

28/10/2023

Object Oriented Programming

Class 01

01: Local and global variable

Global variable:

1. Written outside of the function
2. Accessible to all function (Same Copy)

Local variable:

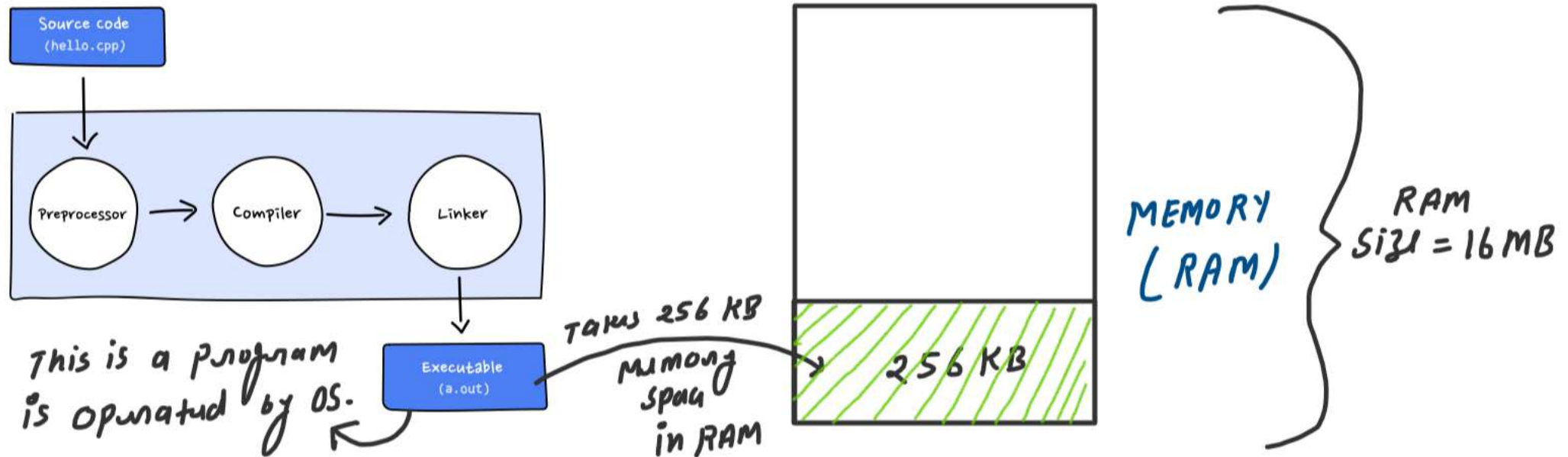
1. Written inside function
2. Accessible inside that function scope only.
3. Scoped

