# Computer Basics

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## What is A Computer

A computer is an electronic machine that accepts information, stores it until the information is needed, processes the information according to the instructions provided by the user, and finally returns the results to the user (Input Data, Manipulate Data, Store Data, Recall Data, and Output Data). The computer can store and manipulate large quantities of data at very high speed, but a computer cannot think. A computer makes decisions based on simple comparisons such as one number being larger than another. Although the computer can help solve a tremendous variety of problems, it is simply a machine. It cannot solve problems on its own.

## History of Computers

Since civilizations began, many of the advances made by science and technology have depended upon the ability to process large amounts of data and perform complex mathematical calculations. For thousands of years, mathematicians, scientists and businessmen have searched for computing machines that could perform calculations and analyze data quickly and efficiently. One such device was the abacus.

The abacus was an important counting machine in ancient Babylon, China, and throughout Europe where it was used until the late middle ages. It was followed by a series of improvements in mechanical counting machines that led up to the development of accurate mechanical adding machines in the 1930's. These machines used a complicated assortment of gears and levers to perform the calculations but they were far to slow to be of much use to scientists. Also, a machine capable of making simple decisions such as which number is larger was needed. A machine capable of making decisions is called a computer.

The first computer like machine was the Mark I developed by a team from IBM and Harvard University. It used mechanical telephone relays to store information and it processed data entered on punch cards. This machine was not a true computer since it could not make decisions.

In June 1943, work began on the world's first electronic computer. It was built at the University of Pennsylvania as a secret military project during World War II and was to be used to calculate the trajectory of artillery shells. It covered 1500 square feet and weighed 30 tons. The project was not completed until 1946 but the effort was not wasted. In one of its first demonstrations, the computer solved a problem in 20 seconds that took a team of mathematicians three days. This machine was a vast improvement over the mechanical calculating machines of the past because it used vacuum tubes instead of relay switches. It contained over 17,000 of these tubes, which were the same type tubes used in radios at that time.

The invention of the transistor made smaller and less expensive computers possible. Although computers shrank in size, they were still huge by today's standards. Another innovation to computers in the 60's was storing data on tape instead of punch cards. This gave computers the ability to store and retrieve data quickly and reliably.

# Computer Tasks

- Input
- Storage
- Processing
- Output

When a computer is asked to do a job, it handles the task in a very special way:

1. It accepts the information from the user.  This is called input.
2. It stored the information until it is ready for use.  The computer has memory chips, which are designed to hold information until it is needed.
3. It processes the information.  The computer has an electronic brain called the Central Processing Unit, which is responsible for processing all data and instructions given to the computer.
4. It then returns the processed information to the user.  This is called output.

Every computer has special parts to do each of the jobs listed above.  Whether it is a multimillion dollar mainframe or a thousand dollar personal computer, it has the following four components, Input, Memory, Central Processing, and Output.

The central processing unit (CPU) is the electronic brain of the computer.  The CPU in a personal computer is usually a single chip.  It organizes and carries out instructions that come from either the user or from the software.  The processor is made up of many components, but two of them are worth mentioning at this point.  These are the arithmetic and logic unit and the control unit.  The control unit controls the electronic flow of information around the computer.  The arithmetic and logic unit, ALU, is responsible for mathematical calculations and logical comparisons.

The processor is plugged into the computer's motherboard.  The motherboard is a rigid rectangular card containing the circuitry that connects the processor and all the other components that make up your personal computer.  In most personal computers, some of the components are attached directly to the motherboard and some are housed on their own small circuit boards that plug into the expansion slots built into the motherboard.


## Input Devices

A computer would be useless without some way for you to interact with it because the machine must be able to receive your instructions and deliver the results of these instructions to you.  Input devices accept instructions and data from you the user.  Some popular input devices are listed below.

Keyboard
Mouse
Scanner
Microphone
CD/DVD-ROM
Joystick

**Memory**

A personal computer must have a means of storing information (data) and instructions so that it can perform processing tasks on the data.  Personal computers have two types of memory.  These are discussed below.

Read Only Memory   (ROM)

ROM is a small area of permanent memory that provides startup instructions when the computer is turned on.  You cannot store any data in ROM.  The instructions in ROM are set by the manufacturer and cannot be changed by the user.  The last instruction in ROM directs the computer to load the operating system.

Every computer needs an operating system.  This is a special computer program that must be loaded into memory as soon as the computer is turned on.  Its purpose is to translate your instructions in English into Binary so that the computer can understand your instructions.  The operating system also translates the results generated by your computer into English when it is finished so that we can understand and use the results.  The operating system serves a bridge between the application software and the computer hardware.

Random Access Memory  (RAM)

This is the area of memory where data and program instructions are stored while the computer is in operation.  This is temporary memory.  NOTE:  **The data stored in RAM is lost forever when the power is turned off.**  For this reason it is very important that you save your work before turning off your computer.  This is why we have peripheral storage devices like your computer's hard disk and floppy diskettes.

Permanent Memory (Auxiliary Storage)

Your files are stored in permanent memory only when saved to your hard drive, written to a CD/DVD, or saved to a flash drive or network drive.  While this memory can be erased or overwritten, information stored in this fashion is not lost when the power to the computer is switched off.


To better understand how a computer handles information and to also understand why information is lost if the power goes off, let's take a closer look at how a computer handles information.  Your computer contains millions of tiny electric circuits (known as integrated circuits).  For every circuit in a computer chip, there are two possibilities:

1) Electric current flows through the circuit or 2) Electric circuit does not flow through the circuit

When an electric current flows through a circuit, the circuit is on.  When no electricity flows, the circuit is off.  An "on" circuit is represented by the number one (1) and an off circuit is represented by the number zero (0).  The two numbers 1 and 0 are called bits.  The word bit is short for "binary digit".  Each time a computer reads an instruction, it translates that instruction into a series of bits, 1's and 0's.  On most computers every character from the keyboard is translated into eight bits, a combination of eight 1's and 0's.  Each group of eight bits is called a byte.

