ABOUT THE TUTORIAL

Computer Fundamentals Tutorial

Computer is an advanced electronic device that takes raw data as input from the user and processes it under the control of set of instructions (called program), gives the result (output), and saves it for the future use.

This Computer Fundamentals tutorial covers a foundational understanding of computer hardware, software, operating systems, peripherals etc. along with how to get the most value and impact from computer technology.

Audience

This tutorial has been prepared for the beginners as well as advanced learners who want to deal with computers. This tutorial is also very useful for the undergraduate students of computer science, engineering, business administration, management, science, commerce and arts where an introductory course on computers is a part of curriculum. After completing this tutorial you will find yourself at a moderate level of expertise in knowledge of computer basics from where you can take yourself to next levels.

Prerequisites

Knowledge of computers is not a prerequisite to follow the contents of this tutorial. This tutorial assumes no background in computers or computer programming.

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Insurance

Insurance companies are keeping all records up-to-date with the help of computers. The insurance companies, finance houses and stock broking firms are widely using computers for their concerns.

Insurance companies are maintaining a database of all clients with information showing

- procedure to continue with policies
- starting date of the policies
- next due installment of a policy
- maturity date
- interests due
- survival benefits
- bonus

Education

The computer has provided a lot of facilities in the education system.

- The computer provides a tool in the education system known as CBE (Computer Based Education).
- CBE involves control, delivery, and evaluation of learning.
- The computer education is rapidly increasing the graph of number of computer students.
Input Devices

Following are few of the important input devices which are used in a computer:

- Keyboard
- Mouse
- Joy Stick
- Light pen
- Track Ball
- Scanner
- Graphic Tablet
- Microphone
- Magnetic Ink Card Reader (MICR)
- Optical Character Reader (OCR)
- Bar Code Reader
- Optical Mark Reader (OMR)

Keyboard

Keyboard is the most common and very popular input device which helps in inputting data to the computer. The layout of the keyboard is like that of traditional typewriter, although there are some additional keys provided for performing additional functions.

Keyboards are of two sizes 84 keys or 101/102 keys, but now keyboards with 104 keys or 108 keys are also available for Windows and Internet.
Output Devices

Following are few of the important output devices which are used in a computer:

- Monitors
- Graphic Plotter
- Printer

Monitors

Monitors, commonly called as Visual Display Unit (VDU), are the main output device of a computer. It forms images from tiny dots, called as pixels, are arranged in a rectangular form. The sharpness of the image depends upon the number of pixels.

There are two kinds of viewing screen used for monitors.

- Cathode-Ray Tube (CRT)
- Flat-Panel Display

Cathode-Ray Tube (CRT) Monitor

The CRT display is made up of small picture elements called pixels. The smaller the pixels, the better the image clarity, or resolution. It takes more than one illuminated pixel to form whole character, such as the letter ‘e’ in the word help.

A finite number of characters can be displayed on a screen at once. The screen can be divided into a series of character boxes - fixed location on the screen where a standard character can be placed. Most screens are capable of displaying 80 characters of data horizontally and 25 lines vertically. There are some disadvantages of CRT:

- Large in Size
- High power consumption
Disadvantages

- Noisy

Non-impact Printers

Non-impact printers print the characters without using ribbon. These printers print a complete page at a time so they are also called as Page Printers.

These printers are of two types

- Laser Printers
- Inkjet Printers

Characteristics of Non-impact Printers

- Faster than impact printers.
- They are not noisy.
- High quality.
- Support many fonts and different character size.

Laser Printers

These are non-impact page printers as they use laser lights to produce the dots needed to form the characters to be printed on a page.

Advantages

- Very high speed
- Very high quality output
- Give good graphics quality
- Support many fonts and different character size

Disadvantages

- Expensive.
- Cannot be used to produce multiple copies of a document in a single printing.
Secondary Memory

This type of memory is also known as external memory or non-volatile. It is slower than main memory. These are used for storing data/information permanently. CPU directly does not access these memories instead they are accessed via input-output routines. Contents of secondary memories are first transferred to main memory, and then CPU can access it. For example: disk, CD-ROM, DVD etc.

Characteristic of Secondary Memory

- These are magnetic and optical memories.
- It is known as backup memory.
- It is non-volatile memory.
- Data is permanently stored even if power is switched off.
- It is used for storage of data in a computer.
- Computer may run without secondary memory.
- Slower than primary memories.
**Ethernet Port**
- Connects to a network and high speed Internet.
- Connect network cable to a computer.
- This port resides on an Ethernet Card.
- Data travels at 10 megabits to 1000 megabits per second depending upon the network bandwidth.

**Game Port**
- Connect a joystick to a PC
- Now replaced by USB.

**Digital Video Interface, DVI port**
- Connects Flat panel LCD monitor to the computer's high end video graphic cards.
- Very popular among video card manufacturers.

**Sockets**
- Connect microphone, speakers to sound card of the computer
Hardware represents the physical and tangible components of a computer i.e. the components that can be seen and touched.

Examples of Hardware are following:

- **Input devices** -- keyboard, mouse etc.
- **Output devices** -- printer, monitor etc.
- **Secondary storage devices** -- Hard disk, CD, DVD etc.
- **Internal components** -- CPU, motherboard, RAM etc.
Relationship between Hardware and Software

- Hardware and software are mutually dependent on each other. Both of them must work together to make a computer produce a useful output.

- Software cannot be utilized without supporting hardware.

- Hardware without set of programs to operate upon cannot be utilized and is useless.

- To get a particular job done on the computer, relevant software should be loaded into the hardware.

- Hardware is a one-time expense.

- Software development is very expensive and is a continuing expense.

