

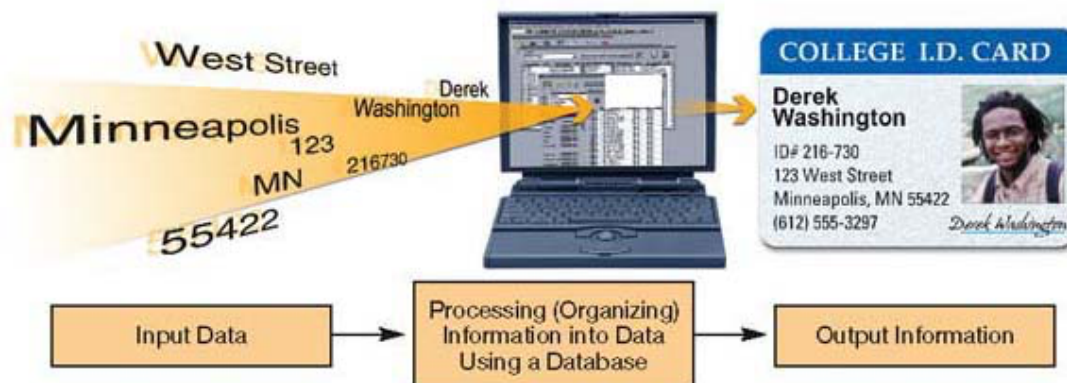
Computer Usage and Document Design

Lesson 2: Introduction to Computers

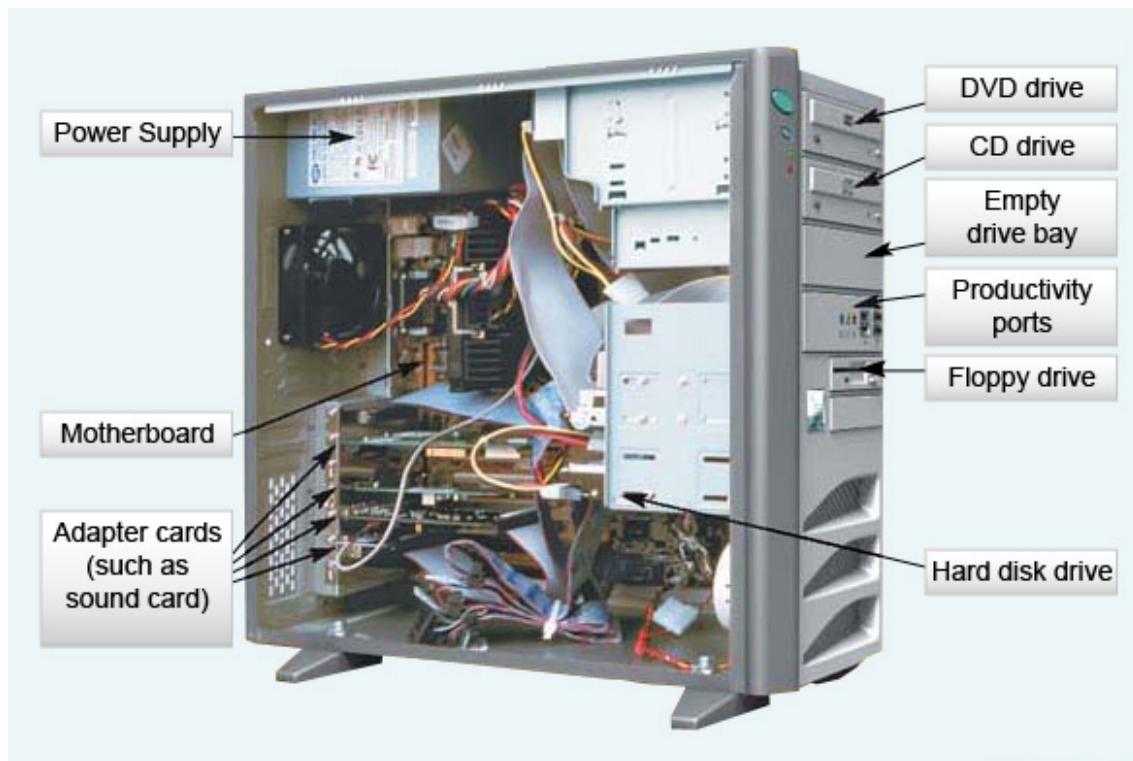
- What is a Computer?
 - According to the Oxford dictionary definitions:
 - A computer is 1.) An electronic device for storing and processing data, according to instructions given to it in a variable program or 2.) A non-electric device that assists in making calculations.
 - The two definitions contradict each other because they are based on the history of computers, or what we consider to be computers.
- The Evolution of Computers:
 - Early computers were non-electric, and assisted us in making calculations. These included the abacus and the slide rule.
 - Abacus: An ancient tool for counting that uses wood or stone beads in rows. Origin - Mesopotamia, Egypt and China.
 - Slide Rule: A tool with two sliding rulers, used to calculate multiplication and division and more advanced calculations.
 - The next evolution was still non-electric, but allowed for primitive “programming”. These mechanical calculating machines belong somewhere midway between our two definitions.
 - Punch Card: A card with holes representing data such as records for the census or for payroll.
 - Calculating Machine: A mechanical version of the calculator.
 - Finally, in the 1940s, electronic computers made their first appearance.
 - ENIAC (Electronic Numerical Integrator And Computer): The first computer, built by the U.S. Army, which was the size of an entire room.
 - The first binary computers (Konrad Zuse’s Z3 and the ENIAC by the U.S. Army) were both developed in the 1940s, yet they bear little resemblance to today’s computers.
- Computers Today:
 - A desktop computer is a modular, stationary computer comprised of a system unit, keyboard, monitor and mouse.
 - A laptop computer (also known as a notebook or portable) is a small portable computer that runs on rechargeable battery.
 - Advances in LCDs (Liquid Crystal Displays) made it possible to develop small, flat monitors, and so laptops were born.
 - Laptop computers are compact, but contain everything that a desktop contains (except smaller in size); this usually means that comparable laptop is more expensive than a desktop computer.
 - Computers now come in various sized and types to solve all kinds of problems. In general, they can be categorized according to their cost, size, storage capacity, number of users and processing speed.
 - The three most common categories are:
 - Mainframe:
 - Introduced in the 1940s.