Byte – The amount of space in memory or on a disk needed to store one character.

8 bits = 1 Byte

1 Kilobyte (KB) = 1000 bytes

1 Megabyte (MB) = 1000 KB

1 Gigabyte (GB) = 1000 MB

1 Terabyte (TB) = 1000 GB        (Lots of zeros and ones!)


Since computers can handle such large numbers of characters at one time, metric prefixes are combined with the word byte to give some common multiples you will encounter in computer literature.


| | |
|---|---|
| Kilo means 1000 | Kilobyte (KB)   =    1000 Bytes |
| Mega means 1,000,000 | Megabyte (MB) =   1,000,000 Bytes |
| Giga Means 1,000,000,000 | Gigabyte  (GB)   =   1,000,000,000 Bytes |

Or, alternately:

1 Kilobyte (KB) = 1000 bytes

1 Megabyte (MB) = 1000 KB

1 Gigabyte (GB) = 1000 MB

1 Terabyte (TB) = 1000 GB        (Lots of zeros and ones!)


## Central Processing Unit   (CPU)

The central processing unit is one of the two most important components of your microcomputer.  It is the electronic brain of your computer.  In addition to processing data, it controls the function of all the other components.  The most popular microprocessors for PC's are manufactured by Intel or AMD.  Typically Apple processors are manufactured by Motorola.

Older generations of microprocessors are listed below.

| | |
|---|---|
| 1981 | 8088 |
| 1984 | 80286 |
| 1987 | 80386 |
| 1990 | 80486 |
| 1993 | Pentium |
| 2000 | Pentium IV |

The table lists Intel processors, along with memory and hard drive limitations.

## x86 PROCESSORS (from Intel)

| | CPU | Clock Speeds (approximate range) | Bus Size (bits) | Max RAM | Floppy Disk | Hard Disk Range | Operating Systems |
|---|---|---|---|---|---|---|---|
| 64-Bit CPUs | Core i5, i7 | 2.6 - 3.3GHz | | | | | Win Vista |
| | Core 2 Duo | 1.8 - 2.6GHz | | | | | |
| | Pentium 4 | 3 - 3.8GHz | | | 3.5" | 30GB- | Win XP |
| | Xeon | 2.2 - 3.6GHz | | | 1.44MB | 1TB | Win 2000 |
| | Pentium D | 2.8 - 3.4GHz | | 64GB | | | Win NT |
| | | | | | | | Win 95/98 |
| 32-Bit CPUs | Core Duo | 1.6 - 2.2GHz | | | | | Win 3.x |
| | Pentium 4 | 1.4 - 2.8GHz | | | | | Linux |
| | Xeon | 400MHz - 3.2GHz | 64 | | | | SCO Unix |
| | Celeron | 266MHz - 2.4GHz | | 4GB | | | Solaris |
| | Pentium III | 450MHz - 1.2GHz | | | 3.5" | 500MB- | DOS |
| | Pentium II | 233 - 450MHz | | | 1.44MB | 60GB | DR DOS |
| | Pentium Pro | 150 - 233MHz | | 64GB | | | OS/2 |
| | Pentium | 60 - 200MHz | | | | | Misc DOS |
| | 486DX | 25 - 100MHz | | | 5.25" | 200 - | Multiuser |
| | 486SX | 20 - 40MHz | | 4GB | 1.2MB | 500MB | |
| | 386DX | 16 - 40MHz | 32 | | | 60 - | |
| | 386SX | 16 - 33MHz | | | | 200MB | |
| | 386SL | 20 - 25MHz | | | | | |
| 16-Bit CPUs | 286 | 6 - 12MHz | 16 | 16MB | 5.25" 1.2MB | 20- 80MB | DOS DR DOS Win 3.x OS/2 1.x |
| | 8086 | 5 - 10MHz | | 1MB | 5.25" | 10- | DOS |
| | 8088 | 5MHz | 8 | | 360KB | 20MB | DR DOS |

**Output Devices**

    Monitor
    Speakers
    Printer
        Impact
                Dot Matrix
        Non-Impact
                Ink Jet
                Laser

**Storage Devices**
    Hard disk
    Floppy disk
    Tape drive
    CD-ROM
    DVD-ROM
    Flash Drives
    Portable hard drives
    On-line storage


**Computer Software**

System Software  (Operating System)

This software acts as an interpreter between the computer and user.  It translates your instructions into binary code and likewise translates binary code into language the user can understand.

In the past you may have used MS-DOS or Microsoft Disk Operating System which was a command line interface.  This form of system software required specific commands to be typed.

Beginning with Windows 3.0 and continuing through Windows95, WindowsME, WindowsXP, Vista, and Windows 7 the operating system became a GUI--a graphical user interface.  This means that it uses graphics or "icons" to represent various operations.  You no longer have to memorize commands; you simply point to an icon and click.

Application Software

Application software is any software used for specified applications such as:
        Word Processing
        Spreadsheet
        Database
        Presentation Graphics
        Communication
        Tutorials
        Entertainment, Games

Programming Languages

A third type of software is programming language software.  It allows a user to develop new application software without having to communicate with the computer in binary code. BASIC, FORTRAN, PASCAL, C, C++, C#, and Java are all examples of programming languages.