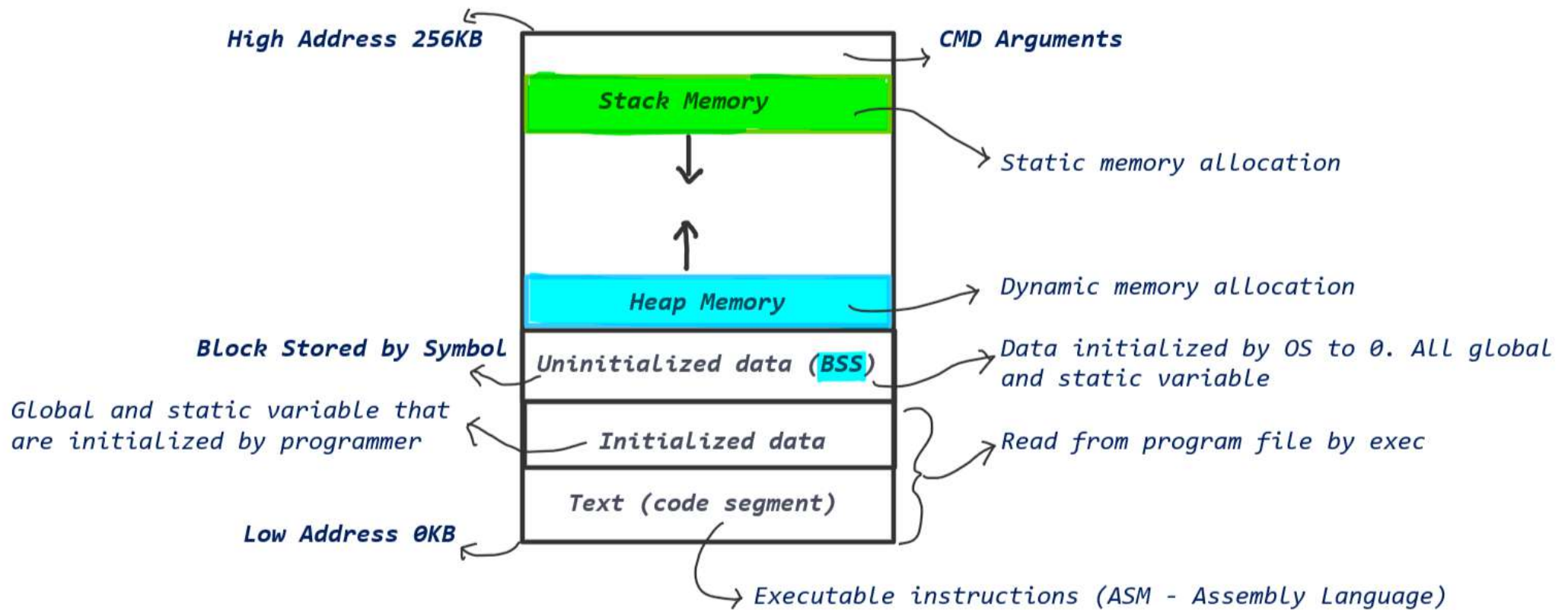
```
1 #include<iostream>
2 using namespace std;
3
4 int x = 2; // Global variable
5
6 void fun(){
7     int x = 60;
8     cout<< x << endl; // Access local variable to fun()
9     ::x = 40; // Updated global variable x by 40
10    cout<< ::x << endl; // Access global variable by ::var_name in fun()
11 }
12
13 int main(){
14     ::x = 4; // Updated global variable x by 4
15
16     int x = 20; // Local variable to main() function
17
18     cout<< x << endl; // Access local variable to main()
19     cout<< ::x << endl; // Access global variable by ::var_name in main()
20
21     {
22         int x = 5;
23         cout<< x << endl; // Access local variable to scope {}
24         cout<< ::x << endl; // Access global variable by ::var_name in scoped{}
25     }
26
27     fun();
28     return 0;
29 }
30 }
```

Output

20
4
5
4
60
40

02: Memory Layout of a program





03: Functional programming

```
#include<iostream>

void greet() {
    // code
}

int main() {
    ... ..
    greet();
    ... ..
}
```

function call

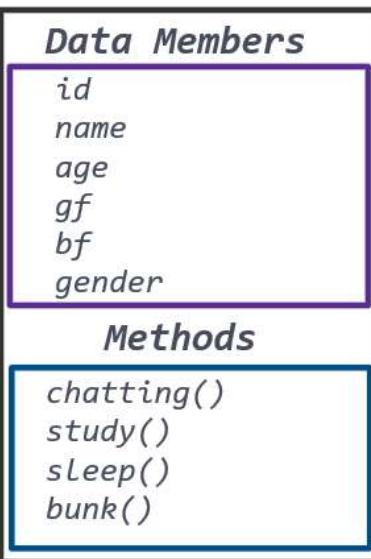
← jis code me class AND object ki koi bat nahi ki ja rahi hai to iss code ko hum functional programming bol sakte hai.

04: Object Oriented Programming

Object-oriented programming (OOP) is a computer programming model that organizes software design around data, or objects, rather than functions and logic.

