**COMPUTER SOFTWARE**

**Computer software** is a collection of computer programs that provide instructions to computer hardware.

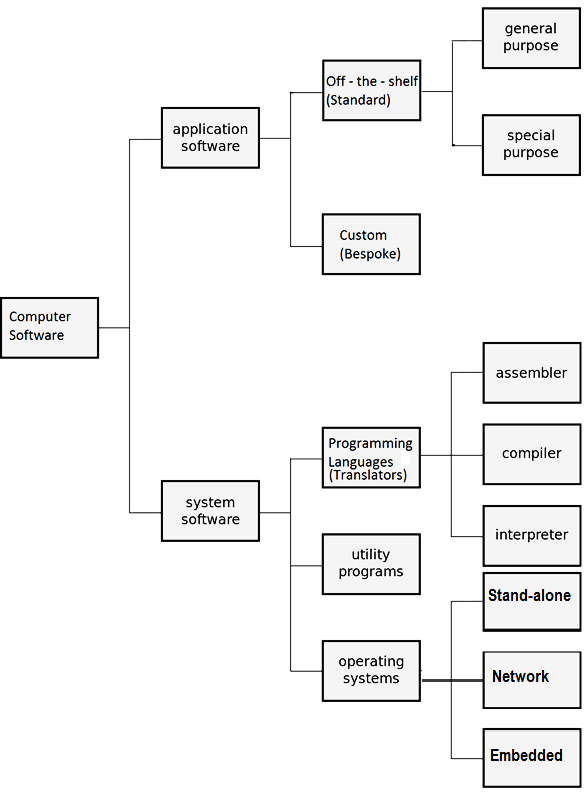
**Or** is a set of instructions or programs that tells the hardware parts on what to do and how to do it.

There are two major types of software: system software and application software. Each performs a different function.

**System software** e.g. the Operating system manages and coordinates all the other computer programs, devices, resources and activities.

**While Application software** like, Word-processors, Paint, Calculator and, Games solve the specific or exact needs of the user.

**Computer software can be generally broken down as shown in the chart below:**



**DEFINITION OF TERMINOLOGIES**

* **Buffer**; is an area in memory in which data/information is placed while waiting to be transferred to its final destination..
* **Virtual memory**; is the portion of a storage medium, usually the hard disk, allocated by the operating system to function as additional RAM.
* **NB SPOOLING** refers to the process of putting tasks that need to be done into a buffer until they can be executed.

**Factors to consider before obtaining a software program**

**Correctness** — does the software do what it is suppose to do (according to the design specs)?

**Robustness** — how does the software respond to unexpected conditions (wrong input)?

**User-friendliness** — is the software easy to use by users from the intended audience?

**Adaptability** — how difficult is it to modify the software to adjust to an ever-changing world?

**Reusability** — can parts of the software be easily reused to build other software systems?

**Interoperability** — does the software interface with other software systems?

**Efficiency** — does the software make good use of its resources (memory, disk, CPU, network)?

**Portability** — can the software to easily ported (moved) to other operating

**Security** — does the software protect the information it is responsible for?

**SYSTEM SOFTWARE**

**System software is** a set of programs that control or maintain all the operations of the computer and its devices, such as the CPU, communication links, and peripheral devices.

OR. These are programs that control, manage and support the operations of the computer and its devices. They are so crucial that the computer cannot do without them

**System Software Includes:**

* 1. An Operating system and Device Drivers
  2. Utility Programs and
  3. Programming Languages (Translators and Library Programs)

**Operating Systems**

An operating system is a generalized program that manages and coordinates all the activities taking place within a computer system.

OR An operating system is a set of programs which act as a platform for the application software, the hardware and the user to interact and process data.

**NB** The operating system functions as a middleman between the user and the computer, as well as between application software programs and the hardware devices**.**

**Device Drivers**

To communicate with the hardware devices, the operating system relies on device drivers.

A device driver is a program that accepts instructions and then converts them into commands that the device understands.

Each device on a computer, such as the keyboard, mouse, monitor, printer, card reader/writer, and scanner, has its own device driver.

**Where does the OS reside?**

In most cases, the operating system is installed and resides on the computer's hard disk.

During the boot process, usually the operating system will look first in drive C: (the designation for the hard disk drive) for the OS system files.

On handheld computers and many mobile devices such as smart phones, however, the operating system may reside on a ROM chip.

**The Kernel of the OS**

This refers to the core of an operating system, responsible for managing memory, files, and devices; maintaining the computer's clock; starting applications; and assigning the computer's resources.

