C++

Object-oriented programming is a programming paradigm based on the concept of objects which can contain data and code: data in the form of fields (often known as attributes or properties) and code, in the form of procedures (often known as methods).

Basic Concepts of OOPs

1. Object : specific data type : a variable of specific data type
2. Class : collection of data member & data methods
3. Data Abstraction (अमूर्तन) : using methods or variable outside the class
4. Data Encapsulation : collection of data and function
5. Inheritance (वंशानुगत) :
6. Polymorphism (बहुरूपता) : the condition of occurring in several different forms
7. Message Passing

C++ is a object oriented programming language and developed by Bjarne Stroustrup.

Main point of C++

Developed at AT & T Bell laboratories
Created by Bjarne stroustrup in 1979
It is based on 'Simula 67'
Used in making software
follows botton-up approach.

Operation in C++

<< Insertion operator
>> Extraction operator
:: Scope resolution operator
Delete Used to release the memory
New Memory allocation operator

Hello guys

welcome to our new channel

C language =>

C is a procedural programming language, developed by Dennis Ritchie in 1972 at Bell laboratory. It can be used to develop software like operating system, data-bases, compilers, and so on.

Its importance

*1- Efficient and high speed.
*2- Portable- not forced by any operating system or any machine.
*3- Structured language.
*4- Wide acceptable
*5- used for writing operating system as well as application level language.

Compiler- It is a translator which is used to translate the c language into machine
language(binary language).
ex- turbo c, visual c, borland c etc.

Tokens(basic unit) in C language =>

*1-**Keywords=>**These are the reserved words in C which is not used as user define word. These are used to write statement or instruction. There are 32 keywords in C.
Ex-char, int, if, for, void, else, float etc.

*2-**Identifiers**=>It is a name given to variable,function or class by user.

Rules to give the name of identifier=>

*1-There can be use of alphabet, digits and underscore(_).
*2-Don't started with digit.
*3-Don't use white space while naming.
*4-There is difference of lowercase and uppercase (case sensitive).
ex- ram and Ram is different for C language as it is a case sensitive language.
*5-Don't use the name of keyword.

*3-**String=>**It is continuous group of character.
ex-Ram, Raj, Anoop and so on.

*4-**Constant**=>Constant means such a value which does not change. It is such a word or value which does not change in whole program. It is declared by word "const".

*5-**Operators**=>Operators are the signs which is used to work with data such as solvivg numerical problems and others.
Ex- +, -, *, /, %, && etc.

Types of operators=>

***1-Arithmetic operator =>**

operator name	symbol	example
(i)- Addition	+	a+b
(ii)- Substraction	-	a-b
(iii)-Multiplication	*(asterisk)	a*b
(iv)- Division	/	a/b,5/2=2
(v)- Module	%	a%b,5%2=1

***2-Relational operator**=>

operator symbol	meaning	example
<	is less than	a<b
>	is greater than	a>b
<=	is less than or equal to	a<=b
>=	is greater than or equal to	a>=b
==	is equal to	a==b
!=	is not equal to	a!=b

***3-Logical operator=>**

operator symbol	meaning/name	example
&&	logical and	a>5&&a<99
||	logical or	a>5||a<7
!	logical not	a=!5

***4-Assignment operator=>**

(i)- simple assignment operator=> The operator is used to substitute a value into a variable is known as simple assignment operator. its symbol is "=".

ex- a=5,b=7

(ii)- shorthand assignment operator=> The format of shorthand assignment operator is "variable(operator)=expression".
It is also known as compound assignment operator.

ex- a+=5 => a=a+5
b-=3 => b=b-3
a*=3 => a=a*5
a/=d => a=a/d
a%=d => a=a%d

***5- Conditional or Ternary operator**=>

It is a combination of "?" and ":". It is used with 3 operand. Its syntax is-

variable=(expression)?true_value:false_value;

ex- If a and b are two numbers and we want to store a greater value in x, for it-

it is written in if statement-

```
if(a>b)
 x=a;
else
 x=b;
```

it is written with ternary operator-

```
x =(a>b)?a:b;
```

***6=>Increment and Decrement operator=>**

++ :It is known as increment operator. It increses the value of an operand by 1.

```
ex- x=5;
    x++;
    x=6;
```