- Can be used by many people at the same time, and can handle very complex problems or large volume jobs.
- Used for data processing for business and scientific applications.
- For example, major banks can process bills for credit card holders all over the world with the aid of a mainframe.
- Large research projects also use the mainframe's vast memory, storage capacity and super-fast processing speed to conduct tests and co-ordinate operations.
- Minicomputer:
 - Introduced in 1963.
 - It is a scaled-down version of the mainframe computer.
 - Capable of performing many jobs that old mainframe computers accomplished in the past.
 - Due to its cost-effectiveness, the minicomputer's most important contribution has been the introduction of distributed computing, where a number of small computers can be used instead of one giant computer.
- Microcomputers:
 - Two major events led to the introduction of the first microcomputer:
 - The development of the first mini-processor in 1969 and the creation of the first general-purpose microprocessor chip in 1971.
 - Microcomputers had a major economic impact due to their small size and drastically improved cost-effectiveness.
 - Power yet easy-to-operate machines have been called home computers, laptop computers, notepad computers, personal computers (PCs), palmtop computers and micros.
 - The microcomputer can perform jobs that were previously only handled by the largest computers.
 - The fourth less well-known category that is often forgotten, although we see and use this type of computer every; embedded computers.
 - Embedded Computers:
 - Found within other devices and perform only one (or a few) functions.
 - Their most common function is to control the operations of the machine in which they are embedded.
 - Embedded computer is a microprocessor designed to operate within another tool.
 - For examples, computes are embedded in digital watches, refrigerators, microwave ovens, stereo systems, automobiles and many other items.
- A Computer's Purpose:
 - We use computers for four major operations:
 - **Inputting data** or gathering data; data=information.
 - **Processing data** - perform calculations and manipulate the information.
 - **Storing data** - to be used later.
 - **Outputting data** - or display it in some way.
- What is a personal computer (PC)?
 - Interactive and useful
 - User-friendly