Each time you turn on the computer, the kernel and other frequently used instructions in the operating system are copied from the hard disk to the computer's RAM

**The term ‘Software Platform**

The operating system that a computer uses sometimes is called its software platform.

When you purchase application software, the package identifies the software platform on which it runs.

A cross-platform application is one that runs on multiple operating systems.

Often, these cross-platform applications contain multiple versions, each corresponding to a different operating system.

**FUNCTIONS OF AN OPERATING SYSTEM**

1. It coordinates a process called booting. During booting, the operating system is automatically loaded to the main memory (RAM) from the hard disk, by a program called Boot routine or boot strap loader
2. It configures and manages other software programs like utilities and application software to ensure that, they communicate properly with the users and hardware devices.
3. The Operating system loads programs and required data into the main memory to facilitate data processing. It therefore acts as a platform for running application programs.
4. It provides a consistent user interface to enable users access the system resources, like files, printers, etc
5. It configures and manages all the hardware components. These include: input devices, output devices, storage devices and the CPU. For example how they communicate and access the system resources.
6. It manages memory, both primary and secondary memory, by allocating storage space to various processes and data in memory. It also ensures that no process or data spills over into another process’s storage space.
7. The operating system helps in spooling the print job. This frees the CPU so that it can start new tasks.
8. Monitoring system performance. The operating system accesses and reports information about various system resources, programs and devices. This helps the user to identify and solve problems with resources
9. Administering security. The operating system ensures that users access the computer with correct user names and passwords if access rights are defined.

**SUMMARY FUNCTIONS OF AN OPERATING SYSTEM**

1. Starting a computer, (Booting the computer)
2. Providing a user interface like windows XP graphical interface.
3. Managing programs,
4. Configuring devices, (Device drivers are often needed). Plug and Play devices are recognized automatically
5. Monitoring performance
6. Providing file management.
7. Administering security.
8. Managing resources.
9. Coordinating tasks, and Spooling.
10. Managing memory,
11. Establishing an Internet connection
12. **Starting a computer, (Booting the computer)**

Booting is the process of loading the operating system (OS) from disk into working memory.

**There are basically two types of booting:**

1. **Cold booting.**

This is the process of turning on a computer after it had been powered off completely.

1. **Warm booting.**

This is the process of restarting a computer that already is powered on.

1. **Providing a User Interface**

A user interface is the part of the software with which you interact; it controls how data and instructions are entered and information is presented on the screen. .

**Types of user interfaces**

**Three types of user interfaces are:**

* 1. command-line interface (CLI),
  2. menu-driven interface (MDI), and
  3. Graphical user interface (GUI).

Most operating systems use a combination of these types of user interfaces to define how you interact with your computer.

**Command-line interface**

Is a user interface where a user types keywords or presses special keys on the keyboard to enter data and instructions into the computer? The set of commands a user uses to interact with the computer is called the command language that should be memorized.

Examples of operating systems with command line interface include; MS DOS, UNIX, LINUX

**Command-line interface**

**ADVANTAGES OF A COMMAND LINE INTERFACE**

1. It takes up little memory and normally does not require very fast processors.
2. Operation is fast because commands can be entered directly through the keyboard
3. The user has complete control over the program
4. Many commands can be grouped together as a batch file so that repetitive tasks can be automated

**DISADVANTAGES OF A COMMAND LINE INTERFACE**

1. A command language has to be learned and memorized
2. No pointing device can be used
3. Commands have to be entered correctly with correct spellings and syntax (rules)
4. There are no graphics and menus
5. The interface can be discouraging, more difficult to use and the user is more likely to make mistakes

**A menu-driven interface** provides menus as a means of entering commands.

**Menu-driven interfaces** are easier to learn than CLI because users do not have to cram keywords for commands.

**The characteristic of being easy to learn and use is described as being user-friendly.**

**Graphical User Interface (GUI)**

A GUI is a user Interface in which visual images such as icons and buttons are used to issue commands.

Of all the interfaces a GUI typically is the most user’s friendly, because it does not require you to know any command language.

**ADVANTAGES OF A GRAPHICAL USER INTERFACE**

1. It is easy to learn and work with hence being user-friendly
2. There is no need to type and memories any command language
3. Interface is similar for any application
4. It is easy to exchange information between software using cut and paste or drag and drop
5. A pointing device like a mouse can be used to select items and make choices

**DISADVANTAGES OF A GRAPHICAL USER INTERFACE**

1. A graphical user interface normally requires more memory
2. A graphical user interface normally requires a faster processor
3. It also occupies more disk space to hold all the files for different functions

**Disadvantages of a GUI as compared to CLI**

* GUI requires the computer to have more RAM as compared to Command Line.
* Command line instructions execute faster than GUI instructions.

