

Computer

Commonly, operating, machine, particularly used for, Technical & educational research

"Programming for Problem Solving"

o Components of a computer:

A computer is an electronic device that accept data, performs operation, displays result and stores the data or result as needed. It is a combination of Hardware & software resources that integrate & provide various functionality to users.

o Hardware is the physical component of computers such as Printer, Processor, Monitor, Keyboard etc

o Software: is the set of Program or Instruction that are required by the hardware resource to function properly

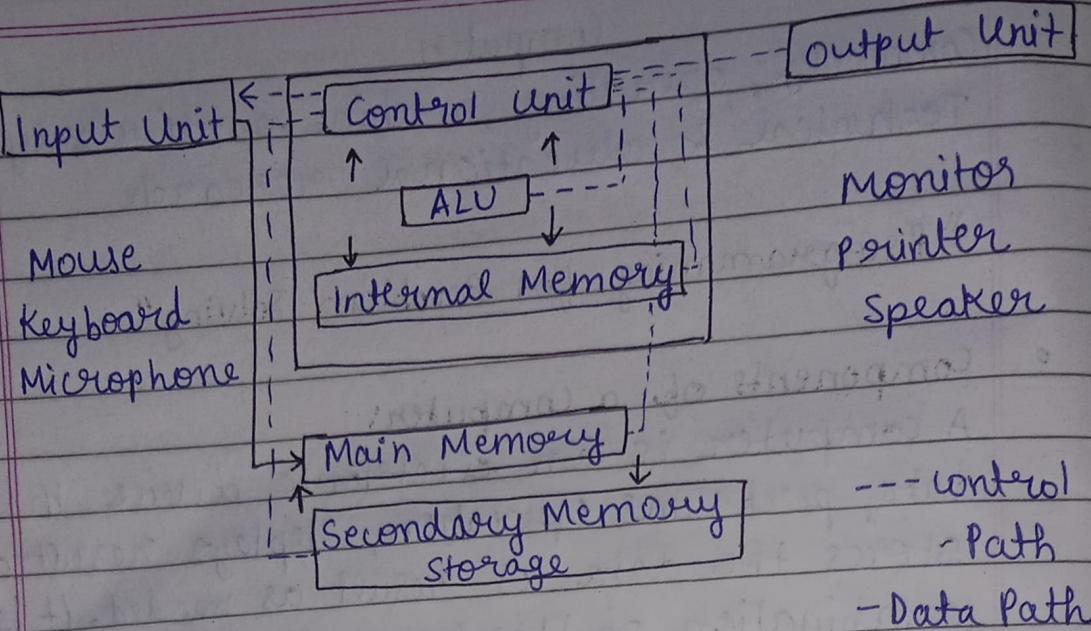
o Components of a Computer

There are mainly 3 components of computer

(A) Input Unit

(B) Central Processing Unit (CPU)

(C) Output Unit



- Input Unit consist of Input devices that are attached to the computer these devices take input & convert it into binary language that are computer understand. Some of the common inputs are "Keyboard, Mouse, Scanner".
- central processing unit (CPU): are the information is entered into the computer by the input device, the processor process it. The CPU is called the brain of computer because it control computer. It first fetches instructions from memory and then interperate them so as to know what to be done there after CPU execute or performs the required compilation and then either stores the output or display it on output deviu

The CPU Has 3 main components →

- Arithmetic logic Unit (ALU)
- Control Unit
- Memory registers

- (A) ALU: The ALU performs mathematical calculations, and takes logical decisions. Arithmetic " include addition, subtraction, multiplication & division.
- logical decision ~~int~~ involve ~~to~~ the comparison of 2 data item to see which one is larger or smaller or equal.
 - ALU is the main component or we can say it is a fundamental building block of the CPU.

- (B) Control Unit: The control Unit coordinates & control the data flow in and out of the CPU, and also controls
- all the operation of ALU, memory register & also input / output units.
 - It decodes the fetch instruction, interpret it & sends control signals to input / output device. Until the required operation is done properly by the ALU & memory. It is also called the central nervous system or brain of the computer.

- (C) Memory register: A register is a temporary unit of the memory in the cell.
- These are used to store the data which is directly used by the processor. register can be of different sizes (16 bit, 32 bit, 64 bit) & each register inside the CPU has a specific function like storing data, storing an instruction address of a location in memory etc.
 - Accumulators acc is the main register in the ALU & contain one of the operand of an

- operations to be performed in the ALU.
→ The main memory also called random access memory.

* Characteristics of Computer:

- Speed
- Accuracy
- Versatility
- Storage
- Reliability
- Diligence

* Speed of computer
measures the forms of
MiPS (Million of Instruction
Per Sec)

- Speed → A computer has an ability to process the data at faster rate.
It's Speed is measured in terms of MiPs.
- Diligence → It is the ability of computer to execute each & every instruction without any tiredness.

BIOS → (Basic I/P O/P system)

UPS → Uninterrupted Power (Power Saving used)

- Accuracy → A computer has the ability to do calculation accurately.
- Storage Capacity → A computer has an ability to store the large amount of data in the memory.
- Versatility → A computer has an ability to perform more than 1 task at a time.

- Reliability → A computer has the ability to perform all the task without any failure.

