Structure

- Structure is a collection of similar or dissimilar data. It is used to bind logically related data into a single unit.
- This data can be modified by any function to which the structure is passed
- Thus there is no security provided for the data within a structure.
- This concept is modified by C++ to bind data as well as functions.

Diff Between struct in c & c++

- struct in c
- We can’t write function inside structure
- At the time of creating variable of structure writing struct keyword is compulsory

  eg. struct time t;
- By default all the members are accessible outside structure. C lang does not have a concept of access specifies
- If we want to call any function on structure variable

  struct time t1;

  input(&t1); print(&t1);

- struct in c++
- We can write function inside structure
- At the time of creating object of structure writing struct keyword is optional
- eg.time t;
- By default all members of struct in c++ are public (we can make them private)
- If we want to call member function on object.
- time t1;
- t1.input();
- t1.print();
-

```
struct time {
      int hr, min, sec;
};

void input( struct time *p)
 {
      printf("Enter Hr Min Sec:");
      scanf("%d%d%d", &p→hr,
      &p→min, &p→sec);
}
struct time t;
input(&t);
```

```
struct time
 {
      int hr, min, sec;
      void input()
      {
      printf("Enter Hr Min Sec::");
      scanf("%d%d%d",&this→hr,
      &this→min, &this→sec);
      }
};
time t;
t.input();
```

Access specifiers

- By default all members in structure are accessible everywhere in the program by dot(.) or arrow(→) operators.
- But such access can be restricted by applying access specifiers
  - private: Accessible only within the struct
  - public: Accessible within & outside struct

this pointer

- When we call member function by using object implicitly one argument is passed to that function such argument is called this pointer
- *this* is a keyword in C++.
- this pointer always stores address of current object or calling object.
- Thus every member function of the class receives *this* pointer which is first argument of that function.
- This pointer is constant pointer.

For complex class member function type of this pointer is Complex * const this

classname * const this

Inline functions

- C++ provides a keyword *inline* that makes the function as inline function.
- Inline functions get replaced by compiler at its call statement. It ensures faster execution of function just like macros.
- Advantage of inline functions over macros: inline functions are type-safe.
- Inline is a request made to compiler.
- Every function may not be replace by complier , rather it avoids replacement in certain cases like function containing switch , loop or recursion may not be replaced

Default arguments

Assigning default values to the arguments of function is called default arguments. Default arguments are always assigned from right to left direction.

Passing these arguments while calling a function is optional. If such argument is not passed, then its default value is considered. Otherwise arguments are treated as normal arguments

```
#include<iostream.h>
int sum (int a=0, int b=0, int c=0, int d=0)
{	return a+b+c+d;
}
int main()
{	int ans=sum();
	cout<<"sum="<<ans<<endl;
	ans=sum(10);
	cout<<"sum="<<ans<<endl;
	ans=sum(10, 20);
	cout<<"sum="<<ans<<endl;
	ans=sum(10, 20, 30);
	cout<<"sum="<<ans<<endl;
	ans=sum(10, 20, 30, 40);
	cout<<"sum="<<ans<<endl;
	return 0;
}
```

```
#include<stdio.h>
void f1(int a)
{
        printf("\n Inside int blcok");
}
void f1(float a)
{
        printf("\n Inside float blcok");
}
void f1(double a)
{
        printf("\n Inside double blcok");
}
int main()
{       f1(1);
        f1(1.2);
        f1(1.2f);
        f1((int)1.2);
        f1(1.2);
        return 0;
}
```

Function overloading :

Function having same name but differs either in different number of arguments or type of arguments or order of arguments such process of writing function is called function overloading .

Functions which is taking part in function overloading such functions are called as overloaded functions.

Function having same name but differs in number of arguments

eg: void sum (int no1, int no2);
void sum (int no1, int no2, int no3);

Function having same name and same number of arguments but differs in type of arguments

eg: void sum (int no1, int no2);
void sum (int no1, double no2);

3. Function having same name ,same number of arguments but order of arguments are different

eg. void sum (int no1, float no2);
void sum (float no1, int no2);

Name mangling: when we write function in c++ complier internally creates unique name for each and every function by looking towards name of the function and type of arguments pass to that function. Such process of creating unique name is called name mangling . That individual name is called mangled name.

Eg:

sum (int no1, int no2, it no3)

sum@ int, int , int

sum(int no1, int no2)

sum@int,int

What is class?