-- : it is known as decrement operator. It decreses the value of an operand by 1.

```
ex- x=4;
    x--;
     x=3;
```

These operator can be used by two types-

(1)-Pre-increment and Pre-decrement operator-

In this,we use the operator before an operand. As- ++a,--b;

```
ex-  x=5;
     y=++x;
     y=6;
```

similarly,

```
     a=4;
     b=--a;
     b=3;
```

(2)-Post-increment and post-decrement operator-

In this,we use the operator after the operand. As- x++; y--;

```
ex-   x=5;
      y=x++;
      y=5 and then x=x+1=6;
```

similarly,

```
      x=3;
      y=x--;
      y=3 and then x=2;
```

***7- size-of operator=>**

```
ex- sizeof(int);
```

Comment=>Comments allows others to better understand the code.

single line comment- //

more than one line- /*_____*/

file extension- .c **++**

compile- alt+F9

run-ctrl+F9

Data types in C

Data types is used to store and process the information. To define the type of data that a variable can store

Types of data type

- Built-in / Primary data type (Pre-defined)
- Derived data type (Created by using Primary)
- User defined data type

Primary data type:
- char (1 bytes)
- int (2 bytes)
- float (4 bytes)
- double (8 bytes)

Derived data type:
- Array ex- int X[5];
- Function ex- main()
- Pointer ex- int *p;

User defined data type:
- Structure — how to use: Struct ex- struct stu.
- Union — union ex- union emp
- Enumeration — enum
  - its takes integer value
  - ex- enum weekday { Sun, mon, tue, wed, thus, fri, Sat } = 0 1 2 3 4 5 6

Formatting Symbol - Format Specifier

%c	char
%d	int
%i	long
%f	float
%s	string

ASCII values:-

1) A to Z — 65 to 90 — ex- A=65, B=66, Y=89, Z=90
2) a to z — 97 to 122 — ex- a=97, b=98, y=121
3) 0 to 9 — 48 to 57 — ex- 0=48, 1=49, 2=50
4) Special character, 60 to 64, 91 to 96, 30 to 45

Escape Sequences -

\n	for new line
\t	for tabs or white space
\a	for sound
\"	for "
\'	for '
\?	for ?
\\	for printing the \

Input/ Output functions in C:

In C language we have 3 below types of I/O functions -

1) Formatted I/O Function
   The function that have fixed format for I/O is known as formatted I/O function
   ⇒ printf(), scanf()

2) String I/O Function
   ⇒ puts(), gets()

3) Character I/O Function
   ⇒ putch(), getch(), getchar() getche()

A- Printf():

- Printf stands for print format
- It is used to display the instruction

Syntax:

```
Printf ("List of specifiers", variable name);
Ex- printf ("%d, %f", x, y);
Prinf ("Enter a number: %f", variable name);
Printf ("String text");
```

3-Scanf():
- Stands for scan format
- used for taken input given by user or program

Syntax:
scanf("List of specifiers", List of address of variables);

Ex- scanf("%d %f", &num, &mun);

2)-puts(): send the cursor in new line
- stands for put string
- used to print the string

Syntax: puts("String value/Variable);

Ex- puts("Enter a no.");
puts(name); //name is variable

4) gets():
- stands for get string
- used to read the string
- we can not read a string with white space by using scanf() but we can read a string with white space by using gets() function

Syntax: gets(String Variable);
gets(name);

5) putch():
- Stands for put character
- Used to print a character

Syntax- putch(char Variable);
putch(x);

6) getch(): Ex- char x=getch();
- Stands for get character
- can read any key including enter button.
- Does not display the entered character