**Examples of Elements/ Objects of a GUI**

* Icons
* Command Buttons
* Drop Down Lists
* Check boxes
* List Boxes
* Dialogue boxes
* Windows
* Cursor
* Scroll bars
* Radio Buttons
* Preview areas
* Slider buttons
* Tabs
* Menus
* Text boxes
* Toolbars
* e.t.c.

**NB A GUI menu displays a set of available commands or options from which you choose one or more.**

**An icon is** a small image that represents an item such as a program, an Instruction, or a file.

**FILE MANAGEMENT**

The operating systems help to organize files and folders on a computer’s hard disk drive.

**What is the difference between a file and a folder?**

**A file** is a collection of bits that have been processed and stored in secondary memory.

A file may be a document that may contain characters such a letter, a database, a computer program, a song, a picture, etc.

**A folder** is a directory that usually contains related information. A folder can contain both files and other sub folders.

**NB**  **ICON** is a small image that represents an item such as a program, an instruction or a file.

***FORMATTING A DISK***; ***Formatting a disk***; is the process of preparing a disk for reading and writing of data by organizing the disk into storage locations called *tracks* and *sectors*. The formatting process also erases the file location information and redefines the file system for these items of a formatted disk

**When do we need to format a disk?**

1. When the disk fails to open files
2. When the disk is recognized but fails to open
3. When the disk fails to copy or move files
4. Before the first recording of data is done in case of a floppy or a compact disk
5. **Managing Programs**

Operating systems can support just one user running one program or many of users running multiple programs.

**These various capabilities of operating systems are described as**

(i) Single tasking,

(ii)Single-user and multi-user,

(iii) Multitasking, and

(iv) Multi processing,

**A single user-**single tasking operating system allows only one user to run one program at a time.

**A single user-multitasking operating system** allows one user to work on two or more programs that reside in memory at the same time.

**A multi-user operating** system enables two or more users to run programs simultaneously. For example, mainframes, allow hundreds of users to connect at the same time**.**

**A multiprocessing** OS manages coordinated processing of data by more than one processor. Multiprocessing increases a computer's speed and helps in fault tolerant systems.

1. **Coordinating**

* The operating system determines the order in which tasks are processed.
* A task, or job, is a piece of work or operation that the processor manages.
* Tasks include receiving data from an input device, processing instructions, sending information to an output device, and transferring items from storage to memory and from memory to storage.

NB **A BUFFER is** an area of memory or storage in which data and information is placed while waiting to be transferred to or from an input or output device.

* Operating systems typically use a technique called spooling to increase computer system efficiency.

**NB SPOOLING** refers to the process of putting tasks that need to be done into a buffer until they can be executed.

* The operating system commonly uses a print spooler with print jobs. A print spooler intercepts documents to be printed from the operating system and places them in the queue in the buffer.
* As soon as the print job is placed in the buffer, the CPU is available to process the next instruction.

1. **Configuring Devices**

* If you add a new device to your computer, such as a printer, its driver must be installed before the device will be operational.
* For devices with Plug and Play support, the OS recognizes the new device and loads the necessary drivers automatically.

1. **Establishing an Internet Connection**

* Operating systems typically provide a means to establish Internet connections.
* This is through a "Connect to a network" Wizard that guides users through the process of setting up a connection between a computer and an Internet service provider.

1. **Monitoring Performance**

* The OS monitors the performance of the computer system.
* It keeps track of each computer job, the various system resources and devices, the processor usage, the amount of unused physical RAM, and network usage.

1. **Administering Security**

* The OS helps users to administer computer access security by use of a user name or user ID and a password, before a user logs on to, a computer.
* After entering a user ID and password, the operating system compares the user's entry with a list of authorized user names and passwords.

**NB Spyware is a** program placed on a computer without the user's knowledge that secretly collects information about user, often related to Web browsing habits

**TYPES OF OPERATING SYSTEMS**

**Three basic categories of operating systems exist today.**

They are stand-alone OS, network OS, and embedded OS.

1. **STAND-ALONE OPERATING SYSTEMS**

A stand-alone operating system is a complete operating system that works on a PC.

