Harambee University

Chapter 1: Introduction to Computer

Computer

- A computer is an electronic device, operating under the control of instructions stored in its own memory that can accept data (input), process the data according to specified rules, produce information (output), and store the information for future use

Functionalities of a computer

Any digital computer carries out five functions in gross terms:

- Takes data as input.
- Stores the data/instructions in its memory and use them when required.
- Processes the data and converts it into useful information.
- Generates the output
- Controls all the above four steps

Functionalities of a computer**(Contd.)**

Processing

Data → → **Information**

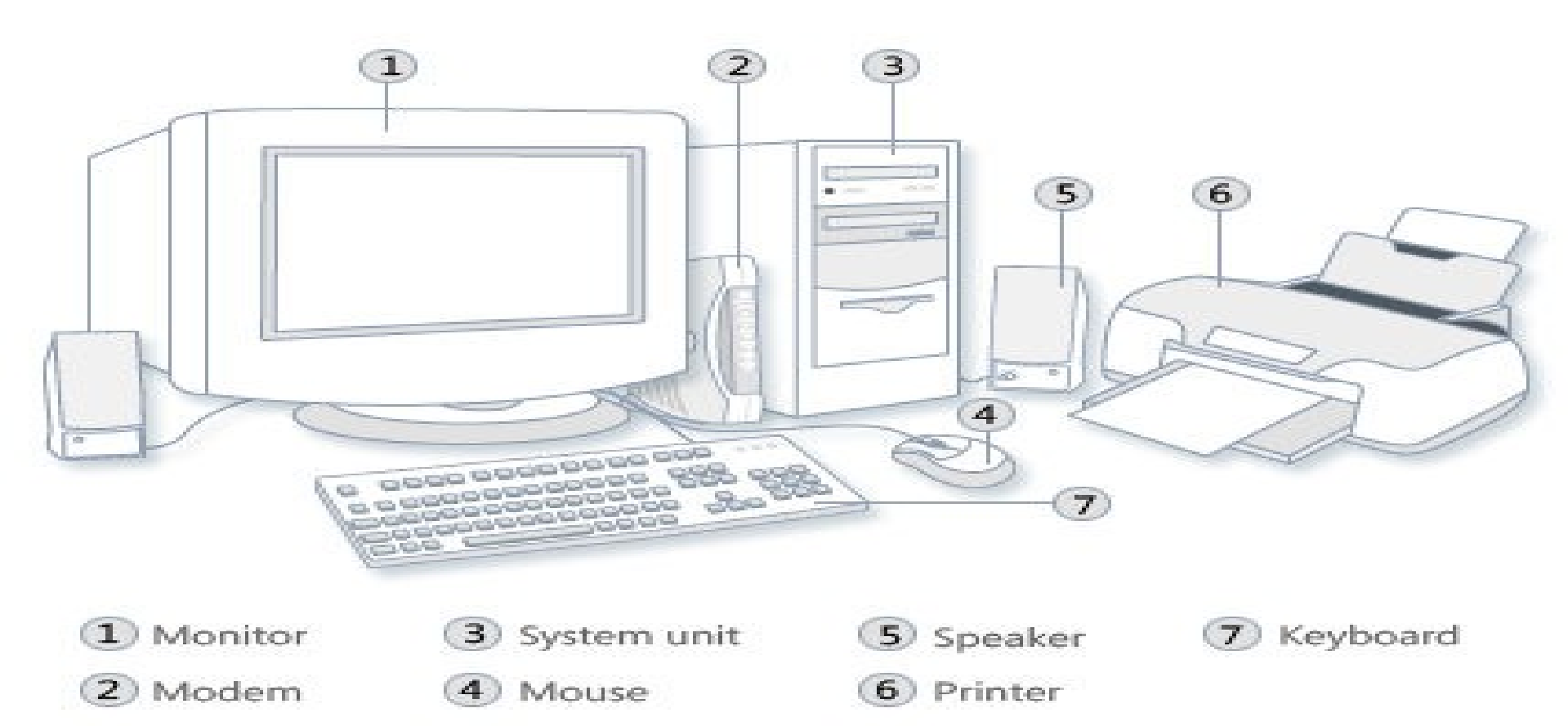
Computer Components

- Hardware
- Software

Hardware

- Computer hardware is the collection of physical elements”Tangible objects”
- that constitutes a computer system.
- The actual machinery, wires, transistors, and circuits … etc.

