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In this chapter

- Milestones in the history of computers
- Computer languages
 - ◆ Binary Number System
 - ◆ Convert decimal number to binary
 - ◆ Convert binary number to decimal number
 - ◆ Types of computer languages

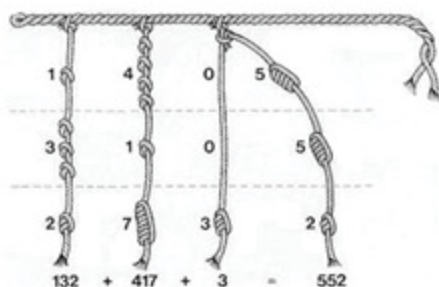
COBOL
PROGRAMMING

Microsoft
Visual Basic

Java



Tally Marks in Cave paintings



Quipu: Inca Method of Counting



Roman Era Abacus

Learning to count is a child's very first step and is considered an important educational/developmental milestone in most cultures of the world. Counting was primarily used by ancient cultures to keep track of social and economic data such as number of group members, domestic animals, property, or debts. In the early days people counted by making tally marks on rocks or by making knots on a piece of string. This practice eventually led to the invention of the Abacus, also called a counting frame.

We have come a long way from the Abacus to the modern day computer as you have been learning in your previous classes.

Let us do a quick recap of this long journey taking into account only the major milestones which changed the face of computers today.



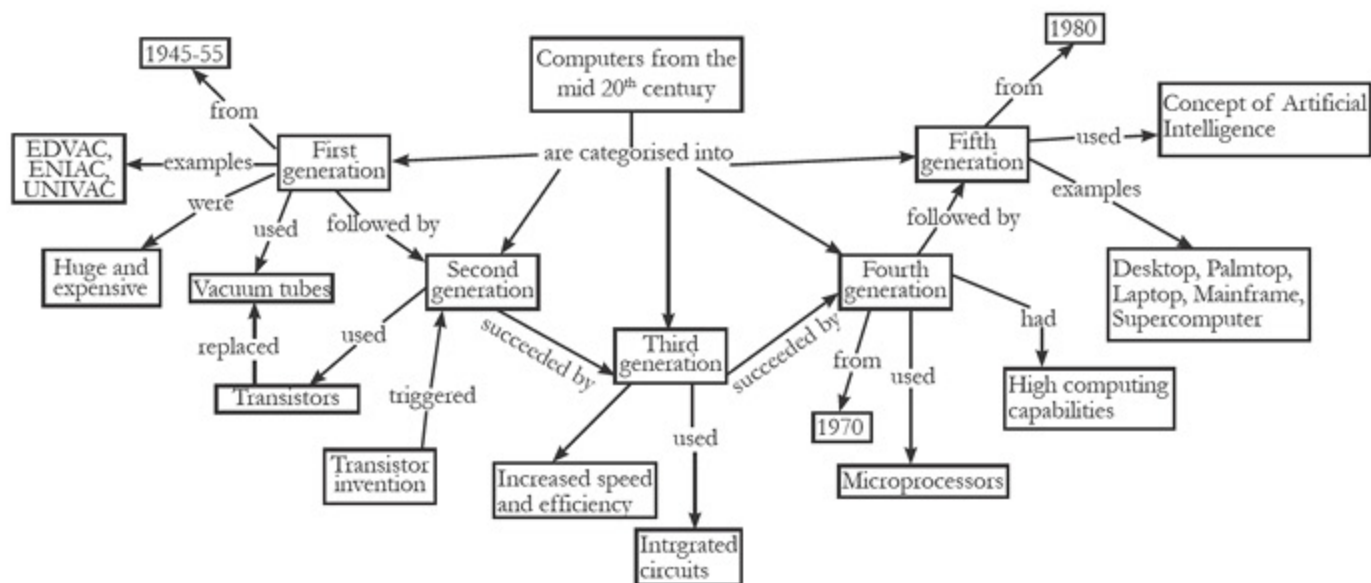
Rewind



Fill in the blanks taking cues from the technology used in the five generations of computers:



Here is a picture which tells about the history of computers from mid twentieth century. Study the picture and answer the following questions:



From the figure can you tell:

1. Which was the technology used in the first, second, third, fourth and fifth generation computers?

.....

.....

2. Which invention resulted in the evolution of Second Generation computers?

.....