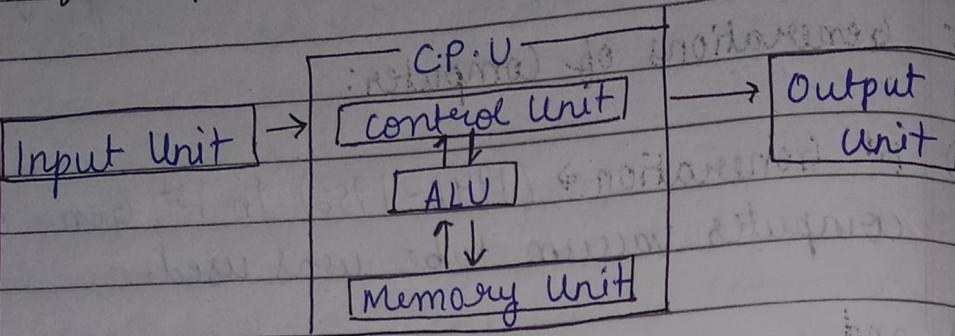
* Generations of Computer:

- (1) 1st Generation → (1946-1956) In 1st Gen. of computer vacuum tube was used.
- (2) 2nd Generation → (1956-1963) 2nd generation of computer uses transistor instead of vacuum tubes.
- (3) 3rd Generation → (1963-1971) In 3rd Gen. of comp. Integrate Circuits (IC) is used instead of Transistors.
- (4) 4th Generation → (1971-2024) In 4th Gen. of computer Microprocessors (MP) was used instead of Integrated circuits.
- (5) 5th Generation → Present to future. In 5th Gen. of comp. Artificial Intelligence will be used instead of microprocessor (MP).

- * Data → Data can be defined as the representation of facts, concepts, or instruction in a particular manner. Data is not processed.
- * Information → Information can be defined as the data that has been converted into meaningful data. Information is always processed it.

Venus
Important

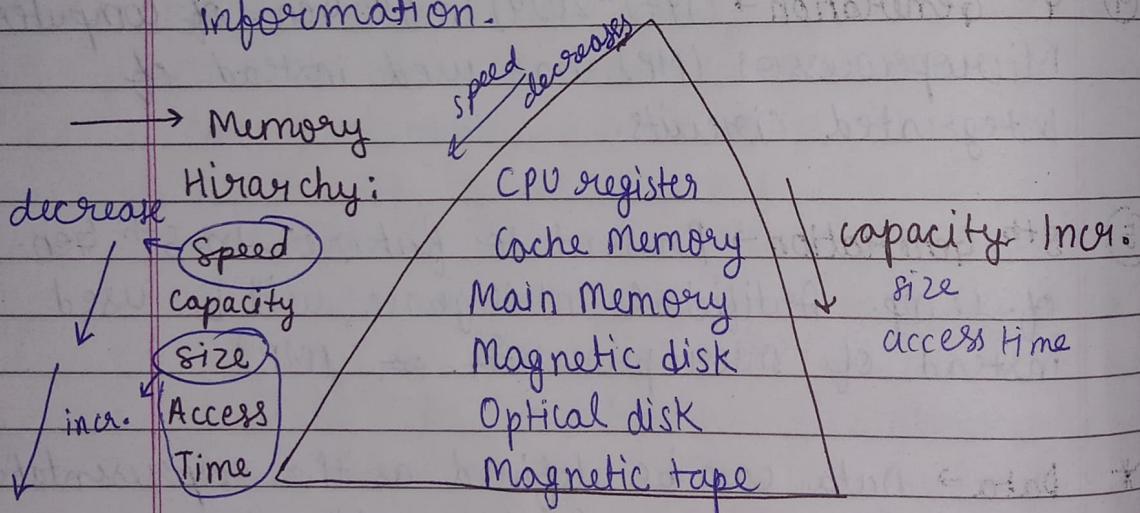
Block Diagram of Computer / Architecture of Computer



→ Memory Unit:

The process of saving a data & instructions permanently in the memory so it is known as storage.

→ Output Unit: It is the process of producing the result from the data to get useful information.



It gathers all the system supported memory and arranged them on priority basis.

→ CPU register: It holds temporary data & its capacity is very less & access time is also less.

- Cache memory: It is a very high speed semiconductor memory which can speed up the CPU & it holds the data & program which are most frequently used by the C.P.U.
 - Cache Hit → If the data found in cache memory then it is known as Cache Hit.
 - Cache Miss: If the data Not found in cache memory then it is known as Cache Miss.
- * Main memory → (Primary memory) Execution of Program takes place in main memory & it is also called Primary Memory. Main memory is divided into 2 parts.
- ① RAM
 - ② ROM

- ① RAM → It is the internal memory of the CPU for storing the data & program result. In RAM we can perform read & write operation. It is volatile in nature because data will be saved till the power is ON.

TYPES OF RAM:

- ① SRAM
- ② DRAM

- ① SRAM → (Static Random access memory) is a type of random access memory that holds its data permanently in the presence of power.
- ② DRAM → (dynamic random access memory) is a

type of semiconductor memory that is typically used for the data or program code needed by computer processor to function.

- ② ROM: In ROM we can perform only read operation. ROM is NON-VOLATILE in nature & in ROM data will be stored permanently in the memory.

ROM Classified in 3 parts.

- ① PROM: Programmable Read only memory
- ② EPROM: Erasable " "
- ③ EEPROM: Electrically Erasable - - -

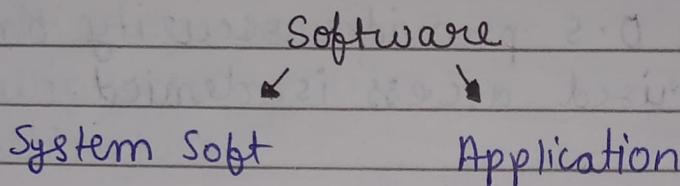
- ① PROM → It is a form of digital memory where the contents can be changed once after manufacture of the device
- ② EPROM: It ~~retains~~ retains its data when its power supply is switched off. It is an array of floating - gate transistors. It does not loose the data when the power supply is cut off.
- ③ EEPROM: is a type of non-volatile ROM that enables individual bytes of data to be erased & reprogrammed.

→ Magnetic Disk:

It is simply a circular in shape & store the data on the surface.