5. Class

Student



S1
Instance

6. Object



```
{
  id = 104
  name = Love
  age = 25
  gf = Lovely
  gender = Male
}
```

S2
Instance



```
{
  id = 105
  name = Lovely
  age = 24
  bf = Love
  gender = Female
}
```

What is a class:

1. Bundle of properties/states/attributes and behaviors.
2. It is a blueprint and also a user defined data type.

What is an object:

1. This is an instance of a class.
2. An object can be defined as a data field that has unique attributes and behavior.


```

1 #include<iostream>
2 using namespace std;
3
4 class Student
5 {
6     private:
7         string gf;
8         string bf;
9
10        void chatting(){
11            cout<< "Chatting" << endl;
12        }
13
14    public:
15        int id;
16        string name;
17        int age;
18        string gender;
19
20        void study(){
21            cout<< "Studying" << endl;
22        }
23
24        void sleep(){
25            cout<< "Sleeping" << endl;
26        }
27
28        void bunck(){
29            cout<< "Buncking" << endl;
30        }
31 };

```

Private
Info.

Public
Info.

7. Access modifiers

What is access modifiers:

1. In class, states and behaviors are private by default.
2. They are used to define scope of access.
3. Access modifiers are **private**, **public** and **protected**.

```

1 int main(){
2     Student s1;
3     s1.id = 104;
4     s1.name = "Love";
5     s1.age = 25;
6     s1.gender = "Male";
7
8     Student s2;
9     s2.id = 105;
10    s2.name = "Lovely";
11    s2.age = 24;
12    s2.gender = "Female";
13
14    return 0;
15 }

```

public info
Accessed in
main()

Issa likh-
ne ka koi
short type
hai

YES, Constructor

8. Constructor

What is constructor:

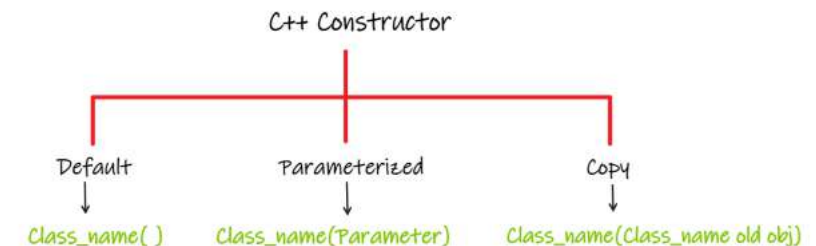
1. A constructor is a special method (Member Function) that initializes a newly created object.
2. The constructor is automatically called when an object is created.
3. A constructor has the same name as the class name and has not return data type.
4. A constructor will be always public.

Why use:

1. It is used to assign the value to class data members.
2. It is used to assign default value to class data members.
3. It is used when we want to assign sensible value to data members.

If we do not create any constructor then compiler add default

Two types of constructor: default, parameterized, and copy constructor



```

1 #include<iostream>
2 using namespace std;
3
4 class Student
5 {
6 private:
7     string gf;
8     string bf;
9
10    void chatting(string name){
11        cout<< "Chatting " << name << endl;
12    }
13
14 public:
15     int id;
16     string name;
17     int age;
18     string gender;
19
20     // Default CTOR: assign garbage value
21     Student(){
22         cout<< "Default ctor called" << endl;
23     }
24
25     // Parameterized CTOR: assign sensible value
26     Student(int _id, string _name, int _age, string _gender, string _gf){
27         id = _id;
28         name = _name;
29         age = _age;
30         gender = _gender;
31         gf = _gf;
32         cout<< "Parameterized ctor called for " << name << endl;
33         chatting(name);
34     }
35
36     // Parameterized CTOR: assign sensible value
37     Student(int _id, string _name, string _gender, string _bf){
38         id = _id;
39         name = _name;
40         gender = _gender;
41         bf = _bf;
42         cout<< "Parameterized ctor called for " << name << endl;
43         chatting(name);
44     }
45
46     void study(){
47         cout<< "Studying" << endl;
48     }
49 };

```

Private

Public

Love

Lovey

```

1
2 int main(){
3
4     Student s1(104,"Love",25,"Male","Lovely");
5     cout<< s1.name << endl;
6
7     Student s2(105,"Lovely","Female","Love");
8     cout<< s2.name << endl;
9
10    return 0;
11 }

