- **What is computer?**

  Computer is an electronic device that accepts the data as an input, process the data, according to the given instructions and gives desired output.

  As per the definition, computer performs following tasks:

  a. It accepts the data as an input.
  b. It processes the given data according to the given instruction.
  c. It gives a desired output, or stores the result in provided file/data files.

- **Characteristics of Computer:**

  1. Speed:

     Computers can perform logical and mathematical calculations at much higher speed than human. It can perform millions of calculations in a mere second. Now a days, the speed of a computer is of the order of microsecond (10^{-6} second) to nanosecond (10^{-9} second).

  2. Accuracy:

     Computer performs mathematical calculation with 100% accuracy. There may be some error due to inconsistency or inaccuracy of data.

  3. Automation:

     Computer can perform mathematical calculation automatically, without any human interference.

  4. Storage capacity:

     Computer can store large amount of data. It can store the data in any form.

  5. Diligence (No tiredness):

     Computer performs a number of tasks without any fatigue or lack of concentration.

6. Versatility:
   Computer can perform different kinds of work with same accuracy and efficiency.
7. Multitasking:

   Computer can perform multiple tasks at the same time resulting in efficiency and time saving.

8. No feelings:

   Computer have no feelings and emotions. It can work continuously according to the instructions provided.

9. No IQ:
   Computer doesn't have their own IQ, it is a dumb machine without a user. It works only according to the instructions provided by the user.
   It cannot correct or modify the given data itself, even if some inconsistent or inaccurate data is provided.

- **Comparison between Human brain and Computer:**

  Human brain is like a powerful computer that controls all the actions of the human body.

  Like a computer, brain inputs, and processes and gives an output. It can also store information.

  Following are the comparisons between 'A human Brain' and 'A Computer':

Field of comparison	**Human Brain**	**Computer**
Construction	Neurons and synapsis	IC, Transistor, Diodes, Capacitors, etc.
Memory growth	Increases each time by connecting synaptic link.	By adding more storage devices.
Information transmission	Use chemicals to transmit the info.	Uses electricity to transmit the info.

Information processing speed	Low	High
Information processing power	Low	High
Storage capacity	High	Low
Reliability	Self-managed, self-organised and reliable.	Performs monotonous tasks, cannot correct itself.
Driving power	Uses oxygen and Carbs.	Uses electrical power.

- **Computer applications:**

  Now a days, computers are an essential part of lives. It is used in perhaps every sector to increase efficiency, reduce error and improve security.

  Some of the main uses of computers are:

  1. Home: Computers are widely used in homes to connect with friends and family, paying utility bills, watching shows and movies, improve security, home tutoring. It enables students to access information from internet.
  2. Medical field: Computers are used in Medical field to manage patient details, to perform diagnosis, perform various scans and checks.
  3. Entertainment: A big part of use of computer is for entertainment purposes. They can be used to watch movies or shows, playing games, social media, and many other stuffs.
  4. Education: Computers have become a big part of education industry to provide better learning to students from any part of the world. Computers have enables the access of internet through which, any information can be retrieved from any part of the world.

5. Banking: Computers helps banks to manage their data and also provide better security in terms of any data errors. It has also helped banks to make data centralised to reduce data redundancy and improve customer services. Due to this, users can access their bank account from anywhere without any worries.

- **Early History of Computer**

  Since the evolution of humans, devices have been used for calculations for thousands of years. One of the earliest and most well-known devices was an abacus. Then in 1822, the father of computers, **Charles Babbage** began developing what would be the first mechanical computer. And then in 1833 he actually designed an Analytical Engine which was a general-purpose computer. It contained an ALU, some basic flow chart principles and the concept of integrated memory.

  Then more than a century later in the history of computers, we got our first electronic computer for general purpose. It was the ENIAC, which stands for Electronic Numerical Integrator and Computer. The inventors of this computer were John W. Mauchly and J.Presper Eckert.