E.g.: CD

- Magnetic tape → It is a simply recording device that is covered with Plastic film.
- Software → It is set of instruction which are given to computers to perform a particular task. It is categories into 2 parts:



- System Software: It includes the program that are dedicated to manage the computer itself.
Eg → OS
- Application Software:
It is a computer software which are designed to perform a specific task.
Eg → MsOffice etc.
- Operating System: It is a software which act as an interface between user & Hardware. An operating system is a Program & it controls the execution of all types of Program.

- Functions & Services of OS:

- ① Security
- ② File Management
- ③ Memory Management
- ④ Device Management
- ⑤ Process Management
- ⑥ Error Handler

① Security → O.S provides security and unauthorised access is denied.

② File management →

In file management OS trap the record of all the files which are present in the system.

③ Memory management →

In this OS provides the space for the execution of all the programs.

④ Device Management →

In device management OS check all the devices which are connected to computer and is working properly or not.

⑤ Process Management →

In this OS assigned the time for each process & it can be completed on time otherwise it will be discarded.

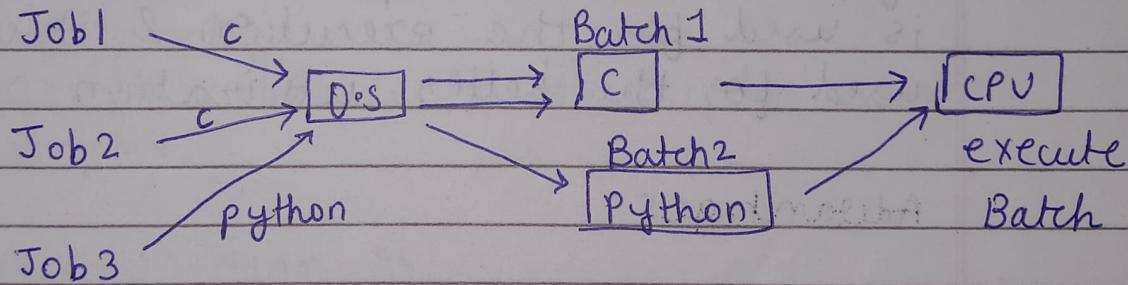
⑥ Error Handling → O.S handles all the errors which are occurred in the system.

EG → Software errors & Hardware errors.

TYPES OF O.S

- ① Batch O.S
- ② Multi programming
- ③ Multiprocessing
- ④ Multitasking
- ⑤ Time sharing
- ⑥ Real Time

① Batch O.S



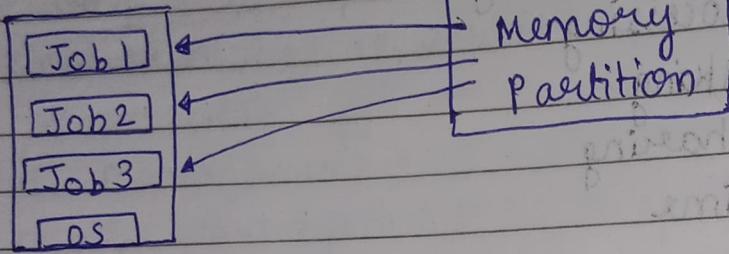
- i. It is the responsibility of operators to sort the job with similar needs.
2. It is designed to manage & execute the large no. of jobs efficiently by processing them in batches.

Date _____

Advantages of Batch OS
It is easy to manage the large no. of work / jobs repeatedly.

Disadvantage
CPU goes to ideal state after every batch then CPU idle time increases.

② multiprogramming OS



It states that more than one program present in the main memory & anyone of them can be kept in execution & it is used for the execution & it can be used for the better utilization of CPU.

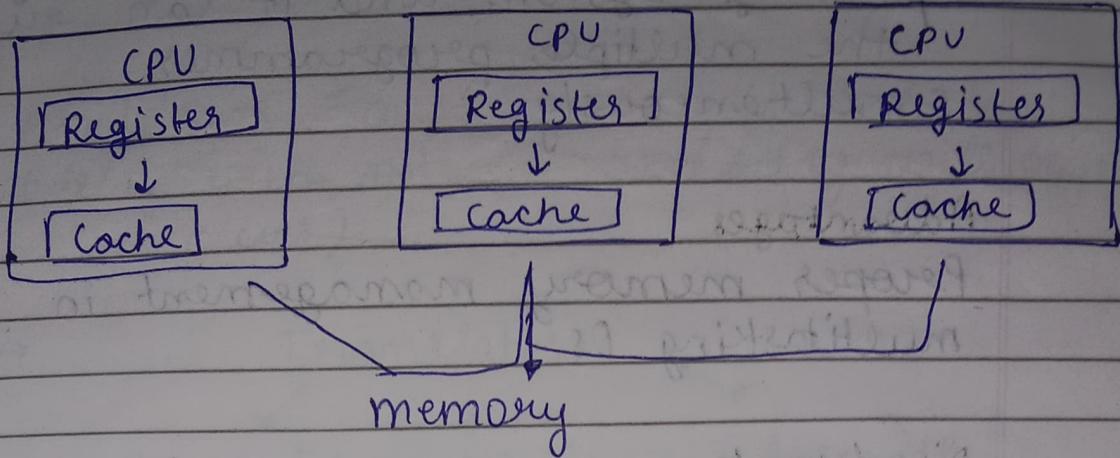
Advantages

1. Increase performance of the system
2. Reduce response time.

Disadvantage

Its design is complex and costly.

(3) Multiprocessing OS



It is a type of O.S in which more than one CPU used for the execution of resources.