```

Output

Parameterized ctor called for Love
Chatting Love
Love
Parameterized ctor called for Lovely
Chatting Lovely
Lovely

9. Polymorphism (Brief)

Many more form for one things jaisi EK ladka

GF → BF
SIS → BRO
wife → Hasband - -- And so on - --

10. this pointer

What is this pointer:

1. this pointer is a private data member in class
2. this pointer points to current object
3. this pointer added by compiler privately

Why use of this pointer:

whenever a local variable or parameter has the same name as a member variable, the 'this' pointer can be used to explicitly refer to the member variable.

```
1 #include<iostream>
2 using namespace std;
3
4 class Student
5 {
6 private:
7     string gf;
8     // Student *this;
9
10 public:
11     int id;
12     string name;
13     int age;
14     string gender;
15
16     // Parameterized CTOR: assign sensible value
17     Student(int id, string name, int age, string gender, string gf){
18         this->id = id;
19         this->name = name;
20         this->age = age;
21         this->gender = gender;
22         this->gf = gf;
23         cout<< "Parameterized ctor called for " << name << endl;
24     }
25 };
```

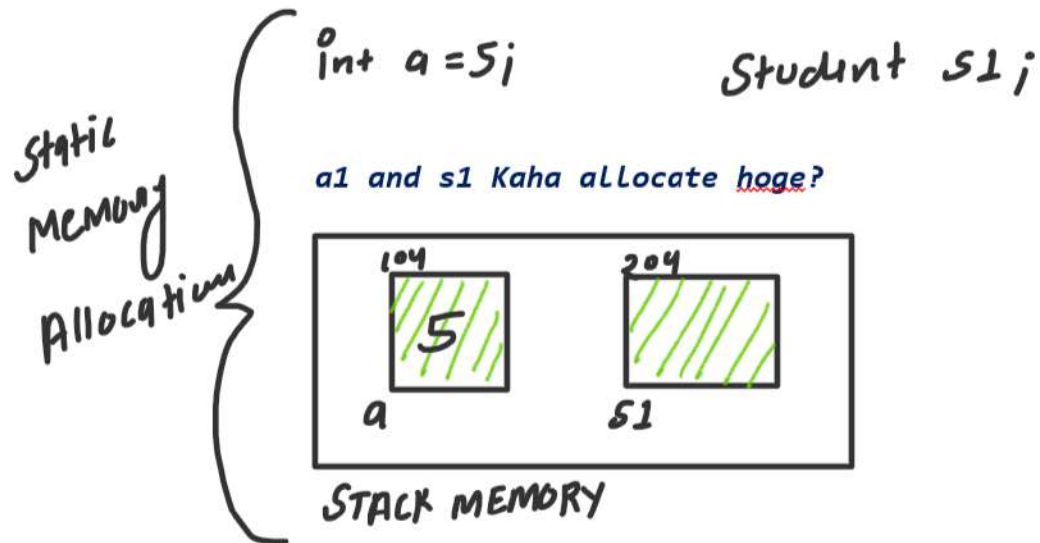
```
1
2 int main(){
3
4     Student s1(104,"Love",25,"Male","Lovely");
5     cout<< s1.name << endl;
6
7     return 0;
8 }
```