  And with times the technology developed and the computers got smaller and the processing got faster. We got our first laptop in 1981 and it was introduced by Adam Osborne and EPSON.

- **Generations of Computer:**

  The division of generations of computer are primarily based on changes in hardware technologies and software.

The latest computer generations inherited all the good features of previous generations. A short description of various generations of computer are as follows:

1. First generation (1946 – 1954):
   - Vacuum tubes were used as main electronic component.
   - Processing speed was in milliseconds.
   - They used machine dependent language for programming.
   - Large amount of heat was generated; thus, they required Air conditioners.
   - Slow mercury based memory.
   - Power consumptions were very high.
   - Very costly and less reliable.
   - Very large in size, thus not portable.

   Examples: ENIAC (Electronic Numerical Integrator and Computer), EDVAC (Electronic discrete variable computer), UNIVAC (Universal automatic computer).

2. Second generation (1955-1964):
   - Second generation computers used transistor which was faster, energy efficient and made the computer small in size.
   - Transistor were used in CPU, input/output processor and other electronic component.
   - Processing speed was increased to microsecond.
   - Magnetic ferrite core was used as main memory.
   - Magnetic disk and magnetic tape was used as a secondary memory.
   - Machine independent high level programming language like FORTRAN was used.
   - Hardware for floating point arithmetic was developed.
   - Input/output processor was developed to supervise and control input/output operation.

- Index register was developed which increased the flexibility in programming.
- Use of transistor made the computer smaller, faster and reliable.

  Example: IBM-1620, IBM-7090, IBM-7094, Digital Equipment Corporation's PDP-1, PDP-5, PDP-8 (Program data processor).

3. Third generation Computer (1965-1974):

   In this generation ICs (Integrated circuits) were used in CPU, I/O processor and other electronic components. The use IC made the computer even smaller, faster and more energy efficient. The important features of 3rd generation computer were:
   - ICs were used in CPU, I/O processor and other electronic components.
   - The processing speed was increased to nanoseconds.
   - Semiconductor was used as main memory.
   - Machine independent high level languages were used.
   - Parallel processing and multiprogramming were developed.
   - Computers were smaller, faster, reliable and more energy efficient.

     Example: Control Data Corporation's CDC-7600, PDP-11, CDC's CYBER-175, etc.

4. Fourth generation Computer (1975-1990):

   In this generation, microprocessor was used as a CPU, the CPU built on single IC is called micro-processor. Memory, I/O processor and other supporting chips also uses ICs, LSI (Large Scale Integration) and VLSI (Very LSI).

In earlier generation, computer cache memory, memory management unit (MMU) and floating point unit (FPU) used separate ICs. But with VLSI technology, it became possible to integrate all these component on single IC along with CPU.

Some important features of these generation computer were:

- Microprocessor were used as CPU.
- Processing speed is increased to Pico second.
- CRT screen was developed.
- Laser printer, inkjet printer and scanner were developed.
- Multi-feature and multi-functional peripheral chips.
- Computer were more user friendly which uses many high level language for programming.
- High speed of computer network such as- LAN and WAN were developed.

Example: Honeywell 6080 series;
Motorola's 68000, 68020, 68030;
Intel's 8086, 80286, CRAY-1, CRAY-2, CRAY-XMD.

5. <u>Fifth generation Computer (1991-Till now):</u>

This generation computers uses ULSI (Ultra large scale integration). An ULSI chip contains millions of component in single IC. 5^{th} gen computers accept spoken commands besides that in earlier generation computers.

It also supports AI. Some fields where AI is used are-

I. Robotics
II. Neural network
III. Game play
IV. Natural language processing
V. Development of expert system to decide real time solution.

Important features of 5th gen computers:

- Uses ULSI technology.
- Development of AI.
- Advance in parallel processing.
- Computers are more user friendly and supports all types of high level languages like- C, C++, Java, Kotlin, Swift, etc.
- Development of huge amount of storage.
- Reduced in size, faster, energy efficient and reliable.

Example: Desktop, laptop, smartphone, etc.