Hardware:


1
2
3
5
6
4
7
1 Monitor
3 System unit
5 Speaker
7 Keyboard
2 Modem
4 Mouse
6 Printer

Software

- Computer Programs
- instructions and data

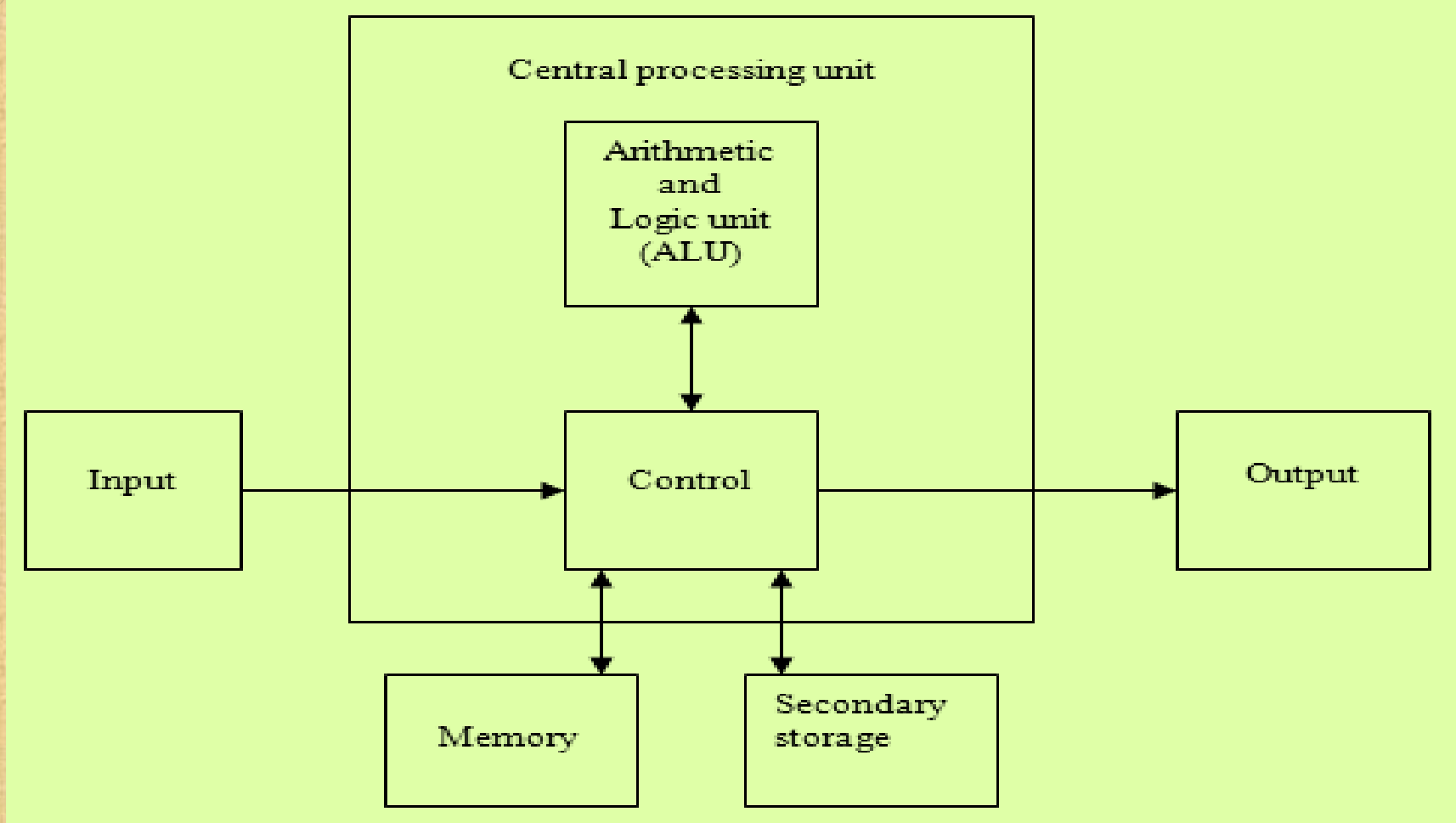
Computer Units

1. **Input Unit**
2. **Central processing Unit**
3. **Primary Memory Unit**
4. **Secondary storage Unit**
5. **Output Unit**

Input Devices

- Input device is any peripheral (piece of computer hardware equipment to provide data and control signals to an information processing system such as a computer or other information appliance.
- Input device Translate data from **form** that humans understand to one that the computer can work with. Most common are keyboard and mouse