this.id = id

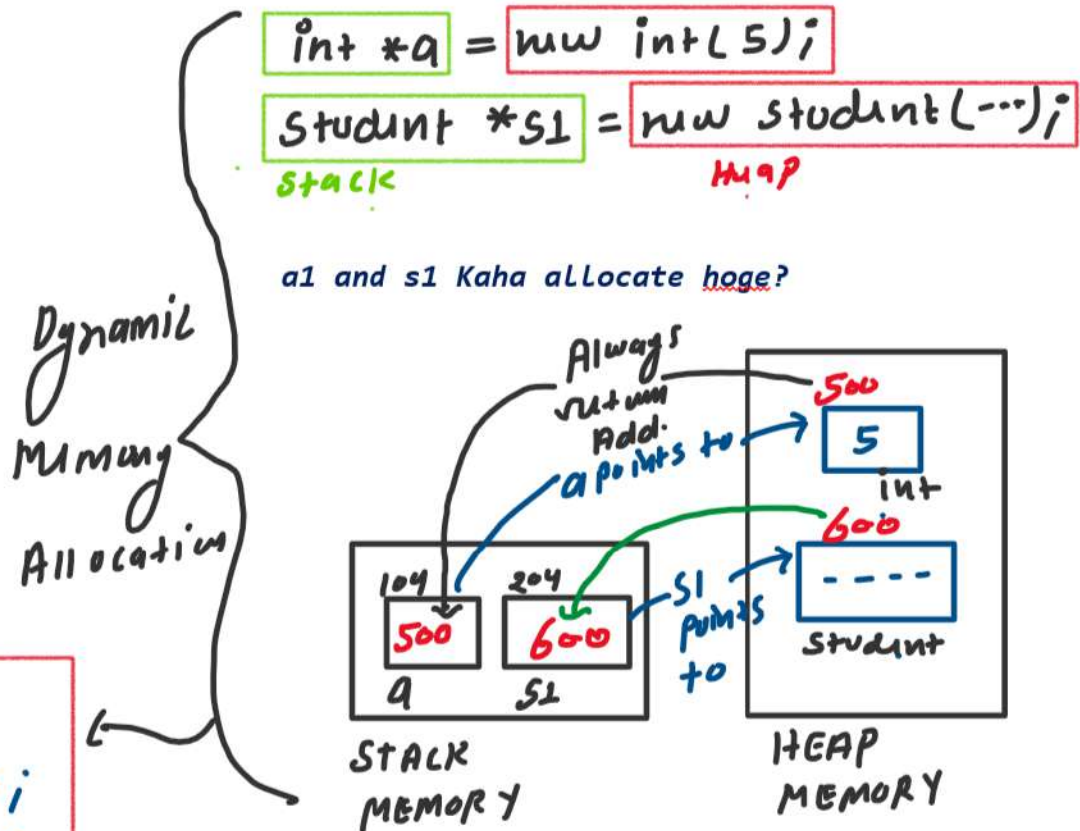
member variable

local variable or parameter

11. Static and dynamic memory allocation



Now
delete a;
delete s1;

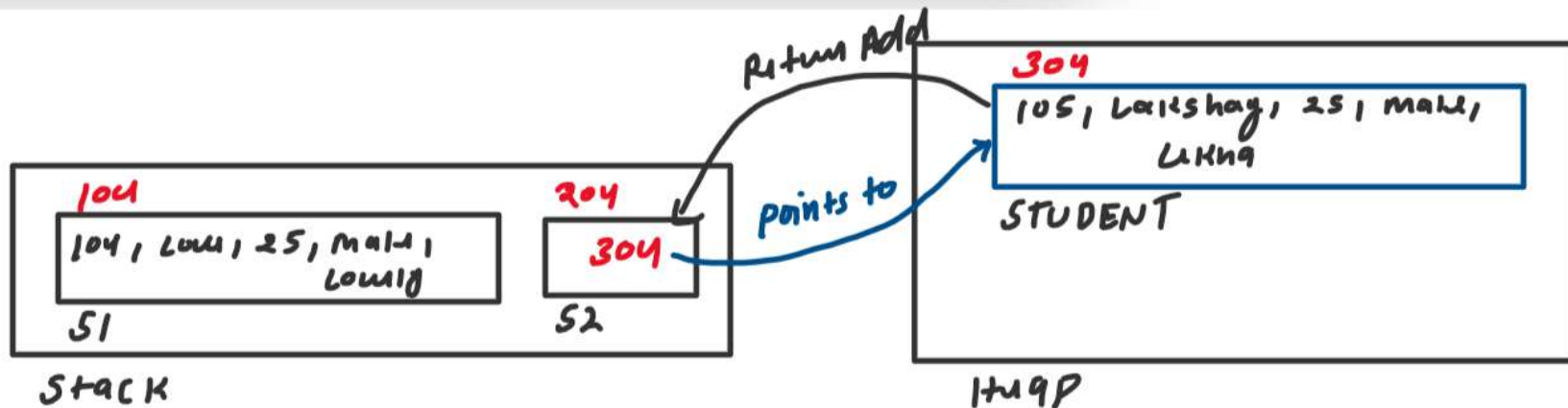


```

1 // Stack and Heap memory allocation
2 int main(){
3
4     Student s1(104,"Love",25,"Male","Lovely"); // Stack Memory Allocation
5     cout<< s1.name << endl; // Access Member of Class using "." operator in case of Stack
6
7     Student* s2 = new Student(105,"Lakshay",25,"Male","Lekha"); // Heap Memory Allocation
8     cout<< (*s2).name << endl; // Access Member of Class using "(*s2).member" dereference operator in case of Heap
9     cout<< s2->name << endl; // Access Member of Class using "s2->member" this pointer in case of Heap
10
11     return 0;
12 }

