



**SAVEETHA SCHOOL OF ENGINEERING**  
**SAVEETHA INSTITUTE OF MEDICAL AND TECHNICAL SCIENCES**



Engineer to Excel

**SUB CODE & NAME : DSA01/ Object Oriented Programming with C++**

**LAB DAY 2/14-03-2024(FN)**

**EASY**

1. Develop a C++ program for default arguments.

The screenshot shows the Programiz C++ Online Compiler interface. The code editor contains the following C++ code:

```
1 #include <iostream>
2 void greetUser(const std::string& name = "Guest")
3 {
4     std::cout << "Hello, " << name << "!" << std::endl;
5 }
6 int main()
7 {
8     greetUser();
9     greetUser("Alice");
10    return 0;
11 }
12
```

The output window shows the following output:

```
/tmp/QLjFGa9XTc.o
Hello, Guest!
Hello, Alice!
```

2. Develop a program to check the entered user name is valid or not using function. Get both the inputs from the user.

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```

main.cpp
1 #include <iostream>
2 #include <string>
3 #include <cctype>
4 bool isValidUsername(const std::string& username) {
5     if (username.length() < 5) {
6         return false;
7     }
8     for (char ch : username) {
9         if (!isalnum(ch)) {
10             return false;
11         }
12     }
13     return true;
14 }
15 int main() {
16     std::string username;
17     std::cout << "Enter a username: ";
18     std::cin >> username;
19     if (isValidUsername(username)) {
20         std::cout << "Valid username!" << std::endl;
21     } else {
22         std::cout << "Invalid username. Please use at least 5 alphanumeric
          characters." << std::endl;
23     }
24     return 0;
25 }
26

```

Output

```

/tmp/hPPKThkPzp.o
Enter a username: Sravanak2
Valid username!

```

- Develop a program to find whether the person is eligible for vote or not. And if that particular person is not eligible, then print how many years are left to be eligible.

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```

main.cpp
1 #include <iostream>
2 int main()
3 {
4     int a,b;
5     std::cout << "Enter ur age : ";
6     std::cin >> a;
7     b = 18 - a;
8     if (a >= 18)
9     {
10         std::cout << "eligible to vota";
11     }
12     else
13     {
14         std::cout << "not eligible to vote you have "<< b << " year to vote";
15     }
16 }

```

Output

```

/tmp/167VJRmQSH.o
Enter ur age : 12
not eligible to vote you have 6 year to vote

```

- Develop a program using function to calculate the simple interest. Suppose the customer is a senior citizen. He is being offered 12 percent rate of interest; for all other customers, the ROI is 10 percent.

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main.cpp

Run

Clear

```
1 #include <iostream>
2 double calculateSimpleInterest(double principal, double rate, int time)
3 {
4     return (principal * rate * time) / 100.0;
5 }
6
7 int main() {
8     double principal;
9     int time;
10    char customerType;
11    std::cout << "Enter the principal amount: ";
12    std::cin >> principal;
13    std::cout << "Enter the time period (in years): ";
14    std::cin >> time;
15    std::cout << "Are you a senior citizen? (Y/N): ";
16    std::cin >> customerType;
17    double rate = (customerType == 'Y' || customerType == 'y') ? 12.0 : 10.0;
18    double interest = calculateSimpleInterest(principal, rate, time);
19    std::cout << "Simple interest: " << interest << std::endl;
20    return 0;
21 }
22
```

Output

Clear

```
/tmp/yXF5qgaXT6.o
Enter the principal amount: 20000
Enter the time period (in years): 5
Are you a senior citizen? (Y/N): y
Simple interest: 12000
```

5. Develop a program using choice to check given string in palindrome or not using inline function.

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main.cpp

Run

Clear

```
1 #include <iostream>
2 #include <string>
3 #include <algorithm>
4 inline bool isPalindrome(const std::string& str) {
5     std::string reversed = str;
6     std::reverse(reversed.begin(), reversed.end());
7     return str == reversed;
8 }
9 int main() {
10    std::string input;
11    std::cout << "Enter a string: ";
12    std::cin >> input;
13    if (isPalindrome(input)) {
14        std::cout << "The string is a palindrome." << std::endl;
15    } else {
16        std::cout << "The string is not a palindrome." << std::endl;
17    }
18    return 0;
19 }
20
```

Output

Clear

```
/tmp/A085QAFQ1R.o
Enter a string: malayalam
The string is a palindrome.
```