Computer Units



Input Devices

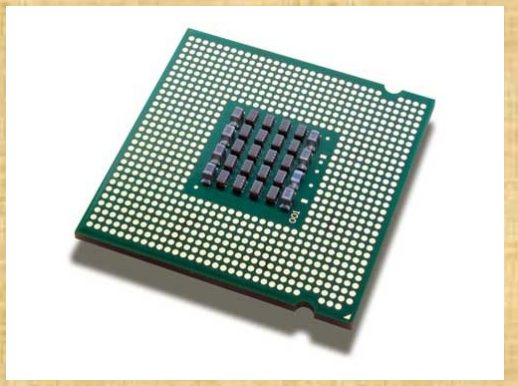
Examples of Manual Input Devices			
Keyboard	Numeric Keypad	Pointing Device	Remote Control
Joystick	Touch Screen	Scanner	Graphics Tablet
Microphone	Digital Camera	Webcams	Light Pens

Example of Input Devices

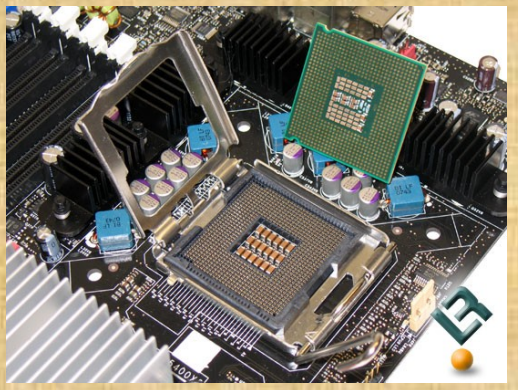
Keyboard	Mouse (pointing device)	Microphone
Touch screen	Scanner	Webcam
Touchpads	MIDI keyboard	
Graphics Tablets	Cameras	Pen Input
Video Capture Hardware	Microphone	Trackballs
Barcode reader	Digital camera	Joystick
Gamepad	Electronic Whiteboard	

Note: The most common use keyboard is the QWERTY keyboard. Generally standard Keyboard has 104 keys

Central Processing Unit



- CPU
- known as microprocessor or processor
- It is responsible for all functions and processes



CPU Components

- The CPU is comprised of three main parts

1. **ALU** (Arithmetic Logic Unit)
2. **Control Unit** (**CU**)
3. **Registers**: Stores the data that is to be executed next.

ALU

- Executes all arithmetic and logical operations.
- Arithmetic calculations like as addition, subtraction, multiplication and division.
- Logical operation like compare numbers, letters, or special characters

Control Unit (CU)

Control Unit (CU): controls and co-ordinates computer components.