```

Note We can't write
syntax to Access
*s2.name X
(*s2).name ✓



12. Padding Concept

1. What is the empty class size?

Ans: Size 1 byte (This is smallest addressable size)

Lekin 1 byte kyun hota hai?

Ans: Compiler assigns 1 byte size for an empty class because of isse class ki existence pta chalti hai ki ek empty class bnayi gy hai.

Lets assume empty class ka size agar 0 hota to iska mtlb simple hai ki koi bhi class bnayi hi nhi gayi hai.

```
1 #include<iostream>
2 using namespace std;
3
4 class Student
5 {
6     // Empty Class
7 };
8
9 int main(){
10
11     cout<< sizeof(Student) << endl;
12     return 0;
13 }
```

Output

1

2. What is the non empty class size?

We can find non empty class size using **padding concept** follows some rules to find the size of non empty class

Step 01: Select biggest data type size

Step 02: Align sum of data types in the boundary of biggest data type size

Note: When we find the size of non empty class, then sabse pahle bade data type size ke nearest multiple memory par le ago

```
1 #include<iostream>
2 using namespace std;
3
4 // Non Empty Class
5 class Student
6 {
7     int a; → big
8     int b;
9     bool x;
10 };
11
12 int main(){
13
14     cout<< sizeof(Student) << endl;
15     return 0;
16 }
```

Student

int
int
bool

int + int + bool + padding
⇒ 4 + 4 + 1 + 3
⇒ 12

12 - 9 = 3
→ Next multiple
Output: 12


```

1 #include<iostream>
2 using namespace std;
3
4 // Non Empty Class
5 class Student
6 {
7     double a;
8     double b;
9     char x;
10 };
11
12 int main(){
13
14     cout<< sizeof(Student) << endl;
15     return 0;
16 }

```

→ big

double
double
char

⇒ 8 + 8 + 1 + padding

⇒ 17 + 7

⇒ 24

Output = 24

24 - 17 = 7

Must
multiple of 17

```

1 #include<iostream>
2 using namespace std;
3
4 // Non Empty Class
5 class Student
6 {
7     double a; → big
8     double b;
9     char x;
10    bool y;
11 };
12
13 int main(){
14
15     cout<< sizeof(Student) << endl;
16     return 0;
17 }

```

double
double
char
bool

$\Rightarrow 8 + 8 + 1 + 1 + \text{padding}$

$\Rightarrow 18 + (24 - 18)$

$\Rightarrow 18 + 6$

$\Rightarrow 24$

Output = 24

```

1 #include<iostream>
2 using namespace std;
3
4 // Non Empty Class
5 class Student
6 {
7     int a;
8     int b;
9     bool x;
10    string str; → Big
11    int c;
12 };
13
14 int main(){
15
16     cout<< sizeof(Student) << endl;
17     return 0;
18 }

```

string has size = 24

int
int
bool
string
int

$\Rightarrow 4 + 4 + 1 + 24 + 4 + \text{padding}$

$\Rightarrow 37 + (48 - 37)$

$\Rightarrow 37 + 11$

$\Rightarrow 48$

output = 48