Object Oriented Programming Lab

Assignment 1

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1. Sum, Average, Product, Maximum, Minimum of Three Numbers

This program takes three integers as input and calculates their sum, product, maximum, minimum, and average.

Code

```cpp
#include <bits/stdc++.h>
using namespace std;

int sum(int a, int b, int c) {
    return a + b + c;
}

int product(int a, int b, int c) {
    return a * b * c;
}

int max(int a, int b, int c){
    if(a >= b && a >= c) return a;
    else if(b >= a && b >= c) return b;
    else return c;
}

int min(int a, int b, int c){
    if(a <= b && a <= c) return a;
    else if(b <= a && b <= c) return b;
    else return c;
}

int average(int a, int b, int c) {
    return (a + b + c) / 3;
}

int main1() {
    int a, b, c;
    cout << "Enter three integers: ";
    cin >> a >> b >> c;
    cout << "Sum: " << sum(a, b, c) << endl;
    cout << "Product: " << product(a, b, c) << endl;
    cout << "Maximum: " << max(a, b, c) << endl;
    cout << "Minimum: " << min(a, b, c) << endl;
    cout << "Average: " << average(a, b, c) << endl;
    return 0;
}
```

Sample Output

```
Enter three integers: 2 4 6
Sum: 12
Product: 48
Maximum: 6
Minimum: 2
Average: 4
```

2. Check if a Number Lies Between 10 and 20

This program checks whether the entered number is in the range [10, 20] inclusive.

Code

```cpp
bool isNumBw(int num){
    return (num >= 10 && num <= 20);
}

int main2(){
    int num;
    cout << "Enter Number: ";
    cin >> num;
    if(isNumBw(num)) cout << "Yes !";
    else cout << "False !!";
}
```

Sample Output

```
Enter Number: 17
Yes !
```

3. Logical Operations on Two Booleans

This program takes two boolean values and performs logical AND, OR, and NOT operations.

Code

```cpp
void boolOperations(bool a, bool b){
    cout << "AND : " << (a && b) << endl;
    cout << "OR  : " << (a || b) << endl;
    cout << "NOT A : " << (!a) << endl;
    cout << "NOT B : " << (!b) << endl;
}

int main3(){
    bool a, b;
    cout << "Enter two Bools (0 or 1): ";
    cin >> a >> b;
    boolOperations(a, b);
}
```

Sample Output

```
Enter two Bools (0 or 1): 1 0
AND : 0
OR  : 1
NOT A : 0
NOT B : 1
```

4. Bitwise Operations

This program performs bitwise AND, OR, and XOR operations on two integers.

Code

```cpp
#include <iostream>
using namespace std;

void operations(int a, int b) {
    cout << "AND : " << (a & b) << endl;
    cout << "OR  : " << (a | b) << endl;
    cout << "XOR : " << (a ^ b) << endl;
}

int main4() {
    int a, b;
    cout << "Enter two numbers: ";
    cin >> a >> b;
    operations(a, b);
    return 0;
}
```

Sample Output

```
Enter two numbers: 5 3
AND : 1
OR  : 7
XOR : 6
```

5. Grade Calculation

This program takes the marks as input and prints the corresponding grade.

Code

```cpp
void grade(int marks){
    if(marks > 100) cout << "Invalid Marks !";
    else if(marks >= 90 && marks <= 100) cout << "Grade A";
    else if(marks >= 80 && marks <= 89) cout << "Grade B";
    else if(marks >= 70 && marks <= 79) cout << "Grade C";
    else if(marks >= 60 && marks <= 69) cout << "Grade D";
    else cout << "Grade F";
}

int main5(){
    int marks;
    cout << "Enter Your Marks: ";
    cin >> marks;
    grade(marks);
}
```

Sample Output

```
1 Enter Your Marks: 82
2 Grade B
```

6. Age Category

This program categorizes a person based on age as Child, Teenager, Adult, or Senior.

