has always been referred to as "the act of informing," usually in regard to education, instruction, or other knowledge communication.

Data is raw material for data processing. Data relates to facts, events and transactions. Data refers to unprocessed information.

Information is data that has been processed in such a way as to be meaningful to the person who receives it. It is anything that is communicated.

For example, researchers who conduct a market research survey might ask a member of the public to complete questionnaires about a product or a service. These completed questionnaires are data; they are processed and analysed in order to prepare a report on the survey. This resulting report is information.

Examples of Data and Information
• The history of temperature readings all over the world for the past 100 years is data. If this data is organised and analysed to find that global temperature is rising, then that is information.

• The number of visitors to a website by country is an example of data. Finding out that traffic from the US is increasing while traffic from Australia is decreasing is meaningful information.

- Often data is required to back up a claim or conclusion (information) derived or deduced from it. For example, before a drug is approved by the FDA, the manufacturer must conduct clinical trials and present a lot of data to demonstrate that the drug is safe.

Data type is a classification of the type of data that a variable or object can hold in computer programming. All computer programs, from brain scanners to video games to music players, use these same basic data types to represent all possible information. The following are the different types of data.

1. Numbers
   - Integers or Whole Numbers - In more common parlance, whole number; a number that has no fractional part. A numeric value, for example, 1 and 1234 are examples of integers. A negative integer is any negative numeric value, for example, -1 and -1234 are examples of a negative integers.

     (e.g., 0,1,2,3,123123, 12)

   - Real Numbers, called doubles, floating-point or floats. These are numbers represented with a decimal point. A number with a decimal point. For example, 3 is an integer, but 3.5 is a floating-point number.

     (e.g., 1.1, 5.0, 3.1419, -1234234.01, 0.0000001)

2. Booleans (true or false)
   Booleans were named after the famous Mathematician George Boole. Booleans are good for knowing the status of something. An example is the status of "I am learning vs.I am NOT learning." Many math operations give us Boolean answers, such as "not equal"(e.g.,"5 ~= 10"), "less than" (e.g., 5 < 10), and "greater than" (e.g., 5 > 10).

   A Boolean consists of operators such as AND, OR, NOT, and XOR. Booleans are often used in programming and today in Internet search engines. Boolean expressions are expressions that result in the value of either TRUE or FALSE.

   As mentioned above a user can use Boolean searches to help locate more exact matches in Internet searches. For example, a user could search for computers help and DOS, which would search for any document containing computer help that also contain the word DOS. Performing Boolean searches often help users find results relating more to what the user may need to find.

3. Characters
   Sometimes abbreviated as char, a character is a single visual object used to represent text, numbers, or symbols. For example, the letter "A" is a single character. With a computer one character is equal to one byte, which is 8 bits. ('a', 'b', ... 'z', '1', '2', ... '9', '!', '^', etc)

4. Alphanumeric
   Alphanumeric is a description of content that is both letters and numbers. For example, "1a2b3c" is a short string of alphanumeric characters. Alphanumeric is commonly used to

help explain the availability of text that can be entered or used in a field such as a password.

5.   Arrays

An array is a list of data. The data are all of the same type. It is also known as structures which is a collection of named data referring to a single entry.

Whenever you talk about an array, you should say, "an array of _WHAT_" (where WHAT is a DATA TYPE).

Several array examples:

```
student_grades = [97, 78, 88, 93, 89];   % an array of integers
student_name   = ['j','i','m'];  % an array of characters (also known as a string)
student_name   = 'jim'; % the same array of characters using a shortcut
```

As Data has different types, then Information can also be classified as follows:

1.   Spatial - Information that deals with location, position and space.

2.   Chronological - Information that deals with time, sequence and period.

3.   Conceptual - Information that deals with relationships and categorizations.

4.   Quantitative - Information that deals with amount and comparison.

Study the diagram below to further illustrate what is written above.
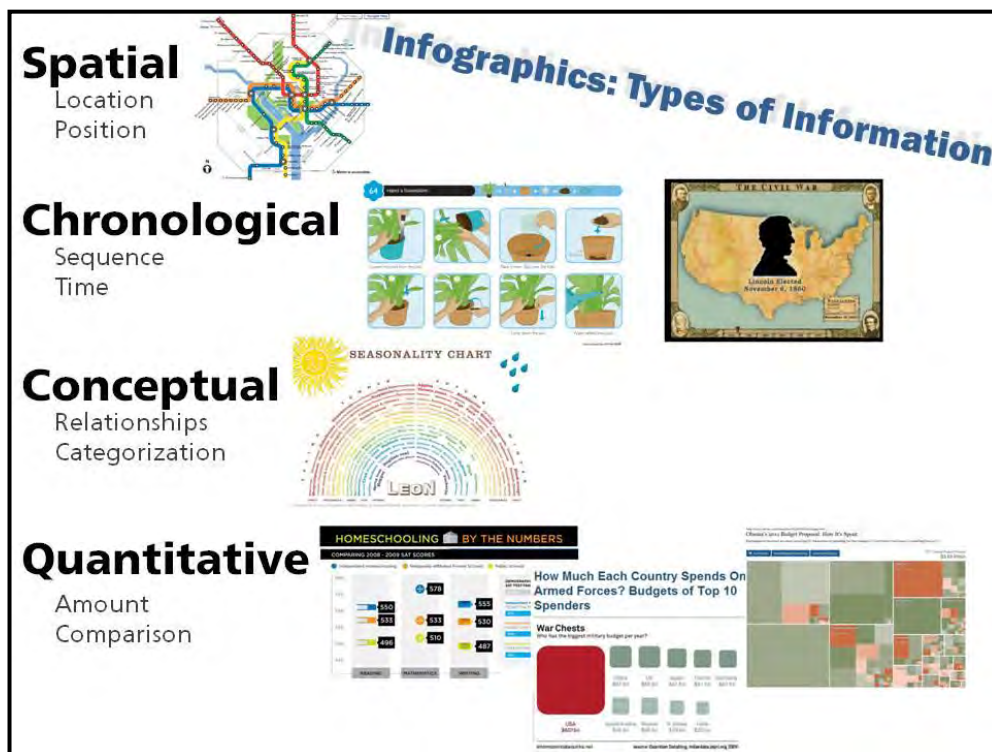
Types of Information

Be aware of what types of information are stored on your computer and take steps to protect it. There are three data security classifications:

- Confidential - Specific data elements subject to more stringent security requirements.

- Restricted - Unless otherwise classified, all information used in the conduct of business is restricted, and not open to the general public.

- Public - data that has been explicitly made available to the public, with no authentication required for network access.

All information should be protected. Even data that you may not consider sensitive should be protected. Take appropriate measures to protect data wherever you are and whatever computer you are using.

Data and information come from many sources. A data source is any of the following types of sources for (mostly) digitised data:

1. A database - A database is an organised collection of data. The data are typically organised to model aspects of reality in a way that supports processes requiring information. For example, modeling the availability of rooms in hotels in a way that supports finding a hotel with vacancies. In the Java software platform, data source is a special name for the connection set up to a database from a server

2. A computer file - A computer file is a resource for storing information, which is available to a computer program and is usually based on some kind of durable storage. A file is "durable" in the sense that it remains available for other programs to use after the program that created it has finished executing. Computer files can be considered as the modern counterpart of paper documents which traditionally are kept in office and library files, and this is the source of the term.

3. A data stream- a data stream is a sequence of digitally encoded coherent signals (packets of data or data packets) used to transmit or receive information that is in the process of being transmitted. It is an uninterrupted flow of a long sequence of data, such as in audio and video data files. It is also a sequence of digitally encoded signals representing information when it is transmitted.

Student Activity 11.1.2.1

53

Identify what type or classification of data is given below. Write your answers on the space provided.

1. 1721   _____

2. !   _____

3. 10ej20dj   _____

4. Amount   _____

5. Time   _____

6. Relationships   _____

7. Location   _____

8. Comparison   _____

9. #   _____

10. 02.24   _____

11.1.2.2   Storage Devices

The computers are very important because they can help us accomplish a lot of things. They can be used for a large variety of tasks such as creating projects, or any other work related tasks, and for entertainment purposes such as watching movies and playing games.

Knowing what kinds of storage devices are available can keep you from using up too much space on your computer's hard drive. They can also help keep your computer's hard drive from crashing, along with keeping it running at top speed.

A storage device is any computing hardware that is used for storing, porting and extracting data files and objects. It can hold and store information both temporarily and permanently, and can be internal or external to a computer, server or any similar computing device. A storage device may also be known as a storage medium.

Storage devices share the same features. These are volatility, accessibility, mutability and addressability. Let us discuss each feature.

1.   Volatility describes the capability of storage devices to either save or not your computer data when power is cut or interrupted. There are two kinds, the volatile and non-volatile.

      a.   Volatile memory is a type of storage whose contents are erased when the system's power is turned off or interrupted. For example, RAM is volatile; meaning users will lose a document if they do not save their work to a non-volatile classification of memory, such as a hard drive, before shutting down the computer.

      b.   NV or Non-volatile is a term used to describe any memory or storage that is saved regardless if the power to the computer is on or off. The best example of non-volatile memory and storage is a computer hard drive,   flash memory, and ROM. If data is stored on a hard drive, it will remain on that drive regardless if the power is interrupted, which is why it is the best place to store your data and documents. This is also how your computer keeps the time and other system settings even when the power is off.

2.   Accessibility refers to reading or writing data. It has two types, the random access and sequential access.

      a.   Random access describes accessibility at any location in storage at any moment in approximately the same amount in time. This is suited for both the primary and secondary storage devices which will be discussed later.

      b.   Sequential access describes accessing of pieces of information in a serial order, one after the other. Therefore, the time to access a particular piece of information depends upon which piece of information was last accessed. This is typical for off-line storage devices.

3.   Mutability allows information to be overwritten at any time. A computer without some amount of read/write storage for primary storage purposes would be useless for many

tasks. Modern computers typically use read/write storage also for secondary storage. There are two types of mutability; it can either be read only storage or slow write, fast read storage.

a. Read only storage retains the information stored at the time of manufacture, and write once storage (Write Once Read Many) allows the information to be written only once at some point after manufacture. These are called immutable storage. Immutable storage is used for tertiary and off-line storage. Examples include CD-ROM and CD-R.

b. Slow write, fast read storage allows information to be overwritten multiple times, but with the write operation being much slower than the read operation. Examples include CD-RW and flash memory.

4.   Addressability describes where the information is stored. It has three types, location-addressable, file addressable and content-addressable.

a. Location-addressable is where each individually accessible unit of information in storage is selected with its numerical memory address. In modern computers, location-addressable storage usually limits to primary storage, accessed internally by computer programs, since location-addressability is very efficient, but burdensome for humans.

b. File addressable is where information is divided into files of variable length and a particular file is selected with human-readable directory and file names. The underlying device is still location-addressable, but the operating system of a computer provides the file system abstraction to make the operation more understandable. In modern computers, secondary, tertiary and off-line storage use file systems.

c. Content-addressable is where each individually accessible unit of information is selected based on the basis of (part of) the contents stored there. Content-addressable storage can be implemented using software (computer program) or hardware (computer device), with hardware being faster but a more expensive option. Hardware content addressable memory is often used in a computer's CPU cache.

Having learned the common characteristics shared by storage devices gave us the idea on how important they are in storing computer files and data. We can now discuss how they are categorised.

Storage Devices can be categorised as primary, secondary, tertiary removable or offline storage and online storage. Look at the diagram on the next page to understand how storage devices are categorised.
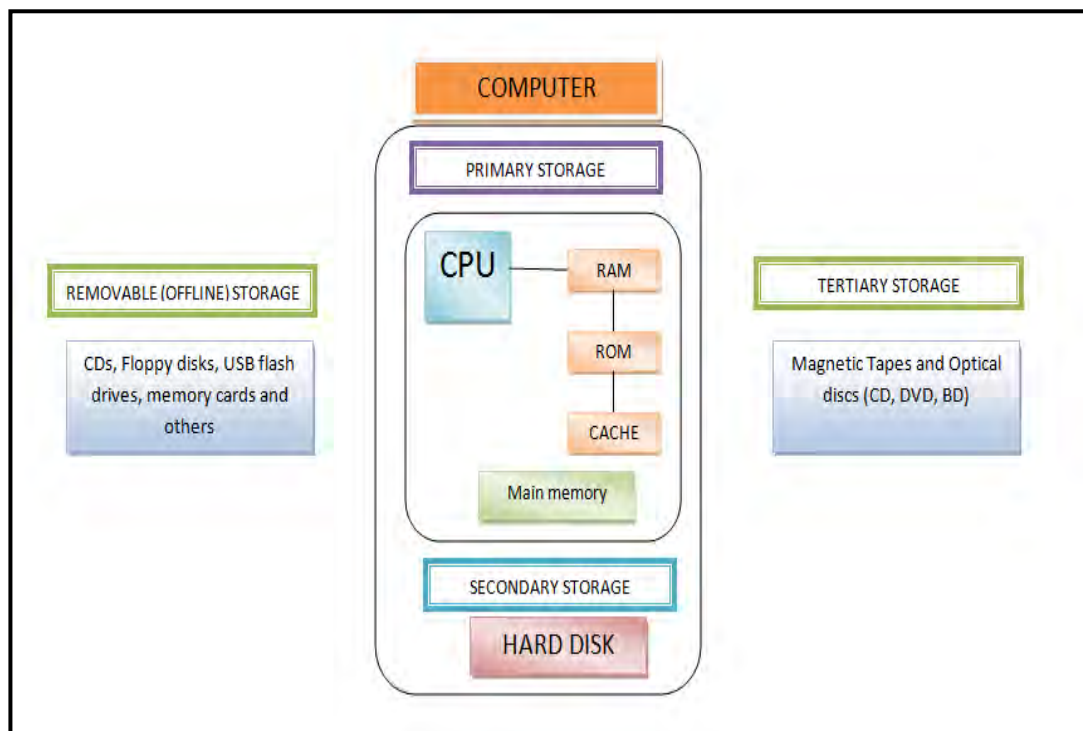
How storage devices are categorised

1.   Primary Storage is also known as main memory. Main memory is directly or indirectly connected to the central processing unit via a memory bus. The CPU continuously reads instructions stored there and executes them as required.

Examples:

- RAM is Random Access Memory; it is very fast and is used to store data and programs which a computer processor is currently processing and needs to be available. It is volatile (loses its contents when the power is switched off). RAM is needed because most data on computers is stored in much slower "storage media" such as hard disks, solid state drives or flash memory. For the processor to be able to work on data or run programs at any reasonable speed, the programs or data need to be copied into RAM first.

- ROM is Read Only Memory. It can also be quite fast. It is non-volatile and used to store data which will not need to change, such as software to start up and run an electronic device or for the basic start-up functions of a computer. ROM can either be write-once, where it holds data permanently, or write-many, where it can be erased and re-written using special equipment (but not during normal use). ROM has become less common than it once was, because other kinds of memory have become cheaper, though of course CD-ROMs are quite prevalent.

- Cache memory is a bit like RAM, except it is built right inside a processor and is even faster than RAM. It is used by the processor to avoid having to slow down to the speed of the RAM all the time. Like RAM, it is also volatile. Cache memory

is usually quite low-capacity (a few megabytes), so we still need RAM in order to avoid constantly accessing things from slow storage media.

2.   Secondary Storage is not directly accessible by the CPU. The computer usually uses its input/output channels to access secondary storage and transfer the desired data using intermediate area in primary storage. With the exemption of Virtual RAM where a little area on secondary storage is allocated by the Operating System (OS) is an addition RAM, hence it is called Virtual RAM.

Example:

- Hard disk drive is the main, and usually the largest, data storage device in a computer.

3.   Tertiary Storage Typically involves a robotic mechanism which will mount (insert) and dismount removable mass storage media into a storage device.

Examples:

- Magnetic Tape is a magnetically coated strip of plastic on which data can be encoded.

- Optical Disc is any storage media that holds content in digital format and is read using a laser assembly. It is also considered as optical media.

    ➢ CD + RW Disc (Compact Disc Rewriteable) – This disc looks like a regular CD. The only difference is that you can write on this disc and erase it as many times as you want. It works just like a floppy disk or a zip disk. A CD + RW disc holds about 650 MB.

    ➢ CD + R Disc (Compact Disc Recordable) – This one is a CD that you can record on. It is mostly used to record audio and once it is written on, you cannot rewrite or erase anything off from it. This compact disc comes in different sizes, but they are usually silver in colour. (Some CDs are black in colour and they actually do not get as many scratches on them as the silver ones do. They are also less fragile).

    ➢ A DVD – R Disc (Digital Video Recordable) – These discs hold the space of about 4.7 GB and are used to record movies on.

4.   Removable (Offline) Storage is also known as disconnected storage. This is computer data storage on a medium or a device that is not under the control of a processing unit. It must be inserted or connected by a human operator before a computer can access it again.

Examples:

- Floppy Disk – They are plastic square disks, usually with a silver or black sliding piece going across the top. These disks come in a variety of colours and they hold about 144 million bytes. (Bytes are characters, symbols and letters).

- Zip Disk – They look like a floppy disk, but they are a little thicker. This disk also comes in a variety of colours and holds about 200 MB of data.

- USB Flash drive is a small, portable flash memory card that plugs into a computer's USB port and functions as a portable hard drive. Flash Drive is a storage device that comes in many colours and has a stick shape to it. They are very small in size, but they can hold anywhere between 256 MB and 32 GB of material on them.

- Memory card is an electronic flash memory storage disk commonly used in consumer electronic devices such as digital cameras, MP3 players, mobile phones, and other small portable devices. Memory cards are usually read by connecting the device containing the card to your computer, or by using a USB card reader.

5. Online storage is data storage online where the user has to pay a monthly fee to an online data storage company and in exchange is given a certain amount of storage space where the user can upload his documents and files. If the user has a lot of files that fill up all his allocated space, the user can simply purchase additional online storage.

Storing data online is secure. The user is given a user name and password so that only he or people he authorised can access his files. The user can also add extra security by providing users with a password token which generates a password that can only be used once before it expires.

The following are reasons why online storage is becoming an increasingly popular method of data storage.

- It provides an additional way to automatically back up data - a program can be run in the background that uploads a copy of any new file either as it is saved to a disk or at a certain time of day.

- It provides peace of mind. Even if the user makes backups at home or in the office, where there is likely to be a fire or theft, he could lose his original data and also his backups. Having a copy of his data stored online means that he can quickly recover everything.

- The user can access his files from anywhere in the world so long as he has an internet connection

- The user can share files with other people if he is prepared to give them access to his account

A **solid-state drive (SSD**, also known as a **solid-state disk** is a solid-state storage device that uses integrated circuit assemblies as memory to store data persistently. SSDs have no moving mechanical components. This distinguishes them from electromechanical magnetic disks such as **hard disk drives (HDD**s) or floppy disks, which contain spinning disks and movable read/write heads. Compared with electromechanical disks, SSDs are typically more resistant to physical shock, run silently, have lower access time, and lower latency. **Latency** is the delay from input into a system to desired outcome

After all the discussions, here is a collection of storage devices. Study each picture on the next page and attempt the activity.

Different storage devices

Student Activity 11.1.2.2

Look at the diagram below and match the storage device to its description. Write the letter on the space provided.

............1. DVD	A. Primary volatile storage
............2. Flash drive	B. Magnetic coated plastic strip where data is encoded
............3. Hard disk drive	C. Used to record movies on
............4. Online storage	D. Largest data storage in a computer
............5. RAM	E. Colored stick shape device
............6. Magnetic tape	F. Needs an internet connection

11.1.2.3   Data Security

Data security refers to protective digital privacy measures that are applied to prevent unauthorised access to computers, databases and websites. Data security also protects data from corruption. Data security is the main priority for organisations of any size and genre.

Data security is also known as information security (IS) or computer security.

Data protection attempts to ensure the security of computer-processed data from unauthorised access, from destructive user actions, and from computer failure. With increasing use of computer-based information systems, there has been increasing concern for the protection of computer-processed data. Data protection is closely allied with other functional areas. The design of data entry, data display, sequence control, user guidance, and data transmission functions can potentially affect the security of the data being processed.

The following are the different threats to data security. Carefully study each threat.

1.   Advanced Persistent Threat (APT) is a type of targeted attack. APTs are characterised by an attacker who has time and resources to plan an access into a network.

2.   Adware is software that displays advertisements on your computer. Adware can slow down your PC. It can also slow down your Internet connection by downloading advertisements. Sometimes programming flaws in the adware can make your computer unstable.

3.   Anonymising proxies allow the user to hide their web browsing activity. They are often used to bypass web security filters—e.g., to access blocked sites from a work computer.

4.   Backdoor Trojan allows someone to take control of a user's computer without their permission.

5.   Boot sector malware spreads by modifying the program that enables your computer to start up.

6.   Botnet is a collection of infected computers that are remotely controlled by a hacker. Once a computer is infected with malicious software (bot), the hacker can control the computer remotely over the Internet. From then on, the computer is a zombie, doing the bidding of the hacker, although the user is completely unaware. Collectively, such computers are called a botnet.

7.   Browser hijackers change the default homepage and search engine in your Internet browser without your permission.

8.   Brute force attack is one in which hackers try a large number of possible keyword or password combinations to gain unauthorised access to a system or file.

9.   Buffer overflow occurs when a program stores excess data by overwriting other parts of the computer's memory, causing errors or crashes.

10. Command and control center (C&C or C2) is a computer that controls a botnet (a network of compromised computers). Some botnets use distributed command and control systems, making them more resilient. From the command and control center, hackers can instruct multiple computers to perform their desired activities.

11. Cookies are files placed on your computer that allow websites to remember details. When you visit a website, it can place a file called a cookie on your computer. This allows the website to remember your details and track your visits. Cookies can be a threat to your privacy, but they cannot infect your computer.

12. Data leakage is the unauthorised exposure of information. It can result in data theft or data loss.

13. Data loss is the result of the accidental misplacement of data, rather than its deliberate theft.

14. Data theft is the deliberate theft of information, rather than its accidental loss. Data theft can take place both inside an organisation (e.g., by a disgruntled employee), or outside the organisation (e.g. by criminals).

15. Denial-of-service attack (DoS) attack prevents users from accessing a computer or website. In a DoS attack, a hacker attempts to overload or shut down a service so that legitimate users can no longer access it.

16. Domain Name System (DNS) hijacking is the phone book of the Internet. It allows computers to translate website names, like www.sophos.com, into IP address numbers so that they can communicate with each other. A DNS hijacking attack changes a computer's settings to either ignore DNS or use a DNS server that is controlled by malicious hackers.

17. Document malware takes advantage of vulnerabilities in applications that let you read or edit documents.

18. Drive-by download is the infection of a computer with malware when a user visits a malicious website.

19. Email malware distribution refers to malware that is distributed via email.

20. Exploit takes advantage of a vulnerability in order to access or infect a computer.

21. Fake antivirus malware reports non-existent threats in order to scare the user into installing malicious software and/or paying for unnecessary product registration and cleanup.

22. Hacktivism is the term used to describe hacking activity that is typically for political and social purposes, attacking corporations, governments, organisations and individuals. Hacktivist groups may deface websites, redirect traffic, launch denial-of-service attacks and steal information to make their point.

23. Hoaxes are reports of false and unsubstantiated claims, in an attempt to trick or defraud users. A hoax could be an attempt to solicit money, an attempt to install malware, or an attempt to consume bandwith (by having users forward a hoax email).

24. Honeypot is a form of trap security specialists use to detect hacking attacks or collect malware samples. Honeypots are frequently used by security specialists or researchers to gather information about current threats and attacks.

25. Internet worm is a form of malware that replicates across the Internet or local networks. Worms differ from computer viruses because they can propagate themselves, rather than using a carrier program or file. They simply create copies of themselves and use communication between computers to spread.

26. Keylogging is the process of secretly recording keystrokes by an unauthorised third party. Keylogging is often used by malware to steal usernames, passwords, credit card details and other sensitive data.

27. Malware is a general term for malicious software. Malware includes viruses, worms, Trojans and spyware. Many people use the terms malware and virus interchangeably.

28. Mobile phone malware is malware intended to run on mobile devices, such as smartphones or PDAs.

29. Parasitic viruses, also known as file viruses, spread by attaching themselves to programs.

30. Patches are software add-ons designed to fix software bugs, including security vulnerabilities, in operating systems or applications.

31. Phishing refers to the process of deceiving recipients into sharing sensitive information with an unknown third party (cybercriminal).

32. Potentially unwanted applications (PUA) are programs that are not malicious but may be unsuitable for use in a business environment, and may create security concerns.

33. Ransomware is software that denies you access to your files or computer until you pay a ransom. Malicious software can hold your data hostage. For example, the Archiveus Trojan copies the contents of the My Documents folder into a password-protected file and then deletes the original files. It leaves a message telling you that you require a 30-character password to access the folder, and that you will be sent the password if you make purchases from an online pharmacy.

34. Rootkit is a piece of software that hides programs or processes running on a computer. Malware frequently installs rootkits upon infection to hide its activity.

35. Social engineering refers to the methods attackers use to deceive victims into performing an action. Typically, these actions are opening a malicious webpage or running an unwanted file attachment.

36. Social networking websites allow you to communicate and share information. But they can also be used to spread malware and to steal personal information. Social networking sites, such as Facebook and Twitter, continue to grow in popularity as attack vectors.

37. Spam is unsolicited bulk email, the electronic equivalent of junk mail, which comes to your inbox.

38. Spearphishing is targeted phishing using spoof emails to persuade people within an organisation to reveal sensitive information or credentials.

39. Spoofing (Email) is when the sender's address of an email is forged for the purposes of social engineering. Spoofing can be put to a number of malicious uses. Phishers (criminals who trick users into revealing confidential information) use spoofed sender addresses to make it appear that their email comes from a trusted source, such as your bank. The email can redirect you to a bogus website (e.g., an imitation of an online banking site), where your account details and password can be stolen.

40. Spyware is software that permits advertisers or hackers to gather sensitive information without your permission.

41. SQL injection is an exploit that takes advantage of database query software that does not thoroughly test for correct queries. Cyber criminals use SQL injection along with cross-site scripting (XSS) and malware to break into websites and extract data or embed malicious code.

42. Suspicious files and behaviour is when an endpoint security solution scans files, it labels them as clean or malicious. If a file has a number of questionable characteristics or behaviour, it is labeled as suspicious.

43. Trojan (Trojan horse) is a malicious program that pretends to be legitimate software, but actually carry out hidden, harmful functions.

44. Virus is a malicious computer program that can spread to other files.

45. Vulnerabilities are bugs in software programs that hackers exploit to compromise computers. Security vulnerabilities are commonplace in software products, leaving users open to attacks.

46. Zombie is an infected computer that is remotely controlled by a hacker. It is part of a large group of compromised computers called a botnet.

Information security is one of the hottest topics in the world of connected computers. The primary targets for information theft are government and business documents of interest to local intelligence services, business documents of interest to competitors, credit card data, and other identification documents. All mobile data should be encrypted to ensure its protection. The following now are ways on how to secure both software and hardware against any threats. Doing these would prevent any computer data threats.

1. Anti-malware software can protect you against viruses and other malware threats including Trojans, worms and spyware.

2. Anti-spam programs can detect unwanted email and prevent it from reaching user inboxes.

3. Appliances are a combination of hardware and software security elements in one solution. This allows you to plug appliances in, rather than installing the software separately.

4. Application control allows you to control the use of applications that may be inappropriate for use on business computers or networks.

5. Device control helps you control the use of removable storage, optical media drives and wireless networking protocols. Device control is a central element of data loss prevention strategies. For example, device control helps prevent malware that spreads through USB drives.

6. Encryption solutions secure your data by encrypting your desktops, laptops, removable media, CDs, email, network files, cloud storage and other devices. Information can only be accessed with the right keys to decrypt data by entering a password.

7. Endpoint security software protects computers or devices against a wide range of security, productivity and compliance threats, and lets you centrally manage the security of multiple endpoints. Endpoint security products bring together in one solution the individual point products you need to protect against modern threats. They often integrate the protection for multiple features into one agent or central console, easing management and reporting. They can include:

    - Antivirus software

    - Firewalls

    - Device control

    - Network access control

    - Application control

    - Runtime protection

    - Encryption technology

    - Web security

    - Patch management

    - Data loss prevention

8. Firewalls prevent unauthorised access to a computer or network. As its name suggests, a firewall acts as a barrier between networks or parts of a network, blocking malicious traffic or preventing hacking attempts.

9. HTTPS scanning is where Malware and other threats can hide in the encrypted traffic from trusted websites. HTTPS scanning decrypts scans and then re-encrypts this data. HTTPS scanning automatically finds and removes malicious content without human eyes viewing the content, maintaining the privacy of encrypted traffic.

10. Intrusion prevention systems (IPS) monitor network and systems for malicious activity. IPS can log activity information, and also attempt to block activity and report it to the network administrators to prevent network infections.

11. IPsec authenticates and encrypts each Internet Protocol (IP) packet of a communication session. IPsec includes protocols for establishing authentication between agents at the beginning of a session and negotiates cryptographic keys for use during the session.

12. Mobile device security refers to the policies, procedures and tools for securing mobile devices.

13. Network access control (NAC) protects your network and the information on it from the threats posed by users or devices accessing your network.

14. Runtime protection blocks attempts to access vulnerable parts of your computer. Runtime protection analyses the behaviour of all the programs already running on your computer and blocks any activity that looks as if it could be malicious.

15. Unified threat management (UTM) brings together multiple security functions into a single network appliance. Unified threat management enables organisations to implement multiple layers of protection

16. URL or web content filtering describes the technology that allows organisations to block specific websites or entire categories.

17. A virtual private network (VPN) is a method of connecting remote offices or computers to the central network. This method typically requires remote users to authenticate themselves by entering passwords or keys. A VPN allows users to communicate or access the organisation's servers securely over the Internet.

18. Web application control blocks unwanted applications that could cause security concerns such as P2P file sharing or instant messaging. It accelerates applications the organisation deems critical by making sure they have appropriate bandwidth, while blocking or limiting unwanted, unproductive applications.

19. Web application firewall (WAF) help keep your servers safe from hackers by scanning activity and identifying probes and attacks.

Student Activity 11.1.2.3

Write a paragraph on the importance of data security.

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11.1.2.4   Electronic File Management

Grade 10 Design and Technology-Computing Topic 3 Lessons 13-17 provided you with the basics of file management. As discussed in Lesson 13, computer file management refers to the manipulation of documents and data filed in a computer. It describes the fundamental methods for naming, storing and handling files.

File Management is the most important concept in learning any application. It will allow you to create, select, copy, move, and rename files and folders in your computer. From the step by step discussions in Lessons 13-17, it is expected at this point that you are now aware and skilled in creating, opening, copying, deleting, naming and renaming files and folders. You can always, however refer back to these lessons for review.

File Management has three fundamental aspects: how files and folders are named, how nested folders are arranged and how files are handled in the folders. The creation of a well-structured file management system can make backup and restoration relatively simple.

Windows Explorer provides the easy set up for file management. Windows Explorer displays the hierarchical structure of files, folders, and drives on your computer. It also shows any network drives that have been mapped to drive letters on your computer. Windows Explorer is your primary tool for copying, moving, renaming and searching for files and folders. To open Windows Explorer, you click Start → All Programs → Accessories, and then select Windows Explorer.

A diagram explaining how to open the Windows Explorer.

Start button
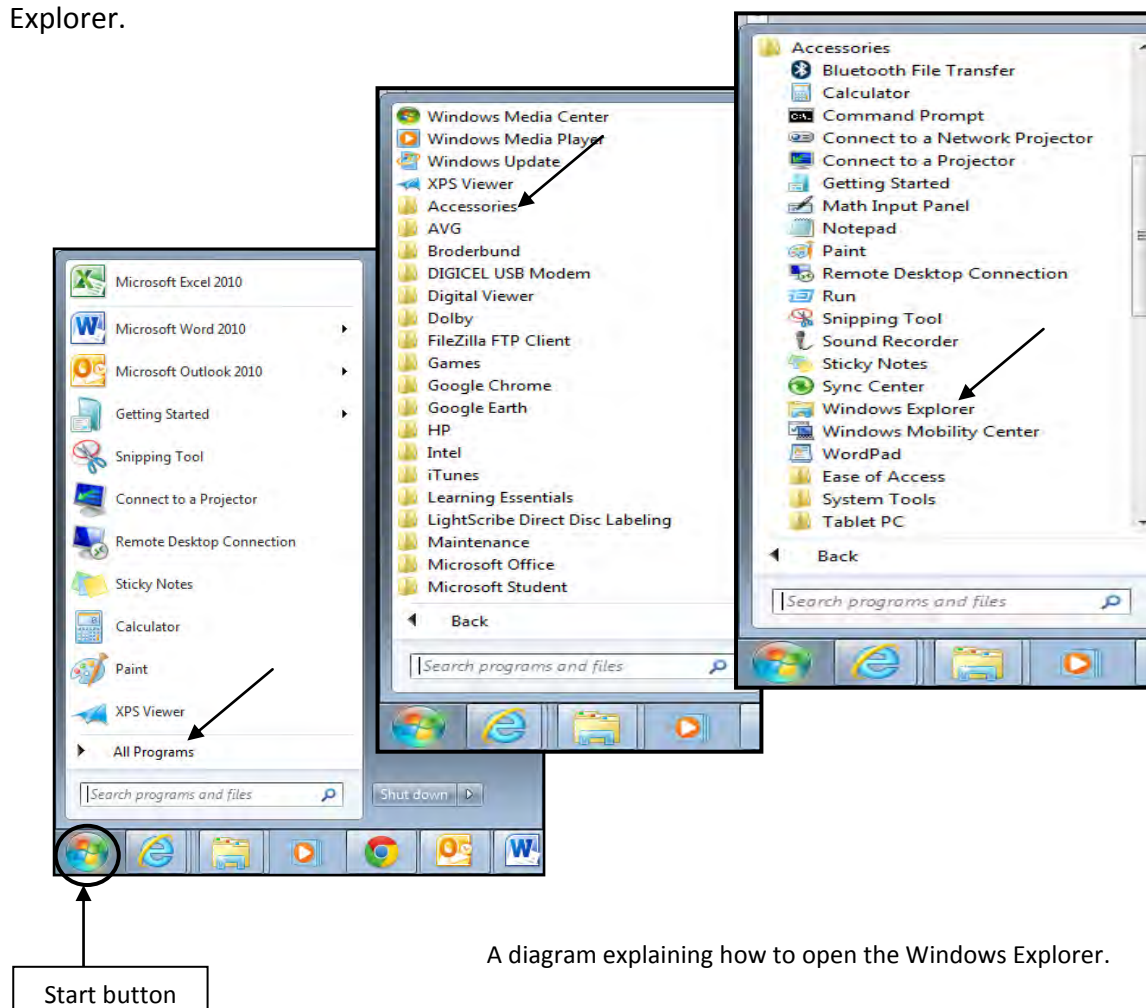
In Windows Explorer you will find the default libraries so when it comes to getting organised; you do not need to start from scratch. You can use libraries, a feature of Windows to access your files and folders, and arrange them in different ways. Below is a list of the four default libraries and what they are typically used for:

- Documents library. Use this library to organise and arrange word-processing documents, spreadsheets, presentations, and other text-related files.

- Pictures library. Use this library to organise and arrange your digital pictures, whether you get them from your camera, scanner, or in e‑mail from other people.

- Music library. Use this library to organise and arrange your digital music, such as songs that you rip from an audio CD or that you download from the Internet.