- Co-operative; connected and communicative
- Accessible
 - Small size= access to a computer when you need it.
 - Low price= you can afford one.
- Purposes:
 - Write and print homework
 - Research
 - Entertainment
 - Create photos, drawings and print them
 - Program application
 - Create and design websites
 - Communicate with other people around the world
 - Stay informed
 - Buy and sell just about anything from anywhere
- Computer Subsystems:
 - A system is made up of subsystems that work together to perform a function.
 - For example: The human body is made up of the circulatory system, the digestive system, the nervous system and so on.
 - A PC's main three subsystems are:
 - Input/Output (IO)
 - Central Processing
 - Storage
 - These three must work together to process information:
 - First, **information is entered into the computer via the input part** of the IO subsystem.
 - Next, the **information is processed by the processing subsystem.**
 - Finally, it **can be sent to the storage subsystems** and/or the output part of the IO subsystem.
 - The physical devices that make up these subsystems are also known as **computer hardware.**
 - In brief:
 - Input Data -> Processing (Organizing) Information into Data Using a Database -> Output information.

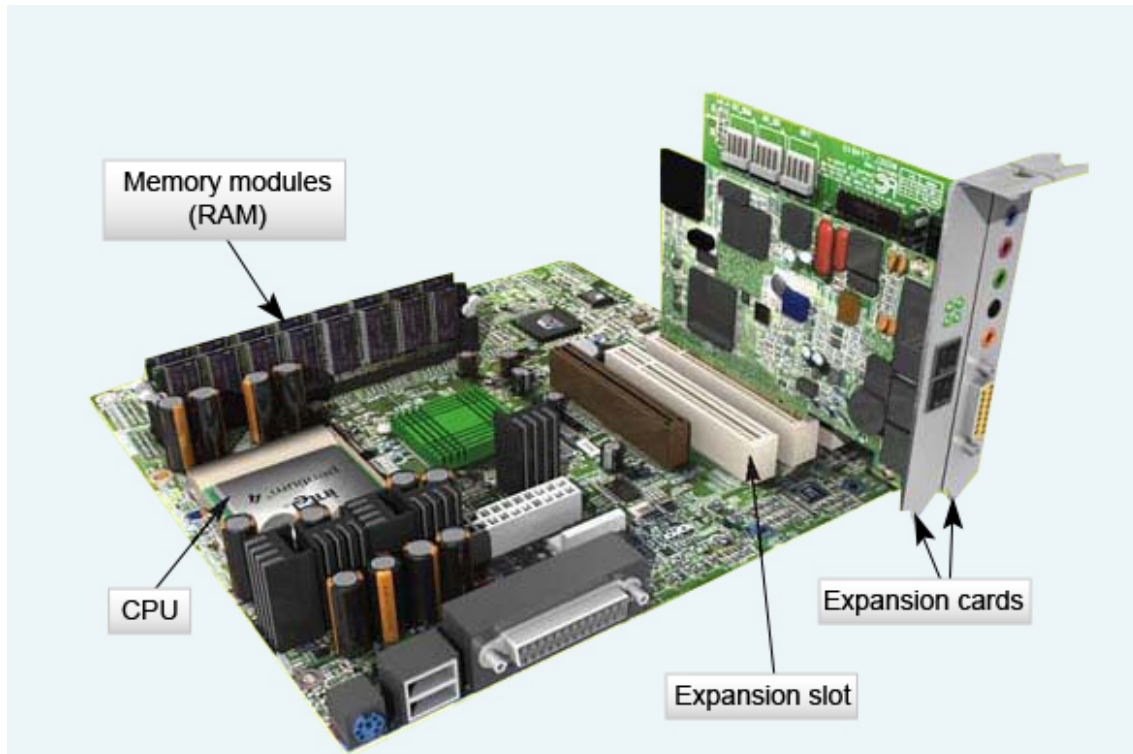


- Computer Hardware:
 - Can usually be divided into the *system unit* and the *peripherals*.
 - System unit (often called the Tower or Case), can be referred to as the 'computer'. Contains the central processor and main storage subsystems, each made up of various hardware (motherboard, CPU, CD/DVD drives, hard drive, power supply).
 - A peripheral is hardware that connects to the system unit. Peripherals usually make the Input/Output subsystem (devices such as monitors, printers, keyboards, and so on), but can also include external storage devices.
- System Unit:
 - Contents:
 - The Motherboard houses the following:
 - The CPU
 - RAM Memory
 - Control Circuitry or Buses
 - Hard Drive - Main Storage (ROM Memory)
 - Other Controllers - Cards
 - Data/Disk Drives - DVD/CD
 - Power Supply



- Motherboard:
 - At the center of every computer system.
 - Houses the computer's microprocessor, computer memory and most of the computer's control circuitry (paths).

- Control circuitry paths allow the different peripherals, the motherboard and the CPU to communicate; they are also known as buses.
- The motherboard is the central nervous system of the computer.