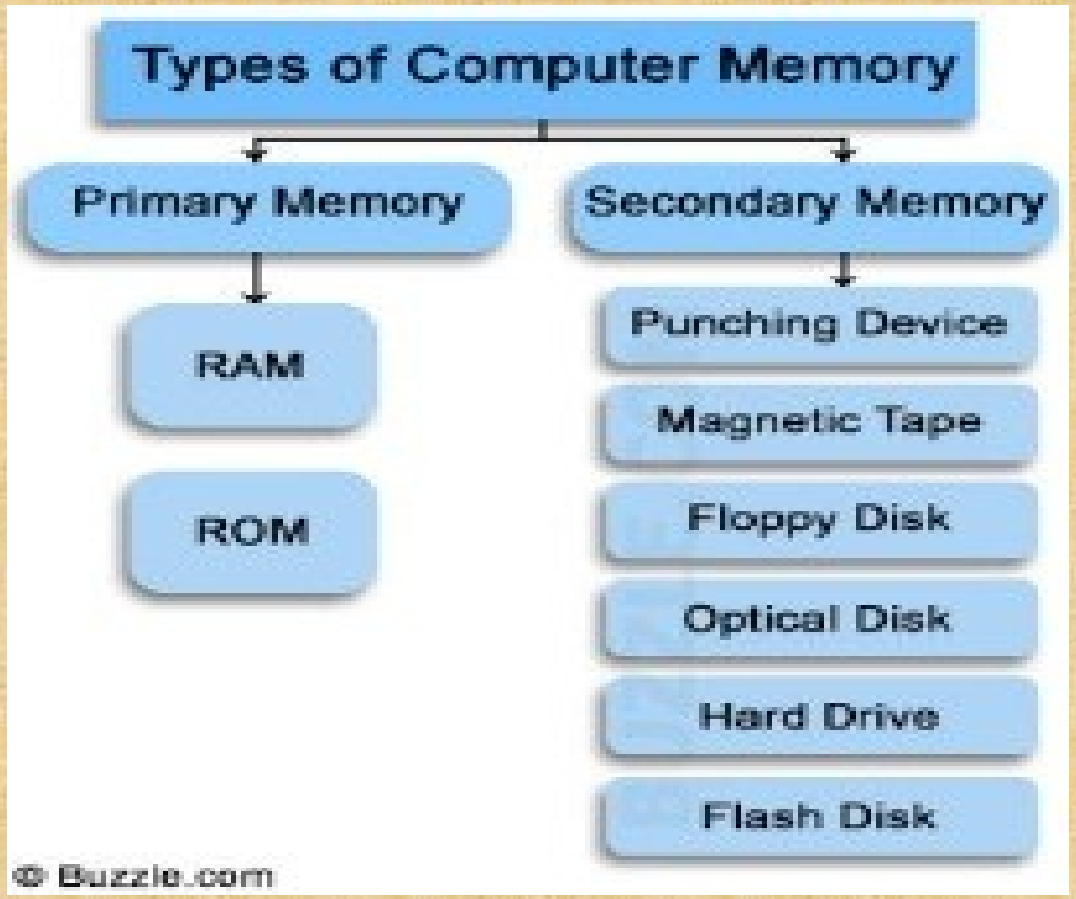
- Read the code for the next instruction to be executed.
- Increment the program counter so it points to the next instruction.
- Read whatever data the instruction requires from cells in memory.
- Provide the necessary data to an ALU or register.
- If the instruction requires an ALU or specialized hardware to complete, instruct the hardware to perform the requested operation.

Registers

- ***Registers***: Stores the data that is to be executed next, "very fast storage area".

Primary Memory

- 1. RAM.
- 2.ROM



Primary Memory

1. **RAM**: Random Access Memory: is a memory scheme within the computer system responsible for storing data on a temporary basis, so that it can be promptly accessed by the processor as and when needed.

- It is volatile in nature, which means that data will be erased once supply to the storage device is turned off.
- RAM stores data randomly and the processor accesses these data randomly from the RAM storage.
- RAM is considered "random access" because you can access any memory cell directly if you know the row and column that intersect at that cell.

Primary Memory

2. **ROM** (Read Only Memory): ROM is a permanent form of storage. ROM stays active regardless of whether power supply to it is turned on or off. ROM devices do not allow data stored on them to be modified.

Secondary Memory

- Stores data and programs permanently
- its retained after the power is turned off
- Main Examples
  1. Hard Disk
  2. Optical Disk
  3. Flash memory

Hard Disk

- Called Disk drive or HDD
- stores and provides relatively quick access to large amounts of data.
- Stores data on an electromagnetically charged surface or set of surfaces.

Optical Disk & Flash

- an optical disc drive (ODD) is a disk drive that uses laser light to store data.
- There are three main types of optical media: CD, DVD, and Blu-ray disc

CD “Compact Disk” can store up to 700MB
DVD “ Digital Video Disk “ can store up to 8.4 GB
Blu-ray disc. can store up to 50 GB

3. Flash Disk

- A storage module made of flash memory chips. A Flash disks have no mechanical platters or access arms, but the term "disk" is used because the data are accessed as if they were on a hard drive. The disk storage structure is emulated.

RAM V.s Hard Disk

- What are the differences between RAM as a main memory and HDD as a Secondary Memory.