- Videos library. Use this library to organise and arrange your videos, such as clips from your digital camera or camcorder, or video files that you download from the Internet.
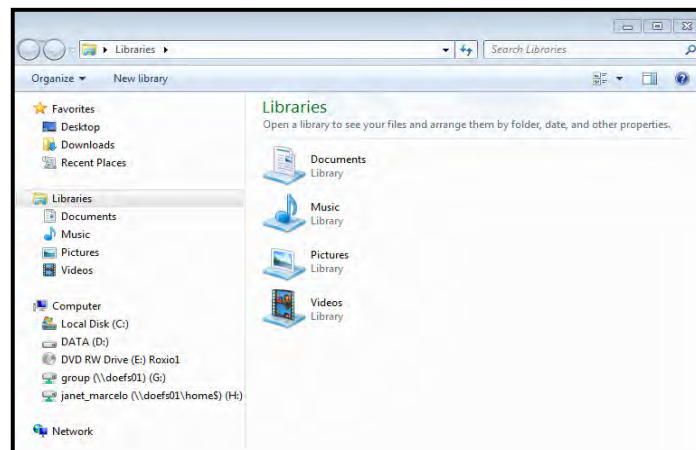
The Windows Explorer

To open the Documents, Pictures, or Music libraries, click the Start button , and then click Documents, Pictures, or Music.
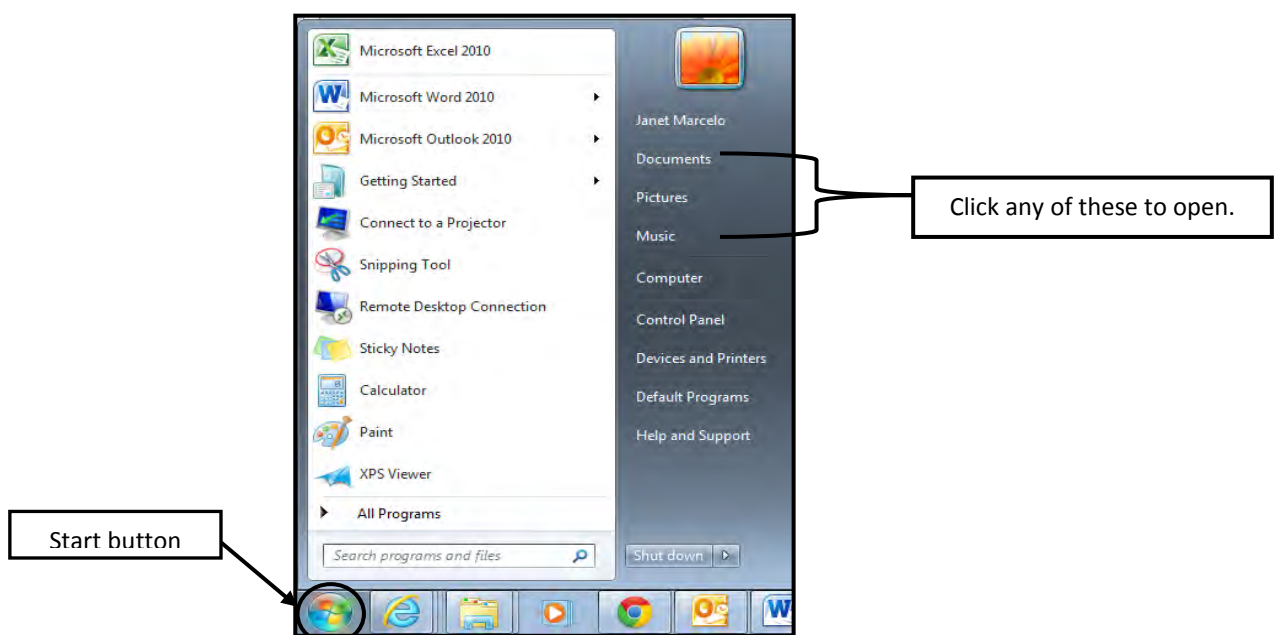
Knowing now what Windows Explorer can do to help with your files and folders management, it is but proper to familiarise ourselves with it. Now, let us start navigate the Windows and explore its parts. Knowing these would enable you to manage and organise well your files and folders.

1.   Navigation pane -Use the Navigation pane to access libraries, folders, saved searches, and even entire hard disks.Use the Favorites section to open your most commonly used folders and searches; use the Libraries section to access your libraries. You can also expand Computer to browse folders and subfolders.

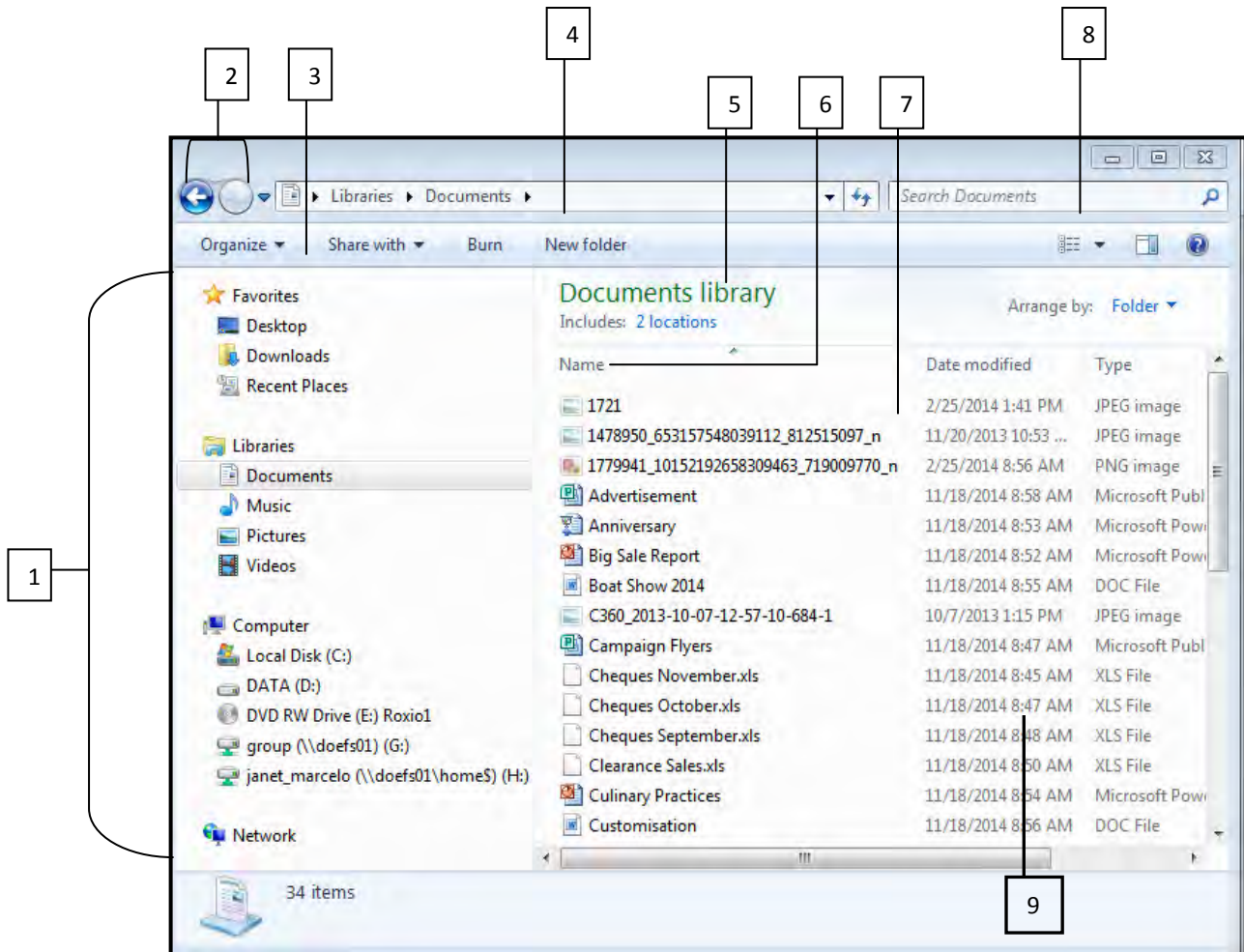2.   Back and Forward buttons-Use the Back button and the Forward button to navigate to other folders or libraries you have already opened without closing the current window. These buttons work together with the address bar; after you use the address bar to change folders, for example, you can use the Back button to return to the previous folder.

3.   Toolbar-Use the Toolbar to perform common tasks, such as changing the appearance of your files and folders, burning files to a CD, or starting a digital picture slide show. The toolbar's buttons change to show only the tasks that are relevant. For example, if you click a picture file, the toolbar shows different buttons than it would if you clicked a music file.

4.   Address bar-Use the Address bar to navigate to a different folder or library or to go back to a previous one.

5.   Library pane-The Library pane appears only when you are in a library (such as the Documents library). Use the library pane to customise the library or to arrange the files by different properties.

6.   Column headings-Use the Column headings to change how the files in the file list are organised. For example, you can click the left side of a column heading to change the order the files and folders are displayed in, or you can click the right side to filter the files in different ways. (Note that column headings are available only in Details view).

7.   File list-This is where the contents of the current folder or library are displayed. If you type in the search box to find a file, only the files that match your current view (including files in subfolders) will appear.

8.   Search box-Type a word or phrase in the search box to look for an item in the current folder or library. The search begins as soon as you begin typing-so if you type "B," for example, all the   files with   names starting with the letter B will appear in the file list.

9.   Details pane-Use the Details pane to see the most common properties associated with the selected file. File properties are information about a file, such as the author, the date you last changed the file,   and any descriptive tags you might have added to the file.

10.   Preview pane-Use the Preview pane to see the contents of most files. If you select an e‑mail message, text file, or picture, for example, you can see its contents without opening it in a program. If you do not see the preview pane, click the Preview pane button in the Toolbar to turn it on.

Parts of the Windows Explorer

1	Navigation	4	Address bar	7	File list
2	Back and Forward buttons	5	Library pane	8	The Search box
3	Toolbar	6	Column	9	Details pane

File management is now easier after combining our previous knowledge and skills learnt in Grade 10 Topic 3 Lessons 13-17 with the information presented about Windows Explorer. Let us study the following ways on how to manage files and folders.

File Management Tip # 1

Use the Windows Explorer Libraries to organise your files. Store like with like which means all documents together, pictures, music and videos in their own folders.
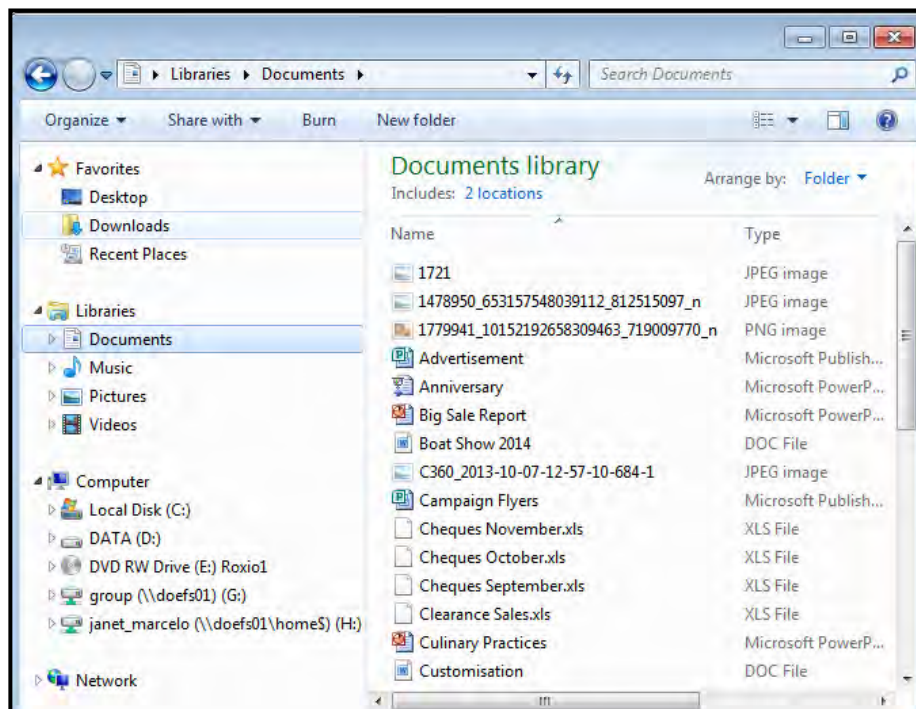
Disorganised filing of different file types
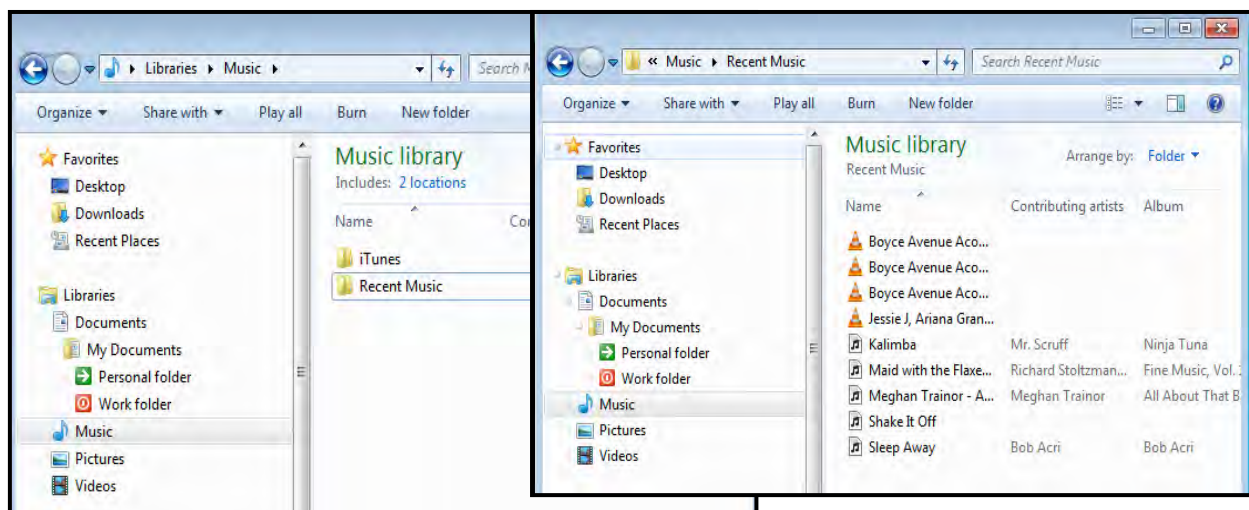
An example of storing like with like where all files with the same type are stored in its own folder.

File Management Tip # 2

Separate your working files from your personal files. Create a folder for each. This will be very helpful especially when doing updating and back up of files.
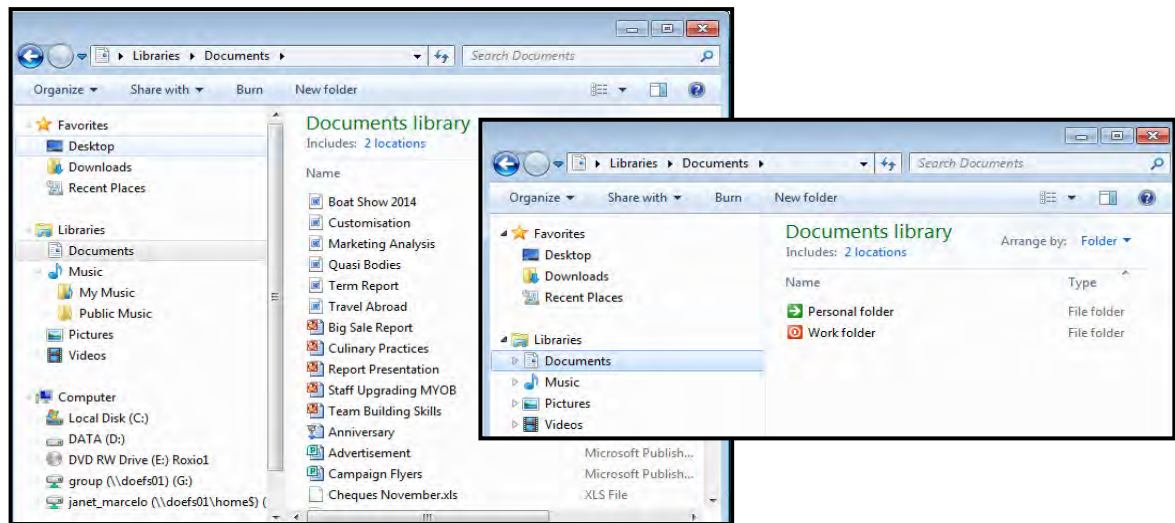
Creating work and personal folders can further organise files.

File Management Tip # 3

From your Work and Personal folders, you can create folders which would now contain the files pertinent to the folder. This ensures easy searching.
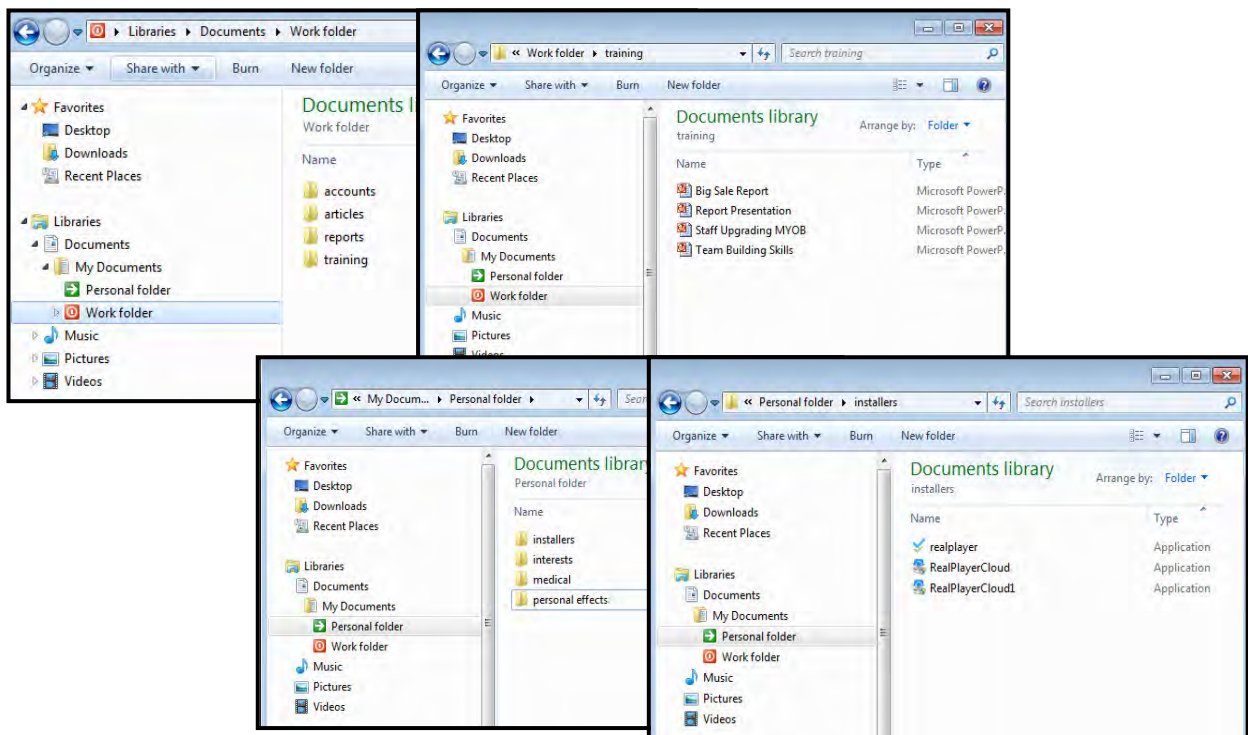
The Work and Personal folders now contain the related files.

File Management Tip # 4

Use descriptive folders to identify files and keep file names short. Doing these methods makes it easier for file and folder identification and location.
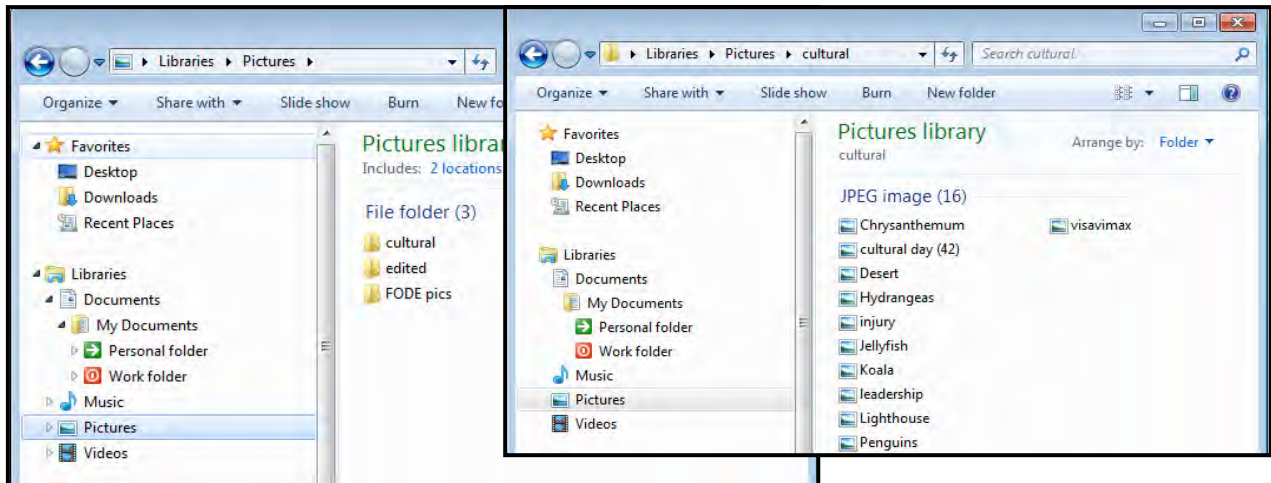
Descriptive folders help in easily identifying what its contents are.

File Management Tip # 5

Use Shortcuts for usually opened files and folders for quick and easy access. You can do this by locating first the file or folder then right click on it and select Send to > Desktop (create shortcut). This also avoids unnecessary multiple creations of files in different   locations to save space in your computer.

Files and Folders which are normally opened can have shortcuts on your desktop for easy access and locating.
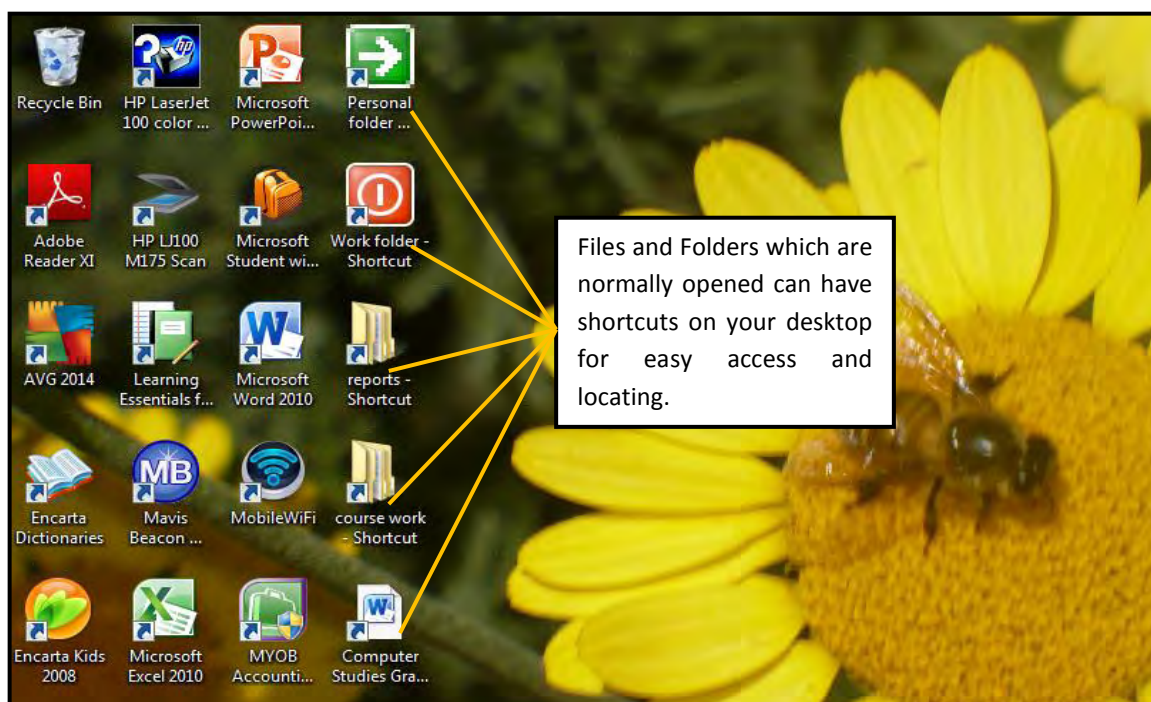
Shortcuts of files and folders created in the Desktop.

File Management Tip # 6

Consider storing your documents online. Microsoft and other providers like Dropbox and Box provides online storage for all your documents and can be accessed online anywhere. You need to sign up, follow the prompts and create your account.

Sample choices for providers for online storage.

Records do not manage themselves as such a sound practice of file management must reflect a systematic and planned approach to control the quality and quantity of its creation, filing, storage and disposal.

Student Activity 11.1.2.4   75

Study the filing management practices below. Put a tick (✓) for an appropriate file management practice and put an (x) mark for an inappropriate practice. Write in the box provided before the number.

[ ]   1.   Folders and files should be unique.

[ ]   2.   Combine all work and personal documents in one folder.

[ ]   3.   The file name should describe exactly what they contain.

[ ]   4.   Create shortcuts for files and folders.

[ ]   5.   Have a consistent naming scheme for files and folders.

[ ]   6.   Name files and folders according to content.

[ ]   7.   Longer names for both files and folders.

[ ]   8.   Store like with like.

[ ]   9.   Consider storing document online.

[ ]   10. Keep at least three the same files in different locations in your computer

11.1.2.5   Creating Back Up for Files

Learning how to organise files and folders is a must. Now that you have learned how to do file management, it is best that you create a backup for these.

Grade 10 Design and Technology-Computing Topic 3 Lesson 18 had discussed about how to create back up of your files. Let us continue to study more information and skills on this topic.

A backup is a copy of one or more files created as a substitute in case the original data is lost or becomes unusable. For example, you may save a copy of a report on your external hard drive as backup file in case you decide to do a revision. Further, to make a backup means to copy files to a second medium (a disk or tape) as a precaution in case the first medium fails. One of the basic rules in using computers is back up your files regularly. Even the most reliable computer will break down eventually. This is a practice of protecting important data by storing duplicate files on a different location on the same drive, on different drives, diskettes, media, computer, and/or site.

Remember you can lose files by accidentally deleting or replacing them, because of a virus or worm attack, software or hardware failure, or a complete hard disk failure. To protect your files, you need to create a backup.

Let us study the different methods of backing up your files. Windows provides tools for backing up files, programs, and system settings.

To back up your files follow these steps;

1.   Click the **Start button**.

2.   Go to **Control Panel → System and Security**.

3.   Click and open **Backup and Restore**.
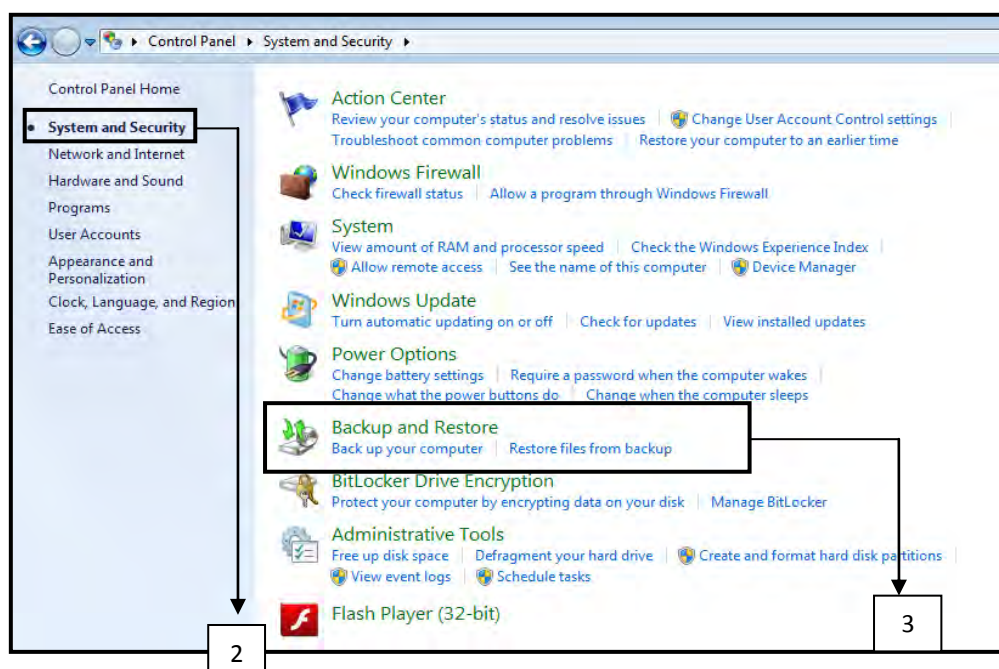
Or

Click **Start button** → type **Backup and Restore** in **Search Box** →click on the search result (Backup and Restore).

Use any of these two options to locate Backup and Restore.
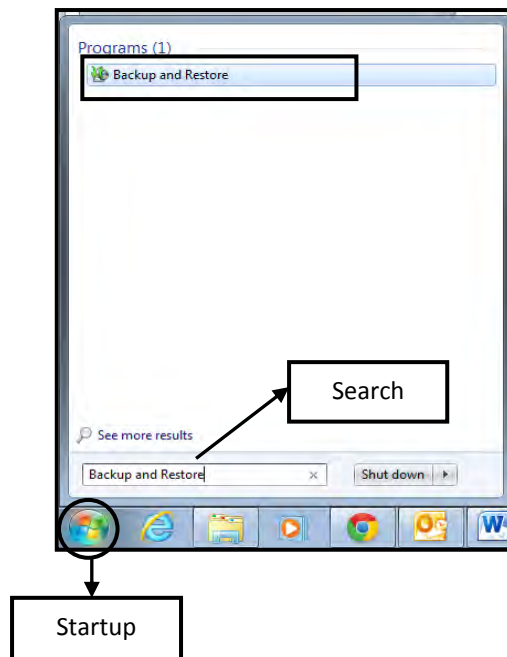
4.   Click **Set up backup**, and then follow the steps in the wizard in case you have not used Backup before. Administrator is permission required and if you are prompted for an administrator password or confirmation, type the password or provide confirmation.

If you have created a backup before, you can wait for your regularly scheduled backup to occur, or you can manually create a new backup by clicking back up now. Administrator permission required and if you are prompted for an administrator password or confirmation, type the password or provide confirmation.
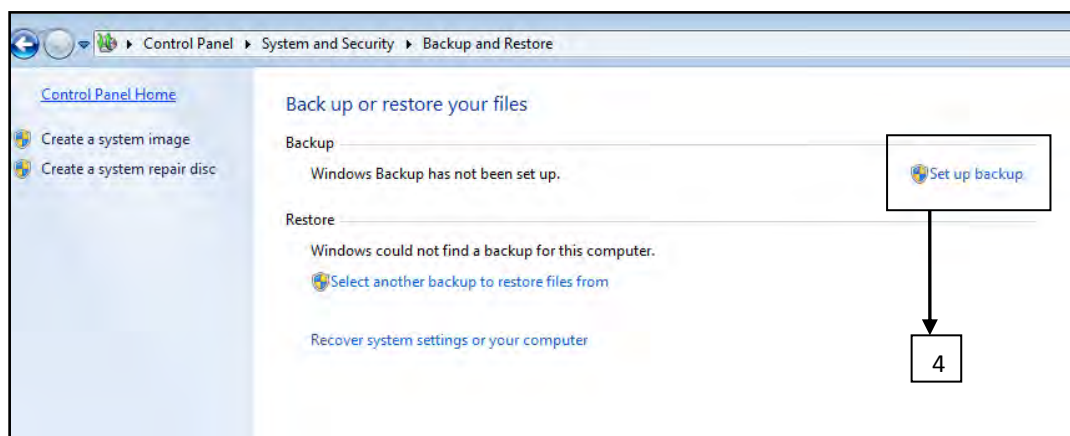
5.   Click **Next** as Windows will search for a suitable drive to store the backup or you can also choose a location on your network. If you backup to a network location you might need the password to the share.
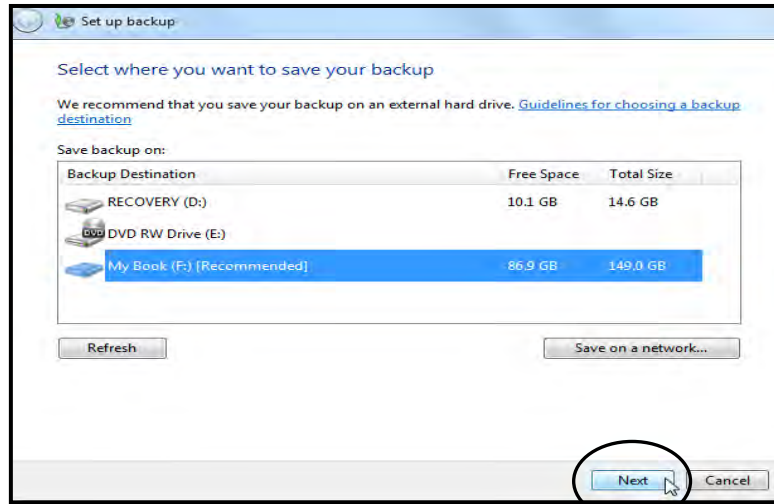
You can have Windows choose what to backup or you can choose the files and directories. It is completely up to you to choose.
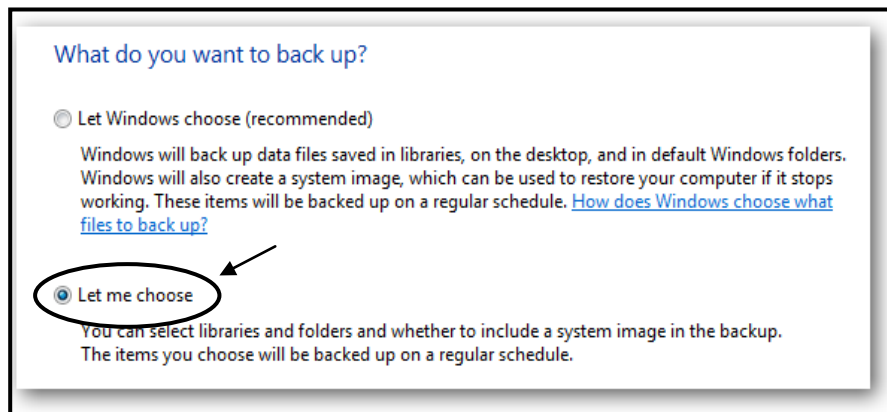
6.   Select the files and folder to include in the backup if you have chosen to choose the files and directories. Then after, click **Next**.
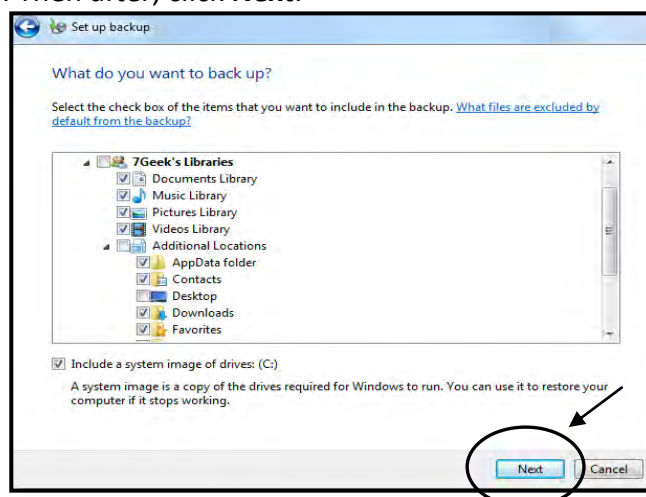
7.   Review the backup job and make sure that everything is correct. When satisfied, click **Save** settings and run backup button. If you choose to change the backup schedule, click on **Change schedule** link and proceed to Step 8.
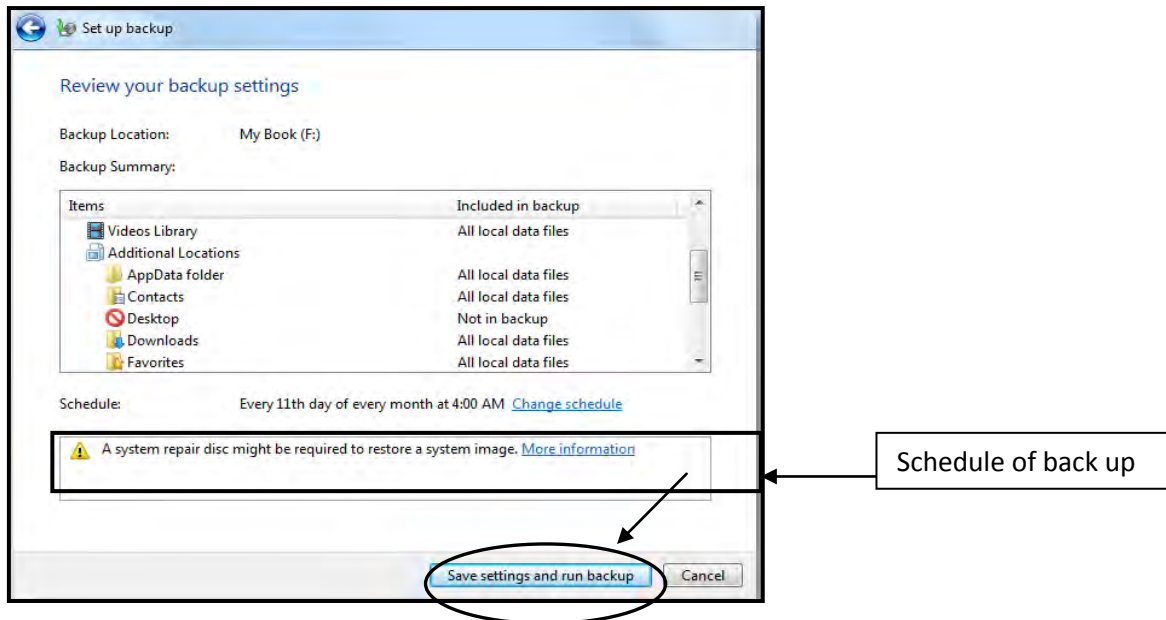
8.   Change the schedule of days and times as preferred, then after click **OK**.
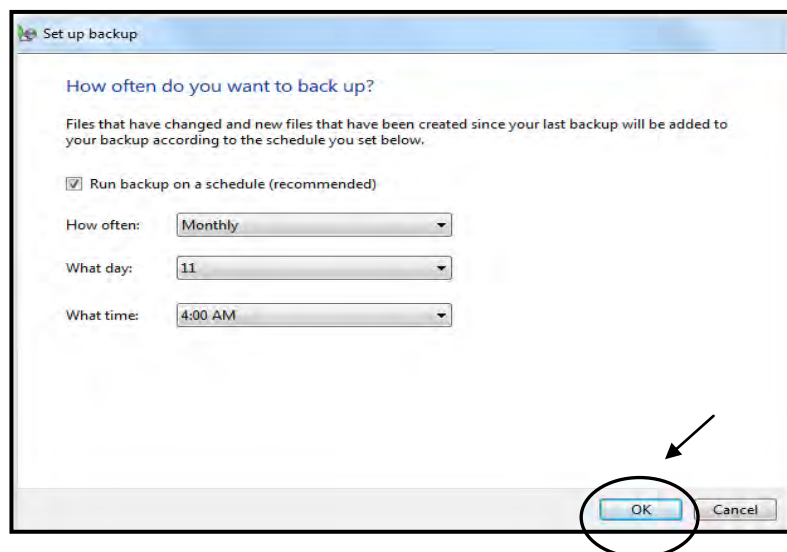
9.   Save the backup settings and do the backup. You can check the progress of the process. You can click on View Details button to see exactly what is being backed up.
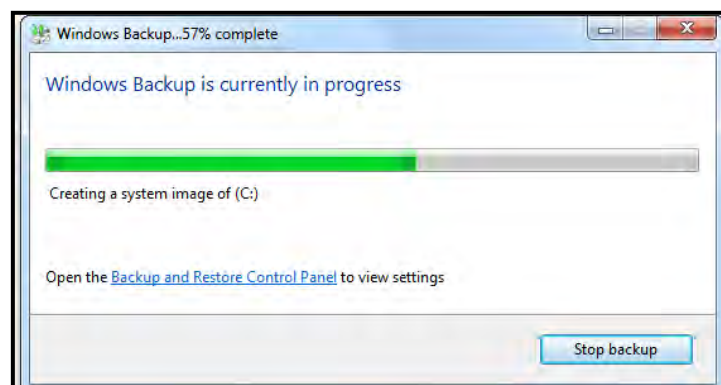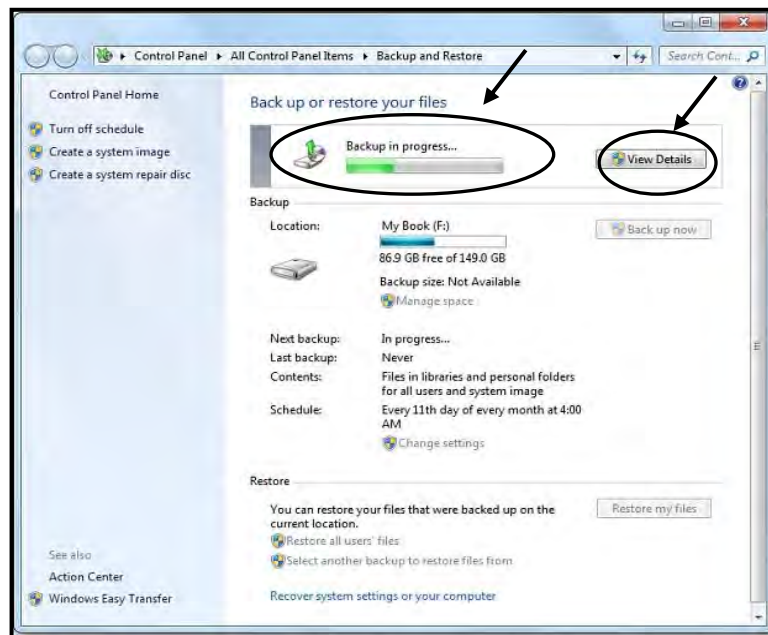
> It is recommended that you do not back up your files to the same hard disk that Windows is installed on because if your computer is intruded by a virus or has a software failure, you might have to reformat the disk and reinstall Windows to recover from the problem.