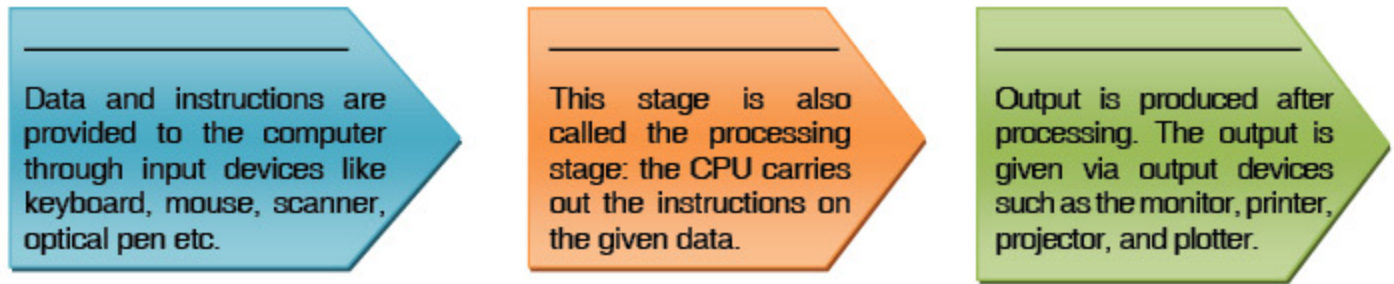
.....

Now that we have learnt about the milestones in the history of computers let us now understand how a computer actually works.

How a Computer Works:

A computer can process data very fast. Every computer follows an Input- Process - Output cycle or IPO cycle.

The IPO cycle has three stages. Write the name of the stage by reading its description.



For the IPO cycle we need the components of the computer to work together.

There are two main components of a computer Hardware and Software.

Hardware

Input and output (I/O) devices are all part of the hardware of the computer—that is, they are realized in pieces made of plastic, metal, glass, and special materials (such as silicon and germanium) that can be seen and touched. I/O devices contain a wide variety of parts, large and small, many of which could be seen in a disassembled printer, mouse, or other I/O device.



◀ Rewind ▶

Name three hardware devices,,



Winchester disk is another name for hard disk.

Software

A series of commands stored in the computer's storage unit is called a program. Computer programs consisting of a series of commands are called software. Software is as essential as hardware in accomplishing the work that computers do. Software is realized as letters and numbers written or printed on a piece of paper or stored in magnetic form on disks and diskettes.



Match the following Software with its inventors:

- | | | |
|----------|---|-----------------|
| Twitter | ● | Sabeer Bhatia |
| Facebook | ● | Bill Gates |
| Hotmail | ● | Jack Dorsey |
| Windows | ● | Mark Zuckerberg |

The computer does not understand our language. It only understands the instructions in 0's and 1's. So if we want to work and make the computer do a task we have to first understand the way this machine interprets our commands. This is called the Binary Number System.

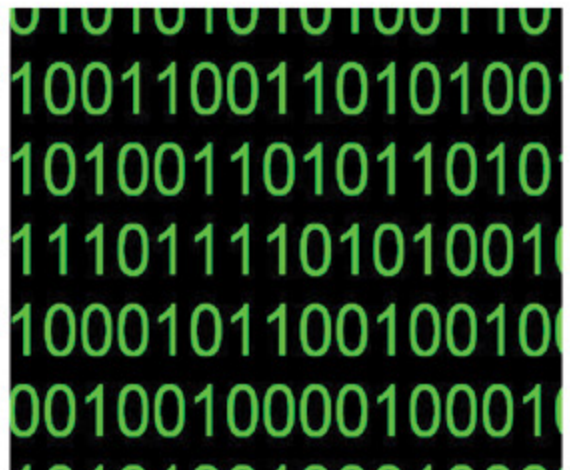
Binary Number System

Computers are based on the Binary Numbering System, which consists of just two unique numbers, 0 and 1. All operations that are possible in the decimal system (addition, subtraction, multiplication, division) are equally possible in the binary system. Computer can only read instructions written in binary code.

In a computer, a current that is considered to be either on or off at any time can represent a series of binary digits: 0s and 1s. This means that when the current is off, the value is 0, and when it is on, the value is 1.

The two-digit binary numbering system is the basis of machine representation of numbers, letters, characters, and symbols. The smallest unit of information is the binary digit, or bit. Eight bits together are known as a byte. A byte is considered a complete unit for storage or computation.

By considering the binary digits in fixed-length groups, the electrical current can be interpreted to mean a series of decimal digits or letters. The coding scheme used in most small computers today is called the ASCII character set. By assigning a unique eight-digit binary number sequence (a byte) to each member in an alphabet of letters, decimal digits, and symbols, the ASCII set can represent each character on a keyboard by 0's and 1's.



What does ASCII stand for?



Find out more about ASCII code and using this code, write your name.