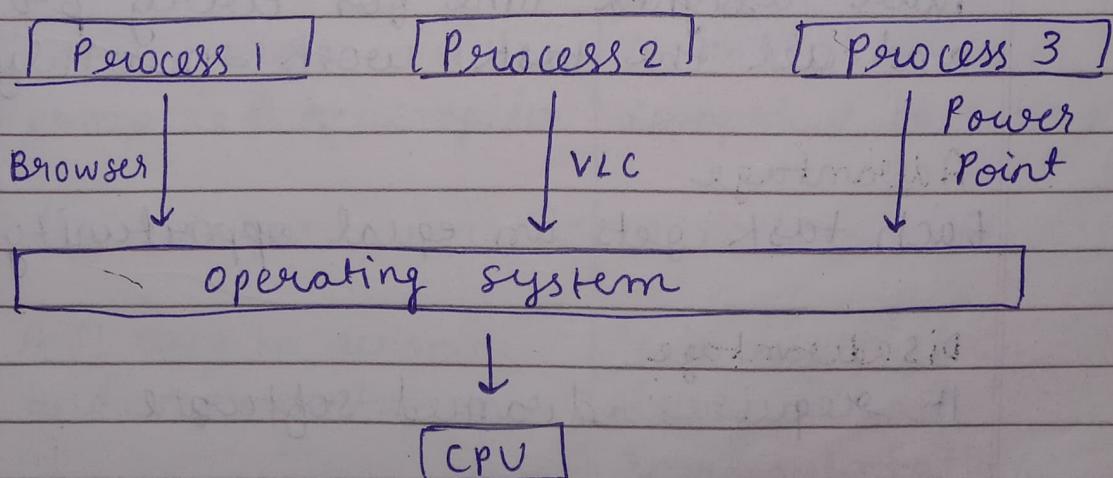
Advantage

It has several processors so if one processor fails then another processor will work.

Disadvantage

Due to multiple CPU it can be more complex.

(4) Multitasking OS



It is simply a multiprogramming operating system and it can run the multiple programmes simultaneously.

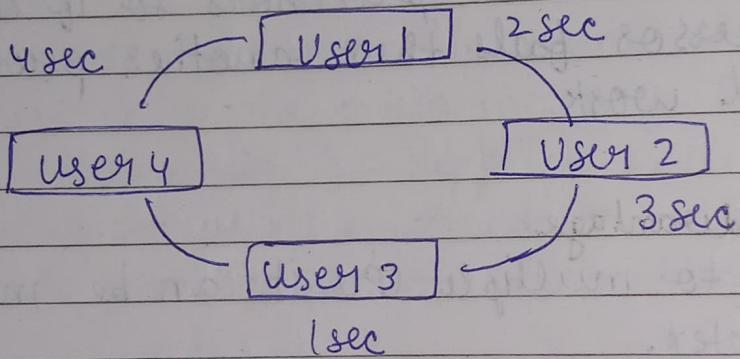
Advantages

Proper memory management in multitasking OS

Disadvantage

System gets heated in case of heavy program.

(5) Time sharing



In Time sharing operating system we have assigned time for every process and all the task work smoothly.

Advantage

Each task gets an equal opportunity

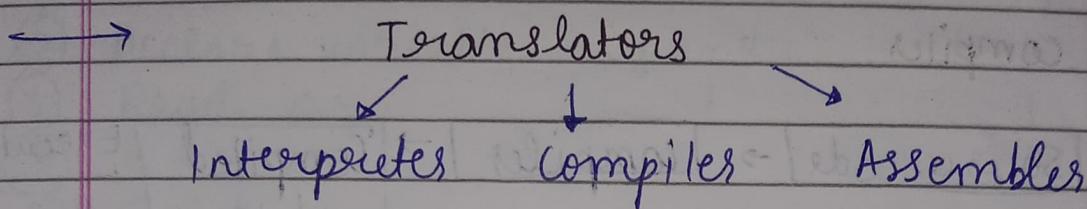
Disadvantage

It requires advanced software.

(b) Real Time Operating system

Hard Real Time
(delay will not occur)

Soft Real Time
(delay will occur)



Translators are the system softwares that converts programming language into binary format.

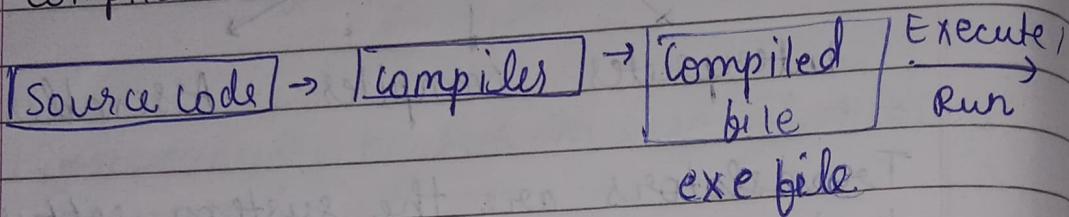
- Difference between Interpreter & compiler

Interpreter	Compiler
1. Interpreter check the program line by line	Compiler checks the whole program and find out the errors after compilation of the program.
2. It takes more time as compared to compiler	It takes less time as compared to interpreter
3. It is cheaper.	It is expensive
4. It is easy in designing and implementation.	It is difficult in designing and implementation.

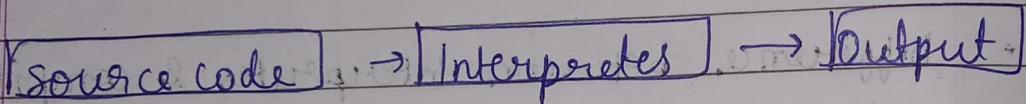
S. It is present in the past time. | It is used in present time.

③ Assembly: It is a type of translator that converts assembly lang. into the machine code.

- compiler



- Interpreter



→ Algorithm: It is a step by step finite set of instructions to solve the computational problem.

Characteristic of Algorithm

- ① Input: Input are supplied by the user
- ② Output: At least one output is produced.
- ③ Definiteness: Each instruction must be clear and no confusion occurs
- ④ Finiteness: Algo. must be terminate after finite no. of steps.

(5) Effectiveness : Algo must be effective if it will produce a correct result.