**Examples of popular stand-alone operating systems include:**

* Mac OS ,
* UNIX,
* Linux,
* -DOS and
* Windows (XP, Windows Vista, Windows 7, Windows 8, etc.).

**Mac OS**

* Macintosh operating system was released in 1984 with Apple’s Macintosh computers.
* Mac OS X includes features such as a GUI, multitasking, large photo-quality icons,

**UNIX**

* UNIX is a multitasking operating system developed in the early 1970s by scientists at Bell Laboratories.
* Some versions of UNIX have a command-line interface, and others offer a graphical user interface.
* Power users often work with UNIX because of its flexibility and power.
* Manufacturers such as Sun and IBM often sell personal computers and workstations with a UNIX operating system.

**Linux**

Linux is one of the fastest growing operating systems.

Linux is a free, open source, UNIX-like operating system.

Open source software means its code is provided for use, modification, and redistribution. It has no restrictions from the copyright holder.

**MS-DOS**

In the early 1980s, Bill Gates’ Microsoft Corporation introduced DOS (Disk Operating System) as its first operating system for IBM PCs.

DOS originally used a command-line interface.

Today, DOS is rarely used because it does not offer a graphical user interface and it cannot take full advantage of modern computer microprocessors

**Microsoft Windows**

Microsoft introduced an operating environment named Windows 1.0 on November 20, 1985.

It was Microsoft's first attempt to implement a multi-tasking graphical user interface-based operating environment on the PC platform.

Since then, many versions have been released, each with various new innovative features and functions.

These include Windows 2.0, Windows 95, 98, Me, Windows NT 3.1, Windows 2000, Windows XP, Windows Vista, Windows 7 and the new Windows 8

1. **NETWORK OPERATING SYSTEMS**

A network operating system (NOS) is an operating system that supports a network and typically resides on the server.

**Examples of network operating systems** include Windows Server 2003, 2008, Solaris, and NetWare, UNIX server, and Linux server.

1. **EMBEDDED OPERATING SYSTEMS**

An embedded operating system is an operating system that resides on ROM chips and typically used on handheld computers and small devices.

Popular embedded operating systems today include Windows Embedded CE, Windows Mobile, Palm OS, Embedded Linux, and Symbian OS.

**Factors to consider when choosing an operating system**

* When choosing an operating system for a computer the following factors may be considered:
* The type of computer in terms of size and make. Operating systems are available for all sizes of computers.
* The hardware configuration of the computer such as the memory capacity, processor speed and hard disk capacity should meet the required minimum requirements for a the operating system to run well
* The application software to be installed on the computer should be supported by the operating system. For example Microsoft Office 2010 cannot run on Windows 2000.
* The operating system should be user friendly. This depends on the skills of the intended users of the computers.
* The operating system should have adequate information and help guides for user reference.
* The cost of the operating system.
* Reliability and security provided by the operating system.
* The number of processors and hardware devices it can support.
* The number of users it can support
* The availability of basic utilities and accessory programs within the operating system.

**Utility Software**

Utility software refers to system software designed to analyze, optimize and maintain a computer in good working conditions.

Utility software usually focuses on how the computer system operates.

Although operating systems typically include some built-in utilities, many stand-alone utility programs are available.

**Examples include Antivirus utility,** Screen Saver utility, File compression utility, and other utilities

1. **Antivirus utility**

**A computer virus is** damaging program that affects a computer negatively by altering the way the computer works without the user's knowledge or permission.

**Antivirus utilities** are programs that scan for computer viruses, remove, disinfect and repair damaged files

**Or** **Antivirus utilities** are programs that prevent, detect and remove viruses from computer’s memory or storage.

1. **Screen Saver Utility**

A screen saver is a program that automatically fills the computer’s VDU (Visual Display Unit) with moving images or patterns when the computer is not in use.

Currently, screensavers are used primarily for entertainment, advertising or security purposes

1. **File compression utility**

A file compression utility shrinks the size of a file. A compressed file takes up less storage space than the original file.

Compressed files, sometimes called zipped files, usually have a .zip extension.

Attaching a compressed file to an e-mail message reduces the time needed for upload and download.

When you download a compressed file, you must uncompress it to restore it to its original form.