Converting a decimal number to a binary number

Decimal numbers can be converted into binary numbers. Converting a decimal number into binary number requires certain number of divisions depending upon the character of the number.

In this method the decimal number is divided by 2 until the remainder reaches 1 and the dividends are queued up in reverse manner i.e. in the opposite manner of their acquiring - beginning from the remainder which is 1. We can show the conversion with the help of an example which will make it easier to understand. Suppose we are converting the decimal number (87)₁₀. Now the conversion is shown below.

2	87	→	1
2	43	→	1
2	21	→	1
2	10	→	0
2	5	→	1
2	2	→	0
	1		



A decimal number is divided by 2 till we get the quotient as 0. Then the number is written backwards starting from the remainder.



Thus 87 in binary form =1010111

Progress Bar

Convert the following numbers from decimal to binary.

a. 36

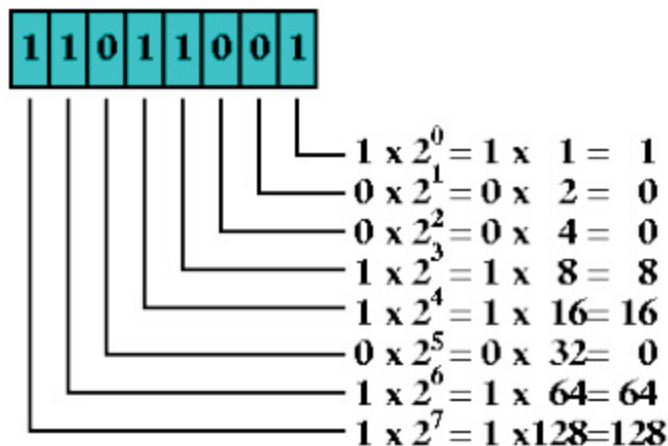
b. 27



Using ASCII codes write a secret message to your friend and ask her to reply to the same.

Converting from Binary to decimal form

We can convert a binary number back to its decimal form. We can show the conversion with the help of an example which will make it easier to understand. Suppose we are converting the binary number 11011001 to decimal form. The steps of conversion are shown below.



$$1 + 8 + 16 + 64 + 128 = 217$$

Thus, 10011011 in decimal form is =217



Progress Bar

Convert the following numbers from binary to decimal.

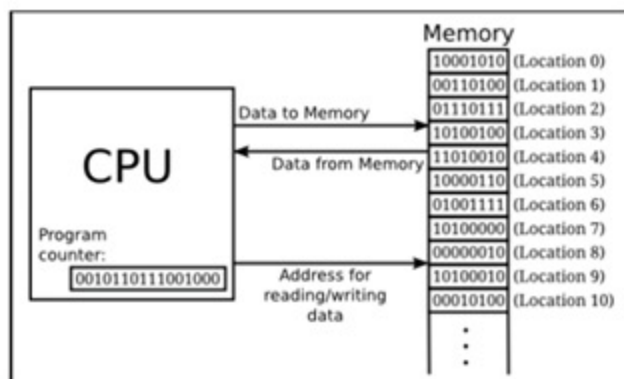
- a. 10001
- b. 111100
- c. 10011001

Since the computer understands only 0's and 1's we can write programs straight into binary, but then it would become long and time consuming. So to help us there are languages that have been developed which can convert numbers, text, symbols types of program whatever we write into binary code. There are two types of programming languages- low level and high level.

Low Level Computer Languages

The low level languages are those which are either in binary code or very close to it. These are of the following two types

Machine language is the first programming language that was developed and used. It is the most basic and consisted of data and instructions in 0's and 1's.