## MEDIUM

1. Develop a C++ program for default arguments.

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main.cpp

Run

```
1 #include <iostream>
2 void greetUser(const std::string& name = "Guest")
3 {
4     std::cout << "Hello, " << name << "!" << std::endl;
5 }
6 int main()
7 {
8     greetUser();
9     greetUser("Alice");
10    return 0;
11 }
12
```

Output

Clear

```
/tmp/QLjFGa9XTc.o
Hello, Guest!
Hello, Alice!
```

2. Develop a C++ program for adding the number using function overloading concept.

Programiz  
C++ Online Compiler

C++ Certification >

main.cpp

Run

```
1 #include <iostream>
2 int add(int a, int b)
3 {
4     return a + b;
5 }
6 float add(float a, float b)
7 {
8     return a + b;
9 }
10 double add(double a, double b)
11 {
12     return a + b;
13 }
14 int main()
15 {
16     int intResult = add(5, 3);
17     float floatResult = add(2.5f, 1.3f);
18     double doubleResult = add(10.7, 3.2);
19     std::cout << "Integer result: " << intResult << std::endl;
20     std::cout << "Float result: " << floatResult << std::endl;
21     std::cout << "Double result: " << doubleResult << std::endl;
22     return 0;
23 }
24
```

Output

Clear

```
/tmp/hEIQkIV0i8.o
Integer result: 8
Float result: 3.8
Double result: 13.9
```

3. Declare a class box, with length (Public variable) and width (Private variable) use set width () and get width () function to set the width and print the length and width.

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```
main.cpp
1 #include <iostream>
2 class Box
3 {
4 public:
5     double length;
6     void setWidth(double w)
7     {
8         width = w;
9     }
10    double getWidth()
11    {
12        return width;
13    }
14 private:
15     double width;
16 };
17 int main()
18 {
19     Box myBox;
20     myBox.length = 10.0;
21     myBox.setWidth(5.0);
22     double boxWidth = myBox.getWidth();
23     std::cout << "Length: " << myBox.length << std::endl;
24     std::cout << "Width: " << boxWidth << std::endl;
25     return 0;
26 }
27
```

Output

```
/tmp/ZibewY6Poa.o
Length: 10
Width: 5
```

4. Develop a C++ program for matrix multiplication using arrays.

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```
main.cpp
1 #include <iostream>
2
3 const int MAX_SIZE = 100;
4 void multiplyMatrices(int A[MAX_SIZE], int B[MAX_SIZE], int C[MAX_SIZE],
5     int rowsA, int colsA, int colsB) {
6     for (int i = 0; i < rowsA; ++i) {
7         for (int j = 0; j < colsB; ++j) {
8             C[i][j] = 0;
9             for (int k = 0; k < colsA; ++k) {
10                 C[i][j] += A[i][k] * B[k][j];
11             }
12         }
13     }
14 }
15 void displayMatrix(int mat[][MAX_SIZE], int rows, int cols) {
16     for (int i = 0; i < rows; ++i) {
17         for (int j = 0; j < cols; ++j) {
18             std::cout << mat[i][j] << " ";
19         }
20         std::cout << std::endl;
21     }
22 }
23 int main() {
24     int rowsA, colsA, rowsB, colsB;
25     std::cout << "Enter the number of rows and columns for matrix A: ";
26     std::cin >> rowsA >> colsA;
27     int A[MAX_SIZE][MAX_SIZE];
28     std::cout << "Enter matrix A:" << std::endl;
29     for (int i = 0; i < rowsA; ++i) {
30         for (int j = 0; j < colsA; ++j) {
31             std::cin >> A[i][j];
32         }
33     }
34     int rowsB, colsB;
35     std::cout << "Enter the number of rows and columns for matrix B: ";
36     std::cin >> rowsB >> colsB;
37     int B[MAX_SIZE][MAX_SIZE];
38     std::cout << "Enter matrix B:" << std::endl;
39     for (int i = 0; i < rowsB; ++i) {
40         for (int j = 0; j < colsB; ++j) {
41             std::cin >> B[i][j];
42         }
43     }
44     int C[MAX_SIZE][MAX_SIZE];
45     multiplyMatrices(A, B, C, rowsA, colsA, colsB);
46     displayMatrix(C, rowsA, colsB);
47     return 0;
48 }
```

Output

```
/tmp/WCKVtEk9a2.o
Enter the number of rows and columns for matrix A: 2
Enter matrix A:
1
2
3
4
Enter the number of rows and columns for matrix B: 2
Enter matrix B:
9
8
7
6
Resultant matrix C:
23 20
55 48
```