- Building blocks that binds together data & code
- Program is divided into different classes
- Class has
  - Variables (data members)
  - Functions (member functions or methods)

What is object?

- Object is an instance of class
- Entity that has physical existence, can store data, send and receive message to communicate with other objects
- Object has
  - Data members (***state*** of object)
  - Member function (***behavior*** of object)
  - Unique address(***identity*** of object)

What is object?

- The values stored in data members of the object called as ‘state’ of object.
- Data members of class represent state of object.

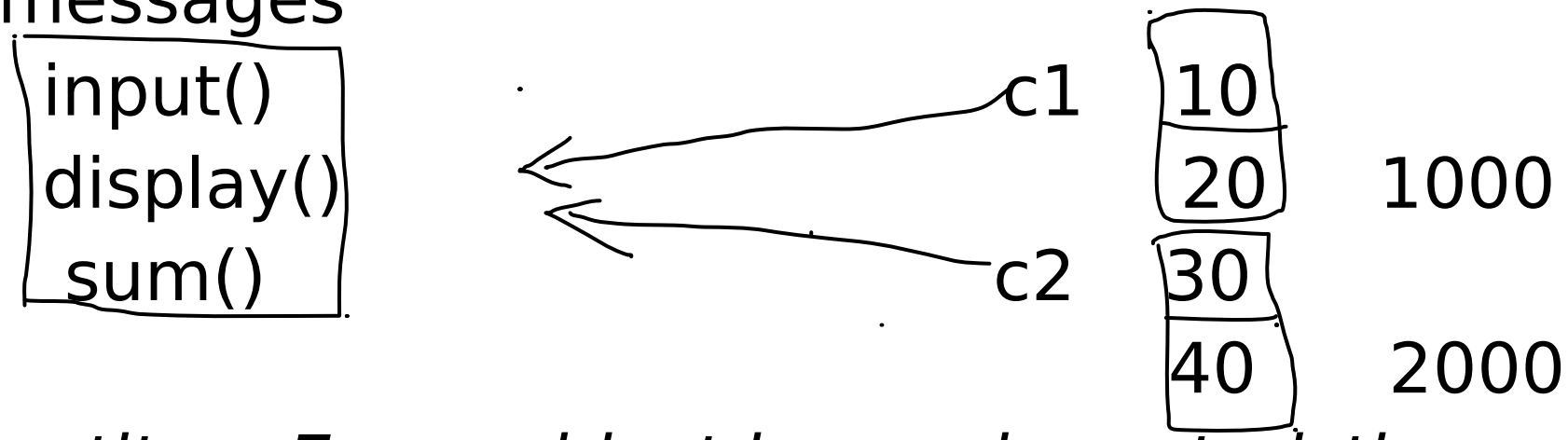
Complex c1, c2;

Behavior is how object acts & reacts,

when operations are done

Behavior is decided by the member functions.

Operations performed are also known as messages



Identity : Every object has a characteristics that makes object unique. Every object has unique address.

Identity of c1 1000 & c2 is 2000

Class

- it is template or blue print for an object.
- object is always created by looking towards class, that’s why it is template for it.
- class is a logical entity.
- memory is not allocated to that class.
- class is collection of data members and member functions.

Object

- it is an instance of class.
- object is physical entity.
- memory is always allocated to object.

- **Data members**
- Data members of the class are generally made as private to provide the data security.
- The private members cannot be accessed outside the class.
- So these members are always accessed by the member functions.

- Size of object of empty class is always 1 byte
- When you create object of an class it gets 3 characteristics
  - State
  - Behavior
  - Identity
- When you create object of empty class at that time state of object is nothing. Behavior of that object is also nothing.

  but that object have unique identity(address).

memory in computer is always organized in form of bytes.