Syntax- ~~getch();~~ char getch();

Control statements
- If statements
- Switch statement

Structure
```
switch (variable)
{
case variable_value:
statement;
break;
case variable_value:
statement;
break;
default:
statements;
}
```

- Simple if statement
- If — else statement
- Nested if statement
- If — else — if statement

Structure
```
if (condition)
{
statement 1;
}
else
{
statement 2;
}
```

Structure
```
if (condition)
{
statement 1;
statement 2;
}
```

Structure
```
if (condition)
{
---
}
else if (condition)
{
---
}
else
{
---
}
```

Structure
```
if (condition)
{
if (condition)
{
---
}
else
{
---
}
}
```

getchar()	getch()	getche()
display character needed enter	do not display character do't needed enter	display character do't needed enter

Loops: to rewrite revised the program

- entry control loop: which condition written in st
- exit control loop: whose conditon written in en
  - For loop
  - While loop
  - Do_while loop

While loop -

```
initialization;                    // Declaration of initializati
  while (condition )               // Declaration of condition
{
  ____
  ____                             // can be declared inc. or de
}
```

For loop -

```
  for (initialization; expression ; increment or decr);
{
  ____
  ____
  ____
  ____
}
```

Note ';' is used between among all three statements

Do ——— while: loop.

```
do
{
   statements ;
}
while (condition ) ;
```

→ Remind this one

Continue, Breaf and Exit Commands

Breaf statement is used to exit the statement.

```
while (condition )
{
  statement 1;
    breaf;
  statement 2;
}
  getch ();
```

Continue statement is used to stuilip the statement again and again

```
a = 1
for (i = 1 ; i <= 10 ; i++)
{
   if ( i < 3 || i > 7)
        continue;
   else a = a * i;
}
```

exit statement is used to exit from the program. It is a function of stdlib. (so use it in header file)

Ex-

```
while (i<5)
{
printf ("smaller than 5");

if (i=3)
exit;
else
printf ("Not 3");
}
```

Arrays:- Arrays are used to store multiple value in a single variable instead of declaring seperate variable for each value.

Declaration of Array :-

Data type array_name [size]; (size: index / size of array)

Ex-

int raj [10]; int age [5] = {16, 17, 18, 19, 20};

Types of Array —

- One dimensional array
- Two dimensional array
- Multi dimensional array

Initialization of array:-

With Declaration Inside the program

```
int age[5];
age[0] = 16;
age[1] = 18;
age[2] = 20;
age[3] = 21;
age[4] = 25;
```

int age[5] = {16, 18, 20, 21, 25};

Initialization of two-D array:-

With Declaration Inside the program

```
int age[2][3];
age[0][0] = 1;
age[0][1] = 2;
age[0][2] = 3;
age[1][0] = 4;
age[1][1] = 5;
age[1][2] = 6;
```

int age[2][3] = {{1, 2, 3}, {4, 5, 6}};

String (Use string.h header file):-

String is a collection of character. Strings are used for storing text.

Initialization of string -

1, `char name[20] = "prateek";`

2,
```
name[0] = 'p';
name[1] = 'r';
name[2] = 'a';
name[7] = '\0'; ⟶ Null character
```

Some String function -

(String.h) header file

- strcpy (Destination, source); - but deleted already written text in destination file
- strcat (S1, S2);
- strlen (variable_name);
- strcmp (S1, S2); - difference of ASCII values
- strcmpi (S1, S2);
- strrev (v_name);
- strlwr (v_n);
- strupr (v_n);

(strrev, strlwr, strupr) → gives result in same variable.

(ctype.h) header file

- isalnum (v_n); - check whether a character is alphanumeric or not
- isalpha (v_n);
- isdigit (v_n);
- islower (v_n);
- isupper (v_n);
- tolower (v_n);
- toupper (v_n);

(math.h) header file

- pow (x,y); ⇒ x^y
- sqrt (v_n);
- sin ( );
- cos ( );
- abs ( );
- fabs ( );

(stdlib.h) header file

- randomize( ); } Executes a random number.
- ran ( ) ;

Pointer :- Pointer is the memory address of a variable where the value of variable stores.