**Other utility software categories**

1. **BACKUP utilities**

**BACKUP utilities** can make a copy 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).

1. **DISK COMPRESSION utilities** can compress the contents of a disk to small amounts of memory. They also uncompress/ expand the compressed files.
2. **DISK DEFRAGMENTERS** can detect computer files whose contents are broken and spread across several locations on the hard disk, and move the fragments to one location to increase efficiency**.**
3. **FILE MANAGERS** provide a convenient method of performing routine data management tasks, such as deleting, renaming, cataloging, moving, copying, merging, generating files and modifying data sets.
4. **SORTING UTILITY for** organizing files in any chosen order.
5. **MERGE UTILITY for** Merging or combining different files in one.
6. **An UNINSTALLER is a** utility that removes a program, as well as any associated entries in the system files.
7. **A DIAGNOSTIC UTILITY** compiles technical information about your computer's hardware and certain system software programs and then prepares a report outlining any identified problems.

**Programming Languages**

* A programming language is a notation for writing computer software.
* Programming languages are can be used to create the procedures and specifications of a computation or algorithm.

**Examples of popular programming languages include:**

* FORTRAN
* (FORmularTranslator)
* BASIC (Beginners’ All-purpose Symbolic Instruction Code)
* Visual BASIC
* COBOL (COmmon Business-Oriented Language)
* C and C++
* Java
* Pascal, Perl, e.t.c.

When computers execute programs written in languages such as BASIC, C, Java, etc., the computer must convert these humanly readable instructions into a form it can understand.

System software contains the special language translation programs that translate these higher-level language programs into machine language that the computer can execute.

**System software includes a** compiler, interpreter, and assembler.

**The program in the high-level language before translation into machine language is called source code.**

**A compiler** translates source code into machine binary code called object code.

**Some programming languages such as** BASIC do not use a compiler but an interpreter.

**An interpreter** translates each source code statement one at a time into machine code and executes it.

**An assembler is similar to compiler**, but it is used to translate only assembly language into machine code

**APPLICATION SOFTWARE**

These are programs designed to help solve specific personal or business problems for the users.

Application software consists of programs designed to perform specific tasks for end-users.

**Classifications of Application Software**

* The common Classifications of application software include:
* Off-the-shelf (standard) software,
* Custom (bespoke) software,
* Shareware, Freeware,
* Open-source, Public-domain software,
* Web-based software, copyrighted software,
* Special Purpose and General Purpose.

**Off-shelf software**

* This refers to packaged software that is designed to meet the needs of a wide variety of end users.
* Off the shelf software is mass-produced, commercially sold software, and copyrighted.
* Examples include; Microsoft office suite, Oracle database management system, Adobe Illustrator, Adobe Photoshop, etc.

**ADVANTAGES OF OFF-SHELF SOFTWARE**

1. They are easily found because they are common and they are cheap to buy
2. They come with manuals to enable users to use them easily
3. They are multipurpose
4. They are pre-tested and certified by a large group of professional programmers and analysts
5. They are easy to learn and use, i.e. menu driven and user-friendly
6. Time and money that would have been spent on program development is saved
7. They can be rented out for a small fee to users who may require such services periodically
8. They are generally portable and usually there is maintenance between the supplier and buyer.

**DISADVANTAGES OF OFF-SHELF SOFTWARE**

1. They may be out-dated thus not durable
2. They may contain packaged viruses (Trojan horses)
3. They may be too common
4. They may not satisfy the buyer’s needs and interests
5. It may just be a pirated or duplicated program

**Custom (bespoke) software**

* Custom software is tailor-made software, which is developed at a user's request to perform specific functions.
* Sometimes, when a company cannot find packaged soft-ware that meets its unique requirements, it pays computer programmers to write custom software that is specifically tailored to meet the needs of the company.
* Custom software usually costs more than packaged software
* ***Examples include***; Air Traffic Control Systems, School Management Information Systems, Inventory Management Systems, Employee Records Systems, Payroll Systems, etc.

**ADVANTAGES OF CUSTOMIZED SOFTWARE**

1. They often satisfy the user’s needs
2. They are more durable
3. They are easily modified in case need arises
4. They are always brand new
5. They may be virus-free
6. It is a source of competitive advantage. Customized software programs are usually unique, in functionality

**DISADVANTAGES OF CUSTOMIZED SOFTWARE**

1. They are expensive to develop
2. They take long to develop and test before coming out
3. They are rarely used
4. They are not multipurpose, i.e. they are for special tasks by specific companies.

**Copyrighted software**

* Copyrighted software refers to computer programs with restrictions regarding use, modification, and redistribution.
* You have to pay for copyrighted software and must not copy it without permission from the manufacturer.
* Copying copyrighted software without paying for it is clearly unethical and illegal**.**

**Shareware**

* Shareware is copyrighted software that is distributed at no cost for a trial period.
* To use a shareware program beyond that period, you send payment to the program developer.