5. Develop a simple program for static field to count the number of objects created using C++.

Programiz

C++ Online Compiler

C++ Certification >

main.cpp

Run

Clear

```

1 #include <iostream>
2 class MyClass {
3 private:
4     static int objectCount;
5 public:
6     MyClass() {
7         objectCount++;
8     }
9     static int getObjectCount() {
10         return objectCount;
11     }
12 };
13 int MyClass::objectCount = 0;
14 int main() {
15     MyClass obj1;
16     MyClass obj2;
17     MyClass obj3;
18     std::cout << "Number of objects created: " << MyClass::getObjectCount() <<
        std::endl;
19     return 0;
20 }
21

```

/tmp/alwhD0Kbkip.o

Number of objects created: 3

## HARD

- Develop a C++ program to demonstrate call by value and call by reference mechanism for swapping of number.

Programiz

C++ Online Compiler

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main.cpp

Run

Clear

```

1 #include <iostream>
2 void swapByValue(int a, int b)
3 {
4     int temp = a;
5     a = b;
6     b = temp;
7 }
8 void swapByReference(int &a, int &b)
9 {
10     int temp = a;
11     a = b;
12     b = temp;
13 }
14 int main()
15 {
16     int num1 = 10, num2 = 20;
17     std::cout << "Original values: num1 = " << num1 << ", num2 = " << num2 << std
        ::endl;
18     swapByValue(num1, num2);
19     std::cout << "After swap by value: num1 = " << num1 << ", num2 = " << num2 <<
        std::endl;
20     num1 = 10;
21     num2 = 20;
22     swapByReference(num1, num2);
23     std::cout << "After swap by reference: num1 = " << num1 << ", num2 = " <<
        num2 << std::endl;
24     return 0;
25 }
26

```

/tmp/0agk6ZVtD2.o

Original values: num1 = 10, num2 = 20  
After swap by value: num1 = 10, num2 = 20  
After swap by reference: num1 = 20, num2 = 10

- Build a class series and use member function input () for getting a number and member function show () to print Fibonacci series of a number.

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```

main.cpp
1 #include <iostream>
2 class FibonacciSeries
3 {
4 private:
5     int num;
6 public:
7     void input()
8     {
9         std::cout << "Enter a positive integer: ";
10        std::cin >> num;
11    }
12    void show() {
13        int first = 0, second = 1;
14        std::cout << "Fibonacci series up to " << num << " terms:\n";
15        std::cout << first << " " << second << " ";
16        for (int i = 2; i < num; ++i) {
17            int next = first + second;
18            std::cout << next << " ";
19            first = second;
20            second = next;
21        }
22        std::cout << std::endl;
23    }
24 };
25 int main() {
26     FibonacciSeries fib;
27     fib.input();
28     fib.show();
29     return 0;
30 }
31

```

Output

```

/tmp/mPY6ZXNawb.o
Enter a positive integer: 8
Fibonacci series up to 8 terms:
0 1 1 2 3 5 8 13

```

- Develop a class in C++ program to compute a record of 10 students, Read the name, Regno, mark1, mark2, mark3 of the student, calculate the average marks and grade for to display it.  
 Test Case Average >90, Grade – S  
 Average >80, Grade A  
 Average >70, Grade C  
 Average >60 Grade D  
 Average >50 Grade E  
 Average less than 50 Grade F

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```

main.cpp
1 #include<iostream>
2 using namespace std;
3 int main()
4 {
5     char name;
6     int reg,s1,s2,s3,s4,s5,t;
7     std::cout<<"Enter ur name : ";
8     std::cin>>name;
9     std::cout<<"Enter ur Reg No. : "<<endl;
10    std::cin>>reg;
11    std::cout<<"Subject 1 mark : "<<endl;
12    std::cin>>s1;
13    std::cout<<"Subject 2 mark : "<<endl;
14    std::cin>>s2;
15    std::cout<<"Subject 3 mark : "<<endl;
16    std::cin>>s3;
17    std::cout<<"Subject 4 mark : "<<endl;
18    std::cin>>s4;
19    std::cout<<"Subject 5 mark : "<<endl;
20    std::cin>>s5;
21    t=s1+s2+s3+s4+s5;
22    if(t>=450)
23    {
24        std::cout<<"S Grade";
25    }
26    else if(t>=400)
27    {
28        std::cout<<"A Grade";
29    }
30    else if(t>=350)
31    {
32        std::cout<<"B Grade";