After you have created your backup, you can use any of the following storage types to store your backups.

- Hard disks (internal or external)

- Other removable disks like Flash drives and Memory cards

- Writeable DVDs and CDs

- Network locations

The first three options are often known collectively as media. These have been thoroughly discussed in Grade 10 Topic 3 Lesson 18.

You can also use an Internet-based file storage service which was discussed in File Management topic of this module.

You have to decide which option to use. Compare the convenience, price, and ease of use, and consider the amount and size of files that you want to back up.

Remember to keep backups in a safe location. Always keep removable storage or media used for backups (such as external hard disks, DVDs, or CDs) in a secure place to prevent unauthorised people from having access to your files.

Here are more information and tips on how to efficiently make use of storage devices for your backup needs.

- Internal hard disks. You can install (or have someone else install) a second internal hard disk in your computer and use it to back up files. Hard disks are relatively inexpensive and are not affected if you have a problem with your operating system. You can even install the disk in another computer if you buy a new computer and still want to use the disk for backups.

- External hard disks. If your computer has a USB port, you can attach an external hard disk to it and then back up files to the external disk. Be sure to buy an external hard disk that has plenty of space for your backups (200 GB is a good choice). For maximum protection, keep your external hard disk in a fireproof location separate from the computer.

- Writeable discs. You can also save your files to DVDs or CDs. Make sure the discs are writeable, which means that you can add, delete, or change the content. If you decide to use this method and have a lot of files to back up, be sure you have enough discs to finish the job. The Back Up Files wizard tells you how much space you need each time you perform a backup and recommends the type of media to use. If you label the discs with the date and time of the backup, they will be easier to find later. For maximum protection, keep the discs in a fireproof location separate from your computer.

- Network locations. If your computer is on a network, you can back up to a network location. Make sure that you have the right permissions for the network and that other users cannot access your backup.

Student Activity 11.1.2.5

Study the given situations below. Place a tick (✔) in the box if the situation is appropriate and write an (x) mark in the box if it is inappropriate.

☐   1.   Take a copy of your backup to your parents' house or put it in your safe deposit box at your bank.

☐   2.   You need to keep a copy of your backed up files at an off-site location safe from harm.

☐   3.   You should also periodically backup to removable optical media such as DVDs or writable Blu-ray disks.

☐   4.   Whenever you burn a disk, write down what is on it and also include the date so you will know when the backup was made.

☐   5.   Leave backup disks lying around.

☐   6.   Run a regular backup schedule.

☐   7.   Keep your data and backup in the same location.

☐   8.   Back up on a network.

☐   9.   One back up is enough.

☐   10.   Back up with internet based file storage service.

11.1.2.6   Graphical User Interface

The Graphical User Interface (GUI) had been discussed in Grade 10- Topic 2: Lesson 9. It focused on the different features of GUI.

A graphical user interface is the most common type of user interface in use today. It is a very "friendly" way for people to interact with the computer because it makes use of pictures, graphics and icons hence, why it is called "graphical".

It is also known as WIMP interface because it makes use of;

Windows which is a rectangular area on the screen where the commonly used applications run

Icon which is a picture or symbol used to represent a software application or hardware device.

Menus which is a list of options from which the user can choose what they require

Pointer which is a symbol such as an arrow which moves around the screen as you move your mouse. It helps you to select object.

Learning well the different features of the GUI will ensure the user of an easier use of the computer as he can explore and use the machine without complicated command. The user is benefited with the What You See is What You Get (WYSIWYG) system.

Let us learn more about each feature of the GUI and their uses.

1.   Functionality
      A window is used to display the contents of files, folders and programs. More than one window can be opened at the same time. Each window is stacked on top of each other. The active window is the highlighted window and all commands are performed on the active window. The title bar is the horizontal bar at the top of the window. The left side of the title bar contains the name of the file. Special buttons in the top-right corner of the title bar are used to rearrange windows:

      • minimize - reduces the window to a button on the taskbar; click the button to   reopen the window

      • maximize - increases the window so that it can be viewed using the entire screen

      • restore - returns the window to its previous size after it has been maximised

      • close - closes a window or exits a program.
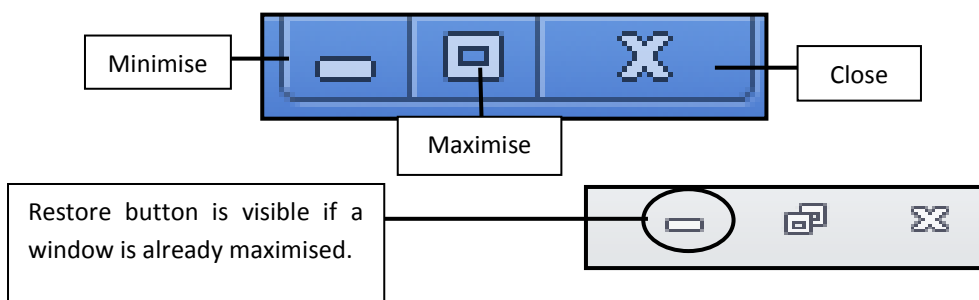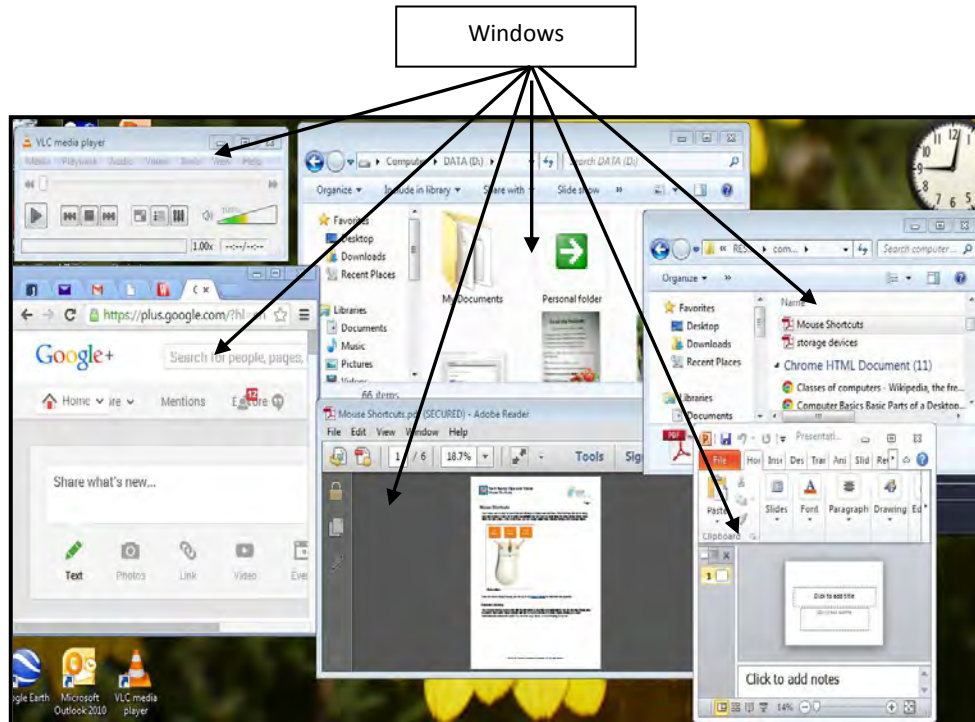
Windows that have not been maximised can be resized and moved on the screen. Here is how to do these:

To resize
1. Point to the border of the window until it turns into a double-headed arrow.

2. Drag the borders to the required size.
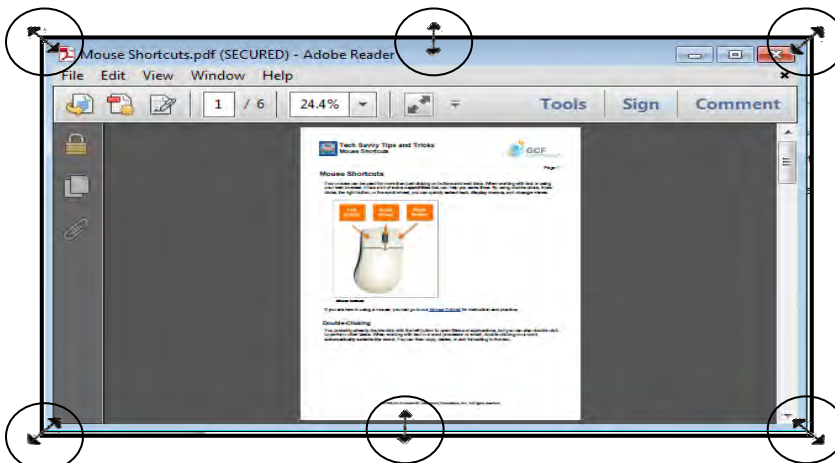
To move
1.   Drag the title bar to its new position.
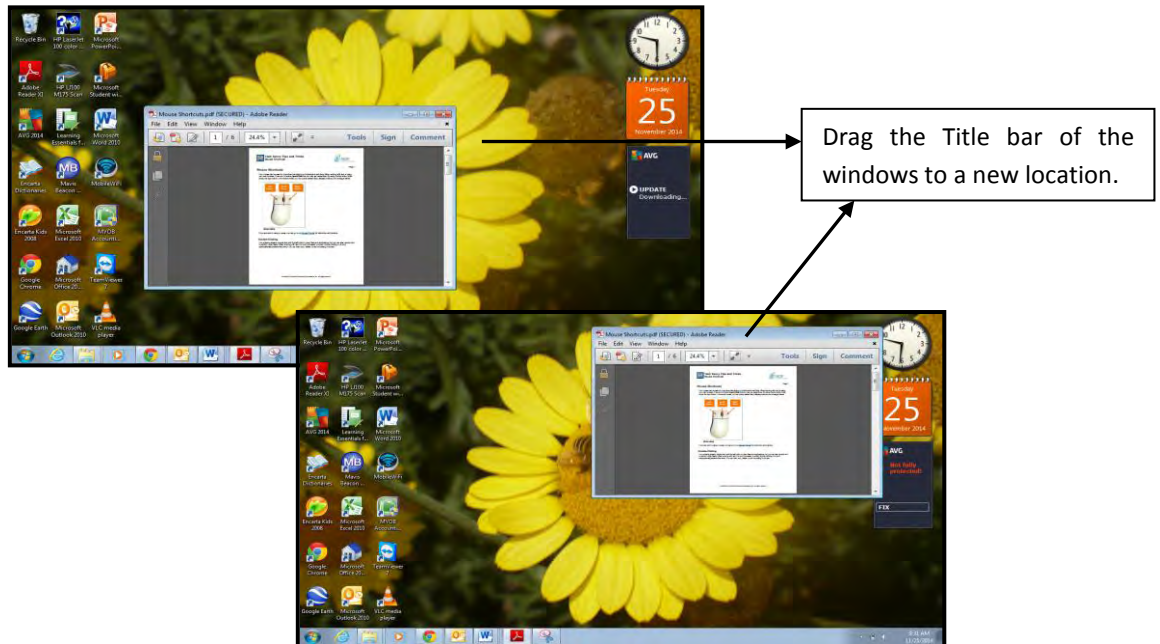
Opening (running or launching) an application starts the application. Applications must be installed before they are opened. Exiting an application quits the program. The operating system will display a Dialogue box for the user to save any work that has been changed.

2.   Navigation
Menus are an on screen list of available commands and tools. The menu bar is a horizontal bar located below the title bar. To open a menu, click the menu name. A menu will either drop down or pop up on the screen. The user then clicks the desired menu option.

Some menu options may be confusing:

- Light grey options are unavailable - the user needs to perform another task before selecting this option

- Options with an arrow ($\rightarrow$) to open to a submenu - pointing to the arrow opens the submenu

- Options marked (✓or •) indicate the current active option - clicking this option turns it off

- Options followed by dots (…) open with a Dialogue box that requires further information.

Menu

Options with an arrow

Option followed by dots

Light grey option
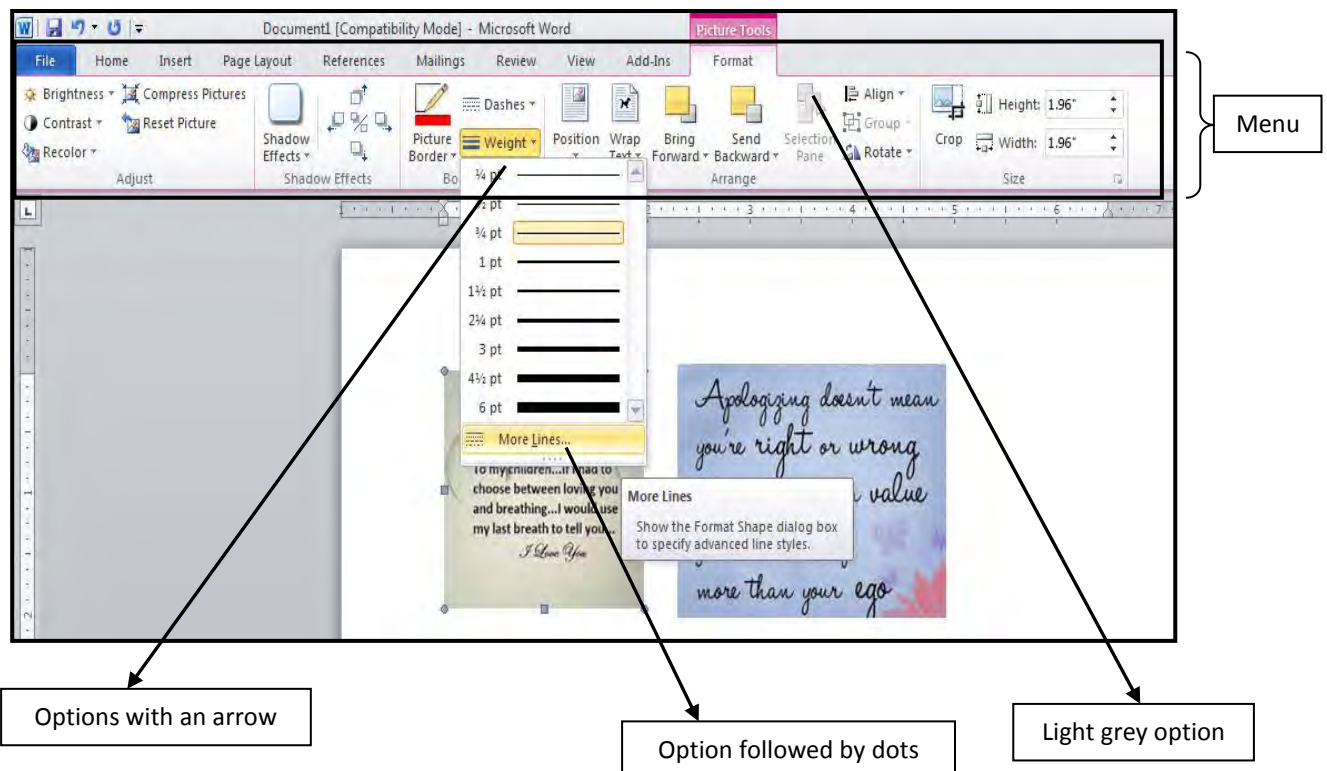
Scrolling is the method of moving within a window if the contents do not fit the window. The document can be scrolled up, down or sideways using the scroll bars. Scroll bars are located at the bottom and side of the window. Pressing the scroll bars provides the user with a scroll tip. It may show the current page or any information to help the user move through the document.

1 Scroll arrow   3 Vertical scroll bar
2 Scroll box   4 Horizontal scroll bar
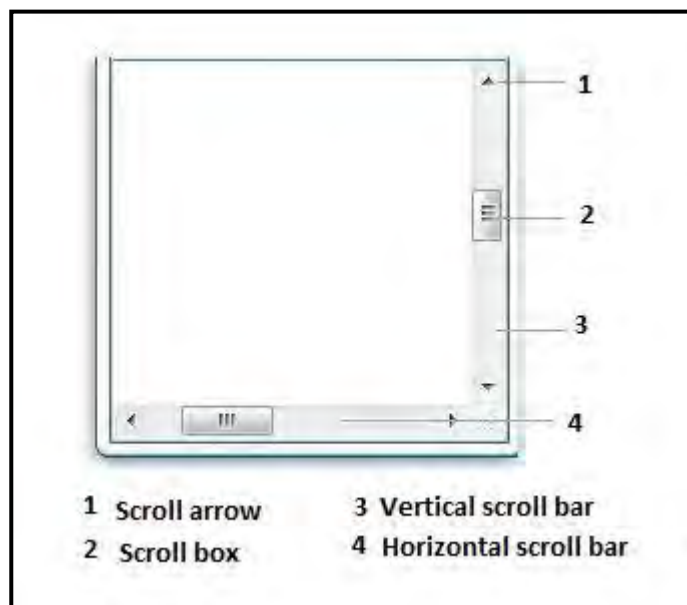
Dialogue boxes are message boxes requesting further information. Information is entered using:

- tab - appears at the top of the page when there are two or more pages of options

- text box - type in text such as the number of pages to be printed

- option button (or radio button) - selects one option from a group

- check box - click to turn an option on or off; more than one option can be selected from a group

- list box - presents the user with two or more options that are viewed using a scroll bar drop-down list - only one item is visible and the rest hidden; click the arrow to the right of the box to display all items

- spin box - text box that has controls to change the settings by set amounts

- slider - drag up, down or from side to side to increase or decrease the setting

- command buttons - OK to confirm selection and Cancel to quit.

3.   Consistency of Elements
      The following commands are consistent in all applications developed for a GUI:

- A new document is needed to start work in an application. It is selected from the File menu, the New Blank button from the standard toolbar or by pressing Ctrl+N or Command+N. A Dialogue box appears displaying the templates and wizards available for that application.

- Opening a document retrieves a previously saved document. It is selected from the File menu, the Open button from the standard toolbar or by pressing Ctrl+O or Command+O. A Dialogue box appears allowing the user to select a file from a particular disk and folder.

- Closing a document removes the active file but keeps the application running. It is selected from the File menu or the Close button at the top-right of the Title bar. To close all open documents, press 'shift' and click 'Close All' on the File menu.

- Mistakes are easily corrected using the 'Undo' and 'Redo' commands from the Standard toolbar or Edit menu. The undo or restore command reverses the last action such as changing a font style. If you decide that you want the change after all, select the redo or undelete command.

- Cut and paste moves a block of text or graphic to another place in the same document or to another document. To cut a block of text, select the Cut command from the Edit menu, the Cut button from the Standard toolbar or by pressing Ctrl+X or Command+X. After the selected text has been cut it is necessary to move the cursor to the new location where the text is to be inserted or pasted. To paste

a block of text, select the Paste command from the Edit menu, the Paste button from the standard toolbar or by pressing Ctrl+V or Command+V.

• Copy and paste copies a block of text or graphic to another place in the same document or to another document. To copy a block of text, select the Copy command from the Edit menu, the Copy button from the standard toolbar or by pressing Ctrl+C or Command+C. This command copies the block of text into the clipboard but does not remove it from the document as the Cut command does. The text is then pasted into a new position using the Paste command.

• Drag and drop is an easy way to move or copy a block of text or graphic a short distance using the mouse. To move a block of text using drag and drop editing, point to the selected text and hold down the mouse button. Drag the text to the new location and release the mouse button.

• Printing a document transfers a copy of it onto a piece of paper. This is called a hard copy or a printout. To print a document, select the Print command from the File menu, the Print button from the standard toolbar or press Ctrl+P or Command+P. The application must recognise the printer otherwise an error message will result.

• Finding text locates specified characters, words or phrases in a document. This is a useful feature if you have a long document. To find text, select the Find or Search command from the Edit menu or press Ctrl+F or Command+F.

• Saving a document stores the document permanently onto a secondary storage device such as a hard disk. Saving a document is selected from the Save command from the File menu, the Save button from the standard toolbar or by pressing Ctrl+S or Command+S. The Save command is used to update a file that has previously been saved. It stores the active file with its current file name, location and file format.

Student Activity 11.1.2.6

Fill-in the table below with the needed information.

	What is it?	**What does it do?**
1.		
2.		
3.		
4.		
5.		

 Summative Learning Activity 11.1.2

Follow the given instructions.

A.   Answer the following questions.

1.   What are the differences between data and information?

_____

_____

_____

_____

_____

_____

2.   Identify the four types of information and give two examples each.

    a. _____

        _____

b. _____

_____

c. _____

_____

d. _____

_____

3. Identify the four types of data and give two examples each.

a. _____

_____

_____

b. _____

_____

_____

c. _____

_____

_____

d. _____

_____

_____

B. Fill out the table with the needed information.

	What is it?	**What does it do?**
1.		
2.		

No.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

C.   Fill in the needed information in the table below.

Security Threat	Describe the Threat	Corresponding Security Measure
1. Adware		
2. Trojan		
3. Email Malware		
4. Parasitic Viruses		

5.	Phishing		
6.	Domain Name System		
7.	Data Theft		
8.	Rootkit		
9.	Hacktivism		
10.	Malware		

D.   Explain in your own words the following file management tips.

a.   Consider storing your documents online.

_____

_____

b.   Use Shortcuts for usually opened files and folders.

_____

_____

c.   Use descriptive folders.

_____

_____

d.   From your folders, you can create subfolders.

_____

_____

e.   Separate your working files from your personal files.

_____

_____

f.   Use the Windows Explorer Libraries to organise your files.

_____

_____

E. **Explain briefly.**

Why is it recommended that you do not back up your files to the same hard disk that Windows is installed?

_____

_____

_____

F. **Describe the following terms.**

a. WIMP

_____

_____

b. WYSISYG

_____

_____

c. Icons

_____

_____

d. Menu

_____

_____

e. Windows

_____

_____

✔ Answers to Student Activity

Student Activity 11.1.2.1

1.   Numbers

2.   Characters

3.   Alphanumeric

4.   Quantitative

5.   Chronological

6.   Conceptual

7.   Spatial

8.   Quantitative

9.   Characters

10.   Numbers

Student Activity 11.1.2.2

1.   C

2.   E

3.   D

4.   F

5.   A

6.   B

Student Activity 11.1.2.3

Data security is critical for most businesses and even home computer users. Client information, payment information, personal files, bank account details - all of this information can be hard to replace and potentially dangerous if it falls into the wrong hands. Data lost due to disasters such as a flood or fire is crushing, but losing it to hackers or a malware infection can have much greater consequences.

Student Activity 11.1.2.4

✓	1. Folders and files should be unique.
x	2. Combine all work and personal documents in one folder.
✓	3. The file name should describe exactly what they contain.
✓	4. Create shortcuts for files and folders.
✓	5. Have a consistent naming scheme for files and folders.
✓	6. Name files and folders according to content.
	7. Longer names for both files and folders.
✓	8. Store like with like.
✓	9. Consider storing document online.
x	10. Keep at least three same files in different locations in your computer

Student Activity 11.1.2.5

✓	1. Take a copy of your backup to your parents' house or put it in your safe deposit box at your bank.
✓	2. You need to keep a copy of your backed up files at an off-site location safe from harm.
✓	3. You should also periodically backup to removable optical media such as DVDs or writable Blu-ray disks.
✓	4. Whenever you burn a disk, write down what is on it and also include the date so you will know when the backup was made.
x	5. Leave backup disks lying around.
✓	6. Run a regular backup schedule.
x	7. Keep your data and backup in the same location.
✓	8. Back up on a network.
x	9. One back up is enough.
✓	10. Back up with internet based file storage service.

Student Activity 11.1.2.6

		What is it?	What does it do?
1.		minimise	reduces the window to a button on the taskbar; click the button to reopen the window
2.		restore	appears when window is already maximized to restore the window
3.		close	closes a window or exits a program
4.		Horizontal scroll bar with slider or scroll bars	Drag from side to side
5.		Vertical scroll bar with slider or scroll bars	Drag up and down

 Answers to Student Activity 11.1.2

A.

1. Data is raw material for data processing. Data relates to facts, events and transactions. Data refers to unprocessed information while Information is data that has been processed in such a way as to be meaningful to the person who receives it. It is anything that is communicated.

2. The answers can be similar to these ones below.

    a. Spatial- Information that deals with location, position and space. Examples: Map location and country location

    b. Chronological – Information that deals with time, sequence and period. Examples: How to bake a cake and tracing the computer generation era

    c. Conceptual–Information that deals with relationships and categorizations. Examples: Relationship study results of birth weight to obesity and study of how pesticides affect the environment

d. Quantitative- Information that deals with amount and comparison. Examples: Papua New Guinea Government 2015 budget allocation for different sectors and comparison of rainfall during the months of January and February 2015

3. The answers can be similar to these ones below.

    a. Numbers- Examples are 21 and 17.2

    b. Booleans- Examples are 5>8 and 7=9

    c. Characters- Examples are J and ,

    d. Alphanumeric- Examples are jan21 and ej10

B.

	What is it?	What does it do?
1.	USB Flash drive	Portable flash memory card that plugs into a computer's USB port and functions as a portable hard drive.
2.	External hard drive	Portable hard drive
3.	Memory card	An electronic flash memory storage disk commonly used in consumer electronic devices such as digital cameras, MP3 players, mobile phones, and other small portable devices.
4.	DVD – R Disc (Digital Video Recordable)	These discs hold the space of about 4.7 GB and are used to record movies on
5.	CD + R Disc (Compact Disc Recordable)	This one is a CD that you can record on. It is mostly used to record audio and once it's been written on, you cannot rewrite or erase anything off of it.

6.		Floppy Disk	For storage for about 144 million bytes
7.		Magnetic Tape	Magnetically coated strip of plastic on which data can be encoded.
8.		Online storage	Data storage online where the user has to pay a monthly fee to an online data storage company and in exchange is given a certain amount of storage space where the user can upload his documents and files.
9.		RAM is Random Access Memory	It very fast and is used to store data and programs which a computer processor is currently processing and needs to have easily to hand.
10.		Zip Disk	They look like a floppy disk, but they are a little thicker and are for storage of about 200 mb

C.

Security Threat	Describe the Threat	Corresponding Security Measure
1. Adware	Adware is software that displays advertisements on your computer. Adware can slow down your PC.	Endpoint security software
2. Trojan	Trojan (Trojan horse) is a malicious program that pretends to be legitimate software, but actually carry out hidden, harmful functions.	Anti-malware software can protect you against viruses and other malware threats including Trojans, worms and spyware.
3. Email Malware	Email malware distribution refers to malware that is distributed via email.	Endpoint security software
4. Parasitic Viruses	Parasitic viruses, also known as file viruses, spread by attaching themselves to programs.	Anti-malware software Endpoint security software

5.	Phishing	Phishing refers to the process of deceiving recipients into sharing sensitive information with an unknown third party (cybercriminal).	Endpoint security software
6.	Domain Name System	Domain Name System (DNS) DNS hijacking is the phone book of the Internet.	Endpoint security software
7.	Data Theft	Data theft is the deliberate theft of information, rather than its accidental loss. Data theft can take place both inside an organisation	Encryption solutions Endpoint security software
8.	Rootkit	Rootkit is a piece of software that hides programs or processes running on a computer.	Appliances
9.	Hacktivism	Hacktivism is the term used to describe hacking activity that is typically for political and social purposes, attacking corporations, governments, organisations and individuals.	Endpoint security software
10.	Malware	Malware is a general term for malicious software. Malware includes viruses, worms, Trojans and spyware.	Anti-malware software HTTPS scanning

D.   The answers can be similar to these ones below.

1. Microsoft and other providers like Dropbox and Box provides online storage for all your documents and can be accessed online anywhere. You need to sign up, follow the prompts and create your account.

2. You can do this by locating first the file or folder then right click on it and select Send to → Desktop (create shortcut). This also avoids unnecessary multiple creations of files in different locations to save space in your computer.

3. Name the folders according to their content. Doing these methods makes it easier for file and folder identification and location.

4. Create subfolders which would now contain the files pertinent to the folder. This ensures easy searching.

5. Separate your working files from your personal files. Create a folder for each. This will be very helpful especially when doing updating and back up of files.

6. Use the Windows Explorer Libraries to organise your files. This is a default manner of organisation of files. Store like with like which means all documents together, pictures, music and videos in their own folders.

E.   It is recommended that you do not back up your files to the same hard disk that Windows is installed on because if your computer gets a virus or has a software failure, you might have to reformat the disk and reinstall Windows to recover from the problem.

F.   Answers can be similar to these.

a.   WIMP
Short for Windows, Icons, Menus and Pointing device, the type of user interface made famous by the Macintosh computer and later imitated by the Windows operating systems. Most people now use the term GUI (graphical user interface) to refer to this type of interface, but it is important to note that when the first GUIs were invented in the 1970s, WIMP was just one possible variation. In those days, it was called a WIMP GUI.

b.   WYSISYG
Pronounced WIZ-zee-wig. Short for what you see is what you get. A WYSIWYG application is one that enables you to see on the display screen exactly what will appear when the document is printed. This differs, for example, from word processors that are incapable of displaying different fonts and graphics on the display screen even though the formatting codes have been inserted into the file. WYSIWYG is especially popular for desktop publishing.

c.   Icons
A small picture that represents an object or program.

d.   Menu
A list of commands or options from which you can choose.

e.   Windows
An enclosed, rectangular area on a display screen. Most operating systems and applications have GUI's that let you divide your display into several windows.

11.1.3   Hardware and Software

11.1.3.1   The Computer Hardware

Grade 10 Design and Technology-Computing Lesson 3 focused on Computer Hardware where computer hardware's definition, classifications as either external or internal and its functions were thoroughly discussed.

For this discussion, we will focus more on facts about computer hardware and on the parts of computer hardware (personal computers like the desktop and the laptop) with its functions and locations.

Computer hardware covers a wide area of definitions to include both external (peripherals like Liquid Crystal Display (LCD), monitors and flat panel, keyboard, mouse, scanner and printer) and internal (Central Processing Unit (CPU), hard drive, motherboard, Blu-ray, DVD and CD drives, Random Access Memory (RAM), sound card and video card).

Commonly known as HW (Hardware) is best described as a device that is physically connected to your computer, something tangible. Without any hardware, your computer would not exist, and software would not be able to run.

The computer hardware can be upgraded. A hardware upgrade is any new hardware that replaces or adds to old hardware in the computer. A good example of a common hardware upgrade is a RAM upgrade, where the user is increasing the computers total memory. Another good example is a video card upgrade, which is the act of removing an old video card and replacing it with a new one, thus increasing the performance of the computer.