In some cases, a scaled-down version of the software is distributed free, and payment entitles the user to the fully functional product

**Freeware**

* Freeware is copyrighted software provided at no cost by an individual or a company that retains all rights to the software.
* Therefore, other programmers cannot include freeware in applications they intend **to sell.**

**Open-source,**

* Open source software is software provided for use, modification, and redistribution. This software has no restrictions from the copyright holder.
* Open source software usually can be downloaded from the Web at no cost.

**Public-domain software**

* Public-domain software has been donated for public use and has no copyright restrictions.
* Anyone can copy or distribute public-domain software to others at no cost.

**Web-based software,**

* Web-based software refers to programs hosted by a Web site.
* Users access and interact with Web-based software from any computer or device that is connected to the Internet.
* Many Web sites allow free access to their programs; some charge a fee.
* Examples of Web-based software include e-mail, Website builders, online games, travel and mapping software, e.t.c.

**Special Purpose (Specialized) Software**

This refers to computer programs developed and dedicated to accomplish particular jobs only.

**Programs that run on special purpose computers like ATMs are special purpose software.**

**Other Examples of specialized software include:**

* Business – Transaction and Sales Management software.
* Science and Engineering software etc..

**General purpose**

* This refers to a Wide a variety of application programs that perform many common tasks.
* Varieties of General purpose application programs include Word processing programs, Spreadsheet programs, web browsers, Graphics programs, etc**.**

**Uses of Popular Application software varieties and their Examples**

**(A). Word Processors –** Used for producing textual documents like letters, notes, reports, memos, etc**.**

**(B). Spread sheet software -** Used for performing calculations, and the creating of graphs.

**(C).Database management software (DBMS)-** Used to create and manage an organized collection of related and structured information (a database)

. **Examples include:**

* Lotus Approach,
* Microsoft Access,
* OpenOffice.org Base,
* Corel Paradox,

**(D).Presentation software -** These applications are used for making presentations and slide shows that can aid a speech presentation.

**Examples include:**

* Screen cast ,
* Microsoft PowerPoint,
* OpenOffice.org Impress,
* Adobe Persuasion

**E) Communications software**

* One of the main reasons people use computers is to communicate and share information with others. A variety of communications software options exist. Common communications software includes Web browsers, e-mail software, chat rooms, newsgroups, Text messaging, FTP programs, blog software, and teleconferencing software.

**(H). Web browsing software for displaying** WebPages from the internet or html documents on computers**. Examples Include:**

* Mozilla Firefox,
* Internet Explorer,
* Safari,
* Opera
* Netscape Navigator, e.t.c.

**(I). Web authoring software – Used** by webmasters for building websites.

**Examples include:**

* Microsoft FrontPage,
* Adobe Dreamweaver,
* Microsoft Expression Web,
* Antenna Web Design Studio

**(J) Email Software / Email client**

* Email software (Commonly known as email client) is a computer program used to access and manage a user's email account.
* Web applications that provide message management, composition, and reception functions are sometimes also commonly referred to as webmail.
* Popular locally installed email clients include Microsoft Outlook, Pegasus Mail, Mozilla's Thunderbird, K Mail, Evolution and Apple Mail.
* Popular web-based email clients include: G mail, Yahoo! Mail, mail.com, Lycos mail, and Hotmail.

**Software Suites**

* A software suit is a collection of individual application soft-ware programs sold as a single package.
* When you install the suite, you install the entire collection of applications at once instead of installing each application individually.
* At a minimum, suites typically include the following software applications: word processing, spreadsheet, database, and presentation graphics,

**Advantages of using software suites**

* Costs significantly cheaper than buying each of the application package separately
* Easy to learn and use because applications within a suite usually use a similar interface and share common features such as clip art and toolbars.
* Easy installation because all the various applications can be installed at once.

**QUESTIONS**

**1. A machine language** is a set of instructions executed directly by a computer’s central processing unit (CPU)

A high level language is a programming language that uses English like vocabularies and mathematical symbols, like +,-,% and many others, others, in its instruction.

**2. Why are computer games and other programs commonly supplied on CD**

-Cd ROM are cheaper to store large amount of data compared to other storage media.

-Cd ROM are ready only , which means computer viruses cannot write themselves.

-No one can erases or change the contents stored in -Cd ROM s