RAM V.s Hard Disk

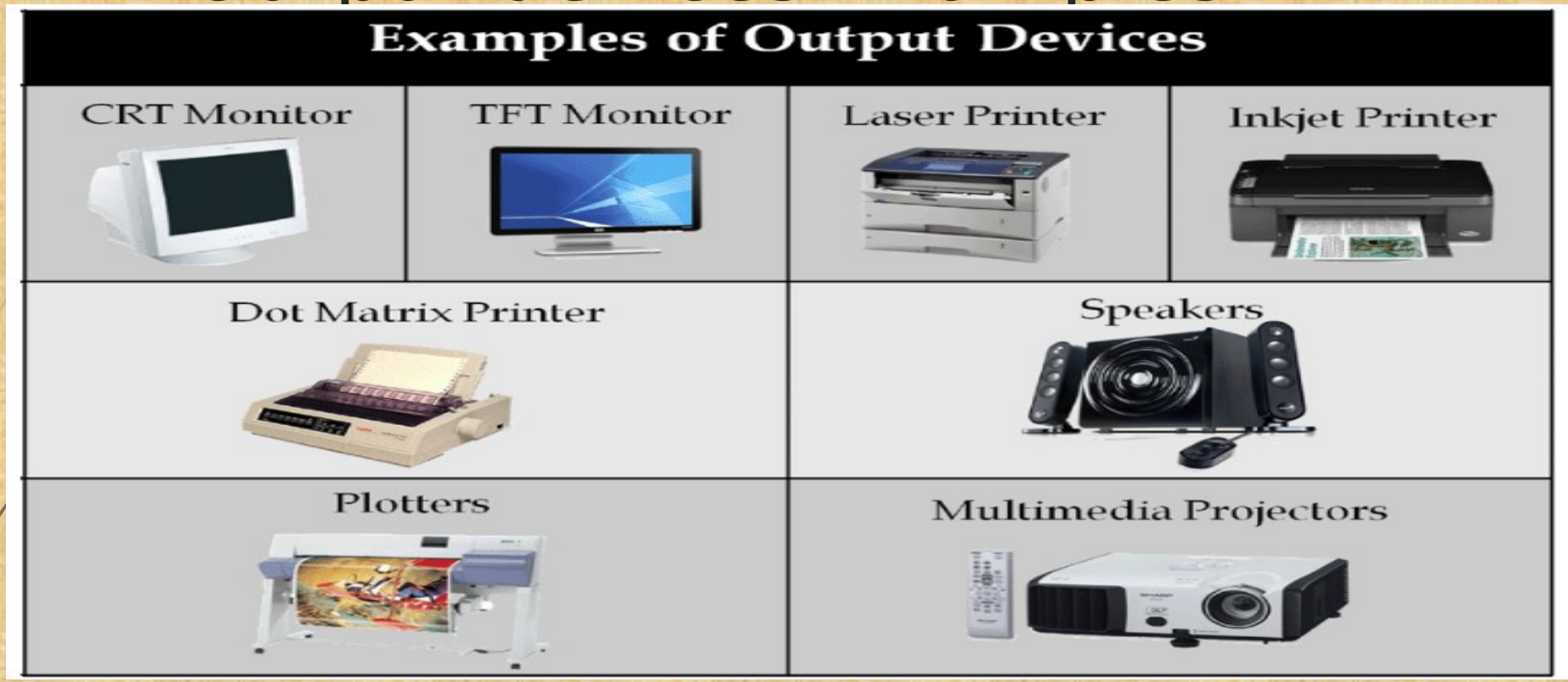
Table2: Comparison between Main memory (RAM) and Secondary Memory (Hard disk)

RAM	Hard Disk (Hard Drive)
Memory	Storage
Smaller amount (typically 500 MB - 6 GB)	Much larger amount (typically 80GB to 1000 GB)
Temporary storage of files and programs	Permanent storage of files and programs
A little like your real desktop - has only your current work on it (which could be ruined by a spill of Coke or coffee!)	Like a file cabinet - has long-term storage of work (it's safe from spills!)
Contents disappear when you turn off power to the computer	Contents remain when you turn off the power to the computer (they don't disappear unless you purposely delete them)
Contents disappear when the computer crashes	Contents remain when the computer crashes
Consists of chips (microprocessors)	Consists of hard disks (platters)
When you want to use a program, a temporary copy is put into RAM and that's the copy you use	Holds the original copy of the program permanently

Output Unit

- An output device is any piece of computer hardware equipment used to communicate the results of data processing carried out by an information processing system (such as a computer)
- converts the electronically generated information into human-readable form.

Output devices Examples



Monitor	LCD Projection Panels
Printers (all types)	Computer Output Microfilm (COM)
Plotters	Speaker(s)
Projector	

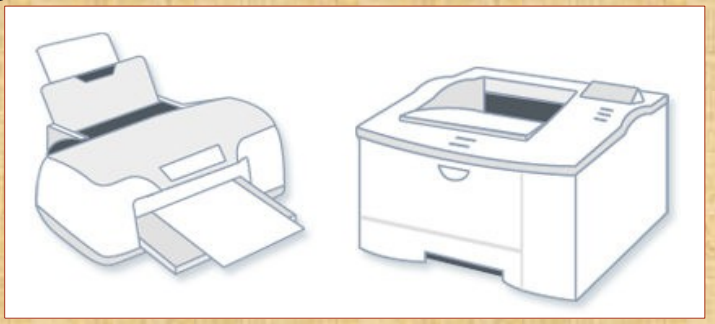
Output devices Examples

1. A monitor

LCD: Liquid crystal display most familiar these days

CRT: Cathode Ray Tube

Output devices Examples



2. Printer:

- transfers data from a computer onto paper

Printer types:

1-Laser Printer.