Byte is unit of memory. Minimum memory at objects unique address is one byte that's why size of empty class object is one byte.

cin and cout

- C++ provides an easier way for input and output.
- The output:
  - cout << “Hello C++”;
- The input:
  - cin >> var;

```
#include<stdio.h>
int main()
{
    printf(“ hellow world”);
}
```

```
#include<iostream>
using namespace std;
int main()
{
   cout<<“hellow world”;
}
```

printf is a function & declared in stdio.h header file. So if we want to use printf it is necessary include stdio.h header file

cout is object of ostream class and ostream class is declared in iostream.h that’s why if u want to use cout object is necessary to include iostream.h header file

operator which is used with cout is called as insertion operator <<

```
int res=30;
printf(“res=%d”, res);
```

```
int res=30;
cout<<“res=”<<res;
```

```
a=10,b=5;
printf(“a=%d b=%d”,a,b);
```

```
int a=10, b=5;
cout<<"a="<<a<<" b="<<b;
```

```c
#include<stdio.h>
int main()
{
    int num;
    scanf("%d",&num);
}
```

```c
#include<iostream>
using namespace std;
int main()
{   int num;
    cin>>num;
}
```

scanf is a function & declared in stdio.h header file. So if we want to use scanf it is necessary include stdio.h header file

cin is object of istream class and istream class is declared in iostream.hthat's why if u want to use cin object is necessary to include iostream.h header file

operator which is used with cin is called as operator extraction (>>)

```c
int  no1, no2;
scanf("%d%d",&no1, &no2);
```

```c
int no1, no2;
cin>>no1>> no2;
```

Constructor

- We can have constructors with
  - No argument : initialize data member to default values
  - One or more arguments : initialize data member to values passed to it
  - Argument of type of object : initialize object by using the values of the data members of the passed object. It is called as copy constructor.

Constructor

- Constructor is a member function of class having same name as that of class and don’t have any return type.
- Constructor get automatically called when object is created i.e. memory is allocated to object.
- If we don’t write any constructor, compiler provides a default constructor.

- Destructor

- Destructor is a member function of class having same name as that of class preceded with ~ sign and don’t have any return type and arguments.
- Destructor get automatically called when object is going to destroy i.e. memory is to be de-allocated.

- Destructor
- If we don’t write, compiler provides default destructor.
- Generally, we implement destructor when constructor of the object is allocating any resource
- e.g. we have pointer as data member, which is pointing to dynamically allocated memory.

Data types

- C++ supports all data types provided by C language. i.e. int, float, char, double, long int, unsigned int, etc.
- C++ add two more data types:
- 1. *bool* :- it can take *true* or *false* value. It takes one byte in memory.
- 2. wchar_t :- it can store 16 bit character. It takes 2 bytes in memory.

Classification of Languages

1. ***Procedure Oriented Programming Language***

FORTRON is 1st POP Language

e.g.: C, FORTRON and PASCAL

2. ***Object Oriented Programming Language***

Simula is 1st OOP Language in 1960

e.g.: C++, Smalltalk, Java and C#

Smalltalk is only language which is purely OOP Language.

C++ is not purely object oriented programming language. it is also called as partial object oriented programming language

3. ***Object Based Programming Language***

Ada is 1st object based language.

e.g.: visual basic, Ada and Modula-2

4. Rule Based Programming Language

e.g.: PROLOG and LISP

Any New language is basically designed for two reasons
1. To overcome or avoid limitations of previous language
2.To provide new features

Advantages of C Language

1. C is portable
2. C is efficient
   – can interact with hardware efficiently
3. C is flexible
   – we can cerate application software or system software
4. C is freely available
   –wide variety of compliers are available

- C is said to be procedure oriented, structured programming language.
- When program becomes complex, understating and maintaining such programs is very difficult.

- ***Limitations of C Programming with respect to C++***
- Language don’t provide security for data.
- Using functions we can achieve code reusability, but reusability is limited. The programs are not extendible.
- We can not write function inside structure

So “Bjarne Stroustrup” designed a new language
c with classes in 1979 on DEC PDP11 machine.
Restructure by ANSI in 1983.

in C++ 63 Keywords are available.
(unmanaged c++)

- ***Procedure oriented***
- Emphasis on steps or algorithm
- Programs are divided into small code units i.e. functions
- Most functions share global data & can modify it
- Data move from function to function
- Top-down approach

- ***Object Oriented***
- Emphasis on data of the program
- Programs are divide into small data units i.e. classes
- Data is hidden & not accessible outside class
- Objects communicate with each other
- Bottom- up approach

Variable declaration

- In C, variable should be declared at the start of the block.
- This restriction is removed in C++. We can declare the variables anywhere in function.

Comments in C++

- In C, comments are written as
- /*This is comment*/
- In C++, we can use above style. In addition C++ provides one more way for writing comments.
- //This is comment
- The second style is preferred for single line comments.