Q Write down the algorithm to add 2 no.'s enter by the user.

- (1) Start
- (2) Declare variable x, y and z
- (3) Read x, y
- (4) $z = x + y$
- (5) Print z
- (6) Stop

Q Write down the algo to calculate the vol. of cylinder

- (1) Start
- (2) Declare variable h, r, v
- (3) Read h, r
- (4) $v = 3.14 * r * r * h$
- (5) Print v
- (6) Stop

Q ----- volume of sphere & also calc. area of \triangle where three sides are diff. & after that multiply these 2 quantities.

- (1) Start
- (2) Declare variable v, r, A, a, b, c, s, F
- (3) Read r, a, b, c
- (4) $v = \frac{4}{3} * 3.14 * r * r * r$
- (5) Print v
- (6) $s = (a+b+c)/2$
- (7) Print s
- (8) $A = \sqrt{s(s-a)(s-b)(s-c)}$
- (9) Print A
- (10) $F = A * v$
- (11) Print F
- (12) Stop

Q Write down the Algorithm to find out lateral surface Area of cone and also calculate the Perimeter of Rectangle and multiply these two quantities.

- (1) Start
- (2) Declare, r , l , b , A , P , M , L
- (3) read r , l , b
- (4) $A = 3.14 * r * l$
- (5) Print A
- (6) $P = 2 * (l + b)$
- (7) Print P
- (8) Stop
- (9) $M = A * P$
- (10) Print M
- (11) Stop

Q Write down the Algorithm to calculate volume of Hemisphere and also calculate areas of right angle triangle and Divide these two quantities.

- (1) Start
- (2) Declare V , A , r , D , b , h
- (3) read
- (4) $V = 2/3 * 3.14 * r * r * r$
- (5) Print V
- (6) $A = 1/2 * b * h$
- (7) Print A
- (8) $D = V / A$
- (9) Print D
- (10) Stop

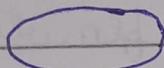
Flowcharts

Flowchart is the most widely used graphical representation of an algorithm and it uses various symbols to show the operations and it follows in sequential order.

→ Flowchart symbols

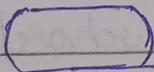
① Terminal Symbol

It is represented with the help of circle for denoting the start and stop symbol



Start / stop

or



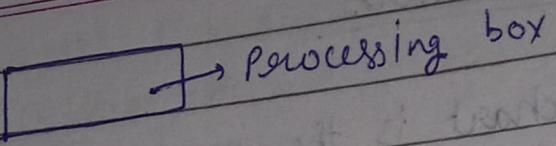
② Input / output symbol

Input symbol is used to represent the input data and output symbol is used to display the output data.

Input/Output  parallelogram

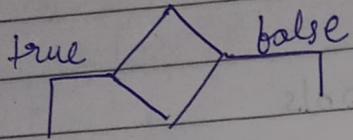
③ Processing Symbol

It is represented in the flow chart with the help of rectangle box and it is basically used for the calculation and declaration of variable



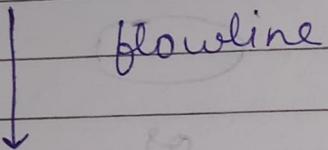
④ Decision Box

Diamond is used for the decision making statement



⑤ Flow lines

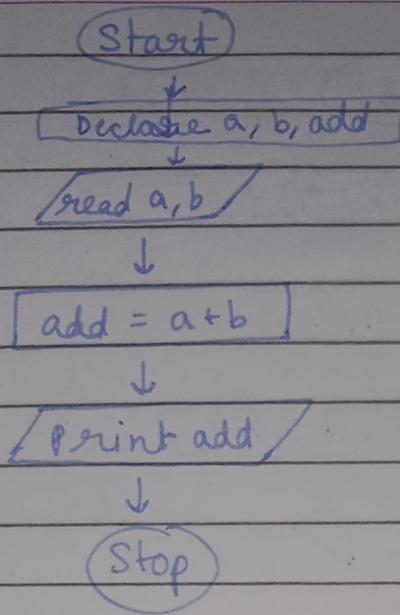
It represent exact sequence in which instruction is executed



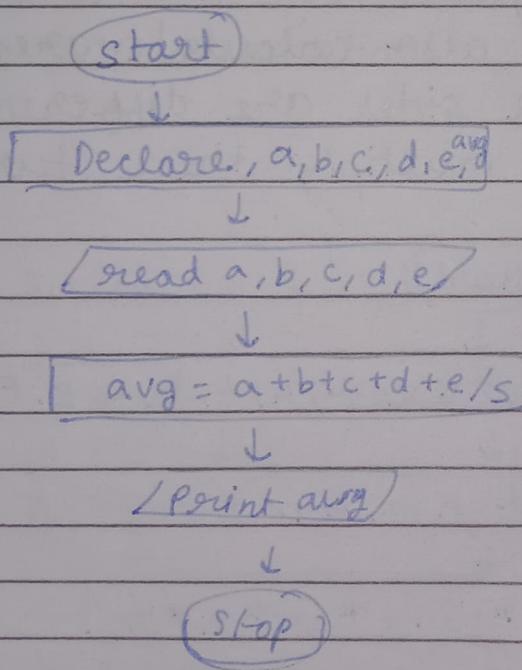
Properties of Flowchart

- ① It should consist of standardised symbols
- ② The symbols should be correctly used according to the flowchart rules.
- ③ It should have clear and readable statement written inside the symbol
- ④ It must have one starting and ending point.