A computer is a system of many parts working together. A personal computer is a common one which can either be a desktop or a laptop. Study the pictures on the below and on the next page.
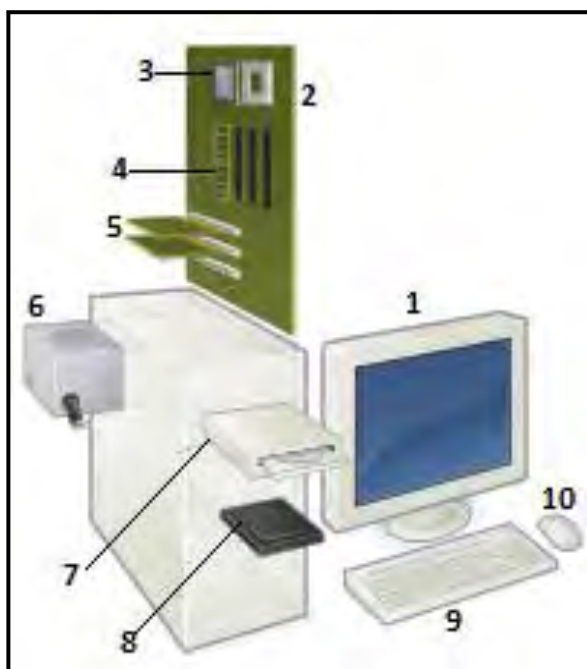
1 – Monitor

2 – Motherboard

3 – Central Processing Unit (CPU)

4 – Random Access Memory (RAM)

5 – Expansion cards

6 – Power Supply

7 – Optical Disc Drive

8 – Hard disk drive

9 – Keyboard

10 - Mouse

Typical Desktop Computer Hardware

Your computer system might not exactly look like the picture in the previous page but it has probably most of the parts as described in the picture.
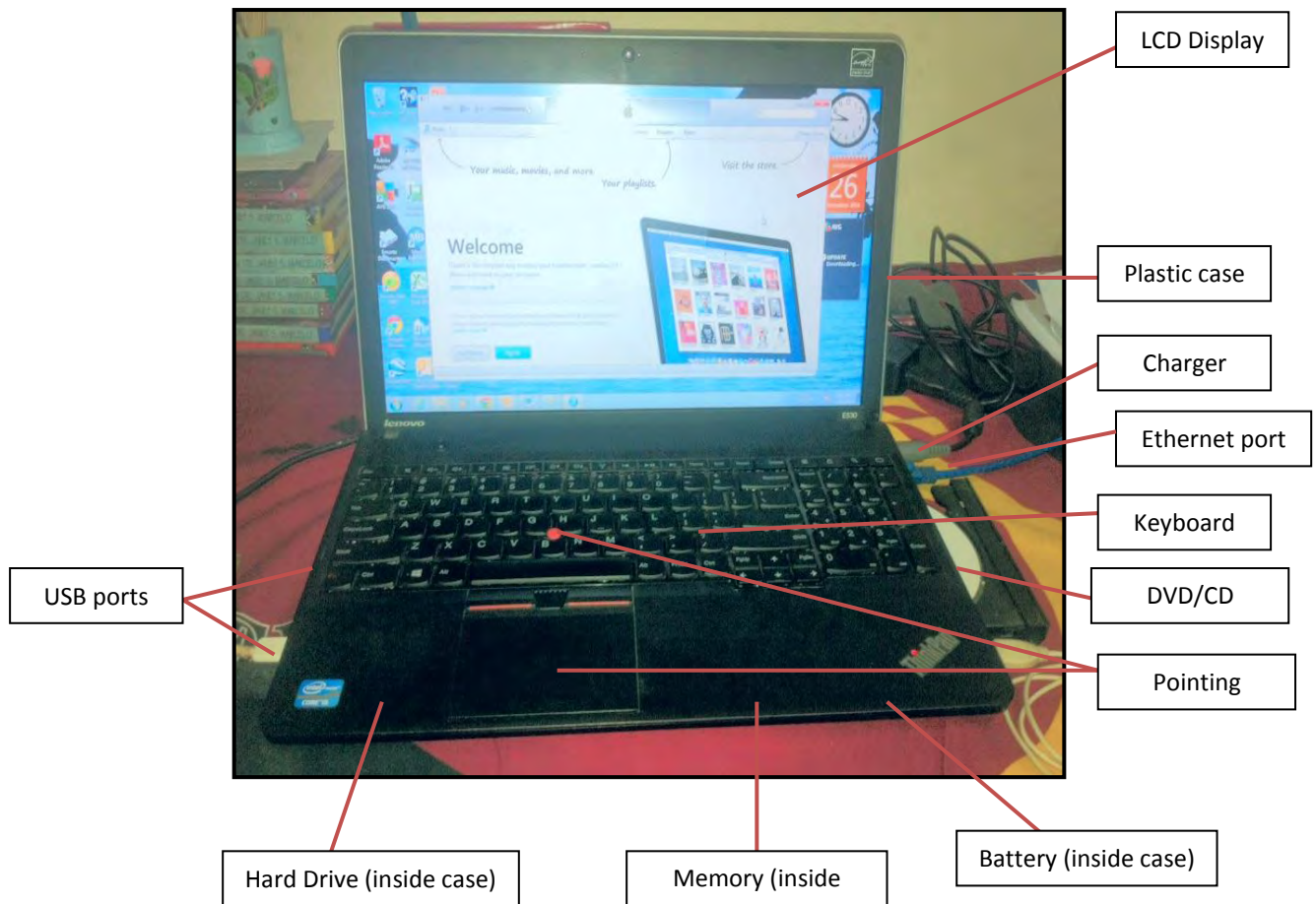
Typical Laptop Computer Hardware

A laptop computer has similar parts but combines them into a single, notebook-sized package. Laptop is often preferred by people who choose portability.

From these pictures, let us look into the common parts of these personal computers.

1.   The computer case is a plastic or metal enclosure that houses most of the components.

2.   A power supply unit (PSU) converts alternating current (AC) electric power to low voltage DC power for the internal components of the computer. Laptops are capable of running from a built-in battery, normally for a period of hours.

A typical desktop power supply unit

A Samsung laptop power supply

3. The motherboard is the main component of computer. It is a large rectangular board with integrated circuitry that connects the other parts of the computer including the CPU, the RAM, the disk drives (CD, DVD, hard disk, or any others) as well as any peripherals connected via the ports or the expansion slots. Refer back to Grade 9 Lesson 7 for a thorough discussion of the motherboard.

Components directly attached to or part of the motherboard includes:

a. The CPU (Central Processing Unit) performs most of the calculations which enable a computer to function, and is sometimes referred to as the "brain" of the computer. It is usually cooled by a heat sink and fan. Most new CPUs include an on-die Graphics Processing Unit (GPU).

b. The Chipset, which includes the north bridge, mediates communication between the CPU and the other components of the system, including main memory.

c. The Random-Access Memory (RAM) stores the code and data that are being actively accessed by the CPU.

d. The Read-Only Memory (ROM) stores the BIOS that runs when the computer is powered on or otherwise begins execution, a process known as Bootstrapping, or "booting" or "booting up". The BIOS (Basic Input Output System) includes boot firmware and power management firmware. Newer motherboards use Unified Extensible Firmware Interface (UEFI) instead of BIOS.

e. Buses connect the CPU to various internal components and to expansion cards for graphics and sound.

f. The CMOS battery is also attached to the motherboard. This battery is the same as a watch battery or a battery for a remote to a car's central locking system. Most batteries are CR2032, which powers the memory for date and time in the BIOS chip.

4. The expansion card in computing is a printed circuit board that can be inserted into an expansion slot of a computer motherboard or backplane to add functionality to a computer system via the expansion bus.
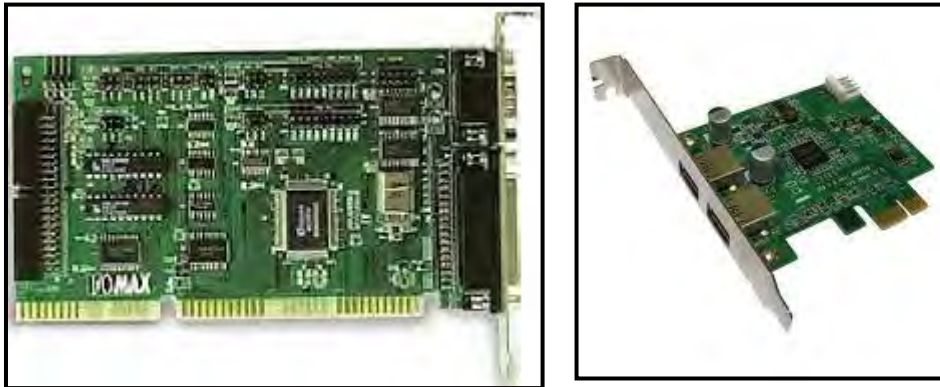
Expansion card samples

5.   Computer data storage, often called storage or memory, refers to computer components and recording media that retain digital data. Data storage is a core function and fundamental component of computers.

6.   Fixed media includes the hard disk drives which are found in virtually all older computers, due to their high capacity and low cost, but solid-state drives are faster and more power efficient, although currently more expensive than hard drives, so are often found in more expensive computers. Some systems may use a disk array controller for greater performance or reliability.

7.   Removable media is needed to transfer data between computers; a USB flash drive or Optical disc may be used. Their usefulness depends on being readable by other systems; the majority of machines have an optical disk drive, and virtually all have a USB port.

8.   Input and output devices are typically housed externally to the main computer chassis. The following are either standard or very common to many computer systems. Input devices allow the user to enter information into the system, or control its operation. Most personal computers have a mouse and keyboard, but laptop systems typically use a touchpad instead of a mouse. Other input devices include webcams, microphones, joysticks, and image scanners. Output devices display information in a human readable form. Such devices could include printers, speakers and monitors.

Student Activity 11.1.3.1

Answer the following.

1. List three parts of a personal computer (desktop or laptop) and describe their functions.

   a. _____

   _____

   _____

   _____

   b. _____

   _____

   _____

   _____

   c. _____

   _____

   _____

   _____

2. Why is computer hardware important?

   _____

   _____

   _____

11.1.3.2   The Computer Peripheral

Grade 10 Design and Technology-Computing Lesson 4, highlighted on the introduction of what Computer Peripherals are. It gave you a list of the commonly used peripherals and its functions. Now let us have an upgrade on this topic by adding more useful information about computer peripherals.

A peripheral is a "device that is used to put information into or get information out of the computer." A peripheral device connects to a computer system to add functionality. From the previous topic; computer hardware covers external peripherals into its definition. Unlike the computer a peripheral is incapable of operating by itself and relies on the computer to function properly.

A computer peripheral is a device that is connected to a computer but is not part of the core computer architecture. The core elements of a computer are the central processing unit, power supply, motherboard and the computer case that contains those three components. Technically speaking, everything else is considered a peripheral device.

It is interesting to take note that the word peripheral is used to refer to a device external to the computer case, like a scanner. However, the devices located inside the computer case are also technically peripherals. Devices that exist outside the computer case are called external peripherals, or auxiliary components. Examples are: "Many of the external peripherals I own, such as my scanner and printer, connect to the peripheral ports on the back of my computer." Devices that are inside the case such as internal hard drives or CD-ROM drives are also peripherals in technical terms and are called internal peripherals, but may not be recognised as peripherals by lay people.

There are three different types of peripherals:

- Input peripherals are used to interact with, or send data to the computer (mouse, keyboards, etc.)

- Output peripherals provide output to the user from the computer (monitors, printers and others)

- Storage peripherals store data processed by the computer (hard drives, flash drives and others)

- Input peripherals are significantly important for sending data to the computer as it allows an interaction between the user and the computer. The output peripheral device provides the user the display, projection and needed reproduction of data. File keeping management can be achieved with the storage peripherals where the user can store and have multiple copies of information stored in the computer.

- Input and Output devices will be further elaborated in our next topic discussion. Storage peripherals can be further classified into primary or secondary as discussed in Grade 10 Design and Technology-Computing: Lesson 11. Let us take a look at the images of some computer peripherals below.

Sample computer peripherals

The picture displays the combination of all three types of peripherals. The most common computer input peripherals are the mouse and keyboards. Monitor, printer and speakers are what you normally see attached to your computer as output peripherals while hard drives; flash drives and optical disc (CD/DVD) are the commonly used storage peripheral devices.

Student Activity 11.1.3.2

Fill out the table below to show the differences of the three types of computer peripherals.

Type of Peripheral	Function of the Peripheral	Example of the Peripheral
Input		
Output		
Storage		

11.1.3.3   Input and Output Devices

From the previous lesson on computer peripherals, it was mentioned that both the input and output devices are peripherals which are added to the computer system to add functionality. Though important as they are to the user, these devices cannot operate on their own as it needs the computer to function properly.

Grade 10 Design and Technology-Computing Lesson 5 focused on the different kinds of input and output devices. Let us take another look at these devices but focusing more on how they function and their importance to the computer system as a whole.

Input Devices

In Computer Science the general meaning of input is to provide or give something to the computer. This further means that it is the state or act of a computer or a component of computer or relevant device accepting something from the user or from a device or from a software either automatically or manually. An example is the use of a keyboard and a mouse to feed data to the computer. Hence, the keyboard and the mouse are called as input devices.

Let us study the function and importance of the common input devices.

1. Keyboards play an important role in the "information input". Through it, the user can input the necessary operating command and text data into the computer. Keyboards are language specific which means that keyboards around the world may contain keys for commonly used characters in their local language.

    Keyboards also come in different layouts. The layout variations exist however manufacturers follow this general pattern. The most widely used layout in the English language is called the QWERTY which is named after the sequence first six letters from the top left

Keyboards come in different layouts. This is an example layout of Japanese keyboard
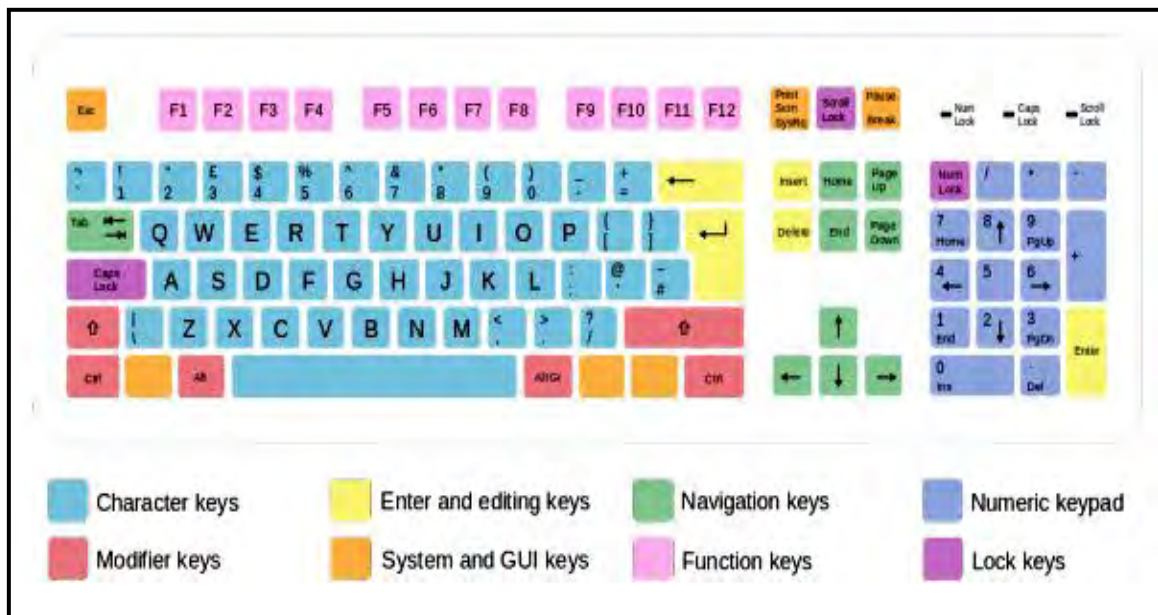
Standard layout of keys

2.   A Mouse is designed for pointing and clicking around a graphical user interface, such as those used by Windows or the Mac OS, as well as by the many applications that run on those operating systems.

      A computer mouse enables the user to move a cursor smoothly and spontaneously across a two-dimensional plane. It is therefore an essential input device for selecting, dragging, hovering, and clicking. The mouse allows users to switch between applications, select options and buttons, and move around the screen with a great degree of accuracy and fluidity. It is used to move between and select links on a website, buttons on an options screen, entries on a menu, and many more tasks that would be far more difficult using a keyboard alone. It can also be used to bring up alternative functions and menus by clicking the right button when hovering over a screen element. The mouse lets users zoom in and out quickly, and scroll up and down using the scroll wheel located between the two buttons. Advanced mouses have extra buttons placed around the casing that can be assigned tasks and functions specific to the operating system or a particular program.

Mechanical mouse   Wireless or optical mouse   Sample of an advanced mouse

3.   Webcam is a small camera attached to a computer. They serve a variety of purposes, from taking still images to sending a live video over conference calls. Many laptops have a webcam built in to the computer screen, but external webcams are also sold. If you

purchase an external webcam for use, you may also need to get a microphone if you plan on using the camera for either captured or live video.

A typical web cam

A built-in web cam in computer laptops

4. Scanner is a device that captures images from photographic prints, posters, magazine pages, and similar sources for computer editing and display. Scanners come in hand-held, feed-in and flatbed types and for scanning black-and-white only, or colour. Very high resolution scanners are used for scanning for high-resolution printing, but lower resolution scanners are adequate for capturing images for computer display. Scanners usually come with software, such as Adobe's Photoshop product that lets you resize and otherwise modify a captured image. Scan files can be sent to or stored on a computer, and you can specify the format of a scan file according to how the file will be used.

Flatbed scanner

Hand held scanner

Feed in scanner

5. Microphone sometimes abbreviated as mic, is a hardware peripheral originally invented by Emile Berliner in 1877 that allows computer users to input audio into their computers. The function of a microphone is to take your sound waves and translates it to appropriate machine readable from and then transmit it as electrical pulses to the central processing unit for processing.

Below is a short list of all the different uses a microphone could be used for on a computer.

- VoIP Alternatively referred to as IP telephone or Internet phone. VoIP is short for Voice over Internet Protocol, and it enables users to make calls over the Internet.

- Voice recognition alternatively referred to as speech recognition, voice recognition is a computer, software program, or hardware device's ability to decode the human voice into digitised speech so it can be understood by the computer. Voice recognition is commonly used to operate a device, perform commands, or write without having to use a keyboard, mouse, or press any buttons.

- Computer gaming

- Online chatting

- Recording voice for dictation, singing,

- Podcasts alternatively referred to as an audio blog, a podcast (sometimes abbreviated as pod) is an audio broadcast that is often listened to on a computer or downloaded to a MP3 player such as an iPod, hence the name.

- Recording musical instruments

Samples of microphones for the computer

Refer back to the list of input devices with their descriptions in the Grade 10 Design and Technology-Computing: Lesson 5.

Output Device

Output is data generated by a computer. This includes data produced at a software level, such as the result of a calculation, or at a physical level, such as a printed document. Devices that produce physical output from the computer are creatively called output devices. The most commonly used output device is the computer's monitor, which displays data on a screen. Devices such as the printer and computer speakers are some other common output devices.

Let us study the following common computer output devices.

1. Monitor is a display adapter that displays information processed by the computer's video card. When a video card or graphics card converts binary information from 1s and 0s into

images, these images are displayed onto the directly connected monitor. There are different types of monitors, including cathode ray tube (CRT) and liquid crystal displays (LCD). Monitors have display functions that include powering it on and off, controlling brightness, contrast and position, among others.

CRT monitor

LCD monitor

2.   Printer is a device that accepts text and graphic output from a computer and transfers the information to paper, usually to standard size sheets of paper. Printers vary in size, speed, sophistication, and cost. In general, more expensive printers are used for higher-resolution colour printing.

Below are four qualities of a printer that most users observe.

a.   Colour: Colour is important for users who need to print pages for presentations or maps and other pages where colour is part of the information. Colour printers can also be set to print only in black-and-white. Colour printers are more expensive to operate since they use two ink cartridges (one colour and one black ink) that need to be replaced after a certain number of pages. Users who do not have a specific need for colour and who print a lot of pages will find a black-and-white printer cheaper to operate.

b.   Resolution: Printer resolution (the sharpness of text and images on paper) is usually measured in dots per inch (dpi). Most inexpensive printers provide sufficient resolution for most purposes at 600 dpi.

c.   Speed: If you do a lot of printing, the speed of the printer becomes important. Inexpensive printers print only about 3 to 6 sheets per minute. Colour printing is slower. More expensive printers are much faster.

d.   Memory: Most printers come with a small amount of memory (for example, one megabyte) that can be expanded by the user. Having more than the minimum amount of memory is helpful and faster when printing out pages with large images or tables with lines around them (which the printer treats as a large image).

A typical desktop printer

A more expensive heavy duty printer

3.   Computer speakers are a way for computers to make sounds by means of digital or analog audio. The speaker has given the computer a new way to interact with its users through sound. There are many different types of speakers for different uses.

Computer speakers function as a new way for computers to interact with their users. They provide a means for the computer to produce audio. There are different types of speakers, depending on the kind of application for which you want to use your speakers. There are digital and analog speakers, depending on how much clarity you want between each channel. Digital speakers provide much more clarity and definition, and usually such clarity is involved in surround sound speakers.

There are two ways a speaker system could be connected to a computer. One way is via an on-board audio chipset on your computer. Another way you could connect your speaker system is through a peripheral sound card that either comes with your PC, or could be purchased in a computer hardware store.

Audio jack in computers

Some samples of speakers for computers

4.   Headsets and headphones. Headphones happen to have earpieces while their main purpose is to listen to music. Headsets too have earpieces (can even have 1 earpiece based upon the style) additionally a microphone, main objective being to aid communications (both talking & listening). Headphones (or "head-phones" in the early days of telephony and radio) are a pair of small loudspeakers that are designed to be held in place close to a user's ears. They are also known as ear speakers, earphones or, colloquially- cans. The alternate in-ear versions are known as ear buds or earphones. In the context of telecommunication, a headset is a combination of headphone and microphone. They are an audio output device that allows audio to be played from them.

Some headsets and headphones use the Bluetooth. Bluetooth is a wireless short-range communications technology. Bluetooth technology is useful when transferring information between two or more devices that are near each other.

Samples of headphones

A headset

Samples of Bluetooth headset for computers

Refer to Grade 10 Design and Technology – Computing: Unit 1: Lesson 5 for a review on the list of other output devices.

Student Activity 11.1.3.3

The table on the next page lists the commonly used input and output devices for a computer. Name the device, identify whether it is an input or an output then write its function or use. Write your answers on the spaces provided in the table.

Name of the device	Type of Device (Input or Output)	Function or use of the device

11.1.3.4   The Computer Software

Grade 10 Design and Technology – Computing: Unit 1 Lesson 6 focused on the basic definitions of software and operating system and the types and functions of an operating system.

For this lesson we will take a deeper look into the functions of computer software and operating system, how these two are related, the current types of computer software and the commonly used operating systems.

Computer software or simply software is also known as computer programs. It is the non-tangible component of computers. Computer software contrasts with computer hardware which was discussed earlier, is the physical component of computers. Computer hardware and software require each other and neither can be realistically used without the other.

Let us study the table below where the different categories or types of software are presented.

Types of software	Description of software	Examples of software
1. Application Software	Application software refers to any software that runs to let the user accomplish a function or create content, but which cannot operate on its own.	Microsoft Office, Excel and Outlook, Google Chrome, Mozilla Firefox and Skype.
2. System Software	Software which includes operating systems and any program that supports application software; System software (systems software) is computer software designed to operate and control the computer hardware and to provide a platform for running application software. System software can be separated into two different categories, operating systems and utility software.	MS - DOS Windows XP, Vista Linux Unix
3. Middleware	Software which is sometimes used to describe programming that mediates between application and system software or between two different kinds of application software; Middleware is computer software that provides services to software applications beyond those available from the operating system. It can be described as software glue. Middleware makes	Android operating system, Miles Sound System; QNX Software Systems and ultimately acquired by BlackBerry

	it easier for software developers to perform communication and input/output, so they can focus on the specific purpose of their application. Middleware is the software that connects software components or enterprise applications.	
4. Utility Software	Small useful programs with limited capability; Utility software helps the user to control, manage, and maintain a computer's operating system, hardware and application software.	Disk utilities like defragmenters, compressors and cleaners.
5. Applets	Small applications that sometimes come with the operating system as "accessories."; an applet is any small application that performs one specific task that runs within the scope of a dedicated widget engine or a larger program, often as a plug-in. The term is frequently used to refer to a Java applet, a program written in the Java programming language that is designed to be placed on a web page.	Simple Example Colour CDT Example Scatterplot Example Karyoscope Example Human FGF Receptor Example Dendrogram Colouring By Correlation Threshold Example
6. Firmware	Software stored on a microprocessor or read-only memory chip; a microprogram stored in ROM, designed to implement a function that had previously been provided in software.	Typical examples of devices containing firmware are embedded systems (such as traffic lights, consumer appliances, and digital watches), computers, computer peripherals, mobile phones, and digital cameras. The firmware contained in these devices provides the control program for the device.

From the table above, it can be seen that the system software is further divided into two categories: the operating systems and the utility software. This will now lead us to the relationship between the operating system and software.

The operating system provides an interface between an application program (software) and the computer hardware, so that an application program can interact with the hardware only by obeying rules and procedures programmed into the operating system. The operating system is also a set of services which simplify development and execution of application programs.

The operating system is the most important program that runs on a computer. Every general-purpose computer must have an operating system to run other programs. Operating systems perform basic tasks, such as recognising input from the keyboard, sending output to the display screen, keeping track of files and directories on the disk, and controlling peripheral devices such as disk drives and printers.

The above functions of the operating system will also spell the importance of an operating system to the entire computer operation. There are commonly used operating systems and these are:

1. Ubuntu
    Ubuntu is based on a version of the Linux operating system known as Debian GNU/Linux. Its main benefit is that it is free and open source. This means users can alter the code as they see fit. Ubuntu also stands out because it is updated once every six months, unlike other open source programs that have no strict upgrade schedule. Most Ubuntu-compatible software is also free and available in on-line software "repositories." Users can try Ubuntu on their PC using the program's "Live CD" mode. This allows you to run the system without actually installing it on your computer. Because Ubuntu programs are less ubiquitous than those for more well-known systems, users may need to do some research before finding the software solutions they need.

2. Android
    Android is a "mobile" operating system maintained by the Open Handset Alliance, a group of companies and organisations that contribute to the system's development under the management of Google Inc. The system is an "open standard," meaning that an entire community of developers can alter the software, not just Google. Android comes pre-installed on smartphones and tablet PCs for which it was designed. As of the date of publication, all four major smartphone carriers -- Verizon, T-Mobile, Sprint and AT&T -- have Android devices available. A variety of manufacturers also make Android-compatible devices. One of the main benefits of the system's open source status is that developers can create different versions of its basic programs, allowing users greater freedom to customise their mobile devices.

3. Mac OS X
    While a version of Mac OS X comes pre-installed on all Apple Macintosh computers, users must pay if they wish to use newer versions when they become available. The system is not open source, so only Apple developers have the ability to legitimately make alterations or improvements to its code. It differs from other computer operating systems in that it only works on Apple computers. Its key feature is its usability. The most recent version as of the date of publication includes a "resume" feature that re-opens applications in the same state they were in when you last closed them. It also includes a "Mission Control" feature, which allows you to see all of your open files at a glance.

4.　　IOS

IOS is Apple's mobile operating system. It runs on the company's iPod, iPhone and iPad devices. Like Mac OS X, it can only be used on Apple's mobile devices. One advantage of iOS is that more applications are available for it than for any other mobile operating system. The system's key features include multitasking support, which allows users to run multiple apps simultaneously, and FaceTime, a video chat program that comes pre-installed on iOS devices.

5.　　Windows

Windows is an operating system owned and operated by Microsoft. It differs from open source systems in that only Microsoft has the ability to make changes to the code. However, it also differs from Mac OS X in that it can be installed on a variety of different computers from a host of competing manufacturers, offering the user more freedom of choice when it comes to hardware. According to Net Market Share, Windows is the most widely used operating system. The latest version as of the date of publication includes touchscreen support, which combines the usability of a touchscreen tablet with the power of a desktop computer. It also features "Play To" and "Remote Media Streaming," which allows you to play media from your computer on other devices in its vicinity and to access your media when you are away from your computer.

Student Activity 11.1.3.4

Answer the following.

1.　　Describe the relationship of the following:

a.　　software and hardware

_____

_____

_____

_____

_____

b.　　software and operating system

_____

_____

_____

_____

_____

_____

_____

c.   computer and software

_____

_____

_____

_____

d.   system software and utility software

_____

_____

_____

_____

_____

_____

11.1.3.5   Utility and Custom Software

Utility and custom software share a comparable degree of importance when it comes to the computer use. Each plays a significant and different role in achieving the desired results to answer the needs of its users. Programming languages can be used to create these programs. A programming language usually refers to high level languages such as BASIC, C, C++, COBOL, FOTRAN, Ada and Pascal. Each language has a unique set of key words and a special syntax for organizing program instructions.

Let us first study the utility software; its definition, use, function and categories and then we shall look at the custom software's definition, use, function and importance.

Utility software is a program that performs a very specific task, usually related to managing system resources. Operating systems contain a number of utilities for managing disk drives, printers, and other devices.

Utilities differ from applications mostly in terms of size, complexity and function. For example, word processors, spreadsheet programs, and database applications are considered applications because they are large programs that perform a variety of functions not directly related to managing computer resources.

Utility software is important as it is system software designed to help analyse, configure, optimise or maintain a computer. Utility software usually focuses on how the computer infrastructure (including the computer hardware, operating system, and software and data storage) operates.

Take a look at the image below. These are commonly installed utility software in a computer.

Examples of utilities installed in a computer

Utility Software Categories
The following are the different utility software categories.

1.   Anti-virus utilities scan for computer viruses

2.   Archivers output a stream or a single file when provided with a directory or a set of files.

3.   Backup software can make copies of all information stored on a disk and restore either the entire disk (e.g. in an event of disk failure) or selected files (e.g. in an event of accidental deletion).

4.   Clipboard managers expand the clipboard functionality of an operating system.

5.   Cryptographic utilities encrypt and decrypt streams and files.

6.   Data compression utilities output a shorter stream or a smaller file when provided with a stream or file.

7.   Data synchronisation utilities establish consistency among data from a source to target data storage and vice versa.

8.   File synchronisation utilities maintain consistency between two sources. They may be used to create redundancy or backup copies but are also used to help users carry their digital music, photos and video in their mobile devices.

9.   Revision control utilities are intended to deal with situations where more than one user attempts to simultaneously modify the same file.

10.   Disk checkers can scan operating hard drive.

11.   Disk cleaners can find files that are unnecessary to computer operation, or take up considerable amounts of space. Disk cleaner helps the user to decide what to delete when their hard disk is full.

12.   Disk compression utilities can transparently compress/uncompress the contents of a disk, increasing the capacity of the disk.

13.   Disk defragmenters can detect computer files whose contents are broken across several locations on the hard disk, and move the fragments to one location to increase efficiency.

14.   Disk partitions can divide an individual drive into multiple logical drives, each with its own file system which can be mounted by the operating system and treated as an individual drive.

15.   Disk space analysers for the visualisation of disk space usage by getting the size for each folder (including sub folders) and files in folder or drive.

16.   Disk storage utilities

17. File managers provide a convenient method of performing routine data management tasks, such as deleting, renaming, cataloging, uncataloging, moving, copying, merging, generating and modifying data sets.

18. Hex editors directly modify the text or data of a file.

19. Memory testers check for memory failures.

20. Network utilities analyse the computer's network connectivity, configure network settings, check data transfer or log events.

21. Registry cleaners clean and optimise the Windows registry by removing old registry keys that are no longer in use.

22. Screensavers were desired to prevent phosphor burn-in on CRT and plasma computer monitors by blanking the screen or filling it with moving images or patterns when the computer is not in use.

23. System monitors for monitoring resources and performance in a computer system.

24. System profilers provide detailed information about the software installed and hardware attached to the computer.

Custom software is:

- designed specifically for a department or company

- owned by a department or a company

- a combination of features from other software

- flexible and upgradeable

- built with industry-standard development tools

From the above, custom software is a computer program or Web site written specifically for a company, according to a company's way of doing business. The opposite of custom software is off-the-shelf software, also known as pre-packaged or pre-written software. One major difference between custom and non-custom software is that with pre-written software, the user does not technically own the software – the user is paying for the right to use the software (a license), and the amount of money paid usually increases with the number of users. With custom software, the user owns the rights to the software, and the user does not pay additional fees to add users. He is free to resell the software to any other party.

Software designed specifically for a company can revolutionise the way it operates and improves the bottom line - by maintaining precise records, eliminating repetitive tasks, sharing information, generating statistical data and much more.

Custom software can be used to combine features from other packages with the features that a company needs, or it can enable the user to instantly access the information in a needed

format. Study the pictures on the next page. These are some examples of what can be done with custom software.

Website can also be considered as custom software and they meet the need of some specific user

Supermarket checkout scanners   ATMs

Custom Software is important as it can create a program that does exactly what the user wants it to do. It can be designed to fit the specialised needs of a user.

These benefits can range from intangibles like, relieving the headaches associated with the less efficient software to a physical reduction in costs. Below are three of the many potential benefits of using custom software:

1.   Automating Excessive Tasks- The range of automated process that generic software (pre-packaged or pre-written software) can provide is limited. This is due to the fact that they are designed to function for a mass market which makes it difficult to provide specific automatic functions. Custom software can be developed to automate tasks that are unique to the users need like the supermarket checkout scanners which enable the supermarkets to efficiently do the same needed task over and over again in accordance to its specific needs.

2. Improves efficiency- Custom software as designed for a specific user and will make work faster, as the software is designed to minimise the amount of necessary tasks performed.

3. Frees up time- It allows the user to spend his time on more important tasks as the work needed to be done is automated in an efficient manner.

Student Activity 11.1.3.5

Answer the following.

1. Explain the difference between each pair of the given terms.

    a. utility software and custom software

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    _____

    b.   pre-written software and custom software

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2. Explain the importance of the following.

    a. Utility software

    _____

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    _____

    b. Custom software

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    _____

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3.   Give examples of the following.

   a. Utility software

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   b. Custom software

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   _____

Summative Learning Activity 11.1.3

Answer the following.

A.   Match the given words with the pictures below. Fill up the table and write your answers on the spaces provided.

- Speakers
- Microphone
- Floppy disks
- DVDs/CDs
- Mouse
- Keyboard
- Flash memory card reader

- System Unit
- Hard drive
- Printer
- CD/DVD drive
- Floppy disk drive
- Monitor

	Name	Input or output (as applicable)	Description	Function
1.				
2.				
3.				
4.				
5.				
6.				
7.				

8.			
9.			
10.			
11.			
12.			
13.			

B.   Write down the differences of the pair of words given below.

1.   laptop versus desktop

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2.   input device versus output device

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3.   Output peripheral versus storage peripheral

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4.   Keyboard versus mouse

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5.   Printer versus speaker

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6.   Headset versus headphones

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7.   Operating system versus utility software

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8.   Application software versus system software

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9.   Utility software versus custom software

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_____

10. Mac OS X versus Windows

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C.   Match Column A to the related items in Column B. Write the letter of your answer on the space provided.