```

Output

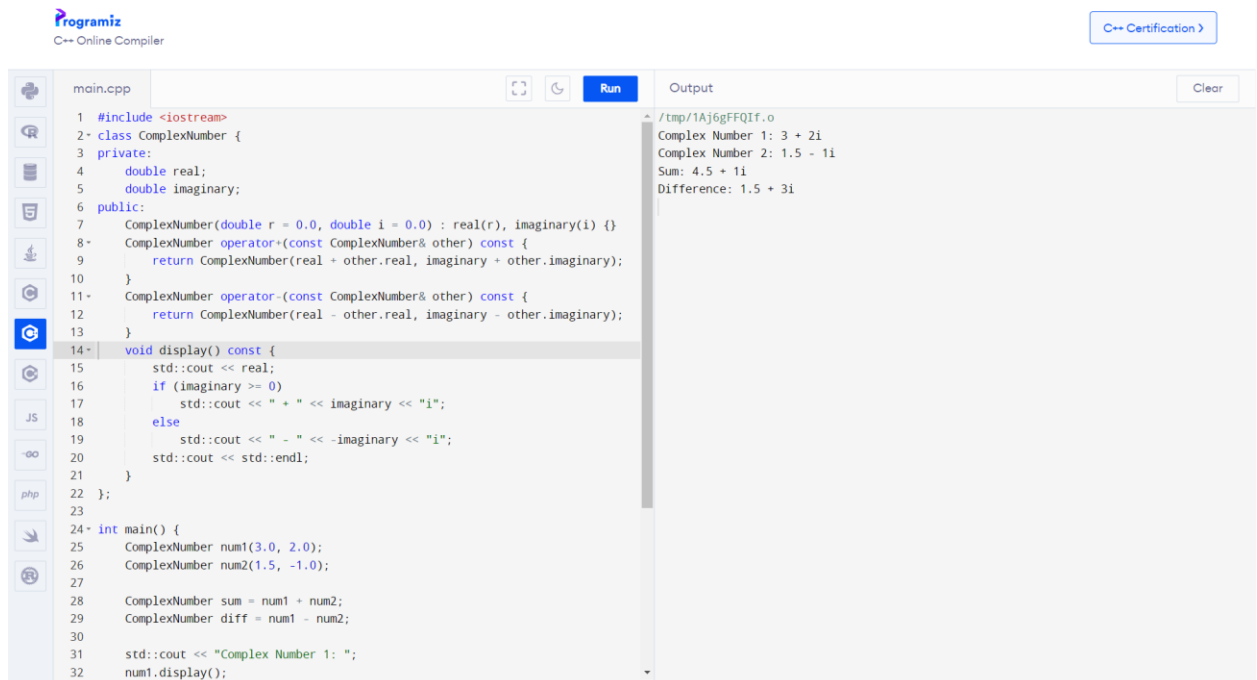
```

/tmp/XeGbbwzkoe.o
Enter details for Student 1:
Enter student name: sravan
Enter registration number (Regno): 192110317
Enter marks for three subjects (separated by spaces): 91 99 93 94 91

Student Record:
Name: sravan
Regno: 192110317
Average Marks: 94.3333
Grade: S

```

#### 4. Develop a Program for binary operator overloading in C++



The screenshot shows the Programiz C++ Online Compiler interface. The code in main.cpp defines a ComplexNumber class with private attributes real and imaginary, and public methods for addition, subtraction, and display. The main function creates two ComplexNumber objects, num1 (3.0, 2.0) and num2 (1.5, -1.0), calculates their sum and difference, and displays the results.