 - First it receives electric signals from a peripheral input device, such as a keyboard or mouse.
 - Then it processes the electronic signals.
 - Finally, to produce output, it sends the processed signals to a peripheral output device, such as a printer or display screen.



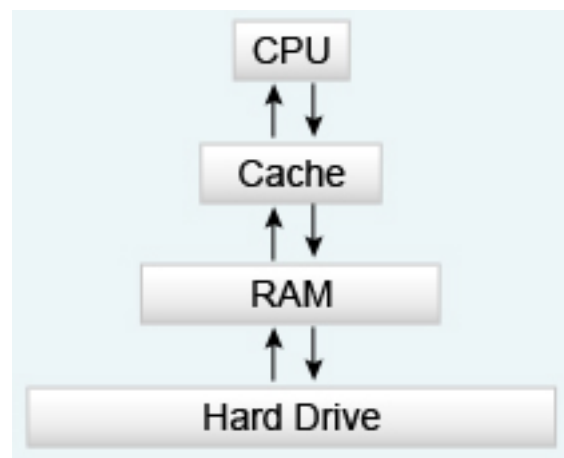
- RAM Memory:
 - Random Access Memory is directly connected to the motherboard.
 - This is **fast-acting memory that is erased when the power is turned off.**
 - This type of memory is also known as **volatile memory.**
 - CPU uses this memory to temporarily store the programs that are currently running.
 - The contents of the memory are temporary and undergo constant change.
 - Memory is also referred to as primary storage.
 - The moment you turn the power off, the data stored in the RAM is lost.
 - Therefore, if the power connecting to the computer fails, RAM is completely erased.
- Processor:
 - The Central Processing Unit (CPU) is thought as the brain of the computer, and is **responsible for interpreting and carrying out instructions.**

- CPU condenses all the computational functions of a computer into just two parts: **the processor and memory.**
- A processor is a single integrated chip that is plugged into a socket located on the motherboard.
- A PC usually has only one processor, though dual processor systems are becoming more common.
- The processor's speed is measured in Mega or Gigahertz (MHz or GHz).
- This varies in different models, so some processors are more powerful than others.
- MHz and GHz are units of measurement based on the Hertz measure of frequency.
- MHz and GHz are 10^6 and 10^9 Hertz, respectively.
- Instructions that the CPU must interpret and carry out are written in binary code, or machine language which the processor understands.
- More on Memory:
 - There is another type of memory called Read Only Memory (ROM).
 - ROM is a form of non-volatile memory, so it is typically used to store programs and data needed for the operation of the computer system.
 - The data stored in the ROM chip is permanently encoded at the factory, and as such can never be erased or changed.
 - Unless you are building computers, you do not have access to ROM.
 - The hard drive is also ROM memory, but you DO have access to this.
 - The basic unit of a memory is a byte. One byte is eight bits (Binary digit) A bit can have a value of 0 or 1. In other words, a byte is a combination of eight ones and zeros.