Declaration of Pointer :-

```
int * p;
char * p;
float * p;
```

Ex-

```
#include <stdio.h>
#include <conio.h>
void main()
{
   int p = 5;
   int *t;
   t = &p;
                    //output is as 06xpy6.
printf("The memory address of p is %d", t);
                    //output is 5.
printf("\n The value of p is %d", *t);

getch();
}
```

Function:- A function is a block (set of instruction that can perform a specific task.

Types of function -
- Library or Predefined function
- User define function

Need of functions:-
To reduce the length of source code
To find the errors easily.
To call the function one or many time
To help make the program more understandable
To modularize the task of the program

Main points to create a function:
1. Function Declaration:
2. Function Definition
3. Function calling
   - Function name (arguments);
   - Ex- sum (20, 30)

Syntax:
- Return type Function name (Parameters);
- Ex- int sum (int x, int y);

Syntax:
- Return type Function name (Parameters)
- {
  //statements
  .
  .
  .
- }

Ex- int sum (int x, int y)
{ int c;
c = x+y;
return c;
}

Types of user define function (UDF)

1, No return type and no parameters
2, Return type and no parameters
3, Return type and parameters
4, No return type and parameters

Types of Function Calling
- Call by value
- Call by Refrence

Call by value:

Ex-

```
#include <stdio.h>
#include <conio.h>
void swap(int a, int b);
void main()
{
  int a, b;
  a = 10;
  b = 20;
  swap(a, b); // call by value
printf("value of variable in main function %d %d", a, b);
  getch();
}
void swap(int a, int b)
{
  int c
  c = a;
  a = b;
  b = c;
Printf("value of variable in swap function %d %d", a, b);
}
```

Output:
Value of variable in swap function 20 10
Value of variable in main function 10, 20

Call by reference:

Ex-
```
# include <stdio.h>
# include <conio.h>
void swap (int *x, int *y);
void main()
{
  int a=10, b=20;
  swap (&a, &b); // call by reference
  printf (" value of variable in main function %d,%d", a,b);
}
void swap (int *x, int *y);
{
  int c;
  c=*x;
  *x=*y;
  *y=c;
  printf (" value of variable in swap function %d,%d", *x,*y);
}
```

Output:

value of variable in swap function 20, 10
value of variable in main function 20, 10

Types of parameters / arguments:
- Actual parameter (at calling function)
- Formal parameter (at defining function)

Parameters: as variables

Ex- int sum (x, y)
parameters

Argument: as constants.

Ex- int sum (20, 90)
Arguments

Recursion: When a function calls itself, that is known as recursion.

Ex-
```
main()
{
  printf("hi");
  main();
}
```

Output:
```
hi
hi
hi
!!
!!
```

Structure :- Structure is collection of different variables or data types. It is opposite of array because array is a collection of same variables.

Syntax of defining structure -

```
struct structure_name
{
   data type variable 1;
   data type variable 2;
   .
   .
};
```

→ Remember it

Syntax of declaring structure -

```
struct structure_name structure variable 1, structure_variable 2;
```

Ex-

```
#include <stdio.h>
#include <conio.h>
struct Rectangle
{
   int length;
   int width;
};
void main()
{
  struct Rectangle rect1;
  struct Rectangle rect2;
   rect1.length = 12;
   rect1.width = 8;
   rect2.length = 5;
   rect2.width = 3;
```

```
printf (" Rectangle 1: %d %d ", rect1.length, rect1.width );
printf (" Rectangle 2: %d %d ", rect2.length, rect2.width );
getch();
}
```

Accessing structure Members

Syntax.

structure_variable. accessing members;

Ex- rect1.length; , rect1.c = 42;

↓ Dot operator.