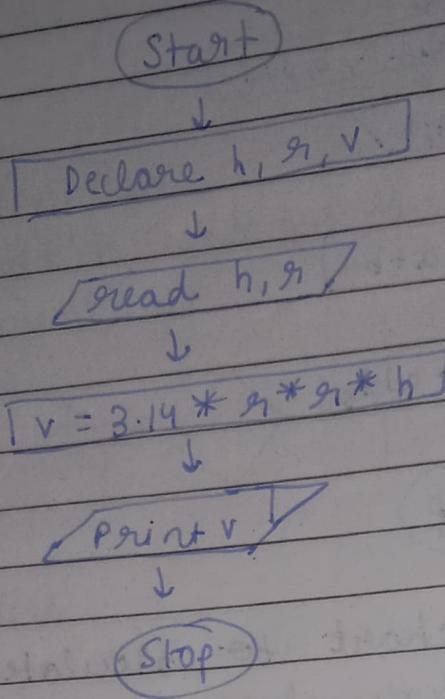
- Q Draw the flowchart for the addition of 2 numbers.



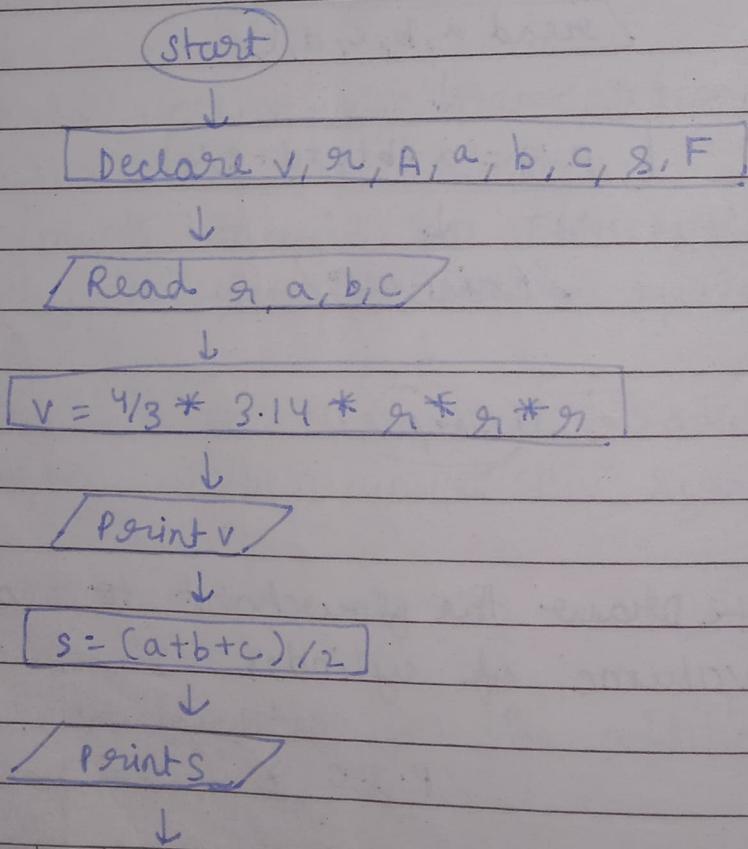
Q Draw the flowchart to calculate the average of 5 numbers.

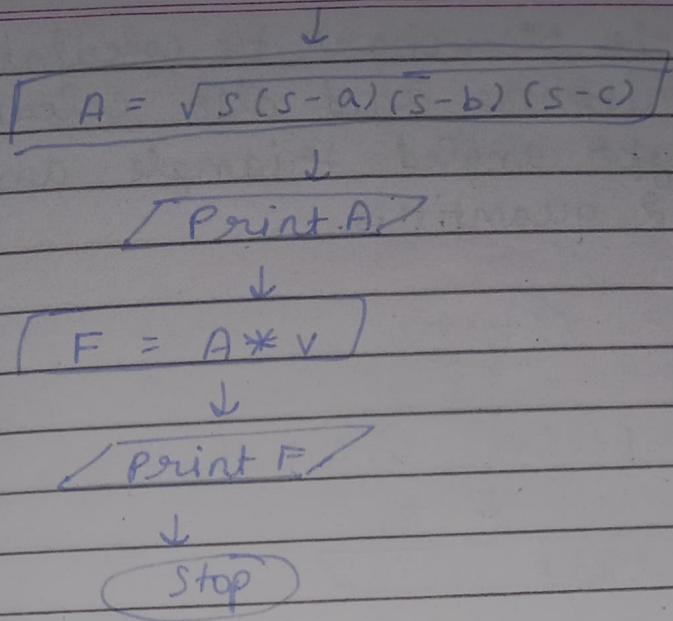


Q Write draw the flowchart to calculate the volume of cylinder

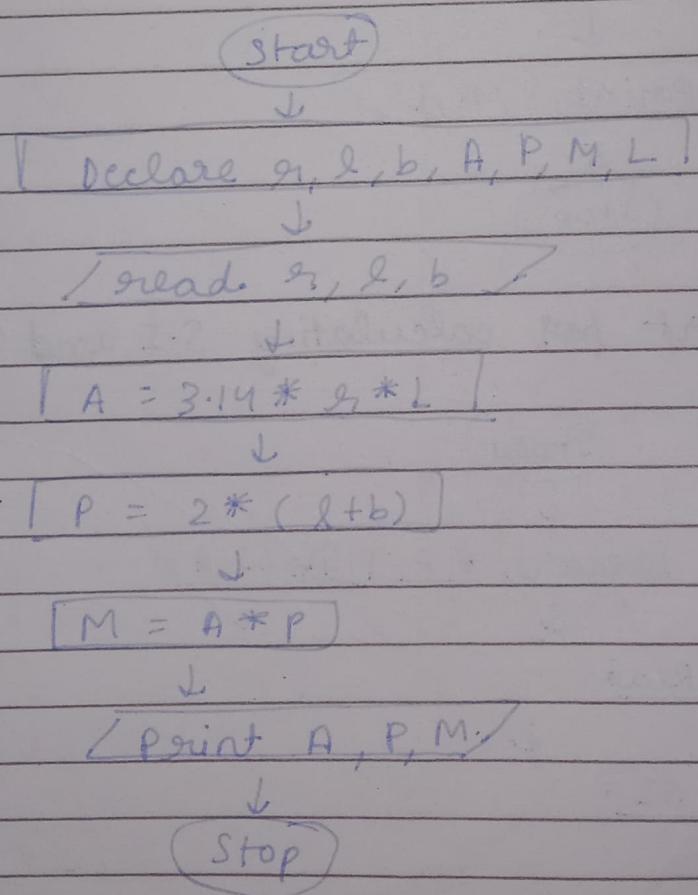


- Q Draw the flowchart of volume of sphere and also calculate area of \triangle where three sides are different and after that multiply these two quantities.

