

# OOP with C++

## Assignment 4

This assignment is individual assignment, every student should submit by himself.

**Due: Next Section**

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### 1. True or False:

- Overloading and Overriding are two terms with the same meaning in Object-oriented programming.**
- If a class has a virtual method then this class is called abstract class.**
- If a class has a virtual method without implementation then this class is called abstract class.**
- The template operator enable the program to define generic data type methods and classes.**
- Polymorphism means one thing with many distinct forms.**

### 2. Create a new C++ project to run the following program then answer the questions

```
1  #include <iostream>
2  using namespace std;
3
4  class Shape{
5  public:
6      int l,w;
7
8      void set_values(int l, int w){
9          this->l=l;
10         this->w=w;
11     }
12     void show_data(){
13         cout<<l<<endl;
14         cout<<w<<endl;
15     }
16 };
17 class Rect:public Shape{
18 public:
19     float area (){
20         return (l*w);
21     }
22 };
23 class Tri:public Shape{
24 public:
25     float area (){
26         return (0.5*l*w);
27     }
28 };
29 int main (){
30
31     Rect r;
32     Shape *s1=&r;
33     s1->set_values(2,3);
34     cout<<r.area()<<endl;
35
36     Tri t;
37     Shape *s2=&t;
38     s2->set_values(2,3);
39     cout<<t.area()<<endl;
40     return 0;
41 }
```

- What is the expected output of this program?
- Replace line 34 with ( cout<<s1.area()<<endl; ), and report the expected error.
- Modify the program to accept the change in (b).
- Remove line 31 and dynamically allocate \*s1 to a rectangle.

3. Stack is a data container which can store and retrieve N elements in a LIFO order (Last In First Out ).  
Stack has 3 main operations:

- **Push:** To store element at the top of the stack.
- **Pop:** To remove element from the top of the stack.
- **Get top:** To retrieve element at the top of the stack.

Create a new C++ project to run the following stack program then answer the questions:

```

1  #include<stdio.h>
2  #include<stdlib.h> //for malloc and free
3  #include<iostream>
4  using namespace std;
5
6  template <class T>
7  class Stack {
8  private:
9      T *data;
10     int size;
11     int top;
12
13 public:
14     Stack(int size){          // Constructor
15
16         this->size=size;
17         data=(T *)malloc(size);
18         top = -1;
19     }
20     ~Stack(){ // Destructor
21         free(data);
22     }
23     T get_top() {
24
25         if (top == -1) {
26             printf("Error: stack empty\n");
27             return -1;
28         }
29         return data[top];
30     }
31     void push() {
32         T d;
33         if (top < size){
34             cout<<"\n Enter an item:";
35             cin>>d;
36             data[++top] = d;
37         }
38         else
39             printf("Error: stack full\n");
40     }
41
42     T pop() {
43
44         if (top == -1){
45             printf("Error: stack empty\n");
46             return -1;
47         }
48         else
49             return data[top--];
50     }

```

```
51 };
52
53 int main()
54 {
55     int size, choice;
56     printf("Enter stack size:");
57     scanf("%d",&size);
58
59     Stack <char> s(size);
60
61     while(1){
62         printf("\n-----\n");
63         printf("1.Push\t2.Pop\t3. Top\t4. Exit\nChoose action: ");
64         scanf("%d",&choice);
65
66         switch(choice){
67             case 1:
68                 s.push();
69                 break;
70             case 2:
71                 cout<<"\nItem is:"<<s.pop()<<endl;
72                 break;
73             case 3:
74                 cout<<"\nTop item is:"<<s.get_top()<<endl;
75                 break;
76             case 4:
77                 exit(0);
78             default:
79                 printf("Wrong choice");
80         }
81     }
82     return 0;
83 }
84
85
```

- a. Run the program then set the stack size to 5 and Push 5 values (2, 9, 4, 3, 0).
  - i. What's the output if you choose to push another value (6).
  - ii. What's the output if you choose to pop a value?
  - iii. What's the output if you choose to get top of the stack?
- b. Modify the program to accept char data type, and then set the stack size to 2 and push 2 values (a, c).
  - i. What's the output if you choose to pop 2 values?
  - ii. What's the output if you choose to pop another value?