2-Ink Jet Printer.

3-Dot Matrix Printer

Software

- Software is a generic term for organized collections of computer data and instructions, often broken into two major categories two major categories**:**

1. **system** software
2. **application** software

System software

- Known as Operating System
- is responsible for controlling, integrating, and managing the individual hardware components of a computer system
- Windows is an example of OS.
- example of System Software:
- 1) Microsoft Windows
- 2) Linux
- 3) Unix
- 4) Mac OSX
- 5) DOS

Application software

- is used to accomplish specific tasks other than just running the computer system.
- It may consist of:
  - a single program, such as an image viewer;
  - a small collection of programs (often called a software package) that work closely together to accomplish a task, such as a spreadsheet or text processing system;
  - a larger collection (often called a software suite) of related but independent programs and packages that have a common user interface or shared data format, such as Microsoft Office,

Table3: Comparison Application Software and System Software

	Application Software	System Software
Introduction:	Application software, also known as an application or an "app", is computer software designed to help the user to perform specific tasks.	Computer software, or just software is a general term primarily used for digitally stored data such as computer programs and other kinds of information read and written by computers. App comes under computer software though it has a wide scope now.
Example:	1) Opera (Web Browser) 2) Microsoft Word (Word Processing) 3) Microsoft Excel (Spreadsheet software) 4) MySQL (Database Software) 5) Microsoft Powerpoint (Presentation Software) 6) Adobe Photoshop (Graphics Software)	1) Microsoft Windows 2) Linux 3) Unix 4) Mac OSX 5) DOS
Interaction:	Users always interact with application software while doing different activities.	Generally, users do not interact with system software as it works in the background.
Dependency:	Application software cannot run without the presence of the system software.	System software can run independently of the application software.

Unit of Measurements - Storage

Storage Units		
Bit	BIT	0 or 1
Byte	B	8 bits
Kilobyte	KB	1024 bytes
Megabyte	MB	1024 kilobytes
Gigabyte	GB	1024 megabytes
Terabyte	TB	1024 gigabytes

Size example

- 1 bit - answer to an yes/no question
- 1 byte - a number from 0 to 255.
- 90 bytes: enough to store a typical line of text from a book.
- 4 KB: about one page of text.
- 120 KB: the text of a typical pocket book
- 3 MB - a three minute song (128k bitrate)
- 650-900 MB - an CD-ROM
- 1 GB -114 minutes of uncompressed CD-quality audio at 1.4 Mbit/s
- 8 -16 GB - size of a normal flash drive

- A. 10B is equivalent 10 * 8 = 80 bits
- B. 3MB is equivalent to how many Bits?
- Answer:
  - 3 *1024 = 3072 KB
  - 3072*1024 = 3145728 B
  - 3145728 * 8 = 25165824 bits

Unit of Measurement -Speed

- The speed of CPU measured by unit called Hertz (Hz)
- 1 Hz represent 1 cycle per second.
- The speed of CPU is known as Computer Speed.

Unit of Measurement -Speed

CPU SPEED MEASURES	
1 hertz or Hz	1 cycle per second
1 MHz	1 million cycles per second or 1000 Hz
1 GHz	1 billion cycles per second or 1000 MHz

Computer Classification

- Computers can be classified by size and power to:
  1. Personal computer (PCs)
  2. Workstation:
  3. Minicomputer
  4. Mainframe:
  5. SuperComputer

Computer Classification

- Personal computer (PCs): a small, single-user computer based on a microprocessor. In addition to the microprocessor, a personal computer has a keyboard for entering data, a monitor for displaying information, and a storage device for saving data.
- Workstation: a powerful, single-user computer. A workstation is like a personal computer, but it has a more powerful microprocessor and a higher-quality monitor.