How Much is a Byte?			
Name	Abbreviation	Number of Bytes	Relative Size
Byte	B	1 byte	Can hold one character of data.
Kilobyte	KB	1,024 bytes	Can hold 1,024 characters or about half of a double-spaced typewritten page.
Megabyte	MB	1,048,576 bytes	A floppy disk holds approximately 1.4 MB of data, or approximately 768 pages of typed text.
Gigabyte	GB	1,073,741,824 bytes	Approximately 786,432 pages of text. Since 500 sheets of paper is approximately 5 cm, this represents a stack of paper about 80 meters high.
Terabyte	TB	1,099,511,627,766 bytes	This represents a stack of typewritten pages almost 82 km high.
Petabyte	PB	1,125,899,906,842,624	The stack of pages is now about 84,000 km high, or about one-fourth the distance from the earth to the moon.

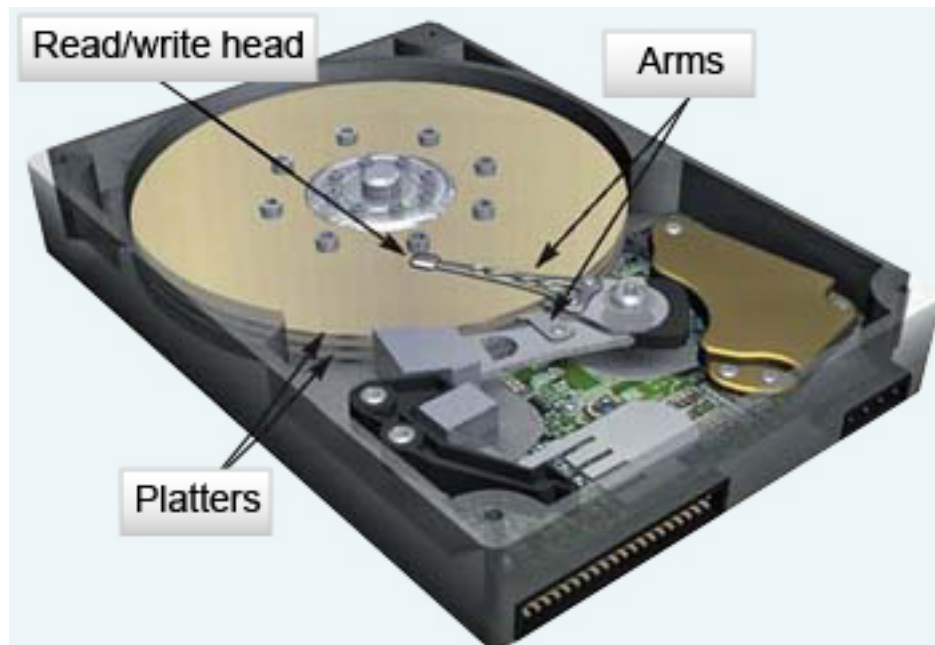
- Memory capacities in computers are typically measured in megabytes (MB), millions of bytes, or gigabytes (GB), billions of bytes.

- What is most important to retain is that there are two types of computer memory called RAM and ROM.
 - The main distinction between the two is RAM is a form of volatile memory used for temporary general-purpose storage, while ROM is permanently encoded.
 - Cache Memory:
 - Found **between the processor and the RAM**.
 - Speeds **up the location and retrieval of data**.
 - Cache is faster but also more expensive than RAM.
 - RAM and hard drives are too slow to provide data to the processor without stalling calculations.
 - So **when a processor needs certain information, it first looks in the cache to check if that piece of data has been recently loaded**.
 - If the processor cannot find the information, it will then proceed to the RAM and finally to the hard drive.
 - Retrieving data from the RAM or the cache makes computers cheaper (time-wise) because it uses small quantities of expensive and fast memory (cache) to compensate for a cheaper but slower memory (hard drive).
 - Virtual Memory:
 - Virtual memory is actually **a file on the hard disk**.
 - Windows and other operating systems require very large amounts of memory to run multiple programs, but RAM only provides part of this memory.
 - In a single-processor computer, only one program runs at a time and it must use RAM.
 - Even though RAM may contain other idle programs and their data, portions of the programs that cannot fit into RAM are stored on the hard disk as virtual memory.
 - Logical Memory Organization:



- Buses and Device Controllers:
 - The processor under control of a computer program, uses its control/ communication operations to direct the flow of the data into and out of memory.
 - Coordinates arithmetic and logic operations.