- Different software applications can be loaded on a hardware to run different jobs.

- A software acts as an interface between the user and the hardware.

- If hardware is the ‘heart’ of a computer system, then software is its ‘soul’. Both are complimentary to each other.
Application Software

Application software products are designed to satisfy a particular need of a particular environment. All software applications prepared in the computer lab can come under the category of Application software.

Application software may consist of a single program, such as a Microsoft's notepad for writing and editing simple text. It may also consist of a collection of programs, often called a software package, which work together to accomplish a task, such as a spreadsheet package.

Examples of Application software are following

- Payroll Software
- Student Record Software
- Inventory Management Software
- Income Tax Software
- Railways Reservation Software
- Microsoft Office Suite Software
- Microsoft Word
- Microsoft Excel
- Microsoft Powerpoint

Features of application software are as follows

- Close to user
- Easy to design
- More interactive
Step 1 12570\(_8\) \((1 \times 8^4) + (2 \times 8^3) + (5 \times 8^2) + (7 \times 8^1) + (0 \times 8^0)\)\(_{10}\)

Step 2 12570\(_8\) \((4096 + 1024 + 320 + 56 + 0)\)\(_{10}\)

Step 3 12570\(_8\) 5496\(_{10}\)

**Note:** 12570\(_8\) is normally written as 12570.

### Hexadecimal Number System

Characteristics of hexadecimal number system are as follows:

- Uses 10 digits and 6 letters, 0,1,2,3,4,5,6,7,8,9,A,B,C,D,E,F.
- Also called base 16 number system
- Each position in a hexadecimal number represents a 0 power of the base (16). Example 16\(^0\)
- Last position in a hexadecimal number represents a \(x\) power of the base (16). Example 16\(^x\) where \(x\) represents the last position - 1.

### Example

Hexadecimal Number: 19FDE\(_{16}\)

Calculating Decimal Equivalent:

<table>
<thead>
<tr>
<th>Step</th>
<th>Binary Number</th>
<th>Decimal Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>19FDE(_{16})</td>
<td>((1 \times 16^4) + (9 \times 16^3) + (F \times 16^2) + (D \times 16^1) + (E \times 16^0))(_{10})</td>
</tr>
<tr>
<td>Step 2</td>
<td>19FDE(_{16})</td>
<td>((1 \times 16^4) + (9 \times 16^3) + (15 \times 16^2) + (13 \times 16^1) + (14 \times 16^0))(_{10})</td>
</tr>
<tr>
<td>Step 3</td>
<td>19FDE(_{16})</td>
<td>((65536 + 36864 + 3840 + 208 + 14))(_{10})</td>
</tr>
<tr>
<td>Step 4</td>
<td>19FDE(_{16})</td>
<td>106462(_{10})</td>
</tr>
</tbody>
</table>

**Note:** 19FDE\(_{16}\) is normally written as 19FDE.
Number Conversion

There are many methods or techniques which can be used to convert numbers from one base to another.

We'll demonstrate here the following:

- Decimal to Other Base System
- Other Base System to Decimal
- Other Base System to Non-Decimal
- Shortcut method - Binary to Octal
- Shortcut method - Octal to Binary
- Shortcut method - Binary to Hexadecimal
- Shortcut method - Hexadecimal to Binary

Decimal to Other Base System

Steps

- **Step 1** - Divide the decimal number to be converted by the value of the new base.
- **Step 2** - Get the remainder from Step 1 as the rightmost digit (least significant digit) of new base number.
- **Step 3** - Divide the quotient of the previous divide by the new base.
- **Step 4** - Record the remainder from Step 3 as the next digit (to the left) of the new base number.

Repeat Steps 3 and 4, getting remainders from right to left, until the quotient becomes zero in Step 3.

The last remainder thus obtained will be the most significant digit (MSD) of the new base number.

**Example**

Decimal Number: $29_{10}$

Calculating Binary Equivalent:
Data Processing Cycle

Data processing is the re-structuring or re-ordering of data by people or machine to increase their usefulness and add values for particular purpose. Data processing consists of basic steps input, processing and output. These three steps constitute the data processing cycle.

- **Input** - In this step the input data is prepared in some convenient form for processing. The form will depend on the processing machine. For example, when electronic computers are used, the input data could be recorded on any one of several types of input medium, such as magnetic disks, tapes and so on.

- **Processing** - In this step input data is changed to produce data in a more useful form. For example, pay-checks may be calculated from the time cards, or a summary of sales for the month may be calculated from the sales orders.

- **Output** - Here the result of the proceeding processing step are collected. The particular form of the output data depends on the use of the data. For example, output data may be pay-checks for employees.
Operating System

It is a program with following features:

- An operating system is a program that acts as an interface between the software and the computer hardware.

- It is an integrated set of specialised programs that are used to manage overall resources and operations of the computer.

- It is specialised software that controls and monitors the execution of all other programs that reside in the computer, including application programs and other system software.

Objectives of Operating System

- To make a computer system convenient to use in an efficient manner

- To hide the details of the hardware resources from the users

- To provide users a convenient interface to use the computer system

- To act as an intermediary between the hardware and its users and making it easier for the users to access and use other resources

- To manage the resources of a computer system

- To keep track of who is using which resource, granting resource requests, according for resource using and mediating conflicting requests from different programs and users

- To provide efficient and fair sharing of resources among users and programs
Intranet

- Intranet is a system in which multiple PCs are connected to each other.
- PCs in intranet are not available to the world outside the intranet.
- Usually each company or firm has their own Intranet network and members/employees of that company can access the computers in their intranet.
- Each computer in Intranet is also identified by a unique IP Address which is unique among the computers in that Intranet.