Computer Classification

- Minicomputer: multi-user computer capable of supporting from 10 to hundreds of users simultaneously.
- Mainframe: powerful multi-user computer capable of supporting many hundreds or thousands of users simultaneously.
- Supercomputer: an extremely fast computer that can perform hundreds of millions of instructions per second.

Computer Classification

- Compare between the previous type of computers based on
  - Price
  - Processing Speed
  - Storage Capacity
  - Powerful
  - Single-user or Multi-user
  - Computer Size
  - Companies size

Laptop computer

- is a portable computer.
- personal computer that can be easily carried and used in a variety of locations.
- run the same software and applica

Netbook Computer

- A netbook is a type of laptop that is designed to be even more portable.
- Cheaper and less powerful than laptops or desktops.
- They are generally less powerful than other types of computers, but they provide enough power for email and internet access, which is where the name "netbook" comes from.

Mobile Devices

- A mobile device is basically any handheld computer.
- It is designed to be extremely portable.
- Some mobile devices are more powerful
- Types:

1. **Tablet Computers**
2. **E-Book Readers**
3. **Smartphones**

Tablet Computers

- designed to be portable.
- The most obvious difference is that tablet computers don't have keyboards or touchpads.
- Best used for tasks like web browsing, watching videos, reading e-books, and playing games.

Tablet Computers

- The most obvious difference is that tablet computers don't have keyboards or touchpads. Instead, the entire screen is touch-sensitive, allowing you to type on a virtual keyboard and use your finger as a mouse pointer.
- Tablet computers are mostly designed for consuming media, and they are optimized for tasks like web browsing, watching videos, reading e-books, and playing games

Smartphones

- a powerful **mobile phone**
- designed to run a variety of applications in addition to phone service.
- Compare it with the tablet?
- **Internet access** is an important feature of smartphones. (3G or 4G)(Wi-Fi Service)

Data, Information and Knowledge

- **Data:**
  - Facts and figures which relay something specific
  - but which are not organized in any way and which provide no further information regarding patterns
  - unstructured facts and figures

Data, Information and Knowledge

- **Information:**
  - For data to become information, it must be contextualized, categorized, calculated and condensed. (Processing)
  - it is data with relevance and purpose.