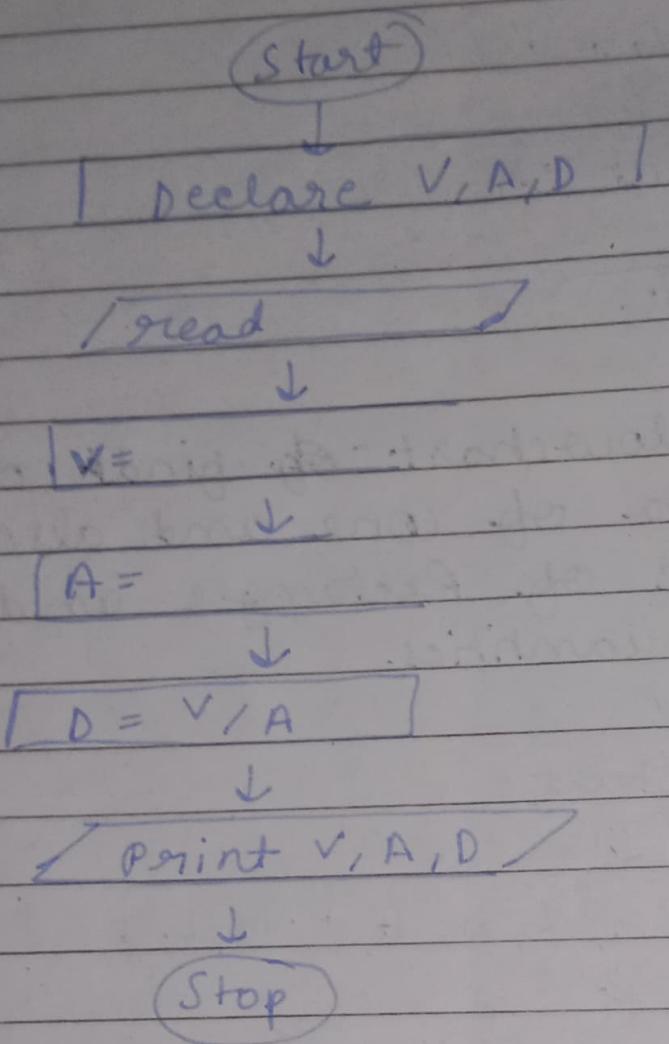




- Q Draw the flowchart to finds out lateral Surface Area of cone and also calculate the Perimeter of Rectangle and multiply these two quantities.



- a) Draw the flowchart to calculate volume of Hemisphere and also calculate area of right angled triangle and divide these 2 quantities.



- a) Flowchart for calculating S.I and C.I

(Start)

Declare SI, P, R, n

Read P, R, n



$$SI = P * R * 100$$



$$CI = P \left(\left(1 + \frac{R}{100} \right)^n - 1 \right)$$



Print SI+CI



(Stop)

STRUCTURE OF C PROGRAM

Was invented by Dennis Ritchie (1972)

- C → case sensitive language
- C → Total 32 keywords
- C → portable

Features of
C programming
language.

→ E "There are 6 basic sections responsible
for the execution of program."

(1) Documentation Section

It consists of the description of the program, name of the program, time and date of the creation of the program.

Ex. /* Addition of two no. */

(2) Preprocessor Section

All the header files of the program will be declared in the preprocessor section of the program.

→ preprocessor Directive

Header files

- ① #include <stdio.h> → printf();
→ scanf();
- ② #include <conio.h> → getch();
→ void main()
or
int main();

(3) definition section

~~Key~~-processors are the programmes that process our source code.

define PI 3.14

(4) Global declaration

Global declaration contains global variables and static variable.

(5) Main function

Every c program must have main function and program execution will also start from the main function.

```
→ void main ()           ← int main ()
{                         {
    getch ();             return 0;
}                         }
```

getch is used to hold the screen at the time of output.

(6) Header file

It is a text file that contains the piece of code written in c-program.

→ #include <stdio.h>

"stdio" stands for standard input / output and it contains 2 functions

printf() → for the O/P

scanf() → for the I/P

→ #include <conio.h>
 conio stands for console I/O and it contains one function:

getch() - This function is used to hold the output screen.

& WAP in C to print hello world.

```
#include <stdio.h>
```

```
#include <conio.h>
```

```
void main()
```

```
{
```

```
  printf("Hello World");
```

```
  getch();
```

```
}
```

& WAP in C to print a pattern * * * *

```
* * *
```

```
#include <stdio.h>
```

```
* *
```

```
#include <conio.h>
```

```
*
```

```
void main()
```

```
{
```

```
  printf("****\n");
```

```
  printf("***\n");
```

```
  printf("**\n");
```

```
  printf("*\n");
```

```
  getch();
```

```
}
```

* * * *

```
#include <stdio.h>
#include <conio.h>

void main()
{
    printf("*\t*\t*\t*\n");
    getch();
}
```

Errors in C Programming

There are 5 Types of errors ^{that} occurs in C programming.

① Syntax Errors

These errors occurs when ~~the~~ rule of writing techniques have been broken.