Combining definition and declaring of structure

Syntax -

```
Struct
{
 data type variable 1;
 data type variable 2;

} structure_variable 1;
```

Ex=

```
Struct
{
 char name[20];
 int age;
 float salary;
}. e1, e2;
```

Initializing structure members

Structure_name structure_variable = {value1, value2 ... };

Ex-

```
struct employee
{
  char name[20];
  int age;
  int salary;
};
employee e1 = {"Ram", 41, 35000};
employee e2 = {"Shyam", 32, 21000};
```

Nested Structure :-

Syntax-

```
struct structure_variable1
{
  datatype var1;
  datatype var2;
};

struct structure_variable2
{
  data type var1;
  structure_variable1 structure variable;
};
```

Ex-

```
Struct employee
{
    char name[20];
    int age;
    int salary;
};

Struct company
{
    char company_name[20];
    employee e1, e2;
};
```

Note- Struct is a key word that is used to make a datatype in which we define that how many variable and what type variable we want to store. It is same as int, char, float etc. The main difference among them is that they are already define but struct_datatype is not already define

File - File is a place of one type on disk where related data is collected.

Types of File -
- Sequential File
- Random File

Operation related with file -
1. Opening and closing the file.
2. Reading and writing the file.
3. Manipulating in file.
4. Searching in file.

Defining and opening a file -

Syntax -

```
FILE *v.name (file pointer);
file_pointer = fopen("file_name", "mode");
```

For reading a file.	← r reading mode
For writing in file / a file	← w writing mode
adding new data in old/new file	← a append mode
Both reading and writing in old file	← r+
Both reading and writing in new file	← w+

Ex- ① File *fptr;
fptr = fopen ("demo1.c", "r");
② File *fopen ("demo1.c", "r");

Reading / Output from a file

- getc();
- gets();
- getw();

getc(); — reading a character
gets(); — syntax- reading a string
getw(); — reading a integer

Syntax-
getc(file pointer);

getw(file pointer);

gets(character array, size, file pointer);

- character array → read data store in it
- size → how many characters you want to read
- file pointer → pointer / name given after the FILE

Writing / Input to a file

- putc();
- puts();
- putw();

putc(variable, file pointer);

puts(entering string, file pointer);
Ex- puts("hi", fptr);

putw(integer, file pointer);
Ex- putw(5, fptr);

Closing a file -

Syntax -

fclose (file_pointer);

Functions -

① fscanf() :-

Syntax -

fscanf(file_pointer, "format specifier", address of variables);

Ex - fscanf (fptr, "%d %d %d", &a, &b, &c);

② fprintf() :-

Syntax -

fprintf (file_pointer, "format - string ~~text~~", address of variables);

~~Ex - fprintf (fptr, "hi bhai",~~

fprintf(fptr, "%d %d %c", a, b, c);

③ Rewind() :- This function is used to take the file pointer in the starting of file.

rewind (file_pointer);

④ ftell():- This function tells the no. of bytes used between from starting of file to current position of file

n = ftell(file pointer);
↓
variable

⑤ fseek():- This function is used to move the current position of file pointer to a valentary position.