Assembly language gives instructions in abbreviations. A program called assembler is needed to translate the assembly language to binary code and a disassembler to do the vice versa. Assembly language written for one computer may not run for other computer. For e.g.: DEL is a command for 'delete'.

```

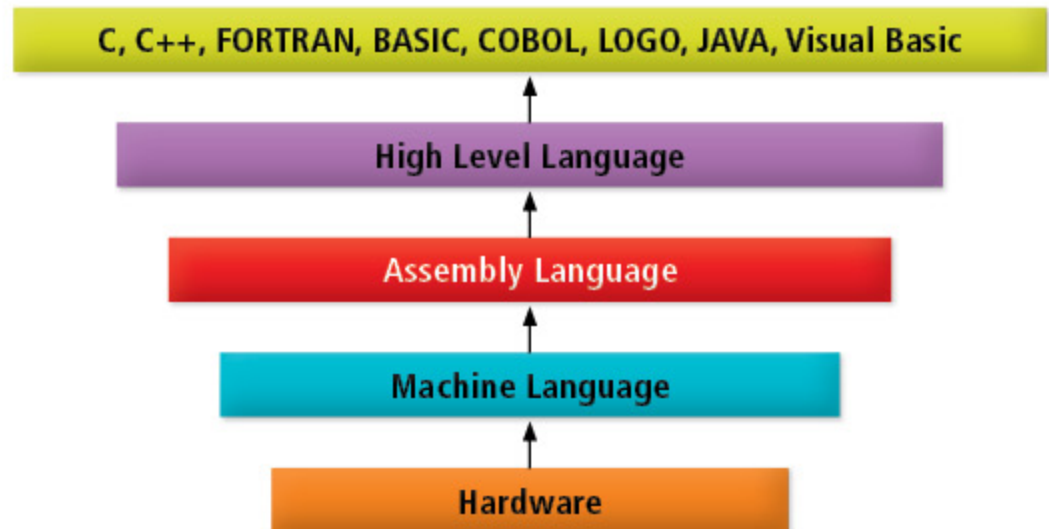
mov ax, 0x000D      : set 320x200 graphics mode
int 0x10            : bios video services
mov ax, 0x0C07     : put pixel in white color
xor bx, bx         : page number 0
mov cx, 200        : x position 200
mov dx, 100        : y position 200
11: int 0x10        : bios video services
dec dx             : decrease y position
loop 11           : decrease x position and repeat
mov ah, 0          : service 0 - get keystroke
int 0x16          : bios keyboard services
mov ax, 0x0003     : 80x25 text mode
int 0x10          : bios video services
mov ax, 0x4C00     : terminate program
int 0x21

```

High Level Computer Languages

Since computer languages were very computer specific, the need for a language came up which could run on any type of computer. Thus High level languages were developed. These are very close to English language. They are very easy to read and to write and very user-friendly as compared to low- level languages. Some of the common high- level programming languages are:

- C
- C++
- FORTRAN
- BASIC
- COBOL
- LOGO
- JAVA
- Visual Basic



High level programs are converted into binary code by using a set of programs called interpreter and compiler.

INTERPRETER	COMPILER
A complete program is fed in as input to the Compiler. Our program is in the human readable format.	The interpreter takes a single line of code as input at a time and executes that line. It will terminate the execution of the code as soon as it finds the error.
The human readable format undergoes many passes and phases of compiler and finally it is converted into a machine readable format.	The memory requirement is less in the case of the interpreter because no code is created in case of interpreter.



What does COBOL stand for and where was it used?



FORTRAN was the first high level programming language which was designed in 1950's and was used by scientists and engineers.



Megabytes

- ❖ The Computer is an electronic device which processes the input to give an output
- ❖ Hardware and software are the two main components of a computer.
- ❖ Binary number system has only two digits - 0 and 1.
- ❖ Computer language can be classified as low- level and high- level languages.
- ❖ Low level languages are machine language and assembly language
- ❖ High level language needs a compiler and interpreter e.g. C, C++ etc.

Vocabulary: Machine Language, Assembly Language, High-level Language, Compiler, Interpreter, Assembler, ASCII

Exercise

I. Tick the right answer:

1. Microsoft Excel is an

a. Application Software	b. System Software	c. Machine Language
-------------------------	--------------------	---------------------
2. Binary Number System uses only

a. 6 single digits	b. 4 single digits	c. 2 single digits
--------------------	--------------------	--------------------
3. The 8 bit unit code is called

a. Megabyte	b. bit	c. byte
-------------	--------	---------
4. Cobol is a

a. Machine language	b. interpreter	c. high level language
---------------------	----------------	------------------------
5. ENIAC is an example of

a. First generation	b. second generation	c. third generation
---------------------	----------------------	---------------------

II. Convert the following decimal number to binary number:

- a. 121
- b. 13
- c. 88

III. Convert the following binary number to decimal number:

- a. 111
- b. 110101
- c. 100001

IV. Answer the following questions:

- 1. Describe briefly the generations of computers.
.....
.....
.....
- 2. What do you understand by the binary number system?
.....
.....
- 3. Differentiate between an Interpreter and a Compiler?
.....
.....
- 4. Write a short note on Low level computer languages.
.....
.....


V.

Lab Work



- 1. Make a MS PowerPoint presentation on the generations of computers.
- 2. Make a chart in group of 3-4 students each and find out about the Low- Level Languages and High- Level Languages.

Geek Rule Students must close all open windows, applications, and log out before leaving the lab.



Teacher should do more conversions of binary and decimal conversions so that the students are clear on the concept.