



# Institute of Geographical Information Systems

## CS-212 - Object Oriented Programming LAB

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Class: SCEE-IGIS - 2024

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### LAB 03: Introduction to Classes

#### Question No 1:

Define a class `Complex_No` that has two member variables; Real and Imaginary. Also include following in the class.

1. A method `SetReIm` that sets values of Real and Imaginary
2. A method `Display` that shows the value of complex number in appropriate format.
3. A method `Magnitude` that calculates the magnitude of complex number

#### Screenshot:

```
1 #include <iostream>
2 #include <cmath>
3 using namespace std;
4
5 class Complex_No
6 {
7 private:
8     float Real;
9     float Imaginary;
10
11 public:
12     void SetReIm(float r, float i)
13     {
14         Real = r;
15         Imaginary = i;
16     }
17
18     void Display()
19     {
20         if (Imaginary >= 0)
21             cout << Real << " + " << Imaginary << "i" << endl;
22         else
23             cout << Real << " - " << -Imaginary << "i" << endl;
24     }
25
26     float Magnitude()
27     {
28         return sqrt(Real * Real + Imaginary * Imaginary);
29     }
30 };
31
32 int main()
33 {
34     // ... (code for testing the class) ...
35 }
```

Complex Number: 3 + 4i  
Magnitude: 5

## Question No 2:

Define a class Student that has following attributes:

- Name: an array of char
- Rollno: an integer.
- Marks: a double type array of 5 elements.
- Percentage: a float

Also include following methods:

- SetData: that takes values of Name, Rollno and Marks from user as input.
- CalculatePercentage: that adds all 5 elements of array Marks and calculate percentage according to formula  $\text{Percentage} = (\text{Total marks} / 500) * 100$  and stores result in member variable Percentage.
- Grade: that calls CalculatePercentage method and displays the grade accordingly.

## Screenshot:

```
1 #include <iostream>
2 #include <string>
3 using namespace std;
4
5 class Student
6 {
7 private:
8     char name[50];
9     int rollno; "rollno": Unknown word.
10    double marks[5];
11    float percentage;
12
13 public:
14    void SetData()
15    {
16        cout << "Enter student name: ";
17        cin.ignore();
18        cin.getline(name, 50);
19
20        cout << "Enter roll number: ";
21        cin >> rollno; "rollno": Unknown word.
22
23        cout << "Enter marks for 5 subjects:\n";
24        for (int i = 0; i < 5; i++)
25        {
26            cout << "Subject " << (i + 1) << ": ";
27            cin >> marks[i];
28        }
29    }
30
31    void CalculatePercentage()
32    {
33        float sum = 0;
34        for (int i = 0; i < 5; i++)
35            sum += marks[i];
36        percentage = (sum / 500) * 100;
37    }
38
39    void Grade()
40    {
41        CalculatePercentage();
42        if (percentage < 50)
43            cout << "Grade: D";
44        else if (percentage < 60)
45            cout << "Grade: C";
46        else if (percentage < 70)
47            cout << "Grade: B";
48        else if (percentage < 80)
49            cout << "Grade: A";
50        else
51            cout << "Grade: A+";
52    }
53
54    void Display()
55    {
56        cout << "Student Report\n";
57        cout << "Name: " << name << "\n";
58        cout << "Roll No: " << rollno << "\n";
59        cout << "Percentage: " << percentage << "%\n";
60        cout << "Grade: " << Grade() << "\n";
61    }
62
63    ~Student()
64    {
65        cout << "Destructor called\n";
66    }
67
68 };
69
70 int main()
71 {
72     Student s;
73     s.SetData();
74     s.CalculatePercentage();
75     s.Display();
76     s.Grade();
77     return 0;
78 }
```

alinalwaz@Alis-MacBook-Air Week-03 % cd "/Users/alinalwaz/Developer/Development/OOP/Week-03/" && g++ Problem3.cpp -o Problem3 && "/Users/alinalwaz/Developer/Development/OOP/Week-03/"Problem3

alinalwaz@Alis-MacBook-Air Week-03 % cd "/Users/alinalwaz/Developer/Development/OOP/Week-03/" && g++ Problem2.cpp -o Problem2 && "/Users/alinalwaz/Developer/Development/OOP/Week-03/"Problem2

```
Enter student name: Ali Nawaz
Enter roll number: 526123
Enter marks for 5 subjects:
Subject 1: 57
Subject 2: 65
Subject 3: 38
Subject 4: 98
Subject 5: 27

--- Student Report ---
Name: Ali Nawaz
Roll No: 526123
Percentage: 57%
Grade: D
alinalwaz@Alis-MacBook-Air Week-03 %
```

### Question No 3:

Create a class Book with the following specifications:

#### Private Data Members:

- title
- author
- price

#### Public Member Functions:

- sets the title, author, and price of the book.
- calculates the discount amount, subtracts it from the price, and also displays how much money was saved.
- shows the book details (title, author, and current price).

#### Test the class in main() by:

- Creating two Book objects.
- Setting their details using SetData().
- Applying a discount of 10% on the first book and 20% on the second book.
- Displaying book details before and after applying the discount.

### Screenshot:

```
1 #include <iostream>
2 #include <string>
3 using namespace std;
4
5 class Book
6 {
7 private:
8     string title;
9     string author;
10    float price;
11
12 public:
13    void SetData(string t, string a, float p)
14    {
15        title = t;
16        author = a;
17        price = p;
18    }
19
20    void ApplyDiscount(float percentage)
21    {
22        float discountAmount = (price * percentage) / 100;
23        cout << "Discount Applied: " << discountAmount << " saved!" << endl;
24        price -= discountAmount;
25    }
26
27    void ShowDetails()
28    {
29        cout << "Titles " << title << endl;
30    }
31
32 int main()
33 {
34     Book b1, b2;
35     b1.SetData("C++ Programming", "Robert C. Martin", 1500);
36     b2.SetData("Clean Code", "Robert C. Martin", 1500);
37     b1.ApplyDiscount(10);
38     b2.ApplyDiscount(20);
39     b1.ShowDetails();
40     b2.ShowDetails();
41     return 0;
42 }
```

Output:

```
Before Discount:
Title: C++ Programming
Author: Robert C. Martin
Price: 1500

Applying Discounts...
Discount Applied: 150 saved!
Discount Applied: 300 saved!
After Discount:
Title: C++ Programming
Author: Robert C. Martin
Price: 1350

Title: Clean Code
Author: Robert C. Martin
Price: 1200
```