fseek(file pointer, offset, position);
integer integer

0	starting of file
1	current position
2	ending of file

⑥ ferror():- This function is used to telling the errors in file

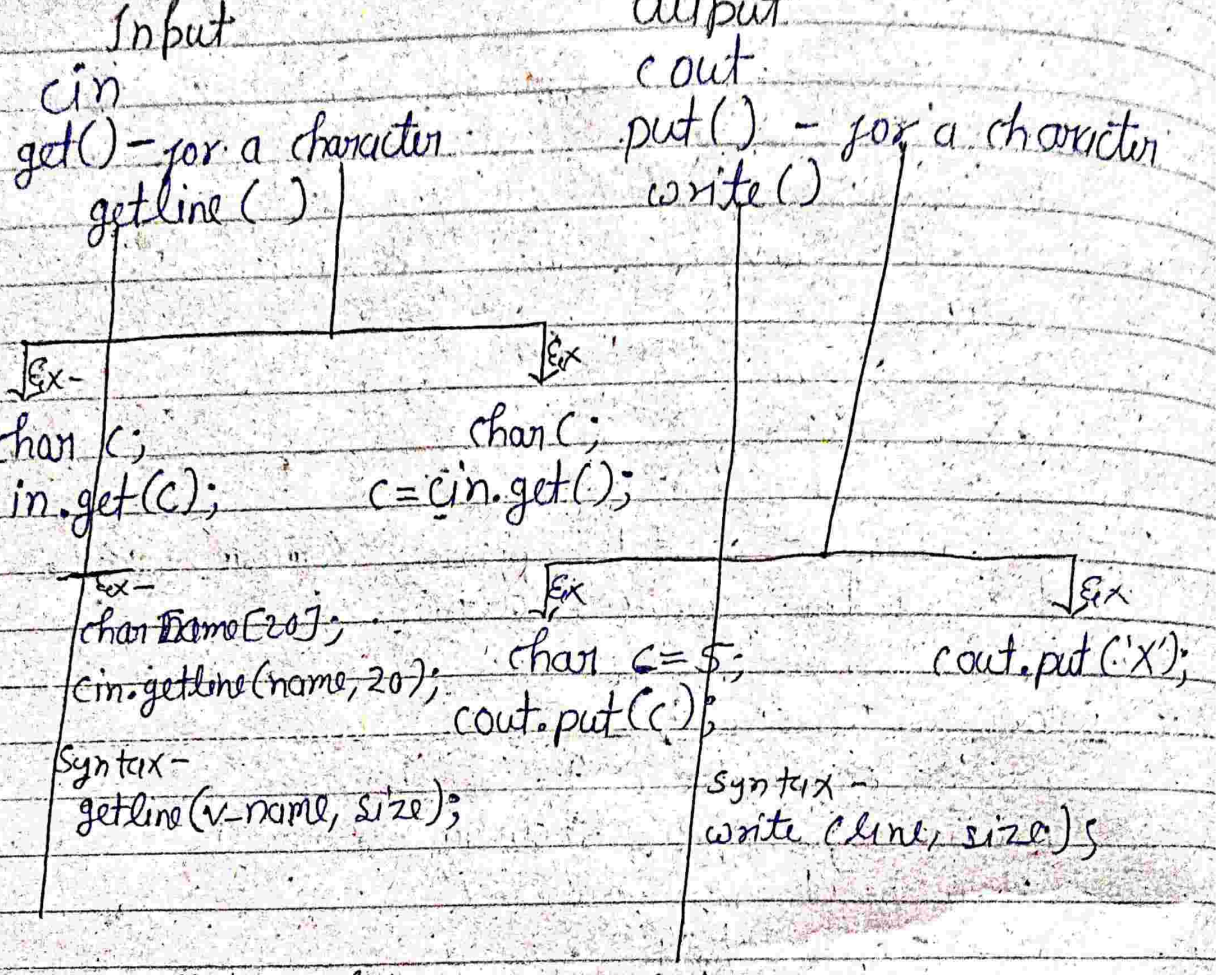
ferror(file-pointer);

It gives integer value if there is an error otherwise zero.

Unformatted Input & output

① For Taking input from user
cin >> c1 >> c2 >> c3;

② For output -
cout << "Enter no. is " << c1;



Formatted Input and Output

① width() - Right ~~to left~~ justified
setw() - Right ~~to left~~ justified.
Syntax- cout.width(d);
Ex- cout.width(5);
cout << 123
output-
__123

cout.setw(7);
cout << 1432;
___1432

② Precision() - Used to represent the floating points digit
Syntax- cout.precision(d);
where d is the no. of digit after the point.