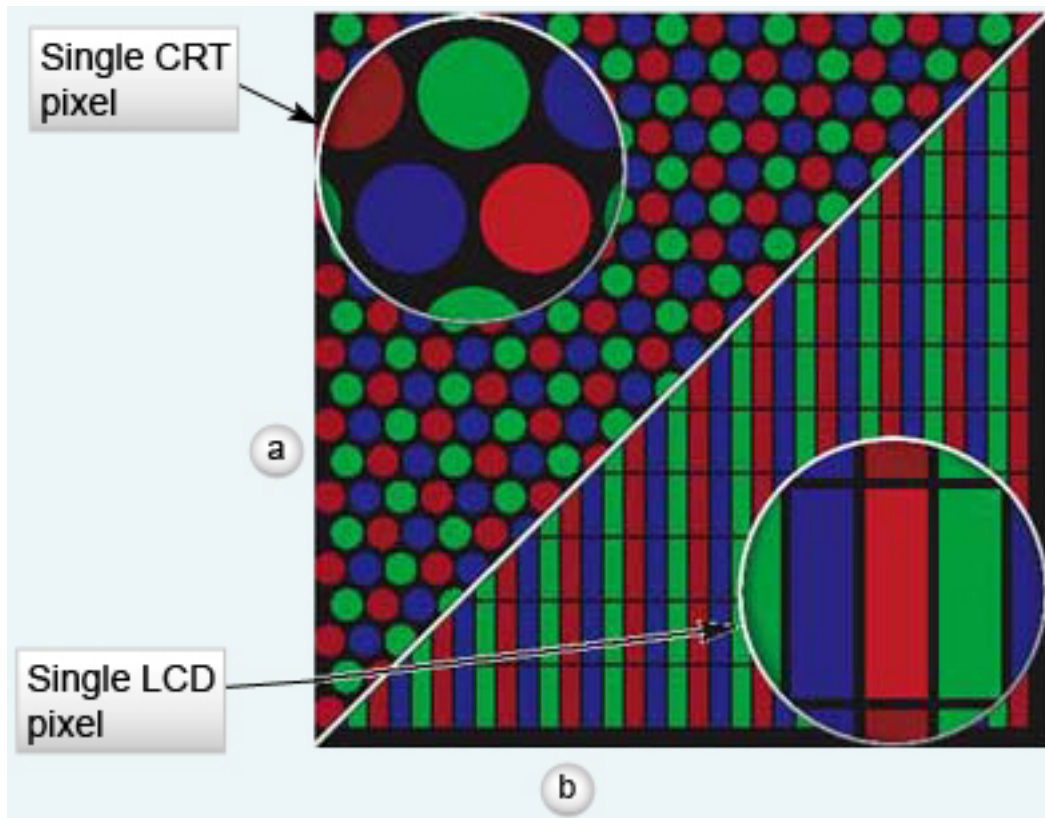
- To perform these operations, instructions and related data are sent along wires or buses.
- Buses can either be internal or external; they are the paths (circuitry) that connect the CPU with internal and external components.
- The bus speed along with the processor speed influence how fast a computer will operate.
- A device controller is a set of chips or a circuit that operates a particular device such as a printer, disk drive or mouse.
- Buses include:
 - PCI and PCI-E slots, which allow connection of graphics cards.
 - PS/2 ports, which allow the connecting of a keyboard or mouse.
 - Universal Serial Bus (USB), which allows the connection of various peripherals.
- Hard Disk Drive:
 - A hard disk is a non-volatile storage device made of rigid aluminum platters that have been coated with a magnetic material.
 - Usually stored within the system unit, and is sealed airtight.
 - You cannot see it except for the disk drive light.
 - The read/write head does not actually touch the hard disk surface, but floats over it.
 - The hard drive has a very high storage capacity (many GB) and most of your applications are stored on it, including Microsoft Office and Internet Explorer.