Column A		Column B
_____ 1. Mouse	A.	Monitor
_____ 2. Scanner	B.	Windows
_____ 3. Custom software	C.	Flatbed
_____ 4. Storage peripheral	D.	Keyboard
_____ 5. Operating system	E.	Google
_____ 6. Application software	F.	Flash drives
_____ 7. Utility installed in computer	G.	Disk clean up
_____ 8. Output device connected to a computer	H.	Central Processing unit
_____ 9. Input device connected to a computer	I.	Optical or mechanical
_____ 10. Attached to or part of a motherboard	J.	Bank ATM machine program
	K.	Anti-virus
	L.	Defragmentation

Answers to Student Activity 11.1.3

Student Activity 11.1.3.1

Any five combinations of the following can be the answers.

a.   The computer case is a plastic or metal enclosure that houses most of the components.

b.   A power supply unit (PSU) converts alternating current (AC) electric power to low voltage DC power for the internal components of the computer. Laptops are capable of running from a built-in battery, normally for a period of hours.

c.   The motherboard is the main component of computer. It is a large rectangular board with integrated circuitry that connects the other parts of the computer including the CPU, the

RAM, the disk drives (CD, DVD, hard disk, or any others) as well as any peripherals connected via the ports or the expansion slots.

d. The expansion card in computing is a printed circuit board that can be inserted into an expansion slot of a computer motherboard or backplane to add functionality to a computer system via the expansion bus.

e. Computer data storage, often called storage or memory, refers to computer components and recording media that retain digital data.

f. Fixed media includes the hard disk drives which are found in virtually all older computers, due to their high capacity and low cost, but solid-state drives are faster and more power efficient, although currently more expensive than hard drives, so are often found in more expensive computers.

g. Removable media is needed to transfer data between computers; a USB flash drive or Optical disc may be used. Their usefulness depends on being readable by other systems; the majority of machines have an optical disk drive, and virtually all have a USB port.

h. Input and output devices are typically housed externally to the main computer chassis. The following are either standard or very common to many computer systems. Input devices allow the user to enter information into the system, or control its operation.

Student Activity 11.1.3.2

Type of Peripheral	Function of the Peripheral	Example of the Peripheral
Input	Input peripherals are used to interact with, or send data to the computer	mouse and keyboards
Output	Output peripherals provide output to the user from the computer	monitors and printers
Storage	Storage peripherals store data processed by the computer	hard drives and flash drives

Student Activity 11.1.3.3

Name of the device	Type of Device (Input or Output)	Function or use of the device
	headphones	Headphones happen to have earpieces while their main purpose is to listen to music. Headsets too have earpieces (can even have one earpiece based upon the style) additionally a microphone, main objective being to aid communications (both talking & listening).

	microphone	The function of a microphone is to take your sound waves and translates it to appropriate machine readable for and then transmits it as electrical pulses to the central processing unit for processing.
	keyboard	Through keyboards, the user can input the necessary operating command and text data into the computer.
	printer	Printer a device that accepts text and graphic output from a computer and transfers the information to paper, usually to standard size sheets of paper.
	Scanner	Scanner is a device that captures images from photographic prints, posters, magazine pages, and similar sources for computer editing and display.
	Web cam	Web cams serve a variety of purposes, from taking still images to sending a live video over conference calls.
	monitor	Monitor is a display adapter that displays information processed by the computer's video card.
	Mouse	A computer mouse enables the user to move a cursor smoothly and spontaneously across a two-dimensional plane. It is therefore an essential input device for selecting, dragging, hovering, and clicking. The mouse allows users to switch between applications, select options and buttons, and move around the screen with a great degree of

		accuracy and fluidity. It is used to move between and select links on a website, buttons on an options screen, entries on a menu, and many more tasks that would be far more difficult using a keyboard alone. It can also be used to bring up alternative functions and menus by clicking the right button when hovering over a screen element. The mouse allows users to zoom in and out quickly, and scroll up and down using the scroll wheel located between the two buttons.
	speakers	Speakers provide a means for the computer to produce audio.

Student Activity 11.1.3.4

The answers can be similar to these ones below.

a.   software and hardware
       Hardware and Software have a mutual relationship, this means that without software hardware is very limited; and without hardware, software wouldn't be able to run at all. They need each other to fulfill their potential. Mainly hardware does the computing work and software run the computer.

b.   software and operating system
       An operating system is software that allows other software to manipulate computer hardware to achieve a desired effect.

       The operating system provides an interface between an application program (software) and the computer hardware, so that an application program can interact with the hardware only by obeying rules and procedures programmed into the operating system. The operating system is also a set of services which simplify development and execution of application programs.

c.   computer and software
       Computer software or simply software is also known as computer programs hence the computer needs the software plus the hardware for it to serve its purpose.

d.   system software and utility software

Utility software is system software designed to help analyse, configure, optimise or maintain a computer. Utility software performs a specific task related to the management of computer functions, resources, or files, as password protection, memory management, virus protection, and file compression while the system software serves the application, which in turn serves the user thus differs from an operating system (which runs a computer). Hence, the system software coordinates the activities and functions of hardware and software, and it controls the operations of computer hardware.

Student Activity 11.1.3.5

The answers can be similar to these ones below.

1.   Distinguish the following terms.

   a.   utility software and custom software
   Utility software is a program that performs a very specific task, usually related to managing system resources while custom software is a computer program or Web site written specifically for a company, according to a company's way of doing business.

   b.   pre-written software and custom software
   Pre-written software, the user does not technically own the software – the user is paying for the right to use the software (a license), and the amount of money paid usually increases with the number of users while custom software is a computer program or Web site written specifically for a company, according to a company's way of doing business and the user owns the rights to the software, and the user does not pay additional fees to add users. He is free to resell the software to any other party.

2.   Give the importance of the following.

   a. Utility software
   Utility software is important as it is system software designed to help analyse, configure, optimise or maintain a computer. Utility software usually focuses on how the computer infrastructure (including the computer hardware, operating system, and software and data storage) operates.

   b. Custom software
   Custom Software is important as it can create a program that does exactly what the user wants it to do. It can be designed to fit the specialised needs of a user.

3.   Give examples of the following.

   a. Utility software
   Anti-virus utilities, Archivers utilities, Backup software , Clipboard managers , Cryptographic utilities ,Data compression utilities , Data synchronisation ,File synchronisation utilities , Revision control utilities , Disk checkers, Disk cleaners, Disk

compression utilities , Disk defragmenters ,Disk partitions , Disk space analysers ,Disk storage utilities, File ,Hex editors ,Memory ,Network utilities , Registry , Screensavers , System monitors and System profilers

b. Custom software

ATMs, supermarket checkout counters, company accounting system

Answers to Summative Learning Activity 11.1.3

A. The answers can be similar to these ones below.

Name	Input or output (as applicable)	Description	Function
1. speakers	output	Computer speakers are a way for computers to make sounds by means of digital or analog audio.	They provide a means for the computer to produce audio.
2. monitor	output	Monitor is a display adapter that displays information processed by the computer's video card.	Monitors have display functions
3. floppy disk drive		A floppy disk drive reads and writes data to a small, circular piece of metal-coated plastic similar to audio cassette tape.	A floppy disk drive (FDD), or floppy drive, is a hardware device that reads data storage information.
4. hard drive		A hard disk drive (HDD) is a data storage device used for storing and retrieving digital information using rapidly rotating disks (platters) coated with magnetic material.	A hard disk drive, also known as a hard drive or HDD, is used to store data long term.
5. printer	output	Printer a device that accepts text and graphic output from a computer and transfers the information to paper, usually to standard size sheets of paper.	Accepts text and graphic output from a computer and transfers the information to paper
6. system unit		A computer system unit is the enclosure that contains the main components of a	The primary function of the computer system unit is to hold all the other

		computer. It is also referred to as computer case or tower.	components together and protect the sensitive electronic parts from the outside elements. A typical computer case is also large enough to allow for upgrades, such as adding a second hard drive or a higher-quality video card.
Flash memory card reader		A memory card reader is a device, typically having a USB interface, for accessing the data on a memory card such as a CompactFlash (CF), Secure Digital (SD) or MultiMediaCard (MMC).	For reading memory cards
CD/DVD drive		Optical discs drive that reads and writes all common CD and DVD formats. All modern optical drives that come with personal computers are CD/DVD drives.	For reading CDs and DVDs
9. mouse	input	Mouse is designed for pointing and clicking around a graphical user interface	A computer mouse enables the user to move a cursor smoothly and spontaneously across a two-dimensional plane. It is therefore an essential input device for selecting, dragging, hovering, and clicking. The mouse allows users to switch between applications, select options and buttons, and move around the screen with a great degree of accuracy and fluidity. It is used to move between and select links on a website, buttons on an options screen, entries on a menu, and many more tasks that would be far more difficult using a

			keyboard alone. It can also be used to bring up alternative functions and menus by clicking the right button when hovering over a screen element. The mouse lets users zoom in and out quickly, and scroll up and down using the scroll wheel located between the two buttons.
10. DVDs/CDs		Optical Disc is any storage media that holds content in digital format and is read using a laser assembly is considered optical media.	For storage of audio, file, music and video.
11. keyboard	input	Keyboards play an important role in the "information input".	The user can input the necessary operating command and text data into the computer.
12. floppy disks		They are plastic square disks, usually with a silver or black sliding piece going across the top.	These disks come in a variety of colours and they hold about 144 million bytes data storage capacity.
13. microphone	input	Microphone sometimes abbreviated as mic, is a hardware peripheral	The function of a microphone is to take your sound waves and translates it to appropriate machine readable for and then transmits it as electrical pulses to the central processing unit for processing.

B.   The answers can be similar to these ones below.

1.   laptop versus desktop
      A laptop is much smaller and therefore often more convenient to use. A desktop
      computer is much larger. A desktop computer can last much longer than a laptop before it
      needs to be repaired or replaced. A laptop is often a self-contained unit, and no additional
      parts are needed to run it while for a desktop computer there is a need to purchase
      monitors and other. A laptop is a single machine with the hard drive, disk drive, monitor,
      wireless modem, keyboard and mouse contained within it, and it can easily be folded and
      stored in a carrying case. The only additional accessory that is often needed is a power

cable with an adapter attached to it. A desktop computer consists of a tower, which is a large rectangular box. The hardware for the computer system is contained in the box. An external monitor, keyboard, mouse and wireless router often need to be attached to a PC in order to fully operate it.

2.   input device versus output device
An input device sends information to a computer system for processing, and an output device reproduces or displays the results of that processing.

3.   Output peripheral versus storage peripheral
Output peripheral is used for displaying the data generated by the computer while storage peripheral is used for saving and file keeping or storage.

4.   Keyboard versus mouse
Keyboard is used for inputting necessary command and text data into the computer while the mouse is used for clicking and pointing around a graphical user interface.

5.   Printer versus speaker
Printer a device that accepts text and graphic output from a computer and transfers the information to paper while Scanner is a device that captures images from photographic prints, posters, magazine pages, and similar sources for computer editing and display.

6.   Headset versus headphones
A headset is a combination of headphone and microphone while headphones only have ear pieces for listening.

7.   Operating system versus utility software
The operating system provides an interface between an application program (software) and the computer hardware while the utility software helps the user to control, manage, and maintain a computer's operating system, hardware and application software.

8.   Application software versus system software
Application software refers to any software that runs to let the user accomplish a function or create content, but which cannot operate on its own while the system software is computer software designed to operate and control the computer hardware.

9.   Utility software versus custom software
Utility software is small useful programs with limited capability while custom software is software that is specially developed for some specific organisation or other user.

10.   Mac OS X versus Windows
Mac OS X is a series of graphical user interface based operating systems developed by Apple Computer Inc. or now Apple Inc. while Windows is developed by Microsoft.

C.

1.   I

2.   C

3.   J

4.   F

5.   H

6.   B

7.   G

8.   A

9.   D

10.   H

11.1.4   Computer and Society

11.1.4.1   Impacts on Society

Computers changed the world a lot. It helped man step forward into the future. Thanks to computers, space exploration came true, new designs of vehicles and other transportation were made; entertainment became more entertaining, medical science made more cures for diseases, and others. The computers impacted our lives in many ways. You may not notice it but they did make life a lot easier. Without computers, the world would be a harder place to live in. Thanks to the computers, everyday life is easier for us. Some people may disagree but most would not. Others say that computers are taking away man power. That may be true but computers did make the impossible possible.

Computers are commonly used items in many areas. Computers impacted many items in today's society. Technology has allowed people to have higher levels of convenience and proficiency. In addition, society has become accustomed to on-demand answers or solutions to requests or services and the Internet is the platform which fulfills the need. Computers have made the dissemination of knowledge easier. Computers connected to networks have made access to knowledge via applications such as web browsers and search engines as easy as clicking a mouse button. Never before in history has so much knowledge been available to people. The Internet has enabled knowledge in the form of databases, webpages and blogs to be connected online and then accessed by anyone who has a connection to the Internet.

Why computers have the impact they do on society? What are the characteristics that are the root of this impact? The characteristics described below are factors in the social impact of computer technology. These will also provide the roles of computers in our society.

1.   Ubiquity - It is perhaps stating the obvious that computers appear to be everywhere today. Even when we do not encounter them directly in their various forms of modern convenience devices, such as digital watches, microwave ovens, VCRs, and the like. We generate transactions that are processed via computers without actively doing anything.

2.   Magnification - Computers tend toward magnification in several different ways. First, the explosion of the availability of information is due in large part to the computer's ability to generate, collect, and store an ever increasing amount of raw data. Since the ability to create and collect data is growing exponentially, so too is the generation of information that can be synthesised from this data. Second, the types of negative impacts a single error can   have has grown enormously with computer technology. Finally, the number of people directly affected by a system error has also grown enormously, to where a single software system literally can affect millions directly.

3.   Accessibility - Access to information continues to increase at hard to believe speeds. To begin with, the vast quantities of information available on-line (through, for instance, the Internet) appear to be growing exponentially. In addition, we now have unprecedented accessibility to information and communications from nearly anywhere we happen to be. Next, information is available to an unprecedented number of people. Finally, the promises of the "information superhighway" to open up new lanes of access, including

text, voice, graphics, and video increases the types of information to which we have access to include all media.

4. Reproducibility and Distributability - The major concern of the recording industry regarding the introduction of digital audio tape (DAT) systems was the ability to make exact duplicates of digital material, indistinguishable from the original. The concern, of course, has been that DAT technology would cause unprecedented reproducing of recordings, to the obvious disadvantage of the recording industry, composers, and performers. Clearly, any digital file can just as easily be duplicated. Many information resources are available only in digital form, via, for instance, the Internet. As more information is converted to digital form (e.g. voice and video), the ability to duplicate and distribute such information increases enormously. (Oz, 1994).

5. Lack of Accountability - It has become a popular complaint that it is getting more and more difficult to locate a human being who is willing to accept responsibility for an error made by a computerised system. While it is tempting to blame such problems on incompetent employees but really the problem may be a poor user interface, lack of training, or an error in the software, none of which can be solved by those providing the front-line service. Another difficulty is finding someone who will, indeed, fix an error in an account. It is often the case that service representatives are reluctant to accept the responsibility for making a necessary change. In addition, it can often be difficult to even find a human being to deal with a problem. Getting lost in a voice-mail system has become a modern urban legend. (Nissenbaum, 1994).

6. Temporality - Computers have several effects on time and the timeliness of information. It seems that computer technology is to be blamed for the "speed up" of modern society - everything has to get done faster, be there sooner, and be available immediately. Another form of temporality in computer systems is that information can be retained over long periods of time, even when they appear to have been destroyed. Another temporal shift for which computers have been responsible is that people who work together do not necessarily have to do so at the same time. Finally, services and information are more frequently available on a 24-hour basis. This allows people to request a service or seek information when it fits their schedule, rather than when it fits the service provider's schedule.

7. Spatiality - Computers have done more to shorten distances than any previous technology, even the supersonic jet. It is possible to send large amounts of data, messages, video, and others virtually anywhere in the world via networks such as Internet. Long distance learning, using information databases or video feeds of courses via satellite, is a reality for a growing portion of our modern society. We can now even be on the move when we talk with someone on the phone, or receive a fax.

8. Surveillability - In addition to the usual surveillance equipment such as cameras and microphones, transactional data is increasingly being collected for virtually all types of transactions, even cash purchases and the acquisition of services.

9. Shifting of Relationships/Changes in Intercommunication Protocols - One of the more difficult characteristics to track is how computer technology has changed communication

between people and groups of people. In particular, the use of email has been shown to eliminate a lot of the usual visual and verbal cues we often use in communicating with one another. In addition to removing such cues, computer-mediated communications mask attributes such as race, gender, age, or physical disability, in addition, perhaps, to the person's social or management status within an organisation. (Grudin, 1994; Perrole, 1987).

10.   Illusion of Precision - It is not difficult to make many people who are not in the computer field believed that any numeric result generated by a computer is correct. Those not well versed in the hardware of computers have little understanding of the fact that numbers must be converted back and forth between decimal and binary forms, or that there is a limitation on the accuracy of numbers due to memory constraints. As a result, they willingly accept values generated by a computer as infinitely accurate. (Liffick, 1985).

From the above presentation, let us then study the pictures below on how computers impacted the different areas of our lives in the society.
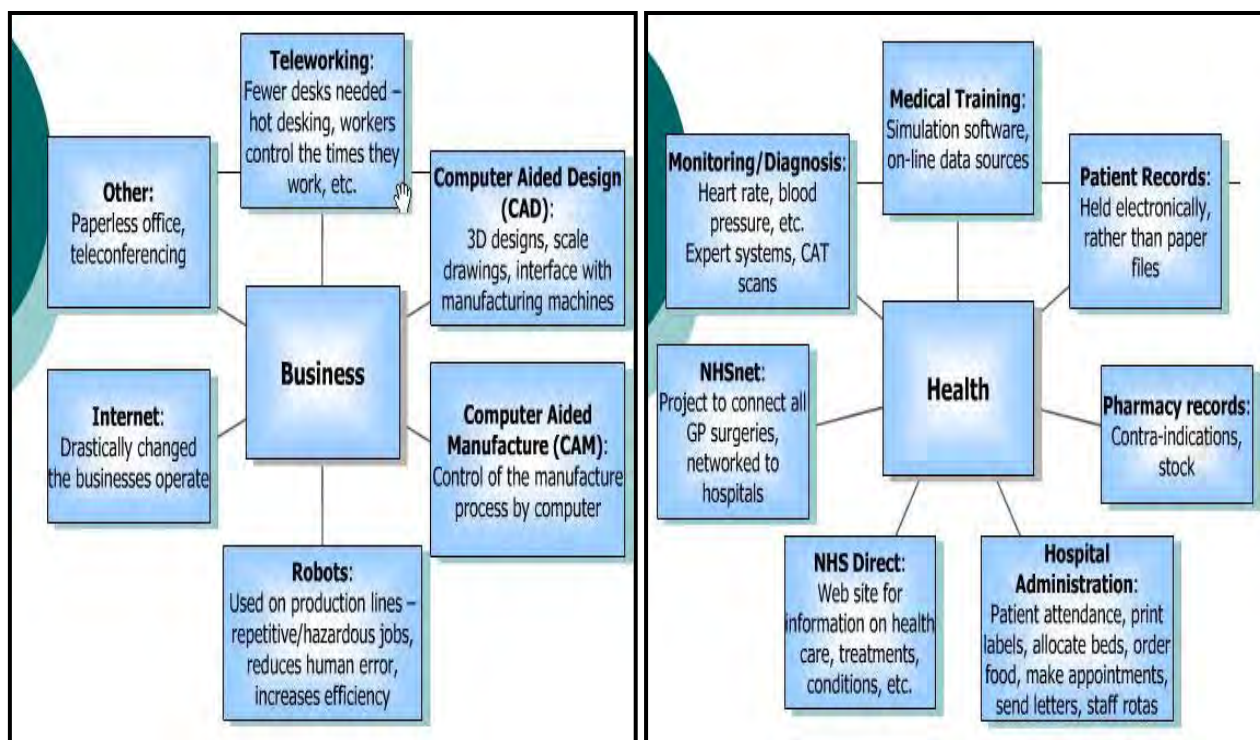
How computers affect the Business and Health aspects of human lives.
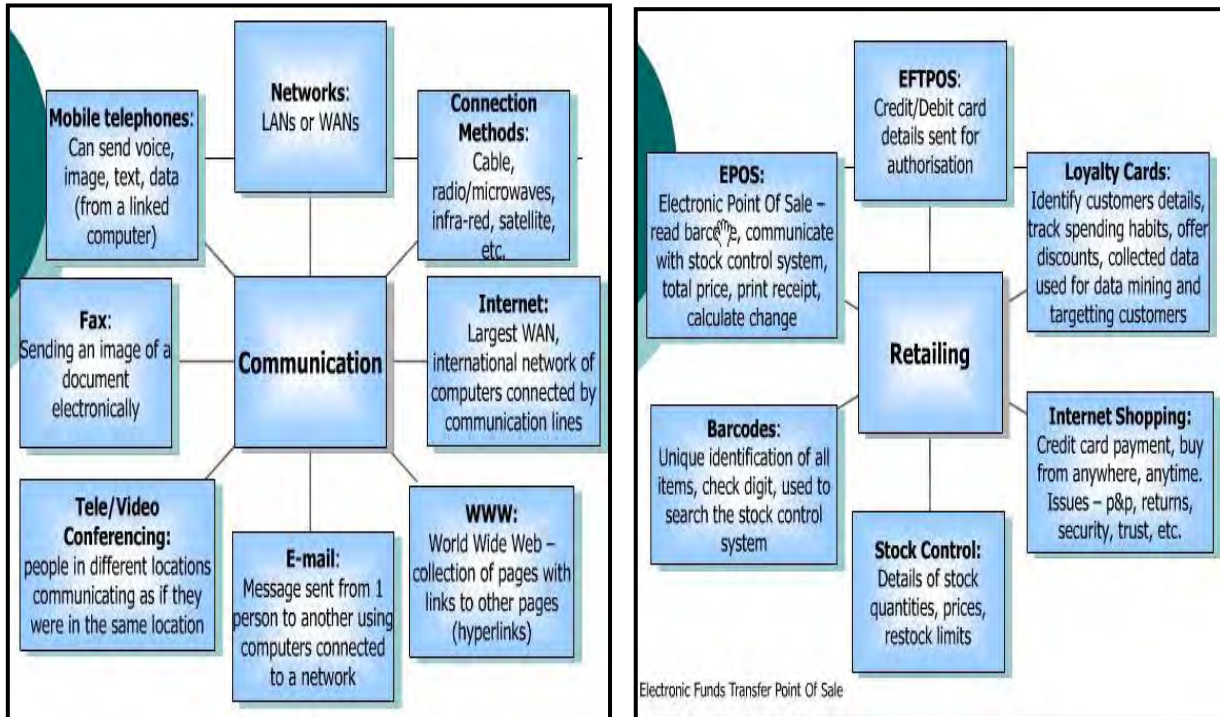
How computers affect the Communication and Retailing aspects of human lives.
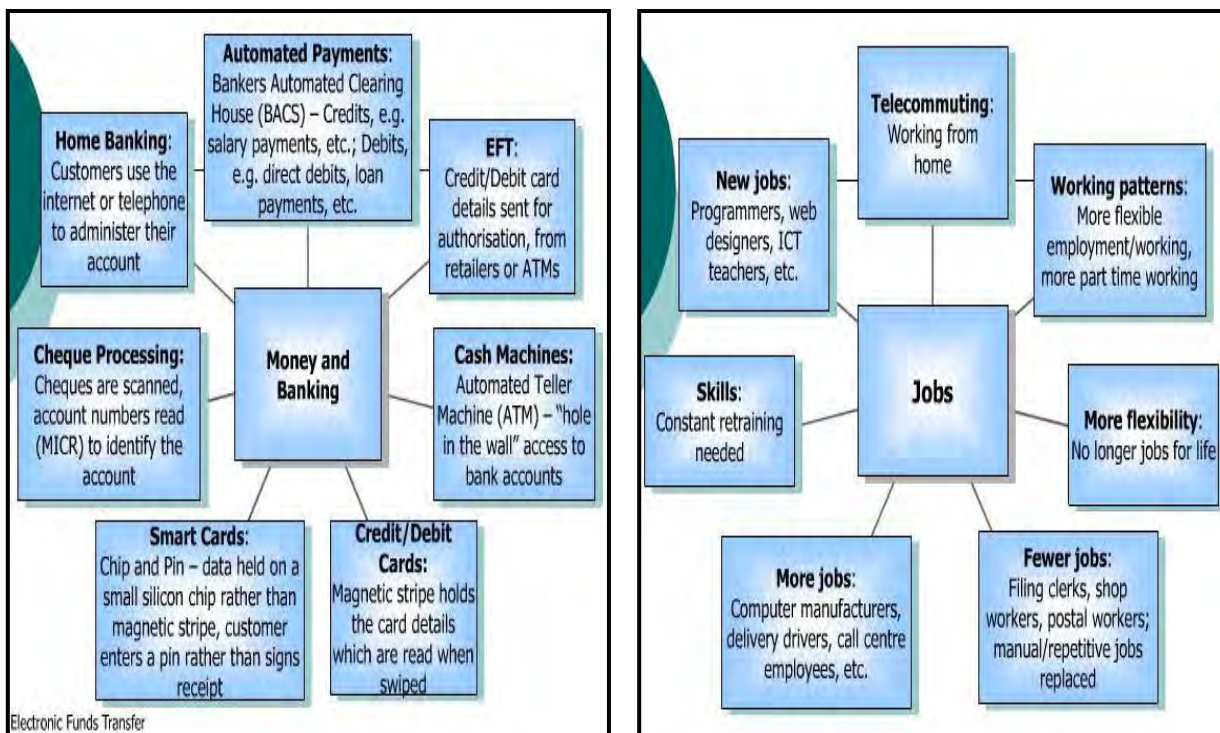
How computers affect the Money, Banking and Jobs aspects of human lives.
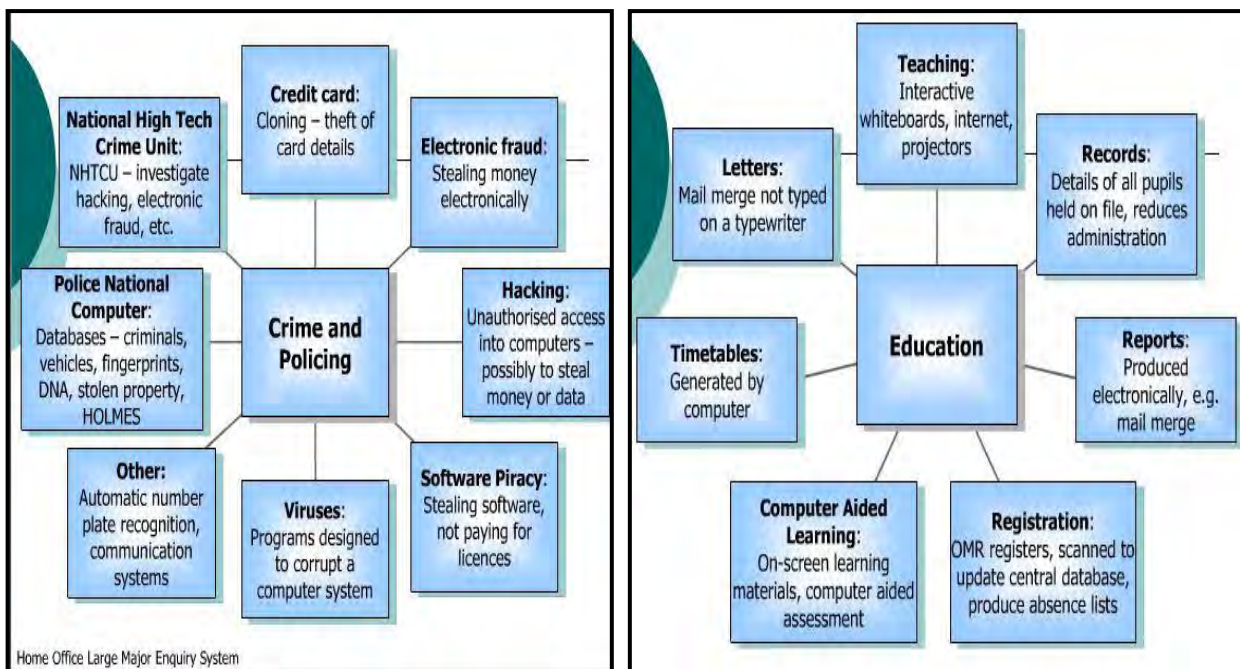
How computers affect the Crime, Policing and Education aspects of human lives.

We can derive from the pictures presented above that there is an extreme increase in the use of computers which has changed our lives. As the computer and the Internet can serve many purposes, they are valuable and indispensable tools for society. The impact that these tools have had on our lives is immense and to this day it continues to grow. On a scholastic basis, the amount of information and data that one can obtain through the internet is immense. On the other hand, it is also important that we, as individuals, take responsibility for our actions.

Student Activity 11.1.4.1

Study the article on the next page and provide a written reaction paper on this. Be guided by the following criteria: (1). 3-6 paragraphs, (2). provision of a summary on how computers impacted human lives, (3). evidence of a critical analysis of the article. Write your answers on the spaces provided after the article.

Survey of Public Attitudes Toward Computers in Society

by David H. Ahl

SUMMARY

Computers are not only invading our lives along a multitude of directions — supermarkets, credit data, medical records, hobbies, etc. — but our society is becoming so dependent upon computers that it can truly be said that we live in the computer age. The computer will have at least as profound an effect on humankind as did the printing press some 500 years ago. In the Gutenberg Museum, a map plots the spread of printing out from Mainz to the rest of the world over scores of years. The computer invasion has taken place at an infinitely greater speed.

Now, some 30 years after its invention, what do people think of the computer? Monster or savior? Slave or dictator? Do people understand this awesome force?

This survey indicates that most people are remarkably optimistic about the benefits the computer can bring to society in a number of areas — for example, education, law enforcement, and health care. People feel they are unable to escape the influence of the computer and that it has some undesirable effects; however, they do not feel particularly threatened by it. Young people tend to be less optimistic and feel more threatened by the computer than do adults. A surprising two-thirds of the population have a fair understanding of both the role and function of the computer although there are a few popular misconceptions.

Compared to the 1971 AFIPS/*Time* survey, people have become more optimistic about the use of computers in most areas with the notable exception of credit data banks. Also, this *Creative Computing* survey identified the computer influence on elections as a real danger area — to our knowledge this has not been previously surveyed.

METHODOLOGY

During the 6-month period, February through July 1975, *Creative Computing* Magazine conducted a survey on people's attitudes toward computers and their role in society. Some 843 people responded in two highly computerized nations, the United States and Germany. About one-third of the respondents were educated or experienced in computer usage; two-thirds were not. Thirty-six percent of the respondents were classified as young people (20 and under) and students; the remainder were a relatively balanced cross-section of adults.

The 17 questions in the survey fell in four major categories (although they appeared in random order on the survey instrument). The categories:

1. Computer Impact on the Quality of Life (4Q)
2. Computer Threat to Society (4Q)
3. Understanding of the Role of Computers (5Q)
4. Understanding of the Computer Itself (4Q)

In some cases where the questions were similarly worded, the responses to this questionnaire are compared to those from a 1971 survey jointly sponsored by AFIPS (American Federation of Information Processing Societies) and *Time* Magazine.

COMPUTER IMPACT ON THE QUALITY OF LIFE

On the whole, respondents felt that the computer will improve the quality of life in four areas: education, law enforcement, health care, and prevention of fraud. Young people and students saw somewhat less improvement from the use of computers than did adults.

Computers will improve education. About 85% of all the respondents strongly or mostly agreed with that statement and only 5% disagreed. This was the highest positive (or negative) response to any single question and also the question which had the greatest agreement between adult and youth.

Computers will improve law enforcement. 82% of the adults agreed with this and only 3% disagreed. The younger respondents were somewhat more cynical; 70% agreed and 10% disagreed.

Computers will improve health care. On this issue, the young respondents had considerably more doubts than adults; about 79% of the adults agreed but only 54% of the youth. More than twice as many youth disagreed with the statement as adults — 12% vs. 5%.

Ranking lower on desirable uses of the computer is its use for *storing and checking credit rating data;* 64% of both adult and youthful respondents saw this as a worthwhile application. However, 13% of the adults thought this was a bad application for the computer, perhaps reflecting previous hassles that they or friends had with computerized credit rating data. Most young people probably haven't been exposed to this malady; only 8% of them objected to this application. While substantial, the 64% of the people in favor of this application represents a substantial decline from the 75% recorded just four years ago in the AFIPS/*Time* survey.
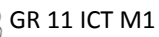
Write your answers here.

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11.1.4.2   Measures to Protect Computers and Data

From our previous study on Data handling and File management, Data security was elaborately discussed to identify and describe all the possible threats and solutions to data theft and loss. It also included a guide to follow on how to protect the computer hardware as well. On the same note, Grade 10 Design and Technology – Computing: Unit 1, Lesson 12 focused on Data Security where its definition and its need for was stressed. Moreover, basic security measures were identified together with the common threats encountered by a user.

In this discussion, we will add more measures to protect both the computer and the data. It will identify the safety requirement measures the user can apply to ensure computer and data protection.

Computer security (also known as cyber security or IT security) is information security as applied to computing devices such as computers and smartphones, as well as computer networks such as private and public networks, including the whole Internet. Data can be accessed at any time and at anywhere; with this situation, all safety precautions must be applied to ensure that the user and his data are both protected against any unauthorized access and use.

The field covers all the processes and mechanisms by which computer-based equipment, information and services are protected from unintended or unauthorised access, change or destruction, and are of growing importance in line with the increasing reliance on computer systems of most societies worldwide.

Protecting sensitive data is the end goal of almost all IT security measures. Two strong arguments for protecting sensitive data are to avoid identity theft and to protect privacy. The improper disclosure of sensitive data can also cause harm and embarrassment.

Grade 10 Design and Technology – Computing: Unit 1, Lesson 12 emphasised on how data can be accessed by either a hacker or a cracker. In this computer driven world, people with advanced understanding and skill of the technology can pose harm.

Study the following safety requirement measures in order to ensure computer and data protection for both the user and the machine.

1.   Computer security

- Establish strong passwords

- Install a strong firewall and virus-checking on computers.

- Make sure that the operating system is set up to receive automatic updates.

- Protect the computer by downloading the latest patches or security updates, which should cover vulnerabilities.

- As much as possible, do not share passwords. However, in some instances as the need arises, only allow trusted persons to access the information.

- Encrypt any personal information held electronically that would cause damage or distress if it were lost or stolen.

- Take regular back-ups of the information on the computer system and keep them in a separate place so that if the computer is lost, the user will not lose the information.

- Securely remove all personal information before disposing of old computers by using technology or destroying the hard disk.

- Consider installing an anti-spyware tool. Spyware is the generic name given to programs that are designed to secretly monitor the activities on the computer. Spyware can be unwittingly installed within other file and program downloads, and their use is often malicious. They can capture passwords, banking credentials and credit card details, and then relay them back to fraudsters. Anti-spyware helps to monitor and protect the computer from spyware threats, and it is often free to use and update.

2.   Email security

- Consider whether the content of the email should be encrypted or password protected.

- When starting to type in the name of the recipient, some email software willsuggest similar addresses that have been used before. If the user has previously emailed several people whose name or address starts the same way - e.g. "Dave" - the auto-complete function may bring up several "Daves". Make sure to choose the right address before clicking send.

- In sending an email to a recipient without revealing their address to other recipients, make sure to use blind carbon copy (bcc), not carbon copy (cc). When cc is used every recipient of the message will be able to see the address it was sent to.

- Be careful when using a group email address. Check who is in the group and make sure if the message is to be really sent to everyone.

- Sending a sensitive email from a secure server to an insecure recipient, security will be threatened. There is a need to check that the recipient's arrangements are secure enough before sending the message.

3.   Other security measures

- Shred all confidential paper waste.

- Check the physical security of the premises.

- Be smart when surfing the Internet or using IM (instant messaging).

- Printed data should be destroyed when no longer required.

Data security is fundamentally crucial as computer dependence for all data and information on matters and services is the technology trend. Computer and data should be protected to a degree appropriate to its importance. A data security strategy must be adhered to for achieving the suitable needs of protection.

Student Activity 11.1.4.2

Study the following practices and identify which practice would protect the computer and the data. Place a tick (✔) in the box of the appropriate practice which ensures computer and data protection.

☐ 1. Authorise any person to access your computer.

☐ 2. Computers must not be left unattended.

☐ 3. Additional security to machines should be done.

☐ 4. Passwords can be revealed to any person.

☐ 5. Backup copies must be held off site or kept in a security cabinet.

☐ 6. Stored data should be deleted when no longer needed.

☐ 7. Shredding printed data which are no longer needed.

☐ 8. Clicking an unexpected link in an email message or in an IM (instant messaging).

☐ 9. Passwords are changed on a scheduled basis.

☐ 10. Firewalls are installed in the machine.