Ex- Cout.precision(3)
cout << 3.19159;
Output -
3.14

cout.precision(3)
cout << 2.599372
cout << sqrt(2);
cout << 2.50032;
Output -
2.599
3.142
2.5

③ Fill() - यदि किसी कि फील्ड उसके लिए आवश्यक width से बहुत बड़ी है तो हम वहाँ पर वाँछित character bhar sakte hai
Syntax -
cout.fill(c);

Ex- cout.fill('*');
cout.width(10);
cout << 5250;
Output -
******5250

④ Setf() -
Syntax -
cout.setf(arg1, arg2);
flag — bit field
which is predefined in ios

Function Prototype

Syntax
return type function name (argument list);

Ex: float volume (int x, int y, int z)
where x, y and z are formal parameters.

float volume (b1, c1, c2)
b1, c1, c2 are the actual parameter;

Function overloading - To call or declare a function with different parameters.
To use a function name with different parameters

Ex -
```
// Declarations
int add (int a, int b);
int add (int a, int b, int c);
double add (double y);
double add (int p, double y);
// Function call
cout << add (5, 10);
cout << add (5, 10, 15);
cout << add (5);
```

Class- A class is a user defined data type that we can use in our program.
To creat a class, we use class keyword.
We can also use the access specifier : Private, Public or protected.

Ex-

```
class hi
{
  private:
  int x, y;
cin.getc(x);
}
```

Object : A variable name of class data type.

Ex-

```
hi a, b, c;
```

Define Member Function
- Outside the class definition.
- Inside the class definition

Syntax-

```
return type class_name :: functionname(arg)
{
//function body
}
```

Access member function by using . dot operator with object & function

```
hi.getc( );
```

Use of scope resolution operator to access the global variable

Syntax:-

```
:: v_name
```

Ex-

```
#include <iostream.h>
#include <conio.h>
int a=10; // global declaration
void main()
{
  clrscr();
  int a=20
  cout << a;    // output=20
  cout << ::a;  // output=10
  {
    int a=25;
    cout << a;    //output=25
    cout << ::a; //output=10
  }
}
```

Use of static -

A member of class can be declared as static. It can declare both data member & data methods

Static data member :-

It is access by all objects.
It is disjoint from normal data-members.
It is only used inside the class but their lifetime is in all over the program.

- It is declare in class definition
- It is defines outside the class.
- Use static keyword to declare static datam
- On no value given to static variable, by default, it will be zero.

2. Static data methods :- that member functions which access only the static data members ; known as static data methods

Static member function can access data member of a class

It is called by class name

classname :: data methods ( );

Friend function :- Friend function is a non-member function which access the private or protected data members of class

* It is used to declare ; friend keyword
* A function can be made friend of class more than one times
* It is declared any where in the class either Public, protected or Private
* It is called as a normal function
* Argument or Parameter of friend function takes Objects of class which they access

Ex~

```
# include<iostream.h>
# include<conio.h>
class sample
{ int a, b;
  public:
  void setvalue()
  { a=25; b=40; }
  friend float mean( sample s);
};
float mean (sample s){
{ return float (s.a+s.b)/2.0;
}
```

```
main()
{
  sample x;
  x.setvalue();
  cout << mean(x) << "\n";
}
```

Note- Scope resolution operator is used to define the class of the member function of class or initialization of data variable.

∴ print is non-member function
∴ there is no use of scope resolution operator.

Function Overloading:-
To use same function name with different types of parameters or different no. of parameters is known as function overloading.

Ex-

```
float de(int a, int b);
float de(int a, int b, int c);
float de(int a, int b, int c, int d)
```

Declaration & definition of function overloading

* The argument list of function is known as function signature in function overloading.

* Function of Equal Signature

```
double hi(float x, float y);   } same function signature
double hi(float x, float y);   }
```
(same return type)

It is known as redeclaration.

2. function signature same but different return type
   it is known as Erroneous declaration
   and compiler gives error

Ex

different return type

```
float square (float f);
double square (float z); // Error
```

so it is not a function overloading