- Controllers and Cards:
 - These devices or cards connect to the Motherboard via buses. They usually include:
 - Video Display Controller:
 - This is often called the graphics card, or the graphics accelerator.
 - The graphics card generator and outputs images to display.

- There are two types of Display controllers:
 - An expansion card which separate a piece of hardware that plugs into a slot on the motherboard.
 - Integrated graphics are actually part of the motherboard.
- Various graphic cards may have different functions and allow you to connect your computer to a TV, or to capture videos as well as to connect to multiple monitors.
- Advanced graphic cards are for gaming, computer graphics applications and programming.
- Expansion graphic cards have their own dedicated memory which is used to process images and have its own dedicated microprocessor called a Graphics Processing Unit (GPU).
- Integrated graphics accelerators may use the computer's RAM.
- Sound Card:
 - The sound card allows for the input and output of audio signals.
 - Like the graphics card, the sound card can be integrated or expansion.
 - An expansion card will plug into a slot on the motherboard.
- Network Card:
 - The network card is also known as LAN (Local Area Network) Adapter and allows the computer to connect to a network; **how computers communicate with each other and with the internet.**
 - Network cards can be integrated or expansion type.
- CD & DVD Drives:
 - Data, or Disk Drives, are hardware that allows the computer **access to external storage media.**
 - Basically, this means that you can store data outside the hard drive and carry it around you.
 - There are two types of optical disk drives: CD and DVD.
- Peripherals:
 - Peripherals connect to the computer (system unit) via ports.
 - Peripherals connect to PCs in a variety of ways.
 - Examples: USB ports, FireWire, Ethernet ports.
- Input Devices:
 - Means by which you enter information into your PCL the primary means by which you interact with your PC.
 - They enable you to communicate with your computer.
 - Basic input devices include:
 - Keyboard - built-in keyboard
 - Mouse - built-in touchpad or other pointing device
 - Scanner
 - Webcam
 - Microphone
 - Printer
- Output Devices:
 - Hardware that sends data out of a computer.
 - Devices include:
 - Printer

- Another monitor or LCD display
- Speakers
- Sound and video output for TV
- Monitor:
 - Displays a temporary output.
 - Especially useful to display information that changes rapidly.
 - The points of light are called picture elements, or pixels for short.
 - CRT and LCD are two common types of monitors.
 - CRT Monitor:
 - Very much like an ordinary television screen, but instead of a television picture tube, it uses a cathode ray tube (CRT).
 - LCD Monitor:
 - Flat screens are more compact and now come with all new computers.
 - Flat screens employ an LCD in which fluorescent light is used to light up liquid crystals and align them in a predetermined configuration, creating output characters.



- Printer:
 - Of all the external peripherals people attach to their PCs, the most popular is undoubtedly the printer.
 - Little wonder, considering that the printer is the primary means of converting your computer's intangible information into the hard copy of the material world.

- Printers use a variety of technologies to put your data on paper, and each has its own advantages and disadvantages.
- You can distinguish between machines by their quality, speed, technology, purpose, weight, color, or any other of their innumerable (and properly pragmatic) design elements.
- Storage Devices:

Storage Media Capabilities			
	STORAGE MEDIUM	CAPABILITIES	STORAGE CAPACITY
	Hard Drive	Read and write	External: Up to 2 TB (Terabyte) Internal: Up to 750 GB
	CD	Read-only	700 MB
	CD-RW	Read and write	700 MB
	DVD	Read-only	4.7 GB (for single-sided, single-layered DVDs)
	DVD+RW	Read and write	9.4 GB (for single-sided, dual-layered DVDs)
	Blu-ray (BD)	Read and write	27 GB (for single-layer discs) 50 GB (for dual-layer discs)
	Flash Memory Cards	Read and write	16 MB to 8 GB
	Flash Drive	Read and write	Up to 12 GB