Ex. Missing semi-colon ;
missing Parenthesis ()

② Runtime Errors

It is also known as "Execution time error"

Ex. divide by zero error 45%

③ Logical Errors

It is also known as ~~semantic~~ errors and it will produce wrong output.

- Ex :**
- Incorrect datatype
 - Wrong Boolean expression

(4) Linker Errors

It occurs during the linking phase of compilation process.

- Ex:** undefined symbol

(5) Preprocessor Errors

This error occurs during the preprocessing phase of the compilation process where preprocessor directive are processed before the actual compilation begins.

- Ex:** Missing #

o Datatypes

int → %d 4 byte

char → %c 1 byte

float → %f 4 byte

Program 1) WAP in c to add two numbers

```
#include <stdio.h>
```

```
#include <conio.h>
```

```
int main()
```

```
{
```

```
    int a, b, c;
```

```

    ↗ scanf ("%d %d", &a, &b);
    ↗ print ("Enter the value of a and b:");
    ↗ a+b;
    ↗ printf ("%d", c);
    ↗ return 0;
}

```

Output: Enter the value of a and b:
 10 20
 30

(P-2) WAP in C to calculate the average of 5 numbers

```

#include <stdio.h>
#include <conio.h>

int main()
{
    int a, b, c, d, e, avg;
    float avg;
    printf ("Enter the value for the average of");
    printf ("a, b, c, d, e:");
    scanf ("%d %d %d %d %d", &a, &b, &c, &d, &e);
    avg = a + b + c + d + e / 5;
    printf ("%d", avg);
    return 0;
}

```

3. Write a C program to calculate the area of a rectangle.
 Output: Area = 382.9

Program - 3

wap in c to calculate area of circle and also calculate circumference of circle and multiply these two quantities.

```
#include <stdio.h>
#include <conio.h>
```

```
int main()
```

```
{
```

```
float A, C; M;
```

```
printf("Enter the value of r:");
```

```
scanf("%d", &r);
```

```
A = 3.14 * r * r;
```

```
C = 2 * 3.14 * r;
```

```
printf("%f %f", A, C);
```

```
return 0;
```

```
M = A * C;
```

```
printf("%d", M);
```

```
return 0;
```

Program - 4

wap in c to calculate SI and CI and add these two quantities

P.T.O →

```
#include <stdio.h>
```

```
#include <conio.h> // in base
```

```
#include <math.h> // for pow function
```

```
int main()
```

```
{ float SI, CI, A;
```

```
int P, R, n; SI, CI, A, T;
```

```
printf("Enter the value of P, R, n: ");
```

```
scanf("%d %d %d", &P, &R, &n);
```

```
SI = P * R * 100 * T
```

```
CI = P * (1 + R / 100) ^ n - 1
```

A = SI + CI;

```
printf("%d", SI);
```

```
printf("%d", CI);
```

```
printf("%d", A);
```

```
return 0;
```

```
}
```

$$SI = (P \times R \times T) \times 0.00;$$

$$CI = P * (pow(1 + \frac{R}{100}), n) - 1;$$

Program-5

WAP in c to calculate Volume of cylinder
and also TSA of cone & divide these 2
quantities.

```
#include <stdio.h>
```

```
#include <conio.h>
```

```
int main ()
```

```
{ float D, V, TSA, P;
```

```
int r, l, P, h;
```

```
printf (" Enter the value of r, l, h");
```

```
scanf ("%d %d %d", &r, &l, &h);
```

$$V = 3.14 * r * r * h;$$

$$TSA = 3.14 * r (l + r);$$

```
printf ("%f %f", V, TSA);
```

$$D = \frac{V}{TSA};$$

```
printf ("%f", D);
```

```
return 0;
```

```
}
```

OUTPUT

Enter the value of r, l, h

2 6 8

100.48

50.24

2

- Q WAP to calculate volume of cuboid & also
calculate volume of sphere after that divide

these two quantities.

```
#include <stdio.h>
#include <conio.h>
```

```
int main()
```

```
{
    int l, b, h, V1, r1, V2, t;
    printf ("Enter l, b, h");
    scanf ("%d%d%d", &l, &b, &h);
    V1 = l * b * h;
    printf ("%d", V1);
    printf ("Enter r");
    scanf ("%d", &r1);
    V2 = 4 * 3.14 * r1 * r1 * r1;
    printf ("%d", V2);
    t = V1 / V2;
    printf ("%d", t);
    return 0;
}
```

Fundamental Datatypes

1) Integer: int \rightarrow 2 bytes

Range: $\rightarrow -32768$ to $+32767$

Format specifier $\rightarrow \%d$

It is a datatype which holds integer value, its format specifier is $\%d$ & its range is -32768 to $+32767$ & it occupies 2 bytes in the memory.

→ Declaration of integer

Datatype variable name;
ex: int x;

2. character: This datatype is basically used to hold the character data. Its format specifier is %c & it occupies 1 byte in the memory & its range is -128 to +127.

3. Float: It is basically used to hold the decimal value upto 8 places. And its format specifier is %f, it occupies 4 byte in the memory & its range is 3.4×10^{-38} to 3.4×10^{38}

→ Declaration float x = 4.0;

4. Double datatype: This datatype holds the decimal value upto 15 places, and its format specifier is %lf. Its range is 1.7×10^{-308} to 1.7×10^{308} , & it occupies 4 byte in a memory.

5. Long double: Basically used to store the value of decimal upto 4 digits &

Its format specifier is %Lf. Range $\rightarrow 3.4 \times 10^{-4932}$ to 1.1×10^{4932} .

Linker and Loader

1. Linker: The main function of linker is to

generate the executable file.

- The linker takes the input as an object code which are generated by the compiler.
 - The process of linking can be understood as a method to combine the different code in order to obtain the executable file.
- d. loader - The main function of loader is to load the executable file & program in the main memory.
- It takes executable file as an input.