11.1.4.3 Environmental, Social and Ethical Issues

No matter how useful technology is, there will always be countless negative impacts to the society. The computer from its time of existence had helped man utilise time and efficiency to accomplish numerous things in the most possible way. In spite of this advantage, it is worthy to take note of its adverse effects on the society. Knowing the issues behind its use will create social awareness that will lead to a more conscious and proactive society.

This discussion will focus on the environmental, social and ethical issues of computer use.

Environmental Issues
The environmental problems associated with computers are two-fold. High energy consumption and highly toxic component materials are currently inherent characteristics of computers, thus making their production, use and disposal ecologically unsound (Lee et al., 2004).

Unfortunately, due to their sheer global quantities and current product life of roughly two years, the problems associated with such characteristics become greatly enhanced at an alarming rate (Brennan et al., 2002). Given the aforementioned product life of these systems, it appears that computers are being disposed of as quickly as they are being produced.

Unfortunately, disposal in landfills is only the first step in a dangerous sequence of events involving the breakdown and discharge of computer material components. Examples include lead, barium, chromium and other endocrine and central nervous system disruptors (Baul, 2002).

Aside from hazardous wastes, the production and use of computers consumes vast amounts of energy, thus further depleting fossil fuel reserves and playing an increasingly significant role in climate change and global warming (Gungor and Gupta, 1999).

Globally speaking, the issue of energy consumption is one that involves all sectors and industries. According to Norfold (1990) and Kawamoto (2002), electronic office equipment such as desktop computers uses significant amounts of electric power. A typical CPU uses 120 Watts (W = 1 joule/second) of electricity, while a CRT monitor consumes an added 150 W (United States Department of Energy, 2005). This implies that a standard office computer which is left on 8 hours per day, for 5 days a week can consume up to 561.6 kW of fossil fuel derived energy.

However, this figure more than triples if such a computer is left on throughout the night or during the entire week.

Desktop computers generally consist of three major units: the main processing machine (CPU consisting of power supplier, fan, IC boards, DVD drive, CD drive, hard disk, soft disk and shell casing), the monitor and the keyboard (Lee et al., 2004). However, these major units compose of various materials, which, in turn consist of a wide range of chemicals, elements and heavy metals. Some of these materials, such as platinum, have a high recovery and recycling efficiency (95%), while others cannot be recycled at all (e.g. mercury, arsenic and barium). There are, however, two desktop components that represent the largest environmental hazards with respect to bioavailability, monitors containing CRTs and flame retardant plastics (Lee et al., 2004).

Since the 1950s, CRTs have been used in television and computer screens. Historically, their production has grown in step with computer demand (Williams, 2003). In 2001, the global CRT monitor industry was valued at US $19.5 billion, producing 108 million units. This figure is expected to fall due to the increasing popularity of LCD monitors (Williams, 2003).

The CRT of a typical monitor accounts for approximately 50% of the monitor's weight, and contains a veritable cocktail of elements (Table 1) of which lead is considered the most important due to its high content (up to 20%) in the funnel glass component of a CRT (Lee et al., 2004).

Table 1: Components of CRT panel and funnel glass (reconstructed from Lee et al., 2004)

Type of Glass	Major Elements (>5%wt)	Minor Elements (<5% wt)
Panel	Silicon, oxygen, potassium, barium and aluminum	Titanium, sodium, cesium, lead, zinc, yttrium and sulphur
Funnel	Silicon, oxygen, iron and lead	Potassium, sodium, barium, caesium and carbon

In most basic terms, a CRT creates the visual image displayed by the monitor, by employing the interaction between an electron tube and a phosphor coated screen (Anonymous, 2003). In order to avoid radiation exposure to the viewer, the funnel glass of the CRT contains high concentrations of lead-oxide (Lee et al., 2004). According to the US Environmental Protection Agency's (EPA) toxicity characteristic leaching procedure (TCLP), the lead found in funnel glass is considered a hazardous waste because it far exceeds the TCLP threshold of 5 mg/L leached, with values ranging from 10-20 mg/L leached per monitor (Lee et al., 2004). Williams (2003) also found that CRT monitors exceeded TCLP limits for zinc leachate, thus classifying it as a hazardous waste. The hazard truly occurs when monitors are permitted to weather in landfills, releasing these toxic chemicals into soil, and subsequent water systems.

Lead is especially an issue in waste disposal because it becomes bioavailable in soils with increasing pH, and becomes available to animals and humans through the food chain and soil dust inhalation (Martinez-Villegas et al., 2004). Once in the body, it can attack proteins and DNA (Bechara, 2004) as well as interfere with the functions of the central and peripheral nervous systems (Needleman, 2004). At high doses, it can result in brain edema and hemorrhage (Needleman, 2004).

The global shipment of LCDs, also known as "Flat Screen" monitors, contain significant amounts of mercury (4-12 mg/unit), which can be leached from improperly discarded systems. Additionally, the production of an LCD monitor requires 266 kg of fossil fuels, a figure that surpasses that required for the production of CRT monitors (Williams, 2003).

The liquid crystals within an LCD monitor are a mixture of polycyclic or halogenated aromatic hydrocarbons, and contain 588 various compounds. However, of these, only 26 possess the potential for acute toxicity in humans (Williams, 2003). While no tests for the carcinogenicity of these compounds have been conducted on animals, tests using bacteria showed no trace of mutagenic effects (Williams, 2003).

Most electronic equipment contains plastic casings that serve as the protective shell and structure for various products including computers (Brennan et al., 2002). These casings often contain plastics such as polybrominated diphenyl ethers (PBDEs); part of a wider group of materials known as brominated flame retardants (BFRs) (Domingo, 2004). While BFRs are considered a safety precaution, they are difficult to recycle and separate from other plastics, and due to their high bromine content, BFRs will be banned from the European Union as of July 1, 2006 (Osako et al., 2004). Very little is known about the effect that BFRs exert on human health, however, due to their long half-lives (2-10 years) and structural similarities with polychlorinated biphenyls (PCBs) and dichloro-diphenyl-trichloroethane (DDT), they are considered environmentally persistent and are known to biomagnify (Domingo, 2004). BFRs have caused neurodevelopmental toxicity in lab rats, and have been found in increasing quantities in human blood, adipose and liver tissues, and in breast milk (Domingo, 2004).

In order to obtain an accurate measure of the environmental impact of computer technology, the production process of computer technology must be examined. From the extraction of raw materials, to the production of computer parts and constituent materials, and the final assembly of the whole computer units, a myriad of environmental problems may arise (Fava et al., 1993).

In order to effectively manage the vast quantities of computer waste being generated annually, at a global scale, the implementation of proactive and design-based measures has begun in several countries. The creation of environmentally friendly products and waste recovery techniques has become increasingly important aspects of computer production, use, and disposal. This is due to a decrease in the number of available landfill sites, society becoming more environmentally aware, and increasing scarcity of non-renewable energy sources (Gungor and Gupta, 1999). One term which incorporates all these factors is "green procurement". Green procurement is the environmentally responsible selection of products and services with consideration of the consequences of such a product throughout the various stages of its life cycle (BSD Global, 2002). This implies that the various ecological costs of securing raw materials, manufacturing, transporting, storing, handling, using and disposing of a product, must not only be considered, but become inherent parts of that product's design. Examples include: designing computers which can easily be broken down for recycling and are less hazardous to recycle due to lower levels of toxic components (Lee et al., 2004), or designing efficient systems which effectively separate and recover recyclable components from obsolete systems (Zhang and Forssberg, 1999).

Equipping computer systems with internal energy regulation devices (SVTC, 2005) and ensuring that human and environmental health are not compromised during recovery and end-of-life management, through policy and public education, (Nagel and Meyer, 1999), are all significant components of green procurement.

Green procurement strategies have already been demonstrated in countries such as Germany and Taiwan, where producers are responsible for the recycling of obsolete computers, thus creating an incentive to produce products which can be easily recycled (Lee et al., 2004). The various "ecolabels", such as ENERGY STAR, ensure that computers are running under energy conservation measures (SVTC, 2005), and even Canadian post-secondary institutions such as the University of Manitoba have recently employed green procurement strategies in an on-campus

setting (Searcy, 2001). Due to its broad definition, green procurement can be applied to all facets of the computer industry, thus making it a model strategy not only for the management, but also for the elimination of computer wastes.

Social and Ethical Issues

Because of its constantly changing nature, the area of computer technology is one that is difficult to assign a specific set of moral codes, although it is necessary that ethics be considered when making decisions in this area. Computing creates a whole new set of ethical problems, unique unto itself. Such problems include:

"…the unauthorised use of hardware, the theft of software, disputed rights to products, the use of computers to commit fraud, the phenomenon of hacking and data theft, sabotage in the form of viruses, responsibility for the reliability of output, making false claims for computers, and the degradation of work." (Forester 4)

These problems engender a whole new set of ethical questions, including:

- "is copying software really a form of stealing?"

- "are so-called 'victimless' crimes… more acceptable than crimes with human victims?"

- "does information on individuals stored in a computer constitute an intolerable invasion of privacy?" (Forester 4 – 5)

These questions demand that ethical principles be applied to their resolution because without the consideration of ethics, these grey areas can easily become completely black.

To begin with, it seems that there are four big areas of computer ethics. They are "(1). computer crime; (2). responsibility for computer failure; (3). protection of computer property, records, and software; and (4). privacy of the company, workers, and customers". (De George 338) This part of our discussion will focus primarily on computer crime and privacy.

Computer Crime is intellectual, white-collar crime. Those that commit such crimes must be intelligent enough to manipulate a computer system and in such a position to access it in the first place. One example of computer crime is stealing funds via computer. Often the worst that can happen to such a thief is that he/she is merely required to return the stolen money. Often that person will be fired, assuming he/she is an employee, but may be quickly hired by a competitor because of his/her skill. This creates practically no deterrent to committing computer theft because legal action is not often taken against the perpetrator.

Another example is unauthorised computer entry. In entering a computer unauthorised, the perpetrator can steal a company's trade secrets and data. Such a crime could be committed by an employee aiming to sell such secrets to a competitor or by an outside source wanting to steal such secrets to promote his/her own well-being. This crime involves both an invasion of property and privacy and also compromises the computer system itself.

This crime goes along with the idea of hacking. Hacking is defined as "any computer-related activity which is not sanctioned or approved of by an employer or owner of a system or network" (Forester 44). Such an activity deals with the ethical dilemma of who actually owns

information and who should have access to that information. At many universities, Computer Science professors have their students hack into the university's system to prove their skill and knowledge of computer systems.

This poses a serious ethical dilemma. Since the students are not causing any harm to the system; is such an action morally reprehensible or acceptable? Many computer professionals feel that this act is not ethically sanctioned and the Computer Science professors must address the issue of computer ethics more fervently in their classes.

Another area of computer ethics regards privacy. The privacy issue focuses on the computer's most basic functions, "its capacity to store, organised, and exchange records". A great deal of concern has to do with the amount of information gathering that is made possible by computers. This puts people's personal information in a vulnerable position. If someone hacks into a computer system, all this information is at his/her disposal. In this way, such crimes as identity theft can occur.

Furthermore, when stored information can be easily exchanged, the effect of a small error can be magnified. Such errors can stay in the system indefinitely. Computers "create the possibility that incidents in one's life or errors in one's records will follow one through life, profoundly affecting how one is perceived and treated". It is because of this effect that people lose control over their lives and the information about them.

Thus, it seems that there are both good and bad consequences of computerised records. A good consequence is that an organisation's need for information suggests "access to relevant information might improve decision making and, therefore, make organisations more efficient". This in turn provides a positive result for the individual because it could mean better services or savings.

However, bad consequences still exist. These are related to the fact that "information is used to make decisions about individuals and such decisions may be based on irrelevant and inaccurate information." There is no way to ensure that the power exercised by organisations because of this access to information is used fairly. Thus, it seems that there should be a balance between the need for information on the part of an organisation and the interests of the individual.

Another area of concern in conjunction with all of these has to do with the power computer professionals wield because of their knowledge of computer systems. Computer professionals can act in one of two ways: "(1). When it is unclear, assume information is in the public realm until there is some evidence that it is not; or (2). When it is unclear, assume information is private unless or until there is evidence that it is not". It is desirable that a professional adopt the second rule because it allows the professional to protect himself or herself from ethical indiscretions, while the first allow for a greater chance of ethical breach.

There are two main reasons for concern regarding this allocation of power to computer professionals. "First, increasing power in the hands of some often leads to exploitation of others, and this is an ethical matter. Second, certain kinds of power are necessary for a decent life, a moral life, and so this also may be an ethical matter". (Johnson 73) Computer professionals should have an obligation to use the information they have access to in a proper manner, but some chose to use this information immorally to the detriment of others.

The power of the computer professional also poses a threat because it is entirely centralised. As noted previously, computers allow for large amounts of information to be stored in one small space. Concern about this centralisation arose because "people reasoned that in a democratic society there is a struggle between the government and the citizenry such that as government agencies become more and more powerful, citizen control and citizen input may become less and less effective". Some people fear that if the government has too much control over information, their privacy will be compromised. Those who do not want to see computers in the hands of the government but rather in the hands of individuals, oppose the centralisation of power.

This idea of the centralisation of power coincides with the concept that technology contributes to the feeling of alienation. Alienation has to do with loss of control in the world in which one lives. This is visible in the fact that because of increased technology advancements, computers have taken over jobs that once belonged to people.

An example of this is the concept of artificial intelligence (AI). This is an attempt by computer experts to simulate the components of human intelligence through machines. This engenders many ethical dilemmas, however, because it forces one to ask "not just whether AI itself is a possible goal, but whether AI is a proper goal of human endeavor". (Forester 129) It degrades the human condition to replace humans with intelligent machines, so is this really necessary? This situation now ties in with the original dilemma about the power manifested in technology. It is of key importance that those who hold such power do not abuse it.

Computer technology brings about a whole new field of ethical dilemmas. From computer crime to privacy to the power of computer professionals, this technology has shifted the way the business world must think about ethical decisions. Yet this is difficult because there is no overarching positive ethical force in the American business community. Combined with the fact that technology changes so rapidly, it is hard to establish firm moral codes of conduct regarding computers and follow them strictly.

There are many grey areas for which to account. Many times people chose to blame the computers when they run into trouble. In reality, however, it is the people that make the mistakes because they are the ones who created the technology. People merely use computers as scapegoats to avoid responsibility. This is why it is of utmost significance to educate people about the power, and potential abuses of computer technology. It is only in doing so that society will acquire a firm grasp of computer ethics and handle moral dilemmas regarding computing in an ethical and proper manner.

Student Activity 11.1.4.3

The article below is taken from the ABC News. Read through and answer the questions that follow.

FBI Pushes for Cyber Ethics Education
W A S H I N G T O N, Oct. 10
By D. Ian Hopper

Thou shalt not vandalize Web pages. Thou shalt not shut down Web sites. Thou shalt not covet thy neighbor's MP3s.

FBI agents are spreading a new gospel to parents and teachers, hoping they'll better educate youths that vandalism in cyberspace can be economically costly and just as criminal as mailbox bashing and graffiti spraying.

The Justice Department and the Information Technology Association of America, a trade group, has launched the Cybercitizen Partnership to encourage educators and parents to talk to children in ways that equate computer crimes with old-fashioned wrongdoing.

The nascent effort includes a series of seminars around the country for teachers, classroom materials and guides and a Web site to help parents talk to children.

"In a democracy in general, we can't have the police everywhere," said Michael Vatis, director of the FBI's National Infrastructure Protection Center, which guards against computer attacks by terrorists, foreign agents and teen hackers.

"One of the most important ways of reducing crime is trying to teach ethics and morality to our kids. That same principle needs to apply to the cyber world," he said.

1. The first line reflects few "commandments" in the use of computer technology. Based on the previous discussions on the environmental, social and ethical issues of computer technology use, create five of these commandments in your own words.

    a. _____

        _____

    b. _____

        _____

    c. _____

        _____

    d. _____

        _____

e. _____

_____

2.   Give two examples each on how the role of the family and school can help in teaching ethics and morality to children on the use of computer technology.

Family

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School

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11.1.4.4   Government Controls and Laws on ICT

Conflict of laws in cyberspace has become a major cause of concern for computer security community. Computer users have to obey the law, just like anybody else.

Since computers are capable of giving great power to their users, a number of laws apply specifically to them. Consequently, the following are other ICT Laws which govern the cyberspace as we know it.

- Data Protection Act 2004 (as amended)

- Computer Misuse and Cyber-Crime Act 2003

- Postal Services Act 2002 (as amended)

- The Information and Communication Technologies Act 2001 (as amended)

- The Electronic Transaction Act 2000 (as amended)

- Independent Broadcasting Authority Act 2000 (as amended)

- Copyright Act 1997 (as amended)

- Child Protection Act

Let us first study the Data Protection Act 1988 (DPA). Most businesses have to register as users of personal data. There are exemptions: mainly those who use data for crime prevention, national security, tax collection, or mental health reasons. Within the Data Protection Act, the people data is called data subjects.

Data subjects have a number of rights. These include the right to:

- see data held on them on request.

- alter inaccurate or incorrect data.

- sue if data is wrong, and the mistake causes harm to them.

Data is collected by data controllers. A person called the data commissioner exists to help make sure the Act is followed.

There are eight principles governing this act which must be adhered to. Study the table of the Eight principles of the Data Protection Act below.

Principles	Meaning
Personal data should be obtained and processed fairly and lawfully.	This means that you should be told about the data which is being collected about you and should be asked for your permission to collect it. You should also be made aware of the reason why the data is to be collected and for what it will be used.
Personal data can be held only for specified and lawful purposes.	The Data Controller has to state why they want to collect and store information when they apply for permission to be able to do so. If they have used the data they have collected for other purposes, they are breaking the law.
Personal data should be adequate, relevant and not excessive for the required purpose.	Organisations should only collect the data that they need and no more.
Personal data should be accurate and kept up-to-date.	Companies should do their best to make sure that they do not record the wrong facts about a data subject. Your school needs to know your parents' number as they may need to contact them in case of emergency. However, they do not need to know what your grandmother's name is, nor do not need to know your eye colour.
Personal data should not be kept for longer than is necessary.	Organisations should only keep personal data for a reasonable length of time. Hospitals might need to keep patient's record for 25 years or more, which is acceptable since they need that information to treat an illness later on. However there is no need for a personnel department to keep the application forms of unsuccessful job applicants.
Data must be processed in accordance with the rights of the data subject.	People have the right to inspect the information held on them (except in certain circumstances). If the data being held on them is incorrect, they have the right to change it.
Appropriate security measures must be taken against unauthorised access.	This means information has to be kept safe from hackers and employees who do not have the rights to see it. Data must also be safeguarded against accidental loss.
Personal data cannot be transferred to countries outside the European Union (E.U.) unless the country has similar legislation to DPA.	This means that if a company wishes to share data with an organisation in a different country, that country must have similar laws to the Data Protection Act in place.

The Computer Misuse Act and Cybercrime Act is aimed at reducing hacking and the threat from viruses, there are three main offences covered by the Act:

- Unauthorised access to computer material (hacking). This includes copying software illegally (called software piracy).

- Gaining unauthorised access to a computer to carry out serious crimes like fraud or blackmail.

- Unauthorised changing of computer files, including planting viruses and deleting files.

Conviction for any of the above can lead to an unlimited fine or five years in prison. Moreover, the Computer Misuse and Cybercrime Act 2003 had been introduced for legal protection against hackers and regulating criminal behaviour in the IT world. Moreover, this Act was enacted to provide for repression of criminal activities perpetrated through computer systems. This legislation is used to protect the society from cybercrimes and to give a strong signal to would-be perpetrators. Cyber criminals face severe penalties if found guilty by this law. Three common cyber-crimes, namely financial crimes, illegal interception of computer services and child pornography on the Web have been made criminal offences under the Computer Misuse and Cybercrime Act.

The Postal Services Act is an Act of the Parliament of the United Kingdom, relating to the postal industry. The Bill has four main objectives. It will give the Post Office the scope to modernise and run a fully commercial business in the 21st century. It will achieve that by converting it from a statutory corporation to a public limited company, with ownership remaining with the Crown. That will complement the greater financial flexibility that we intend to give the Post Office. The measure will promote competition by establishing a regulator, which will reduce the part of the market that is reserved largely as a monopoly for the Post Office. The reserved area will be reduced and opened to competitors to the extent that the universal service obligation will continue to be fulfilled. The Bill will put consumers first by establishing a new independent regulator and a new consumer council. Both will have strong powers to protect and promote the interests of those who use postal services. The Bill will reinforce the Government's commitment to a modern counters network, which will ensure reasonable access to the counter services offered by the Post Office.

The next law is the Information and Communication Technologies Act that was enacted by the Parliament of Mauritius. It aimed to establish the Information and Communication Technologies Authority, the Information and Communication Technologies Advisory Council, the Information and Communication Technologies Appeal Tribunal and to provide for the regulation and democratisation of information and communication technologies and related matters.

In addition, the Parliament of Mauritius also enacted the Electronic Transaction Act which aimed to provide for an appropriate legal framework to facilitate electronic transactions and communications by regulating electronic records and electronic signatures and the security thereof.

The Independent Broadcasting Authority Act enacted by the government of South Africa aimed to provide for the regulation of broadcasting activities in the public interest; for that purpose to establish a juristic person to be known as the Independent Broadcasting Authority which shall function wholly independently of State, governmental and party political influences and free from political or other bias or interference; to provide for the representation of that Authority by and its functioning through a council, and to define the powers, functions and duties of that Authority; to provide for the devolution of powers relating to the administration, management, planning and use of the broadcasting services frequency bands to the said Authority; and to provide for incidental matters.

Continuing, the Copyright, Design and Patents Acts aim to protect the investment of time, money and effort by the people who create original pieces of work. This includes the authors of books, composers of music, the makers of films, a computer game designer or a company that creates applications. It aims to provide the appropriate legal framework for the protection of intellectual property rights, including software and electronic databases. It applies to material on computer as well as printed work. This means that you must credit any work that you download or copy from other sources. Even then, you may still have broken the law. This law applies to material on a computer, including websites. This also means that it is illegal to copy computer software without a license to do so like using a pirated copy of the software - just as it is illegal to copy entire books without a license. In brief, this Act has two main purposes: (1). to ensure people are rewarded of their endeavours and (2). to give protection to the copyright holder if someone tries to copy or steal their work.

Lastly, the Child Protection Act is for the protection of children against any harm or abuse of any form. As the most fragile in the society, children are prone to be subjects of abuse and harm. Every country has its own child protection legislation. This legislation can protect the child from any form of harm and abuse. It is worthy to take note that the PNG Parliament passed the Lukautim Pikinini Act in 2009. The objective of this Act is to protect and promote the rights and wellbeing of all children regardless of gender and to protect children from all forms of violence, abuse, neglect, exploitation and discrimination, with a clear focus on services for prevention and family strengthening. The Act is based on the principles and provisions of the Convention of the Rights of the Child, placing the best interests of the child as the paramount consideration and requiring that protective interventions prioritise community based mechanisms over institutional alternatives. The Act legislates the responsibility of parents to meet the basic rights of children, including equal access to school and removes previously legislated discrimination against children born outside of marriage. The introduction of a stronger, rights-based legislation now enables all children to demand the right to protection from statutory authorities.

The importance of ICT and its vast effects on the society has paved way for a new discipline, the ICT Law which a new legal area of expertise starts to establish itself in the field of computer science, internet and telecommunication. The digitalisation of data, the rapid developments in the field of mobile telephony and their general legal framework are complex and linked, making it impossible to classify the rising questions to a single classical branch of the intellectual property law. IT law not only reaches into the areas of software law, trademark and domain name law, but also rises questions in the fields of contract law, administration and data protection law. Likewise, problems arise, for example concerning advertising and liability law.

These timely developments prove that the importance of ICT which includes the areas of the information technologies (IT) and communication technologies has strongly grown in the last decade. The increasing merger of the data, information and communication technology implicates that the legal understanding of life circumstances requires a substantiated comprehension of the technological principles and correlations.

Student Activity 11.1.4.4

In your own words, write a description of the given law or act and state its importance.

Law/ Act	Description	Importance
1. Child Protection Act		
2. Copyright, Design and Patents Acts		
3. Data Protection Law		

Law/ Act	Description	Importance
4. Computer Misuse and Cybercrime Act		
5. Independent Broadcasting Authority Act		

11.1.4.5   Netiquette: Rules of Behaviour on the Internet

The rise of computer technology paved way for new world with a new culture to exist. The cyber space has its own conventions. One needs to comply by its rules to avoid "social blunders". One might offend people without intending to do so or one might misunderstand what others say and take it as an offense when it is not intentional.

The existence of internet provides us with so many chances to communicate and have our say by participating online. There are online discussion forums and social networking sites where one can share knowledge and ask other people questions on just about every topic imaginable. One might also provide input on issues that affect social life and community by participating in online consultations.

It is worth knowing how to represent oneself online, because no one can tell who will see what one has written. Also, no one is always sure on how other people will interpret what one has written. This is important because it can be hard to change or remove something from the internet once it has been published.

Before we will discuss how netiquette came to existence, let us first define the word.

The word netiquette is a combination of 'net' (from internet) and 'etiquette' which means respecting other users' views and displaying common courtesy when posting your views to online discussion groups. It is also a set of rules for acceptable online behaviour. Similarly, online ethics focuses on the acceptable use of online resources in an online social environment.

Both phrases are frequently interchanged and are often combined with the concept of a "netizen" which itself is a contraction of the words inter<u>net</u> and citi<u>zen</u> and refers to both a person who uses the internet to participate in society, and an individual who has accepted the responsibility of using the internet in productive and socially responsible ways.

Picture collage representation of Netiquette

Network etiquette (commonly known as netiquette) is the 'golden rules' or do's and don'ts of online communication. The Core Rules of Netiquette by Virginia Shea (2003) is a good place to start. Shea describes ten rules that cover both how to be courteous online as well as some of the informal 'rules of the road' of cyberspace.

1. **Remember the Human**
    Communicating online is different from communicating face-to-face. One does not have the luxury of gestures, the tone of voice or facial expressions to support because there are only words to use. However, if one organises himself well then he may find the discipline of online discussions more productive than many face-to-face situations.

    Be respectful to   others. Before responding to a posting, think to oneself-would you say it to their face? If no, then one needs to edit the posting. As a rule always read, what you have written before you send it.

2. **Adhere to the same standards of behaviour online that you follow in real life.**
    Do not lower your own ethical/personal behavioural standards just because you are in cyberspace. You must never belittle, harass, or insult other people. No discriminatory comments (racist, sexist or homophobic) will be tolerated. This is not just about being polite it is about abiding by the law.

3. **Know where you are in cyberspace**
    Not all online discussion groups are the same. What might be perfectly acceptable in one domain may not be appropriate in another.

4. **Respect other people's time and bandwidth**
    Do not ramble. Just get to the point succinctly and do not post multiple copies of the same response to different threads in the same discussion board. Opening new   threads or attachments can be time-consuming so make it worthwhile for the reader.

5. **Make yourself look good online**
    When participating in online discussions, you will be judged on your ability to express yourself effectively in writing. Spelling and grammar do count so brush up on your skills. Pay attention to the content of your message and make sure you have researched your material so that you know what you are talking about. Make sure that your argument is clear and logical. Keep it simple and be polite. You want to avoid creating any potential misunderstandings.

6. **Share expert knowledge**
    Do not be afraid to ask questions and do not be shy about sharing expert knowledge. The   Internet itself came about because scientists wanted to share knowledge (Shea, 2005) and its rapid growth is due to more of us wanting to share our knowledge. You need to remember to cite your sources and not plagiarise. Plagiarism is an act of taking other people's work and idea and passing it off as one's own. One must not share information without a copyright permission.

7. **Help keep flame wars under control**
Flaming (the posting of strongly held opinions that may be deliberately provocative) is a long-standing network tradition. Avoid offending others.

8. **Respect other people's privacy**
Respecting other people's privacy is good netiquette so be careful about the content of messages.

9. **Do not abuse your power**
It is important to respect others and their opinions. It is good to acknowledge a different point of view and also be able to present your point of view. Avoid SHOUTING (using capital letters) and being dogmatic or overly arrogant, dominating and authoritative.

10. **Be forgiving of other people's mistakes**
Everyone was a discussion board beginner once. Try not to show off or put people in their place by correcting them publicly (especially spelling mistakes). Inform them privately if they have done something that is a real no-no but it is best to assume that they do not know any better, rather than they have done it deliberately.

Most internet users automatically apply the same responsible respectful behaviour online as they do in every other environment and by nature apply netiquette an online ethics, and are good netizens. The minority who fail to apply societal values in some or any environment including the internet are quickly identified as exceptions to be dealt with on a social, or criminal level.

Student Activity 11.1.4.5

Study the given netiquette rules below. State whether the rule is a DO or a DON'T on the space provided.

_____ 1.   Ask yourself, "Would you say it to that person's face?"

_____ 2.   Be confrontational just to start a fight.

_____ 3.   Be ethical.

_____ 4.   Break the law.

_____ 5.   Forward spam, jokes or chain letters unless a recipient actually wants it.

_____ 6.   Jump onto a web page without making sure it is safe.

_____ 7.   Remember the other people in Cyberspace are all human beings with feelings.

_____ 8.   Remember your words are never erased. They will always be 'out there'.

_____ 9.   Do not do unto others: The Golden Rule!

_____ 10. Use capital letters unless you intend on YELLING!

_____ 11. Use good grammar and spelling.

_____ 12. Use offensive language.

11.1.4.6   Ergonomics in ICT

Ergonomics is the science of designing things with the comfort, safety and efficiency of people in mind. Ergonomics allow designs of computer workplaces to be as safe and efficient as possible - for example the chair needs to be a certain height, distance from the monitor needs to be just so. The light need not too bright and not too dim.

Ergonomics is necessary especially when the user is constantly engaged in repetitive and prolonged computer work and without applying computer ergonomic rules, he becomes more susceptible to muscle aches, discomfort and potentially serious repetitive-motion injuries like carpal tunnel syndrome which is a painful condition of the hand and fingers caused by compression of a major nerve that passes over the carpal bones through a passage at the front of the wrist. Moreover, improper body posture and incorrect positioning of the computer can also cause many problems that can be avoided by following some simple computer ergonomic principles. Let us study the following ergonomic principles:

1.   Use a Good Chair
A chair with a dynamic, adjustable back that is angled slightly will support your back well. The height of the chair should be adjusted so that your feet rest flat on the floor.
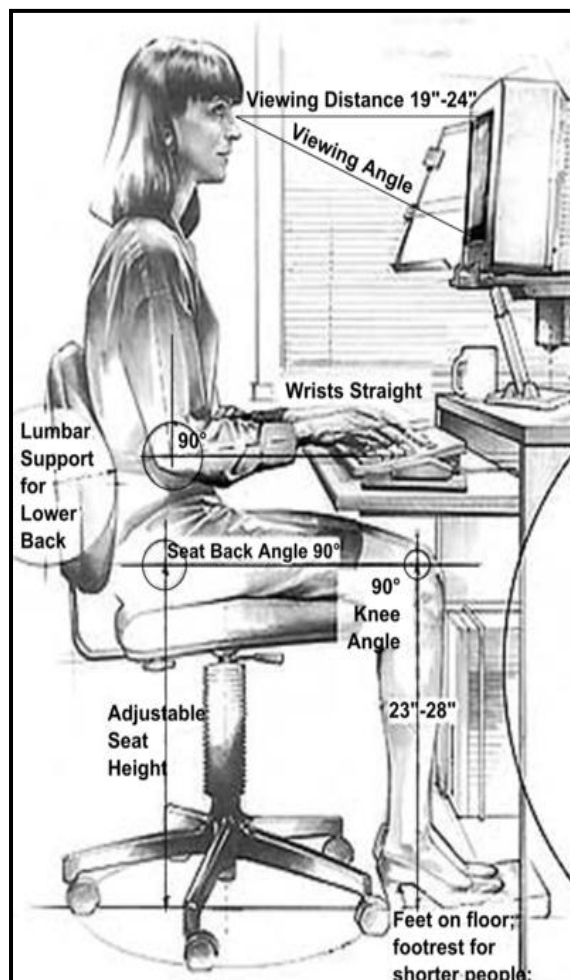
Ergonomics show proper positioning and angles when seated in front of a computer.

2.   Position the Computer Monitor Correctly
        The top of the monitor should be placed at least 2 to 3 degrees higher than the eye
        level.

3.   Use an Anti-Reflection Screen
        In order to avoid glare on the monitor screen, use an anti-glare optical glass filter on the
        computer monitor. Glare causes eyestrain and encourages the user to twist his neck and
        head to try to avoid it.

4.   Keep Distance from the Monitor
        Maintain a distance of at least an arm's length between the user and the monitor. It is
        even better if the user can increase this distance, as long as the screen is still readable
        for him.

Proper distance and position of the user.

5.   Take a Break
        Take multiple short breaks during work. One does not have to leave the office; just get
        up, walk around and stretch at least once each hour. Focus the eyes at different
        distances to prevent eye fatigue. The rules of computer ergonomic dictate that the user
        must rest your feet on the floor or on a comfortable footrest. The user must also
        remember to keep moving intermittently during work for continued blood circulation.

6.   Use a Document Holder
        If the work involves looking at a document while typing, use a document holder aligned
        with the computer screen so that there will be no constantly looking up and down at the
        paper.

7.   Watch Your Wrist and Forearm Position
        Rest the forearms on the armrests of the chair and keep the wrists straight while typing.
        Never bend the wrists to reach the keyboard.
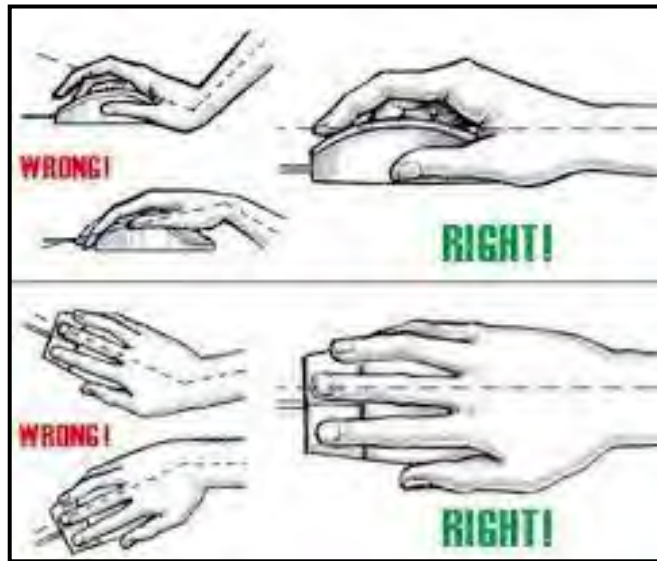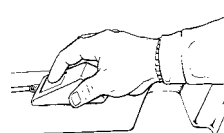
Proper wrist and arm position when using the mouse

8. Center-Align the Monitor and Keyboard
   Position the keyboard and monitor so that they are aligned directly in front of the user.

9. Check Your Keyboard and Mouse Height
   According to computer ergonomic rules, make sure the keyboard is set at a height where the wrists do not have to bend to reach it.

10. Ensure Your Work Surface is Stable
    Make sure that you have a stable work surface and a firm keyboard tray. It must neither bounce   nor wobble.
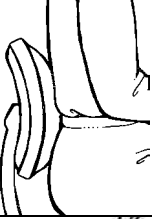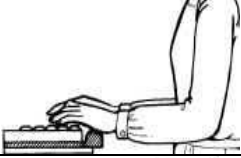
If a user follows computer ergonomic rules for better positioning of his home or office workstation, he will start seeing results almost immediately. He will not only feel better, he may also avoid computer-related work injuries in the long run.

Student Activity 11.1.4.6

Look at the pictures below write A if it does and B if it does not follow the principles of ergonomics. Write your answer on the spaces provided.

_____ 1.	
_____ 2.	

_____ 3.	
_____ 4.	
_____ 5.	
_____ 6.	
_____ 7.	The screen should be in front of you and 18 to 28 inches away
_____ 8.	
_____ 9.	
_____ 10.	