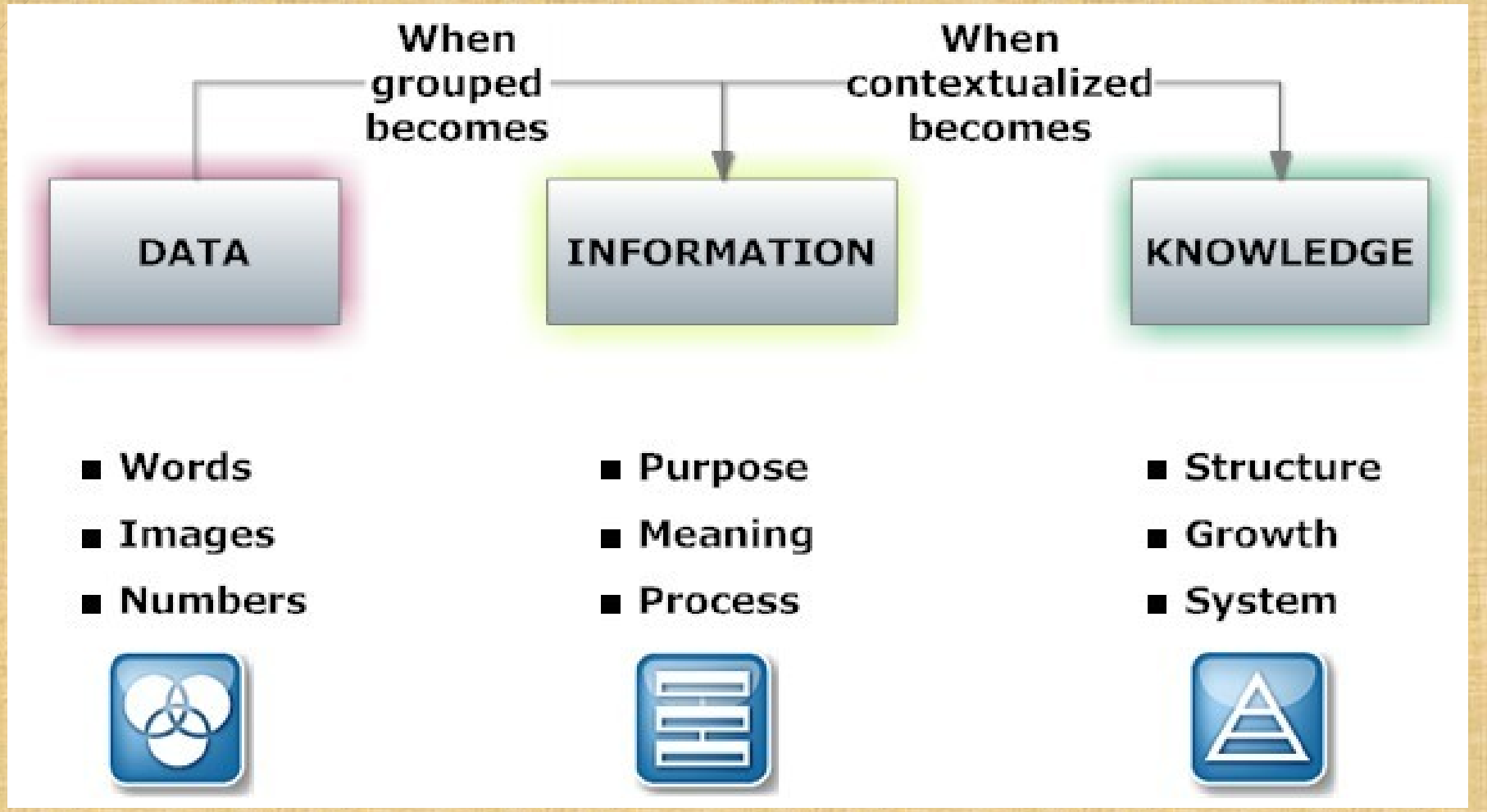
Data, Information and Knowledge

- **Knowledge:**
  - Knowledge is closely linked to doing and implies know-how and understanding.
  - Processing Information

Data, Information and Knowledge

- **Data**: symbols
- **Information**: data that are processed to be useful; provides answers to "who", "what", "where", and "when" questions
- **Knowledge**: application of data and information; answers "how" questions

Data, Information and Knowledge



Data, Information and Knowledge

- Processing data produces information, and processing information produces knowledge.

Characteristics of Computer

1.Speed

2.Accuracy

3.Diligence

4.Storage Capability

5.Versatility

Characteristics of Computer

- ***Speed*** :The computer can process data very fast, at the rate of millions of instructions per second
- ***Accuracy:*** Computer provides a high degree of accuracy. For example, the computer can accurately give the result of division of any two numbers up to 10 decimal places.
- ***Diligence***: When used for a longer period of time, the computer does not get tired or fatigued. It can perform long and complex calculations with the same speed and accuracy from the start till the end.

Characteristics of Computer

- ***Storage Capability***: Large volumes of data and information can be stored in the computer and also retrieved whenever required. A limited amount of data can be stored, temporarily, in the primary memory. Secondary storage devices like floppy disk and compact disk can store a large amount of data permanently.
- ***Versatility***: Computer is versatile in nature. It can perform different types of tasks with the same ease. At one moment you can use the computer to prepare a letter document and in the next moment you may play music or print a document.

Computer Viruses

- **Viruses**:
- **E-mail viruses**:
- **Trojan horses**:
- **Worms**:

Viruses

- A computer virus is an application program designed and written to destroy other programs.
- A virus is a small piece of software that piggybacks on real programs
- virus might attach itself to a program such as a spreadsheet program
- and it has the chance to reproduce (by attaching to other programs)

E-mail viruses:

- e-mail virus travels as an attachment to e-mail messages
- Replicates itself by automatically mailing itself to dozens of people in the victim's e-mail address book.

Trojan horses

- simply a computer program
- The program claims to do one thing (it may claim to be a game) but instead does damage when you run it

Worms

- A worm is a small piece of software that uses computer networks and security holes to replicate itself.
- worm scans the network for another machine that has a specific security hole.

Malicious Software

- How do you know if you have a virus?
  - Lack of storage capability
  - Decrease in the speed of executing programs
  - Unexpected error messages
  - Halting the system

Tips to avoid viruses and lessen their impact?

1. Delete e-mails from unknown or suspicious, untrustworthy (unreliable) sources, especially those with files attached to an e-mail.
2. Never open a file attached to an e-mail unless you know what it is, even if it appears to come from a friend.
3. Download files from the Internet only from legitimate and reputable sources.
4. Update your antivirus software at least every two weeks as over 200 viruses are discovered each month.
5. Backup your files periodically