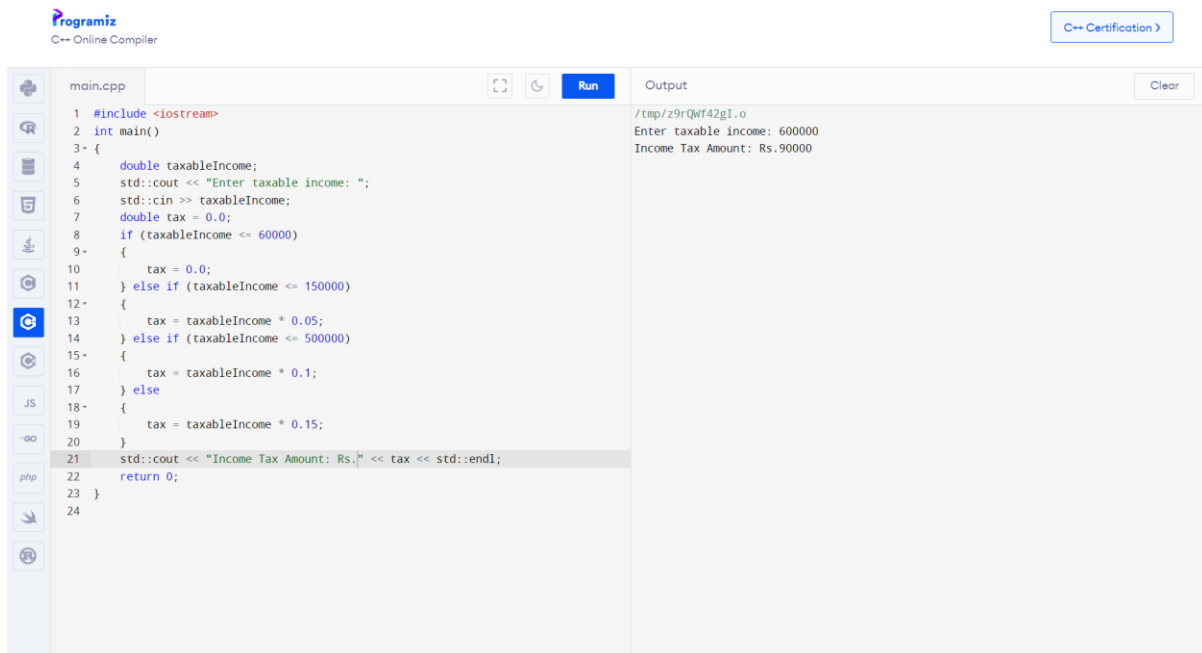
```
1 #include <iostream>
2 class ComplexNumber {
3 private:
4     double real;
5     double imaginary;
6 public:
7     ComplexNumber(double r = 0.0, double i = 0.0) : real(r), imaginary(i) {}
8     ComplexNumber operator+(const ComplexNumber& other) const {
9         return ComplexNumber(real + other.real, imaginary + other.imaginary);
10    }
11    ComplexNumber operator-(const ComplexNumber& other) const {
12        return ComplexNumber(real - other.real, imaginary - other.imaginary);
13    }
14    void display() const {
15        std::cout << real;
16        if (imaginary >= 0)
17            std::cout << " + " << imaginary << "i";
18        else
19            std::cout << " - " << -imaginary << "i";
20        std::cout << std::endl;
21    }
22 };
23
24 int main() {
25     ComplexNumber num1(3.0, 2.0);
26     ComplexNumber num2(1.5, -1.0);
27
28     ComplexNumber sum = num1 + num2;
29     ComplexNumber diff = num1 - num2;
30
31     std::cout << "Complex Number 1: ";
32     num1.display();
```

The output shows the results of the operations:

```
/tmp/1Aj6gFFQIF.o
Complex Number 1: 3 + 2i
Complex Number 2: 1.5 - 1i
Sum: 4.5 + 1i
Difference: 1.5 + 3i
```

#### 5. Develop a Program in C++ to calculate income tax for the employee based on the following condition

- 1 if taxableincome $\leq$ 60000, tax=0;
2. if taxableincome >60000 and taxableincome  $\leq$ 150000, tax= taxableincome \*0.05;
- 3.if taxableincome >150000 or taxableincome  $\leq$ 500000) tax= taxableincome \*0.1;
- else tax=tableinc\*0.15;



The screenshot shows the Programiz C++ Online Compiler interface. The code in main.cpp defines a program that prompts the user to enter taxable income and calculates the tax amount based on the specified conditions.

```
1 #include <iostream>
2 int main()
3 {
4     double taxableIncome;
5     std::cout << "Enter taxable income: ";
6     std::cin >> taxableIncome;
7     double tax = 0.0;
8     if (taxableIncome <= 60000)
9     {
10         tax = 0.0;
11     } else if (taxableIncome <= 150000)
12     {
13         tax = taxableIncome * 0.05;
14     } else if (taxableIncome <= 500000)
15     {
16         tax = taxableIncome * 0.1;
17     } else
18     {
19         tax = taxableIncome * 0.15;
20     }
21     std::cout << "Income Tax Amount: Rs." << tax << std::endl;
22     return 0;
23 }
24
```

The output shows the results of the calculation:

```
/tmp/z9rQWf42gI.o
Enter taxable income: 60000
Income Tax Amount: Rs.90000
```