Summative Learning Activity 11.1.4

A.   Fill up the table below.

Ten Commandments of Computer Ethics	Relate to ICT Law	Give an example of a social, environmental or ethical issue arising from this when it is not followed.
1. Thou shalt not use a computer to harm other people.		
2. Thou shalt not interfere with other people's computer work.		
3. Thou shalt not snoop around in other people's computer files.		
4. Thou shalt not use a computer to steal.		

5. Thou shalt not use a computer to bear false witness.		
6. Thou shalt not copy or use proprietary software for which you have not paid.		
7. Thou shalt not use other people's computer resources without authorisation or proper compensation.		
8. Thou shalt not use other people's intellectual output.		
9. Thou shalt think about the social consequences of the program you are designing.		
10. Thou shalt always use a computer in ways that insure consideration and respect for your fellow humans.		

B.   **Write a 100 word- reflection of the article taken from ComputerWeekly.com. Consider a mention of the previous topics on impacts of computers to society, measures to protect computer and data and ICT laws. Write on the space provided after the article.**

CYBER ATTACKS

Hacker group Lizard Squad downs Sony PlayStation Network

Warwick Ashford
Monday 08 December 2014
09:30

Sony remains in the firing line of hackers who have now brought down its PlayStation Network and PlayStation Store.

But hacker group Lizard Squad has claimed responsibility, and not GOP – or "Guardians of Peace" – who said they downed Sony Pictures Entertainment's network on 24 November 2014.

Sony's PlayStation Network (PSN) became unreachable to PS4 and PS3 users just after midnight on Sunday 7 December 2014 UK time, reports the *Express*.

The Lizard Squad tweeted the message: "PSN Login #offline #LizardSquad."

Sony's PSN was among several gaming networks downed by distributed denial of service (DDoS) attacks in August 2014.

The attacks were linked to the jihadist group Islamic State, but a hacker linked to the Anonymous hacktivist collective later said PSN had been targeted to highlight vulnerabilities in Sony's system.

DDoS attacks are commonly used by competitors or activists to take services offline using a variety of techniques that make services impossible to reach.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

C.   Identify three examples of computer and data security threats and provide solutions to resolve these issues.

1.

Threat:

_____

_____

Solution:

_____

_____

2.

Threat:

_____

_____

Solution:

_____

_____

3.

Threat:

_____

_____

Solution:

_____

_____

✓ Answers to Student Activity

Student Activity 11.1.4.1

Answers can be similar to this one below.

Computers have great impact in our lives. It has invaded almost all aspects of human life. Throughout its existence, it had proved to serve its purpose of improving how man does things and the result is an improved way of living.

Computers can be seen almost anywhere, in schools, in hospitals, in offices, in different commercial establishments and even in church. People use computers in variety of ways. The research presented by David H. Ahl speaks of how the respondents view the significant contribution of computers to society. Looking at it, the study can be summarised into points of agreement that there is no denying on how computers are really useful in these four areas: education, enforcement, health care and prevention of fraud.

In all countries, computers play the significant role in helping man accomplish all tasks in an accurate and speedy manner thereby increasing production and improving quality of life that would result in life preservation and maintenance. Because of this technology, we have achieved great heights in economic, social and educational success. Peace and order have greatly improved as well.

Computers are merely technology hence, it is us the human being who must be oriented morally on how we must properly make use of this technology. There will always be disadvantages in every situation. The threats and dangers of using computers can always be minimised, controlled or eradicated if and when humans come together to agree and implement proper and moral ways of its use.

Student Activity 11.1.4.2

x	1.	Authorise any person to access your computer.
✓	2.	Computers must not be left unattended.
✓	3.	Additional security to machines should be done.
x	4.	Passwords can be revealed to any person.
✓	5.	Backup copies must be held off site or kept in a security cabinet.
✓	6.	Stored data should be deleted when no longer needed.
✓	7.	Shredding printed data which are no longer needed.
x	8.	Clicking an unexpected link in an email message or in an IM (instant messaging).
✓	9.	Passwords are changed on a scheduled basis.

✓ 10. Firewalls are installed in the machine.

Student Activity 11.1.4.3

Answers can be similar to these ones below.

1.

   a. Thou shall respect other people's privacy

   b. Thou shall act appropriately when using the Internet

   c. Thou shall not steal any file, data or information from other people

   d. Thou shall not use what is not your property

   e. Thou shall respect the environment while using the computer. Use eco-friendly computers.

2.

Family
The family as the starting point of all moral beliefs and principles must imbibe to the children all good values and right conduct. The family must maintain a good example of proper and moral ways of behaviour for the children to follow.

School
The school must enforce and monitor to strengthen all good values and right conduct of the children. The school must correct and impose proper and moral ways of behaving.

Student Activity 11.1.4.4

Law/ Act	Description	Importance
1. Child Protection Act	Child Protection Act is for the protection of children against any harm or abuse in any form. As the most fragile in the society, children are prone to be subjects of abuse and harm. Every country has its own child protection legislation	This legislation can protect the child from any form of harm and abuse.
2. Copyright, Design and Patents Acts	It aims to provide the appropriate legal framework for the protection of intellectual property rights, including software and electronic databases. It applies to material on computer as well as printed work. This means that you must credit any work that you download or copy from other	The Copyright, Design and Patents Acts aim to protect the investment of time, money and effort by the people who create original pieces of work.

		sources.	
3.	Data Protection Law	Most businesses have to register as users of personal data.	To prevent data misuse especially those who use data for crime prevention, national security, tax collection, or mental health reasons.
4.	Computer Misuse and Cybercrime Act	The Computer Misuse Act and Cybercrime Act is aimed at reducing hacking and the threat from viruses, there are three main offences covered by the Act	The following can be reduced: • Unauthorised access to computer material (hacking). This includes copying software illegally (called software piracy). • Gaining unauthorised access to a computer to carry out serious crimes like fraud or blackmail. • Unauthorised changing of computer files, including planting viruses and deleting files.
5.	Independent Broadcasting Authority Act	The Independent Broadcasting Authority Act enacted by the government of South Africa is aimed to provide for the regulation of broadcasting activities in the public interest	To provide for the regulation of broadcasting activities in the public interest

Student Activity 11.1.4.5

1. Do

2. Don't

3. Do

4. Don't

5. Don't

6. Don't

7. Do

8. Do

9. Do

10. Don't

11. Do

12. Don't

Student Activity 11.1.4.6

<u>**B**</u> 1.

<u>**A**</u> 2.

<u>**A**</u> 3.

<u>**A**</u> 4.

<u>**A**</u> 5.

<u>**B**</u> 6.

<u>**A**</u> 7.

<u>**B**</u> 8.

<u>**B**</u> 9.

<u>**B**</u> 10.

✔ Answers to Summative Learning Activity 11.1.4

A.   Answers may be similar to these ones below.

Ten Commandments of Computer Ethics	Relate to ICT Law	Give an example of a social, environmental or ethical issue arising from this when it is not followed.
1. Thou shalt not use a computer to harm other people.	Data Protection law prohibits entities in using data against any other person or entity. The Child protection Act protects the minors from abuse arising from the use of computers	Misuse of data and information Child abuse in pornography, cybercrimes and the likes.
2. Thou shalt not interfere with other people's computer work.	Copyright, Design and Patents Acts protects the author from any stealing and misuse of his work.	Piracy and plagiarism
3. Thou shalt not snoop around in other people's computer files.	Computer Misuse and Cybercrime Act protects the users against any cybercrimes and hacking	Falsification of documents, misuse of data of other people and defamation of victims
4. Thou shalt not use a computer to steal.	Computer Misuse and Cybercrime Act protects the users against any cybercrimes and hacking Data Protection law prohibits entities in using data against any other person or entity.	Falsification of documents, misuse of data of other people and defamation of victims
5. Thou shalt not use a computer to bear false witness.	Data Protection law prohibits entities in using data against any other person or entity.	False witnessing against the victim
6. Thou shalt not copy or use proprietary software for	Copyright, Design and Patents Acts protects the author from any stealing	Piracy and fraud

which you have not paid.	and misuse of his work.	
7. Thou shalt not use other people's computer resources without authorisation or proper compensation.	Copyright, Design and Patents Acts protects the author from any stealing and misuse of his work.	Plagiarism and violations against intellectual property rights
8. Thou shalt not steal other people's intellectual output.	Copyright, Design and Patents Acts protects the author from any stealing and misuse of his work.	False declaration of work. Plagiarism and violations against intellectual property rights
9. Thou shalt think about the social consequences of the program you are designing.	Computer Misuse and Cybercrime Act protects the users against any computer misuse	Propagation of wrong information and morale to the users
10. Thou shalt always use a computer in ways that insure consideration and respect for your fellow humans.	Child Protection Act protects the children who is the most fragile in the society from any abuse. Copyright, Design and Patents Acts protects the author from any stealing and misuse of his work. Data Protection law prohibits entities in using data against any other person or entity.	Violations to human rights and defamation of people Abuse and misuse of information Plagiarism and stealing Fraud and piracy Cybercrimes

B.   The answers can be similar to these ones below.

Hackers are offenders who go against the different laws of proper use of computers in the society. They steal and cause harm than good to people affected from what they are stealing or digging into. These hackers are people who do not have respect to persons, property and information.

In order to be safe from these groups of people, the institution or organisation must have a strong computer security installed and maintained for regular monitoring against any computer and data misuse. All the people working in the organisation must be oriented with the dos and don'ts of computer, data and network use. There must be policies on these matters and the administration must be clear on the consequences of each misuse the computer, data and network.

C.   Answers can be similar to these ones below.

1.   Threat: Unauthorised access to computer

      Solution: Establish strong passwords

2.   Threat: viruses, worms and Trojan

      Solution: Install a strong firewall and virus-checking on computers

3.   Threat: Email hacked

      Solution: Consider whether the content of the email should be encrypted or password protected

Summary

Computers have touched every part of our lives: the way we work, the way we learn, the way we live, even the way we play. It almost is impossible to go through a single day without encountering with a computer, a device dependent on a computer, information produced by a computer, or a word that was introduced or whose meaning has changed with the advent of computers. Because of the significance of computers in today's world, it is important to be computer literate. Being computer literate means you have knowledge and understanding of computers and their uses.

This module presented broad discussions of concepts and terminology related to computers. The idea of computer literacy is introduced. You discovered what a computer is and what it does. You learn about the components of a computer, the power of computers, computer hardware and software, and computer and society. Information processing cycle, categories and parts of computers are identified, including personal computers, minicomputers, mainframe computers, and supercomputers. Data handling and file management provided a much needed know how on electronic file management and data security while hardware and software re oriented in a higher level what hardware, peripheral, operating system and software types are. You also discovered how people employ computers, from home users to large business users. Finally, you learnt how people use computers to provide information. Relevant issues in relation to computer use were discussed as well as how to properly behave in the electronic world. Reading and understanding the material in this chapter should help you better understand these on topics as they are presented in more detail in the following chapters.

This introductory module is designed as support for other Grade 11 Information and Communication modules. It aims to familiarise those who may be unacquainted with some of these basic computer concepts. As well as describing the concepts associated with computer technology, this module explains some of the key concepts necessary to establish knowledge and understanding of computer basics needed to study the other modules. This has provided an avenue for the discussion of the entire module on Understanding Computers.

In this module we have identified and demonstrated the following:

- identified and demonstrated the appropriate use of a range of hardware and software components and peripheral devices

- described major components of a computer system and explained their functions

GLOSSARY

Access- To call up information out of storage.

> **Random access** - A technique that permits information to be directly retrieved, regardless of its location on the storage medium.

> **Sequential access** - A technique for retrieving stored information that requires a sequential search through one item after another on the storage medium.

Access time- The amount of time it takes for requested information to be delivered from disks and memory.

Active matrix display- A type of monitor typically used on laptop or portable computers; provides a brighter, more readable display than older LCD equipment.

Ada
A programming language developed at the behest of the US department of Defense for use in "real time systems containing embedded computers. The name commemorates Augusta Ada King who assisted Charles Babbage.

Adapter- A circuit board that plugs into a computer and gives it additional capabilities. (See also Circuit board.)

AI- See Artificial intelligence.

Algorithm- A step-by-step procedure designed to solve a problem or achieve an objective.

Alpha testing- First-stage testing of computer products, typically done in house by the developer. (See also Beta testing; Gamma testing.)

Alphanumeric- Consisting of letters, numbers, and symbols.

Antivirus software- A program designed to look for and destroy viruses that may infect the memory of a computer or files stored on a computer.

Applet- A small application, that is, a program designed to perform a simple task. An applet is usually embedded within a larger program or downloaded from the Internet when needed.

Application (or app) - A program designed to perform information processing tasks for a specific purpose or activity (for example, desktop publishing and database management). (See also Applet; Killer app.)

Archive- A file compressed for more efficient use of storage space. The compression of files may be accomplished by means of such programs as StuffIt.

Artificial intelligence (AI) - Computer systems that attempt to imitate human processes for analysing and solving problems.

Ascending sort- Sorting records from A to Z or 0 to 9. (See also Descending sort.)

ASCII (pronounced as-kee) - An acronym derived from American Standard Code for Information Interchange. ASCII is a standard 7-bit code that represents 128 characters. The use of this standard code permits computers made by different manufacturers to communicate with one another.

B, b. B is the abbreviation of byte; b is the abbreviation of bit.

Background printing - The ability of a computer to print a document while other work is being done on the keyboard and the display screen at the same time.

Backup- Storage of duplicate files on disks, diskettes, or some other form of magnetic medium (such as tapes) as a safety measure in case the original medium is damaged or lost. (One word as a noun or an adjective: backup procedures; two words as a verb: back up your hard disk.)

Bacn- An e-mail message that might be considered spam except for the fact that the recipient has elected to receive it. Bacn (pronounced bacon) has been described as "e-mail you want but not right now." Newsletters, alerts, and automated reminders are considered examples of bacn.

Bandwidth. The volume of information that a network can handle (usually expressed in bits per second). The greater the bandwidth, the more quickly data can be downloaded from the Internet or moved from a network to a user's computer. The term bandwidth is now also used to refer to a person's attention span (as in "Burt is a low-bandwidth kind of guy") or a person's ability to handle an assignment (as in "Sally lacks the bandwidth to do this job").

The question "How's your bandwidth?" means "Are you busy?"

BASIC
An all-purpose symbolic instruction code.

Basic Input/Output System (BIOS) - A set of programs stored in read-only memory (ROM) on IBM or IBM-compatible computers. These programs control the disk drives, the keyboard, and the display screen, and they handle start-up operations.

BBS - See Bulletin board system.

Beta testing - Second-stage testing of computer products, typically done by potential customers and outside experts to identify problems that need to be fixed   before the product can be released for sale. (See also Alpha testing; Gamma Testing.)

Binary code - The language used by computers in which data and instructions are represented by a series of 1s and 0s. Binary numbering system. A numbering system in which all numbers are represented by various combinations of the digits 0 and 1.

BIOS - See Basic Input/ Output System.

Bit (b) - An acronym derived from binary digit. The smallest unit of information that can be recognised by a computer. Bits are combined to represent characters. (See also Byte.)

Bitmap - A method of storing a graphic image as a set of bits in a computer's memory. To display the image on the screen, the computer converts the bits into pixels.

Bits per second (bps) - A measurement that describes the speed of data transmission between two pieces of equipment. (See also Transfer rate.)

BlackBerry - A wireless palmtop computer that is especially helpful to business travellers. It permits users to send and receive e-mail and view other documents that they have on file. (See also Wi-Fi.)

Blawg - See Blog.

Bloatware - A program that uses an excessive amount of disk space and memory.

Block - A segment of text that is selected so that it can be moved to another location or processed in some other way. (See also Block delete; Block move; Cut and paste.)

Block delete -A command to delete (or erase) a segment of text.

Block move - A command to reproduce a segment of text in another place and at the same time erase it from its original position. (See also Cut and paste.)

Block protect -A command to prevent a page break from occurring within a block of text (for example, a table). (See also Orphan protection; Widow protection.)

Blog - A blog (short for Web log) is an online diary in which an individual records and publishes his or her thoughts on one or more subjects. A blog devoted to legal matters is known as a blawg.

Blogger - Someone who creates and maintains an online diary.

Blogosphere - The complete set of blogs on the Internet.

Blook - A blook is a blog that has been turned into a book or an online book that is published on a blog.

Bluetooth - A protocol that permits a wireless exchange of information between computers, cell phones, and other electronic devices within a radius of about 30 feet.

Board - See Circuit board.

Boilerplate - Standard wording (for example, sentences or paragraphs in form letters or clauses in legal documents) that is held in storage. When needed, it can be used as is, with minor modification, or in combination with new material to produce tailor-made documents.

Bookmark list - See Favorites.

Boot (short for bootstrap) - To start a computer and load the operating system to prepare the computer to execute an application.

Bozo filter - A program that screens out unwanted e-mail or other messages from individuals or organisations you no longer want to hear from.

Bps -See Bits per second.

Bricks-and-clicks - Refers to a traditional business with a Web site. (See also Clicks-to-bricks.)

Bricks-and-mortar - Refers to a traditional business that sells merchandise only in stores. (See also Clicks-and-mortar.)

Brochureware - A product that is being actively marketed, even though the product is not yet (and may never be) ready for sale. (See also Vaporware.)

Browser- See Web browser.

B2B- Business-to-business (online transactions).

B2C - Business-to-consumer (online transactions).

B2G - Business-to-government (online transactions).

Buffer - A holding area in memory that stores information temporarily. Also called cache.

Bug - A software defect that causes a program to malfunction or cease to operate. Some writers now use bug to refer to hardware problems as well. (See also Debugging; Glitch.)

Bulletin board system (BBS) - An online information system, usually set up by an individual (called a system operator, or SYSOP) on a non-profit basis for the enjoyment of other individuals with similar interests. (See also Internet.)

Bundled software - Software that is sold along with a computer system; several software programs that are packaged together (also called software suites).

Burn - To record information on a disc such as a CD-R, a CD-RW, a DVD-R, or a DVD-RW.

Bus - A pathway along which electronic signals travel between the components of a computer system.

Button bar - See Toolbar.

Byte (B) -An acronym for binary term. The sequence of bits that represents a character. Each byte has 8 bits.

C
A programming language originallt developed for implementation of the UNIX operating system.

C++
A programming language derived from C. It has become the language of choice or implementing applications to run under Microsoft Windows.

Cache - See Buffer.

Cancelbot (from cancel robot] - A program that detects spamming in newsgroups and automatically issues a cancel command. (See also Ham.)

Card - See Circuit board; Adapter.

Carpal tunnel syndrome - A wrist or hand injury caused by using a keyboard for long periods of time. A type of repetitive strain injury (RSI). (See also Mouse elbow.)

Cathode-ray tube (CRT) - See Display screen.

CD-R - Compact disc-recordable.

CD-ROM (pronounced cee-dee-rom) - An acronym derived from compact disc-read-only memory. A form of optical storage. One compact disc can hold up to 250,000 text pages; it can also be used to store graphics, sound, and video. (See also DVD-ROM.)

CD-RW - Compact disc-rewritable.

Cell - A box or rectangle within a table or spreadsheet where a column and a row intersect; an area in which information can be entered in the form of text or figures.

Central processing unit (CPU) - The brains of an information processing system; the processing component that controls the interpretation and execution of instructions. (See also Motherboard.)

Character - A single letter, figure, punctuation mark, or symbol produced by a keystroke on a computer. Each character is represented by a byte.

Character set - The complete set of characters-alphabetic, numeric, and symbolic—displayable on a computer. (see also ASCII.)

Character string - A specified sequence of typed characters, usually representing a word or phrase. A character string is often used to locate a particular word or phrase wherever it appears in a document so that it can be automatically replaced with another word or phrase. If a person's name has been consistently misspelled or a date appears incorrectly in several places, the error can be easily corrected. (See also Search and replace.)

Characters per inch (cpi) - The number of characters in a fixed-pitch font that will fit within 1 inch. Characters per second (cps). The number of characters printed in 1second; a measurement frequently used to describe the speed of a printer.

Chat - A method of communication in which people type text messages to each other, thereby holding a conversation over a network such as the Internet. (See also Newsgroup.)

Check box - A small box that appears onscreen alongside each option displayed in a Dialogue box. When an option is selected, an X or a check mark appears inside the box.

Chip - An integrated circuit used in computers.

Chip jewelry - An obsolete computer.

Circuit board - A board or card that carries the necessary electronic components for a particular computer function (for example, memory). The circuit boards that come with the original equipment perform the standard functions identified with that type of equipment. Additional circuit boards expand the kinds of functions that the equipment can perform. Also called a board, a card, or an expansion board.

Clear - A command to erase information.

Click - To quickly press and release a mouse button once while the cursor (mouse pointer) is positioned over a specific item on the screen. (See also Double-click.)

Clicks-and-mortar - Refers to a business that sells merchandise online as well as in stores. (See also Bricks-and-mortar.)

Clicks-to-bricks - Refers to an Internet company that opens stores. (See also Bricks-and-clicks.)

Client/server computing - A network of computers that consists of a file server (a computer that runs a database management system) and individual clients (computers that request and process data obtained from the file server).

Clipboard - A holding area in memory where information that has been copied or cut (text, graphics, sound, or video) can be stored until the information is inserted elsewhere. (See also Copy; Cut; Cut and paste.)

COBOL
Common Business Oriented Language is the de facto standard for commercial processing.

Column - A vertical block of cells in a table or spreadsheet. (See also Row.)

Command - An instruction that causes a program or computer to perform a function. A command may be given by means of a special keystroke (or series of keystrokes), or the command may be chosen from a menu.

Commercial online service - See Internet service provider.

Compatibility - The ability of one type of computer, device, data file, or program to share information or to communicate with another. (See also ASCII.)

Computer - An electronic device that is capable of (1) accepting, storing, and logically manipulating data or text that is input and (2) processing and producing output (results or decisions) on the basis of stored programs of instructions. Some computers are also capable of processing graphics, video, and voice input. Most computers include a keyboard for text entry, a central processing unit, one or more disk drives, a display screen, and a printer—components referred to as hardware.

Control menu - An onscreen Windows element that appears in a box in the upper left corner of a window. The control menu allows the user the option of adjusting the size of the window, closing or reopening the window, or switching to another window.

Cookie - A small text file that a Web server stores on a user's hard drive when the user visits certain Web sites. A cookie contains all the information that a user has to submit on a first visit to a particular Web site in order to gain access. When a user revisits that Web site, the cookie makes it unnecessary for the user to enter the same information all over again. The positive aspect of cookies is that they make it possible for users to take advantage of the convenient "shopping cart" feature of many Web sites. Unfortunately, cookies also make it possible for marketing organisations to monitor users' browsing patterns; users then find themselves the targets of custom-tailored marketing campaigns.

Copy-To reproduce information elsewhere. The original information remains in place. (See also Cut.)

cpi - See Characters per inch.

cps - See Characters per second.

CPU - See Central processing unit.

Cracker - The preferred term (rather than hacker) used to refer to a computer criminal who penetrates a computer to steal information or damage the program in some way.

Crash- A malfunction in hardware or software that keeps a computer from functioning. (See also Bug; Glitch.)

CRT - Cathode-ray tube. (See also Display screen.)

Cursor - A special character (usually a blinking underline, dot, or vertical line) that indicates where the next typed character will appear on the display screen. Also known as the mouse pointer (arrow) or I-beam pointer. Microsoft Word refers to the cursor as the insertion point. (See also Prompt.)

Cursor positioning - The movement of the cursor on the display screen. Most computers have four keys to control up, down, left, and right movement. Many computers also permit the use of a mouse to position the cursor.

Cut - To remove text from its original location and place it on a clipboard. (See also Copy; Paste.)

Cut and paste - To move a block of text from one place to another.

Cyberspace - A realistic simulation of a three-dimensional world created by a computer system; also referred to as virtual reality. Now commonly used to refer to the world of the Internet as a whole.

Cybersquatting - Registering a potentially valuable Internet address in the hope of selling it at a profit later on to an organisation for which this address would be ideal.

Cybrarian -The electronic equivalent of a librarian. A person who makes a career of online research and data retrieval.

Data - Information consisting of letters, numbers, symbols, sound, or images—in a form that can be processed by a computer.

Data compression - A procedure for reducing the volume of data so as to shorten the time needed to transfer the data or to reduce the amount of space needed to store the data.

Database - A stored collection of information.

Database Management System (DBMS) -The software needed to establish and maintain a database and manage the-stored information.

DDE - See Dynamic data exchange.

De1ad-tree edition - The paper version of a publication available online.

Debugging - Locating and eliminating defects in a program. (See also Bug.)

Decimal tab - A type of tab that aligns columns of figures on the decimal point.

Default settings - The pre-established settings (for margins, font, type size, tab stops, and so on) that a program will follow unless the user changes them.

Delete - A command to erase information in storage.

Denial of Service (DoS) attack - A malicious act intended to shut down a Web site or a network by flooding it with too much information. Users who attempt to visit the site will be denied access.

Descending sort - Sorting records from Z to A or 9 to 0. (See also Ascending sort.)

Desktop - The electronic work area on a display screen.

Desktop computer - A microcomputer that is bigger than a laptop.

Desktop Publishing (DTP) - A system that processes the text and graphics and, by means of page layout software and a laser printer, produces high-quality pages suitable for printing or in-house reproduction.

Dialogue box - A message box on the screen that supplies information to - or requests information from - the user.

Dictionary - A program used to check the spelling of each word entered in the computer.

Digerati - A term referring to the elite group of intellectuals in the computer world (in the same way that literati refers to the elite group of intellectuals in the literary world).

Directory - A list of the files stored on a disk.

Disc - A nonmagnetic storage medium that is used in conjunction with optical technology. (See also CD-ROM.)

Disk - A random-access, magnetically coated storage medium used to store and retrieve information. (See also Diskette; Hard disk.)

Disk drive - The component of a computer into which a disk is inserted so that it can be read or written on.

Disk operating system - See DOS.

Diskette - A small, nonrigid disk with limited storage capacity. Also known as a floppy disk.

Display screen - A device similar to a television screen and used on a computer to display text and graphics. Also called a video display terminal (VDT) or a monitor.

Distributed processing system - A form of a local area network in which each user has a fully functional computer but all users can share data and application software. The data and software are distributed among the linked computers and not stored in one central computer.

DNS - Domain name system.

Document - Any printed business communication—for example, a letter, memo, report, table, or form. (See also File.)

Documentation - The manuals or guides distributed with hardware or software.

Domain - Typically, a three-letter element in a Web address or an e-mail address. The domain - commonly referred to as the zone -indicates the type of organisation that owns the computer being identified in the address. For example, .com signifies a commercial organisation; .edu signifies an educational institution.

DOS (pronounced dahs or doss) - An acronym derived from disk operating system. The term refers to a program that allows the computer to manage the storage of information on disks and controls other aspects of a computer's operation.

DoS (pronounced dee-oh-ess) - See Denial of service attack. (Note the differences in spelling and pronunciation between DOS and DoS.)

Dot - The period symbol used in e-mail and Web addresses. Always referred to as a dot (never as a period). Thus the domain name aol.com would be pronounced ay-oh-ell-dot-com. Internet surfers who spend a lot of time in the .com domain are sometimes referred to as dot communists.

Dot-com - An organisation that sells its products or services on a Web site (with a URL ending in .com). A dot-com that fails to stay in business is referred to as a dot-bomb.

Dot matrix printer - A printer that uses pins to produce characters made up of small dots. This kind of printer is generally used by organisations that want to produce form letters or mailing labels economically.

Double-click -To quickly press and release a mouse button twice while the cursor (mouse pointer) is positioned over a specific item on the screen. (See also Click.) The expression "Double-click on that" means "That's really quite good."

Download - To transfer information to the user's computer from another computer.

Drag-and-drop editing - A software feature that allows the user to (1) highlight text to be moved and (2) use a mouse to drag the text to a new location.

DRAM - Dynamic Random Access Memory.

Drop-down menu - See Menu.

DSL - Digital Subscriber Line. DSL is a high-bandwidth method of connecting to the Internet by means of telephone lines.

DTP - See Desktop publishing.

Duplexing - A procedure that permits two computers to transmit data to each other simultaneously.

DVD - Digital video disc or digital versatile disc.

DVD-E - Digital video disc-erasable.

DVD-R - Digital video disc-recordable.

DVD-RAM - Digital video disc–random-access memory.

DVD-ROM -Digital video disc–read-only memory.

DVD-RW - Digital video disc–read/write.

Dynamic data exchange (DDE) - A technology that permits the user to transfer or paste data from one application (for example, a spreadsheet) to another (for example, a report). Because of the dynamic link created by this technology, any change in the data in the original application will be automatically reflected in the data copied in the second application. (See also Object linking and embedding.)

Easter egg -An unexpected image or message that pops up on the display screen when the user innocently enters a secret combination of keystrokes. Programmers playfully code Easter eggs into software and operating systems as a way of surprising and amusing users engaged in more serious tasks.

E-book - A small reading device that displays downloaded digital text.

Editing - The process of changing information by inserting, deleting, replacing, rearranging, and reformatting. Also known as changing or customizing.

Ellipsis marks - Three spaced dots (. . .) that appear as part of a menu option. Ellipsis marks indicate that a Dialogue box will appear if that option is selected.

E-mail (short for electronic mail) - The term e-mail refers to the transfer of messages or documents between users connected by an electronic network. The term is also used to refer to the message that is being transmitted in this way. The original form-E-mail-is rarely seen except at the beginning of a sentence, and industry professionals now commonly write the word without a hyphen-email. One wit has suggested replacing the term e-mail with e-pistle.

Emoticon - See Smiley.

Encryption - Coding confidential data so that only a user with the right password can read the data.

Enter - To input data into memory. (See also Type.) Also the name of a key on a computer keyboard. Enter. To input data into memory. (See also Type.) Also the name of a key on a computer keyboard.

Escape key - A key that permits the user to leave one segment of a program and move to another.

Ethernet - A type of computer network.

Ethernet card - A circuit board that allows a computer to be connected to a network by cable.

Execute - To perform an action specified by the user or the program.

Expansion board - See Circuit board.

Expert system - See Artificial intelligence.

Export - To save information from one computer or program to another.

Extranet - A technology that permits users of one organisation's intranet to enter portions of another organisation's intranet in order to conduct business transactions or collaborate on joint projects.

E-zine - A magazine published in an electronic format. Also called Webzine.

Face time - Time spent dealing with someone face to face (as opposed to time spent communicating electronically). Sometimes referred to as facemail. (See also f2f.)

FAQ. Frequently asked question. Pronounced as a word (to rhyme with pack) or as separate letters.

Favorites - A customised list of a user's favorite Web sites that permits the user to access a particular

Fax (n.) - A shortened form of the word facsimile. A copy of a document transmitted electronically from one machine to another.

Fax (v.). To transmit a copy of a document electronically.

Fax modem - A device built into or attached to a computer that serves as a facsimile machine and a modem.

Field - A group of related characters treated as a unit (such as a name); also, the area reserved for the entry of a specified piece of information.

File - A collection of information stored electronically and treated as a unit by a computer. Every file must have its own distinctive name. (See also File name.)

File name - The name assigned to a file stored on a disk.

File transfer protocol (FTP). A set of guidelines or standards that establish the format in which files can be transmitted from one computer to another.

Firewall - A security system usually consisting of hardware and software that prevents unauthorised persons from accessing certain parts of a program, database, or network.

Fixed-pitch font - A typeface such as Courier in which each character has exactly the same width (like this). Also referred to as a monospace font.

Flame (n.) - An inflammatory e-mail message; one deliberately designed to insult and provoke the recipient. (See also Rave.)

Flame (v.) - To send an inflammatory message.

Flat-panel display - A type of desktop computer monitor that consists of an LCD in a thin case. A flat panel display has a much smaller footprint than the traditional CRT.

Floppy disk - See Diskette.

Folder - A storage area on a disk used to organise files.

Font - A typeface of a certain size and style. Includes all letters of the alphabet, figures, symbols, and punctuation marks. (See also Monospace font)

Footer - Repetitive information that appears at the bottom (the foot) of every page of a document. A page number is a common footer. (See also Header.)

Footnote feature - The ability of a program to automatically position footnotes on the same page as the text they refer to. If the text is moved to another page, any related footnotes will also be transferred to that page.

Footprint - The amount of space a computer occupies on a flat surface.

Forelash - Negative reactions to a technology not yet in existence but excessively promoted in advance.

Format - The physical specifications that affect the appearance and arrangement of a document—for example, margins, spacing, and font.

Forms mode - The ability of a program to store the format of a blank document or form so that it can later be viewed on the display screen and completed by the user. Once a fill-in has been entered, the cursor automatically advances to the beginning of the next area to be filled in. (See also Style sheet;Template.)

Forum - **See Newsgroup.**

FORTRAN
Formula Translation is widely used for scientific computation.

Freenet - A local network that offers free (or low-cost) access to host computers located in libraries and to other public-interest groups in the community. A freenet may also offer limited access to the Internet.

Freeware - Copyrighted software that is available for use without charge. (See also Shareware.)

f2f - Communicating face to face.

FTP - See File transfer protocol.

Function keys - Keys on a keyboard (for example, F1) that give special commands to the computer— for example, to set margins or tabs.

G or GB - See Gigabyte.

Gamma testing - Third-stage testing of computer products, typically done just before the products are released for sale. (See also Alpha testing; Beta testing.)

Gateway - A machine that links two networks using different protocols.

Gigabyte - A measurement of the storage capacity of a device. One gigabyte represents 1024 megabytes. This term may be abbreviated as G or GB; however, GB is the clearer abbreviation since G also stands for the metric prefix giga (meaning 1 billion). A gigabyte is often referred to as a "gig."

Gigahertz (GHz) - A measurement used to identify the speed of the central processing unit. One gigahertz is equal to 1 billion cycles per second.

GIGO - Garbage in, garbage out. In other words, your computer output is only as good as your computer input.

Glitch - A hardware problem that causes a computer to malfunction or crash. (See Bug.)

Global - Describing any function that can be performed on an entire document without requiring individual commands for each use. For example, a global search-and-replace command will instruct the computer to locate a particular word or phrase and replace it with a different word or phrase wherever the original form occurs in the document.

Gopher - A protocol used for locating and transferring information on the Internet. The use of Gopher has diminished as diminished as the Web's hypertext transfer protocol (HTTP) has become the dominant protocol.

Graphical user interface (GUI) - A visual computer environment that permits the user to click on icons or select options from a menu.

Graphics. Pictures or images presented or stored using a computer.

Grok - To research and comprehend something in great detail and great depth.

Groupware - Software that lets network users collaborate on a variety of documents.

GUI (pronounced goo-ee) - See Graphical user interface

Hack - T**o work on an electronic project.**

Hacker - A dedicated computer programmer. The term hacker is sometimes used erroneously to refer to a computer criminal that penetrates and tampers with computer programs or systems. The preferred term for a computer criminal is cracker.

Ham - A legitimate e-mail message that is blocked because it contains one or more keywords associated with spam messages.

Handheld computer - A portable computer smaller than a notebook computer. Also called a palmtop computer.

Hard copy- Text or graphics printed on paper; also called a printout. (See also Soft copy.)

Hard disk -A rigid type of magnetic medium that can store large amounts of information.

Hard drive - Another name for the hard disc that stores information in a computer.

Hard hyphen - A hyphen that is a permanent character in a word. A word that contains a hard hyphen will not be divided at this point if the word comes at the end of a line. (See also Soft hyphen.)

Hard page break - A page-ending code or command inserted by the user that cannot be changed by the program. A hard page break is often used (1) to prevent a table from being divided between two pages and (2) to signify that a particular section of a document has ended and the following text should start on a new page.

Hard return - A command used to end a paragraph, end a short line of text, or insert a blank line in the text. (See also Soft return.)

Hard space - A space inserted between words in a phrase that should remain together (for example, the word page and the number, month and day, number and unit of measure). The hard space ensures that the phrase will not be broken at the end of a line.

Hardware - The physical components of a computer: the central processing unit, the display screen, the keyboard, the disk drive, the modem, the mouse, and the printer. (See also Software.)

Hardwired - Describes something physically built into a system using hardware, instead of being accomplished by programming.

Header - Repetitive information that appears at the top (the head) of every page of a document. A page number is a common header. (See also Footer.)

Hit - A single request for information made by a client computer from a Web server. The popularity of a given Web site is often measured by the number of hits it receives. However, this number can be extremely misleading, since a particular Web page may contain a number of elements, each one of which will be counted as a hit when a visitor opens that page. Thus the number of hits recorded for a particular Web page can be significantly greater than the actual number of visitors to that page.

Home - The upper left corner of the display screen; the starting position of a page or document.

Home page - The main page for a Web site established by an organisation or an individual; it usually serves as the entrance for a series of related pages.

Host computer - A computer that provides information or a service to other computers on the Internet. Every host computer has its own unique host name.

Hot key - A keyboard shortcut that allows quick access to a command or menu option.

Hot list - See Favorites.

HTML - See Hypertext markup language.

HTTP - See Hypertext transfer protocol.

Hyperlink - An element in a hypertext document that is highlighted by means of underlining or the use of a different colour. When a user clicks the highlighted element, the user is connected with another element in the same document or another document.

Hypermedia - An extension of hypertext that integrates audio, video, and graphics with text.

Hypertext - A technology that links text in one part of a document with related text in another part of the document or in other documents. A user can quickly find the related text by clicking on the appropriate keyword, key phrase, icon, or button.

Hypertext markup language (HTML) - The formatting language used to establish the appearance of a Web page.

Hypertext transfer protocol (HTTP) - The protocol used on the World Wide Web that permits Web clients (Web browsers) to communicate with Web servers. This protocol allows programmers to embed hyperlinks in Web documents, using hypertext markup language.

Hyphenation - The ability of a program to automatically hyphenate and divide words that do not fit at the end of a line. If the text is later revised so that the divided word no longer begins at the right margin, the hyphen is automatically removed and the word prints solid. (See also Soft hyphen.)

I-beam pointer - A mouse- or keyboard- controlled cursor that looks like a capital I.

Icon - A symbol (such as a picture of a trash can or a file folder) that represents a certain function. When the user clicks on the icon, the appropriate function is executed. (See also Graphical user interface.)

ICQ (from I seek you). An instant messaging service.

IM - See Instant messaging.

Import - To retrieve any text or other information created by one program (for example, images created by a graphics program) and transfer it to another program (for example, a spreadsheet program).

Indexing - The ability of a program to accumulate a list of words or phrases that appear in a document (along with their corresponding page numbers) and to print or display the list in alphabetic order.

Information processing - The coordination of people, equipment, and procedures to handle information, including the storage, retrieval, distribution, and communication of information. The term information processing embraces the entire field of processing words, figures, graphics, video, and voice input by electronic means.

Information Superhighway (or I-way) - The Internet. Also referred to as the Infobahn (based on the German term for its network of highways, the Autobahn).

Ink-jet printer - A nonimpact printer that forms characters by spraying tiny, electrically charged ink droplets on paper.

Input (n.)- Information entered into the computer for processing.

Input (v.) - To enter information into the computer. (See also Type; Key.)

Input device - A hardware component (such as a mouse, a keyboard, or a microphone) that lets the user input information.

Insert - To add information to a file.

Insertion point - See Cursor.

Instant Messaging (IM) - A chat program that lets people communicate over the Internet in real time.

Integrated circuit - Multiple electronic components combined on a tiny silicon chip. (See also Microprocessor.)

Integrated software - Software that combines in one program a number of functions normally performed by separate programs.

Interface - The electrical connection that links two pieces of equipment so that they can communicate with each other. Also, the software that controls the interaction between the hardware and the user.

Internesia. Forgetting where one obtained a piece of information on the Internet.

Internet (or Net) - A system that links existing computer networks into a worldwide network. The Internet may be accessed by means of commercial online services (such as America Online) and Internet service providers.

Internet community - A group of individuals with common interests who frequently exchange ideas on the Internet.

Internet protocol (IP) address - A unique set of numbers that identifies a computer over a network.

Internet Service Provider (ISP) - An organisation that provides access to the Internet for a fee. Companies like America Online are more properly referred to as commercial online services because they offer many other services in addition to Internet access—for example, news, travel services, and financial and shopping information.

Internet telephony - Another name for Voice over Internet Protocol (VoIP).

Intranet - A private network established by an organisation for the exclusive use of its employees. Firewalls prevent outsiders from gaining access to an organisation's intranet. (See also Extranet.)

I/O - An abbreviation for input/output.

IP address - See Internet Protocol address.

ISP - See Internet service provider.

Java - A programming language designed for programs or applets used over the Internet.

JPEG - _Joint Photographic Experts Group. A format for storing complex graphics in compressed form. The file extension. jpeg or .jpg indicates that a particular file uses this format.

Justification - Aligning lines of text at the left margin, the right margin, both margins, and the center. Text aligned at both margins is considered fully justified. Text aligned only at the left margin is said to have a ragged right margin.

K or KB - See Kilobyte.

Kern - To make fine adjustments in the space between any two characters.

Key - To enter characters into the memory of a computer. (Key is being replaced by the word type. See also Type.)

Keyboard - The device used to enter information into a computer.

Keystroke - The depression of one key on a keyboard.

Keyword - A word or phrase that briefly identifies a document. Keywords serve as the basis for a variety of computer operations—for example, conducting an online search.

Killer app (short for application) - Software that is considered "so great it will blow you away."

Kilobyte - A measurement of the storage capacity of a device. One kilobyte represents 1024 bytes. Kilobyte may be abbreviated K or KB; however, KB is the clearer abbreviation since K also stands for the metric prefix kilo (meaning 1000).

Kluge (pronounced klooj) - An expedient (but often inelegant) way to solve a problem when time is of the essence.

LAN - See Network, local area.

Landscape orientation - The positioning of a page so that information is printed across the long dimension of the paper. (See also Portrait orientation.)

Language - The characters and procedures used to write programs that a computer is designed to understand.

Laptop computer - A portable computer. Also known as a notebook computer.

Laser printer - A nonimpact printer that produces sharper text and graphics than any other type of printer. (See also Dot matrix printer; Ink-jet printer.)

LCD - See Liquid crystal display.

L33t - The term l33t (pronounced leet) is an alphanumeric expression derived from "elite." This term is used to describe a person's prowess in accessing restricted Web sites. (See also W00t.)

Line or paragraph numbering - The ability of a program to automatically number each line or paragraph sequentially in a document. The line or paragraph numbers can be deleted before the preparation of the final printout.

Line spacing - The ability of a program to automatically change vertical line spacing (for example, from double to single to double again).

Linux - A type of open source software. When combined with other components, Linux serves as an increasingly popular operating system that competes with Microsoft Windows.

Liquid Crystal Display (LCD) - A type of monitor typically used on laptop computers or portable computers. (See also Active matrix display; Flat-panel display.)

Listserv - Any software that manages a mailing list. The most widely used programs are LISTSERV (as distinct from the generic terms listserv and listserve), Listproc, and Majordomo.

Load - To transfer information or program instructions into a computer's memory.

Local Area Network (LAN) - See Network, local area.

Log off or log out (v.) - To exit or leave a computer system.

Logoff or logout (n.) - The process of exiting a computer system.

Log on or log in (v.) - To access a computer system. Log onto and log into are not correct.

Logon or login (n.) - The process of accessing a computer system.

M or MB. See Megabyte.

Macro - A time-saving feature (like telephone speed dialling) that allows the user to store in memory a set of keystrokes or commands that will accomplish a certain task.

Macro virus - A type of virus that attaches itself to documents or word processing templates.

Mail merge - The mode.)

Mailbomb - A deluge of process of taking information from a database and inserting it into a form letter or other document in order to customise the document for an individual recipient. For example, mail merge can be used to create the inside address and the salutation for a form letter. (See also Forms e-mail messages from one or more sources, deliberately intended to overload the recipient's computer and make it crash. A mailbomb is typically sent to punish someone guilty of spamming or some other serious breach of netiquette.

Mailing list. An e-mail discussion group devoted to one or more specific topics.

Mainframe. A large computer system.

Malware. Software that disrupts normal computer functions or sends a user's personal data without the user's authorization.

Maximize. A command used in a graphical user interface (GUI) that enlarges a window so that it fills a desktop.

Megabyte. A measurement of the storage capacity of a device. One megabyte represents more than 1 million bytes. Megabyte may be abbreviated M or MB; however, MB is clearer since M also stands for the metric prefix mega (meaning 1 million). A megabyte is often referred to as a "meg."

Megahertz (MHz). A measurement used to identify the speed of the central processing unit. One megahertz is equal to 1 million cycles per second.

Memory. The part of a computer that stores information. (See also Storage.)

Random-Access Memory (RAM). The temporary memory that allows information to be stored randomly and accessed quickly and directly (without the need to go through intervening data).

Read-Only Memory (ROM). The permanent memory of a computer; a set of instructions that has been built into the computer by the manufacturer and cannot be accessed or changed by the user.

Menu. A list of choices shown on the display screen. For example, a format menu would include such options as the type style and the type size to be selected. A menu is often referred to as a pull-down menu, a drop-down menu, or a pop-up menu because it appears onscreen after the user clicks the menu bar or some other item on the screen.

Menu bar. The bar across the top of the screen or window that displays the names of available menus.

Merge. A command to create one file by combining information that is stored in two different locations.

Microcomputer. A small and relatively inexpensive computer, commonly consisting of a display screen, a keyboard, a central processing unit, one or more disk drives, and a printer, with limited storage based upon a microprocessor. (See also Desktop computer; Laptop computer.)

Microprocessor. An integrated circuit on a silicon chip that serves as the central processing unit of a computer.

Middleware. A type of software that connects different applications that were not originally designed to work together.

Minimize. A command used in a graphical user interface (GUI) that reduces a window to an icon or a label, usually at the bottom of a desktop.

MIPS. An acronym derived from millions of instructions per second. Used to measure the speed of a processor.

Modem. An acronym derived from modulator/demodulator. A device that (1) converts digital signals into tones for transmission over telephone lines and (2) converts the tones back into digital signals at the receiving end.

Monitor. The display screen of a computer.

Monospace font. See Fixed-pitch font.

Morph (from metamorphosis). To change one image into another by means of digital technology.

Motherboard. The computer's main circuit board, which contains the central processing unit, the memory, and expansion slots for additional circuit boards called adapters or cards. (See also Adapter.)

Mouse. A hand-operated electronic device used to move a cursor or pointer on the display screen. Mostly used with microcomputers. Referred to in Spanish as el maus. (See also Word of mouse.)

Mouse arrest. To be placed under mouse arrest is to be denied further access to an Internet service provider or a commercial online service as a result of violating the terms of service.

Mouse elbow. A repetitive strain injury (similar to tennis elbow) that is caused by repeatedly using a mouse. (See also Carpal tunnel syndrome.)

Mouse potato. A person who sits glued to a computer screen (in the same way that a couch potato sits glued to a TV screen).

Mousetrapping. Blocking someone's exit from a Web site.

MS-DOS (pronounced em-ess-dahs or -doss). Derived from Microsoft disk operating system. An operating system used on the first IBM and IBM-compatible microcomputers.

MP3. Compact audio and video file format. The small size of the files makes them easy to download and e-mail. Format used in portable playback devices.

Multimedia. The use of several types of media (such as text, graphics, animation, sound, and video) in a document or an application.

Multitasking. The ability of a computer to execute more than one program at a time. The derivative term "multislacking" means playing games at the computer instead of working.

MS-DOS. An early operating system developed by Microsoft Corporation (Microsoft Disc Operating System).

Net. See Internet.

Netiquette. A set of guidelines for formatting and composing e-mail messages.

Netizen. A "citizen" of the Net; an active participant in the Internet community. Netizens in general are sometimes referred to as netkind.

Network. A system of interconnected computers. (See also Notwork; Sneakernet.)

Local Area Networks (LANs) use cable to connect a number of computers within the same location or in close proximity.

Wide Area Networks (WANs) use telephone lines or other telecommunications devices to link computers in widely separated locations. Internet is a system that links existing networks into a worldwide network.

Newbie. A newcomer to a bulletin board system or some other network facility.

Newsgroup. An electronic discussion group maintained over the Internet or tied into a bulletin board system. Each newsgroup is typically organised around a specific interest or matter of concern. Also called a forum.

Newsreader. A program that permits users to read and respond to messages posted on Usenet.

Notebook computer. A portable computer. Also known as a laptop computer.

Notwork. A network that does not live up to its advance billing. Also called a nyetwork.

Number crunching. Processing large amounts of numerical data.

Object Linking and Embedding (OLE). A process that permits the user to take material (referred to as an object) from one source and insert (embed) it in another document. If the user subsequently makes changes in the original material, those changes will be automatically transferred to the second document as a result of the OLE linking process.

OCR. See Optical Character Reader.

Offline. Refers to the state in which a computer is temporarily or permanently unable to communicate with another computer (even though it is turned on and capable of performing other functions). The term offline is also used humorously to refer to "real life." The expression "Let's take that offline" means "Let's discuss that in private."

Offscreen. Refers to any computer function that does not produce a display on the screen.

OLE (pronounced oh-lay). See Object linking and embedding.

Online. Refers to the state in which a computer is turned on and ready to communicate with other computers.

Onscreen. Refers to anything displayed on the screen of a computer.

Open. To transfer a file from a disk into the memory of a computer.

Open source software. Software that makes the underlying source code available to all users at no charge. Users may make changes and improvements as long as they do not try to sell the software commercially. Linux is the best example of open source software currently available.

Operating System (OS). Software that manages the internal functions and controls the operations of a computer.

Optical Character Reader (OCR). A device that can scan text from hard copy and enter it automatically into a computer for storage or editing. Also called an optical scanner.

Option button. An onscreen element that allows a user to select one option from a group of items. An empty circle precedes each option not selected. A dot appears in a circle to signify that the user has selected that option. Also referred to as a radio button.

Orphan protection. The ability of a program to prevent the first line of a paragraph from printing as the last line on a page. When the first line of a paragraph does appear as the last line on a page, it is referred to as an orphan. (See also Widow protection.)

OS. See Operating system.

Outlining. The ability of a program to automatically number and letter items typed in an indented format.

Output. The results of a computer operation.

Output device. A hardware component (such as a monitor, a printer, or a sound speaker) that delivers the results of computer operations to the user.

Overwriting. Recording and storing information in a specific location on a storage medium that destroys whatever had been stored there previously.

Page break. A command that tells the printer where to end one page and begin the next. (See also Hard page break; Soft page break.)

Page numbering. The ability of a program to automatically print page numbers on the pages that make up an entire document. If the document is revised and the total number of pages changes, the page numbering is automatically adjusted.

Pagination. The ability of a program to take information and automatically divide it into pages with a specified number of lines per page. If the information is changed because of the addition, deletion, or rearrangement of copy, the material will be automatically repaged to maintain the proper page length. (See also Soft page break.)

Palmtop computer. A portable computer smaller than a notebook (or laptop) computer that fits on the palm of your hand. Also called a handheld computer.

Papernet. Ordinary mail service. (See also Voicenet.)

Pascal
A programming language in common though decreasing use. It was designed to assist the teaching of programming as a systematic discipline.

Password. A user's secret identification code, required to access stored material. A procedure intended to prevent information from being accessed by unauthorised persons.

Paste. A command that transfers information from a clipboard and inserts it in another location. (See also Cut and paste.)

Patch. A small program that improves an existing piece of software or corrects an error in it.

PC. See Personal Computer.

PDA. See Personal Digital Assistant.

PDF. See Portable Document Format.

Peripheral. A device that extends the capabilities of a computer (for example, a printer).

Personal Computer (PC). A microcomputer for personal and office use.

Personal Digital Assistant (PDA). A palm-sized, handheld computer. Personal Information Manager (PIM). A database management system that permits a user to store and retrieve a wide range of personal information (for example, names, addresses, phone numbers, appointments, and lists of people to call and things to do).

Phishing. A type of computer fraud that tries to trick users into their passwords and other confidential information.

Pica. A measurement used for a font; equal to 1/6 inch or 12 points.

PIM. See Personal Information Manager.

Piracy. The illegal copying of software or other creative works.

Pitch. The number of monospace characters (each with exactly the same width) that will fit in a 1-inch line of text. (See also Fixed-pitch font.)

Pixel. An acronym derived from picture element. The smallest element (a dot) on a display screen. Pixels are used to construct images on the screen.

Platform. A term used to define the type of microprocessor and operating system on which a computer is based.

Plug-and-play. The ability to plug in a peripheral and have it works without difficulty. The term plug-and-play is now sometimes used to refer to a new employee who can immediately do the job without any preliminary training. Because of the problems some users have experienced with items so labelled, they refer instead to plug-and-pray.

POD. Publishing On Demand. A process that allows for the printing of individual copies as orders come in (as distinguished from the traditional method of printing a number of copies on the basis of estimated sales for the foreseeable future).

Podcasting. Posting audio files online so that they can be downloaded to a portable audio player such as an MP3 player.

Point. A measurement that indicates the size of a font; 72 points equals 1 inch and 12 points equals 1 pica.

Pointer. An onscreen device that indicates the current position of the mouse.

Pop-up menu. See Menu.

Port. A socket on a computer into which an external device (such as a printer cable) can be plugged.

Portable Document Format (PDF). A format that makes it possible—with the help of Adobe Acrobat— to view documents that employ different fonts, various types of graphics, and complex layouts.

Portrait orientation. Positioning paper so that information is printed across the short dimension of the paper. (See also Landscape orientation.)

Posting. A message entered into a network (such as a newsgroup) or on a Web site.

Print preview. A software feature that reduces the pages of a document so that a full page (or two facing pages) can be seen on the screen before being printed. This feature permits the user to spot and correct problems in format and page breaks.

Printers. Output devices of various types that produce copy on paper. (See also Dot matrix printer; Inkjet printer; Laser printer.)

Printout. The paper copy of information produced on a printer.

Program. An established sequence of instructions that tells a computer what to do. The term program means the same as software.

Programming language. The rules, conventions, and specific commands used to write a computer program. Most programs must be converted into machine language or binary code so that the instructions can be performed on a specific computer platform.

Prompt. An onscreen symbol (for example, a cursor) that indicates where to type a command; a message that indicates what action is to be taken.

Proportional font. A typeface in which the width of each character varies (as in this sentence), so that the letter I takes much less space than the letter M. (See also Font.)

Protocol. A set of standards that permits computers to exchange information and communicate with each other.

P2P. Peer-to-peer (network).

Publishing on demand. See POD.

Pull-down menu. See Menu.

Push technology. A process that allows a user to obtain automatic delivery of specified information from the Internet to the user's computer—for example, stock market quotes, weather forecasts, and sports scores.

Radio button. See Option button.

RAM. See Memory, random-access.

Rave. To annoy someone by persistently talking about something. The act of raving is different from flaming in that flaming is deliberately provocative and even insulting, whereas raving is simply annoying because it goes on so long.

Read. To transfer information from an external storage medium into internal storage. (See also Storage, external and internal.)

Record (n.). A collection of all the information pertaining to a particular subject.

Redlining. A word processing feature that allows writers and editors to display (by means of a shaded panel or some other method) the additions and deletions they have made in a document. Redlining in drafts of reports, contracts, and manuscripts makes it easy for others to see the changes that have been made. All redlining is removed from the final version of the document.

Response time. The time a computer takes to execute a command.

Retrieve. To call up information from memory or storage so that it can be processed in some way.

Right-click. Using the right mouse button to open context-sensitive drop-down menus.

ROM. See Memory, read-only.

Row. A horizontal block of cells in a table or spreadsheet. (See also Column.)

RSI. Repetitive strain injury; sometimes referred to as chiplash. (See also Carpal tunnel syndrome; Mouse elbow.)

Ruler. A bar (displayed on the screen) that shows the width of the page, the margin settings, the paragraph indentions, and the tab stops.

Save. To store a program or data on a storage device such as a disk.

Scanner. An input device that can copy a printed page into a computer's memory, thus doing away with the need to type the copy. A scanner can also convert artwork and photographs into a digital format and store these in memory.

Screen. See Display screen.

Screen dump. A printout of what is displayed on the screen.

Screen saver. A program that changes the screen display while the user is away from the computer. Originally intended to prevent images from becoming etched on a monitor's screen when that was still a problem. Now used primarily for aesthetic purposes.

Scroll. To move information horizontally or vertically on a display screen so that one can see parts of a document that is too wide or too deep to fit entirely on one screen.

Scroll bar. An onscreen element that allows a user to scroll by using a mouse.

SCSI (pronounced scuz-zy). See Small computer system interface.

Search and replace. A command that directs the program to locate a character string or information (text, numbers, or symbols) wherever it occurs in a document and replace this material with new information. (See also Global.)

Search engine. A free program that helps Web users locate data by means of a keyword or concept. Among the most popular search engines are Google, Yahoo!, Excite, WebCrawler, and AltaVista.

Server. A computer that delivers data to other computers (clients) linked on the same network.

Shareware. Software that usually may be downloaded and used initially without charge; the author may subsequently ask for some payment. (Compare with Freeware.)

Shouting. The use of all caps in e-mail. This practice is considered a violation of netiquette and is actively discouraged.

Small computer system interface (SCSI). A type of hardware and software interface for connecting peripherals such as a disk drive or a CD-ROM.

Smiley. In e-mail messages, a facial expression constructed sideways (for the "lateral-minded") with standard characters. Also referred to an emoticon (emotional icon).

Snail mail. A term employed by e-mail users to refer to regular mail service.

Sneakernet. The procedure for transferring files from one computer to another when the computers are not connected by an electronic network. (Users remove diskettes or other storage devices from one computer and carry them on foot to another.)

Soft copy. Information shown on the display screen. (See also Hard copy.)

Soft hyphen. A hyphen that divides a word at the end of a line; considered soft (non-permanent) because the hyphen will automatically be deleted if the word moves to another position as a result of a change in the text. (See also Hard hyphen; Hyphenation.)

Soft page break. A line inserted by the program to show where a page will end. If copy is added or deleted, the original page break will be replaced with a new soft page break at the appropriate place. (By contrast, a hard page break will remain fixed, no matter what changes are made in the copy.) (See also Pagination.)

Soft return. A software feature that automatically breaks text between words at the right margin. The line ending is considered soft (non-permanent) because the line ending will change if the user adds or deletes text. (See also Hard return; Word wrap.)

Software. The instructions that a computer needs to perform various functions. The term software means the same as program. (See also Hardware.)

Sort. To arrange fields, records, or files in a predetermined sequence.

Spam (n.). The electronic equivalent of junk mail; also called unsolicited commercial e-mail (UCE). (See also Ham.)

Spam (v.). To send an e-mail message to a great number of recipients without regard for their need to know. A user who spams sometimes receives a mailbomb in return as a form of retaliation.

Spider. An automated program that searches the Internet for new Web sites and indexes their URLs and content descriptions in a database for examination by a search engine for matches.

Spim. Spam that is delivered by instant messaging (IM Spim).

Spit. Spam that is delivered by Internet Telephony (IT).

Split screen. The ability of some programs to display information in two or more different areas on the screen at the same time.

Spreadsheet. A program that provides a worksheet with rows and columns to be used for calculations and the preparation of reports.

Spyware. Software that enables a user to track someone's computer activities without that person's consent.

Storage. The memory of a computer.

External storage. A magnetic medium such as a disk, diskette, or tape used to store information; can be removed from the computer.

Internal storage. An integral component of a computer; cannot be removed.

Store. To place information in memory for later use.

Streaming. The process of sending and temporarily storing large amounts of audio or video information in small pieces and playing them back on the computer so that there is a continuous flow.

Style sheet. A collection of the user's formatting decisions regarding font, type size, margins, justification, paragraph indentions, and the like.

Surfing the Net. Browsing through various Web sites on the Internet in search of interesting things.

Surge protector. A device that protects computer hardware from being damaged by sudden increases in voltage.

SYSOP (pronounced siss-op). An acronym derived from system operator. A person who operates a bulletin board system.

Tab grid. A series of preset indentions (usually a half inch apart). If the tabs are reset by the user, the grid will change to show the new location of the tabs.

Tablet. A computer that accepts handwritten notes entered on the display screen by means of an electronic pen. The notes are then converted into text.

TCP/IP. See Transmission Control Protocol/Internet Protocol.

Telecommunications. The process of sending and receiving information by means of telephones, satellites, and other devices.

Telecommuter. An employee who works away from the office (usually at home) and uses a computer (1) to access needed information on the organisation's intranet and the Internet and (2) to communicate with other employees, suppliers, and customers or clients.

Teleconferencing. Conducting a conference by using computers, video, and telecommunications to share sound and images with others at remote sites.

Telnet. A protocol that allows a computer to connect with a host computer on the Internet. The use of Telnet has diminished as the Web's Hypertext Transfer Protocol (HTTP) has become the dominant protocol.

Template. A pre-established format for a document, stored in a computer. The template determines the margins, the type style and size to be used for the text, placement instructions for various elements (such as the date line), and design specifications for certain items (such as a letterhead). The user can modify the original template or create a new template to satisfy personal preferences.

Terminal. Any device that can transmit or receive electronic information.

Terabytes (TB).A thousand gigabytes.

Text. Broadly speaking, the material displayed on a screen or printed on paper. Within a given document, the term refers to the body of the document as distinct from headers, footers, and other elements.

Text entry. The initial act of typing that places text in storage. (See also Type.)

Thread. A series of posted messages that represents an ongoing discussion of a specific topic in a bulletin board system, a newsgroup, or a Web site.

Toolbar. An onscreen element that offers instant access to commonly used commands. The commands are represented by icons on a row of buttons at the top of the screen. Also called a button bar.

Touchpad. The device on a laptop computer that takes the place of a mouse.

Touchscreen technology. The technology that permits a user to perform a function simply by touching the screen in an appropriate spot.

Trackball. An input device in which the user rolls a ball (usually with a thumb) to move the pointer.

Transfer rate. The rate at which data is transmitted between two computers or other electronic equipment.

Transmission Control Protocol/Internet Protocol (TCP/IP). A collection of over 100 protocols that are used to connect computers and networks.

Treeware. Anything printed on paper.

Trojan horse. A type of computer virus that is hidden within an innocent-looking program.

Type. To enter characters into the memory of a computer. For a number of years the verb type began to be replaced by the verb key as a way of emphasizing the difference between a computer and a typewriter. However, the simpler verb type has made a comeback in computer terminology and is now the word commonly seen in users' manuals and on display screens.

Typeface. See Font.

Typeover. See Overwriting.

Uniform Resource Locator (URL). The specific Internet address for a resource such as an individual or an organisation. (See also World Wide Web.)

Uninterruptible Power Supply (UPS). A battery-powered backup system that provides enough electricity to a computer during a power outage (or, in most cases, a brownout or power surge) so that the user can save files before shutting down the computer.

UNIX. A very powerful operating system used as the basis of many high-end computer applications.

Universal Serial Bus (USB). A common standard for connecting multiple peripherals to a computer as needed.

Upload. To transfer information from a client computer to a host computer.

UPS. See Uninterruptible power supply.

URL (pronounced you-are-el or erl). See Uniform resource locator.

USB. See Universal Serial Bus.

Usenet (from Users' Network). A bulletin board system or Internet site that hosts thousands of newsgroups.

User-friendly. Describes hardware or software that is easy to use. A related phrase, user-obsequious, describes hardware or software that is so simplistic in design that it is virtually unusable.

Userid (pronounced user-eye-dee). The name a person must use, along with a password, to gain access to restricted areas on a network.

Vaporware. Software that is being widely advertised, even though it is still in the developmental stage and has serious problems that may doom its eventual release. The premature marketing of software is designed to deter prospective customers from buying competitive products already available for sale. (See also Brochureware.)

Video teleconferencing. A remote "face-to-face chat," when two or more people using a webcam and an Internet telephone connection chat online. The webcam enables both live voice and video.

Video display terminal (VDT). See Display screen.

Virtual reality. See Cyberspace.

Virus. A piece of computer code designed as a prank or malicious act to spread from one computer to another by attaching itself to other programs. Some viruses simply cause a humorous message to appear on the screen. Some cause minor glitches, but others cause serious damage to a computer's memory or disks. Some viruses flood an organisation's Web site, interrupting or entirely preventing access to the organisation's customers. (See also Antivirus software; Denial of service attack.)

Voice over Internet Protocol (VoIP). The transmission of voice communications by means of the Internet Protocol. VoIP is an inexpensive alternative to long-distance telephone calls.

Voicenet. Ordinary telephone service.

VoIP. See Voice over Internet Protocol.

WAIS (pronounced ways). See Wide-Area Information Server.

WAN. See Network, wide area.

Web. See World Wide Web.

Web browser. Software that permits a user—with a click of a mouse—to locate, display, and download text, video, audio, and graphics stored in a host computer on the Web. The most common Web browsers now in use are Internet Explorer and Mozilla Firefox.

Web site. One or more related pages created by an individual or an organisation and posted on the World Wide Web. (See also Home page.)

Webcam. A video camera that sends live images over the Internet to a Web site.

Webcaster. An application that can be custom-tailored to satisfy an individual user's need for constantly updated information in specific areas. A Webcaster, when appropriately programmed, will automatically deliver the needed information to the user's computer. (See also Push technology.)

Webmaster. The person who maintains a specific Web site and is responsible for what appears there.

Wide-Area Information Server (WAIS). An Internet search system that will locate documents that contain keywords specified by the user.

Wide area network (WAN). See Network, wide area.

Widow protection. The ability of a program to avoid printing the last line of a paragraph as the first line on a page. When the last line of a paragraph does appear as the first line on a page, it is referred to as a widow. (See also Orphan protection.)

Wi-Fi. Wireless fidelity. A process that permits high-speed wireless transmission of data.

Wiki. A procedure that permits a Web site to be continually edited or added to by those who visit the site.

Window. A frame that permits users to view messages they have received or documents they are working on.

Windowing. The ability of a program to split its display screen into two or more segments so that the user can view several different documents or perform several different functions simultaneously. (See also Split screen.)

Windows. A Microsoft operating system used on the vast majority of PCs.

Wizard. An interactive feature within an application that helps a user through each step of a task, such as creating a customised document or adding hardware. The term wizard is also used to refer to the person in an organisation who can quickly find and fix everyone else's computer problems.

W00t. The term w00t is an alphanumeric acronym that stands for "we owned the other team." This term is typically employed by Internet users to express happiness or joy. Word of mouse. Gossip spread by e-mail.

Word processing. The electronic process of creating, formatting, editing, proofreading, and printing documents. (See also Information processing.)

Word wrap. A software feature that detects when a word will extend beyond the right margin and automatically transfers it to the beginning of the next line.

Workstation. A desktop computer that runs applications and serves as an access point in a local area network. (See also Network.)

World Wide Web. The component of the Internet that combines audio, video, and graphics with text. Also called the Web or WWW. (WWW is sometimes pronounced triple-dub, to avoid pronouncing each W separately.)

Worm. A type of computer virus that runs a program to destroy data on a user's hard drive. Worms spread by sending copies of themselves to everyone on the user's list of e-mail addresses.

WWW. See World Wide Web.

WYSIWYG (pronounced wiz-zy-wig). An acronym derived from what you see is what you get. A computer design standard that lets the user see on the screen how a page will look when it is printed.

Zombie. A computer that has been hijacked by a cracker without the owner's knowledge and used to perform malicious tasks on Internet.

Zone. See Domain.

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FODE SUBJECTS AND COURSE PROGRAMMES

GRADE LEVELS	SUBJECTS/COURSES
Grades 7 and 8	1. English
	2. Mathematics
	3. Personal Development
	4. Social Science
	5. Science
	6. Making a Living
Grades 9 and 10	1. English
	2. Mathematics
	3. Personal Development
	4. Science
	5. Social Science
	6. Business Studies
	7. Design and Technology- Computing
Grades 11 and 12	1. English – Applied English/Language& Literature
	2. Mathematics - Mathematics A / Mathematics B
	3. Science – Biology/Chemistry/Physics
	4. Social Science – History/Geography/Economics
	5. Personal Development
	6. Business Studies
	7. Information & Communication Technology

REMEMBER:
- For Grades 7 and 8, you are required to do all six (6) subjects.
- For Grades 9 and 10, you must complete five (5) subjects and one (1) optional to be certified. Business Studies and Design & Technology – Computing are optional.
- For Grades 11 and 12, you are required to complete seven (7) out of thirteen (13) subjects to be certified.

Your Provincial Coordinator or Supervisor will give you more information regarding each subject and course.

GRADES 11 & 12 COURSE PROGRAMMES

No	Science	Humanities	Business
1	Applied English	Language & Literature	Language & Literature/Applied English
2	Mathematics A/B	Mathematics A/B	Mathematics A/B
3	Personal Development	Personal Development	Personal Development
4	Biology	Biology/Physics/Chemistry	Biology/Physics/Chemistry
5	Chemistry/ Physics	Geography	Economics/Geography/History
6	Geography/History/Economics	History / Economics	Business Studies
7	ICT	ICT	ICT

Notes: You must seek advice from your Provincial Coordinator regarding the recommended courses in each stream. Options should be discussed carefully before choosing the stream when enrolling into Grade 11. FODE will certify for the successful completion of seven subjects in Grade 12.

CERTIFICATE IN MATRICULATION STUDIES		
No	**Compulsory Courses**	**Optional Courses**
1	English 1	**Science Stream:** Biology, Chemistry, Physics
2	English 2	**Social Science Stream:** Geography, Intro to Economics and Asia and the Modern World
3	Mathematics 1	
4	Mathematics 2	
5	History of Science & Technology	

REMEMBER: You must successfully complete 8 courses: 5 compulsory and 3 optional.

FODE PROVINCIAL CENTRES CONTACTS

PC NO.	FODE PROVINCIAL CENTRE	ADDRESS	PHONE/FAX	CUG PHONES	CONTACT PERSON		CUG PHONE
1	DARU	P. O. Box 68, Daru	6459033	72228146	The Coordinator	Senior Clerk	72229047
2	KEREMA	P. O. Box 86, Kerema	6481303	72228124	The Coordinator	Senior Clerk	72229049
3	CENTRAL	C/- FODE HQ	3419228	72228110	The Coordinator	Senior Clerk	72229050
4	ALOTAU	P. O. Box 822, Alotau	6411343 / 6419195	72228130	The Coordinator	Senior Clerk	72229051
5	POPONDETTA	P. O. Box 71, Popondetta	6297160 / 6297678	72228138	The Coordinator	Senior Clerk	72229052
6	MENDI	P. O. Box 237, Mendi	5491264 / 72895095	72228142	The Coordinator	Senior Clerk	72229053
7	GOROKA	P. O. Box 990, Goroka	5322085 / 5322321	72228116	The Coordinator	Senior Clerk	72229054
8	KUNDIAWA	P. O. Box 95, Kundiawa	5351612	72228144	The Coordinator	Senior Clerk	72229056
9	MT HAGEN	P. O. Box 418, Mt. Hagen	5421194 / 5423332	72228148	The Coordinator	Senior Clerk	72229057
10	VANIMO	P. O. Box 38, Vanimo	4571175 / 4571438	72228140	The Coordinator	Senior Clerk	72229060
11	WEWAK	P. O. Box 583, Wewak	4562231/ 4561114	72228122	The Coordinator	Senior Clerk	72229062
12	MADANG	P. O. Box 2071, Madang	4222418	72228126	The Coordinator	Senior Clerk	72229063
13	LAE	P. O. Box 4969, Lae	4725508 / 4721162	72228132	The Coordinator	Senior Clerk	72229064
14	KIMBE	P. O. Box 328, Kimbe	9835110	72228150	The Coordinator	Senior Clerk	72229065
15	RABAUL	P. O. Box 83, Kokopo	9400314	72228118	The Coordinator	Senior Clerk	72229067
16	KAVIENG	P. O. Box 284, Kavieng	9842183	72228136	The Coordinator	Senior Clerk	72229069
17	BUKA	P. O. Box 154, Buka	9739838	72228108	The Coordinator	Senior Clerk	72229073
18	MANUS	P. O. Box 41, Lorengau	9709251	72228128	The Coordinator	Senior Clerk	72229080
19	NCD	C/- FODE HQ	3230299 Ext 26	72228134	The Coordinator	Senior Clerk	72229081
20	WABAG	P. O. Box 259, Wabag	5471114	72228120	The Coordinator	Senior Clerk	72229082
21	HELA	P. O. Box 63, Tari	73197115	72228141	The Coordinator	Senior Clerk	72229083
22	JIWAKA	c/- FODE Hagen		72228143	The Coordinator	Senior Clerk	72229085