Code

```cpp
1  int ageee(int age) {
2      if (age < 0)
3          cout << "Invalid age entered!" << endl;
4      else if (age < 13)
5          cout << "You are a Child." << endl;
6      else if (age >= 13 && age <= 19)
7          cout << "You are a Teenager." << endl;
8      else if (age >= 20 && age <= 59)
9          cout << "You are an Adult." << endl;
10     else
11         cout << "You are a Senior." << endl;
12     return 0;
13 }
14
15 int main6(){
16     int age;
17     cout << "Enter a Age : ";
18     cin >> age;
19     cout << ageee(age);
20 }
```

Sample Output

```
1 Enter a Age : 21
2 You are an Adult.
```

7. Print First 10 Natural Numbers (For Loop)

This program prints the first 10 natural numbers using a for loop.

Code

```cpp
1  void naturalNums(){
2      for(int i = 1; i < 11; i++) cout << i << " ";
3  }
4
5  int main7(){
6      naturalNums();
7  }
```

Sample Output

```
1  1 2 3 4 5 6 7 8 9 10
```

8. Countdown from n (While Loop)

This program prints numbers from the given positive number down to 1 using a while loop.

Code

```cpp
void printNum(int n){
    while(n != 0){
        cout << n << " ";
        n--;
    }
}

int main8(){
    int num;
    cout << "Enter a number : ";
    cin >> num;
    printNum(num);
}
```

Sample Output

```
1  Enter a number : 5
2  5 4 3 2 1
```

9. Input Until Zero (Do-While Loop)

This program asks the user to enter numbers repeatedly until the user enters 0.

Code

```cpp
int main9() {
    int n;
    do {
        cout << "Enter a number (0 to stop): ";
        cin >> n;
    } while (n != 0);
    cout << "You entered 0. Program terminated." << endl;
    return 0;
}
```

Sample Output

```
1  Enter a number (0 to stop): 9
2  Enter a number (0 to stop): 8
3  Enter a number (0 to stop): 0
4  You entered 0. Program terminated.
```

10. Array Operations: Sum, Max, Min, and Average

This program takes 5 integers into an array and calculates their sum, maximum, minimum, and average.

Code

```cpp
#include <iostream>
#include <climits>
using namespace std;

void arrayOperations(int arr[]) {
    int sum = 0;
    int maxi = INT_MIN;
    int mini = INT_MAX;

    for (int i = 0; i < 5; i++) {
        maxi = max(maxi, arr[i]);
        mini = min(mini, arr[i]);
        sum += arr[i];
        cout << i + 1 << " element of the array: " << arr[i] << endl;
    }
    cout << "Sum: " << sum << endl;
    cout << "Average: " << (sum / 5.0) << endl;
    cout << "Max: " << maxi << endl;
    cout << "Min: " << mini << endl;
}

int main10() {
    int arr[5];

    for (int i = 0; i < 5; i++) {
        cout << "Enter " << i + 1 << "th Number: ";
        cin >> arr[i];
    }
    arrayOperations(arr);
    return 0;
}
```

Sample Output

```
Enter 1th Number: 5
Enter 2th Number: 10
Enter 3th Number: 2
Enter 4th Number: 8
Enter 5th Number: 3
1 element of the array: 5
2 element of the array: 10
3 element of the array: 2
4 element of the array: 8
5 element of the array: 3
Sum: 28
Average: 5.6
Max: 10
Min: 2
```

11. Frequency of Each Element in an Array

This program reads n integers and prints the frequency of each unique element using a map.

Code

```cpp
#include <iostream>
#include <map>
using namespace std;

int main11() {
    int n;
    cout << "Enter the number of integers: ";
    cin >> n;
    map<int, int> freq;
    for (int i = 1; i <= n; i++) {
        int num;
        cout << "Enter " << i << "th number: ";
        cin >> num;
        freq[num]++;
    }
    cout << "\nFrequencies :\n";
    for (auto pair : freq) {
        cout << pair.first << " => " << pair.second << endl;
    }
    return 0;
}
```

Sample Output

```
Enter the number of integers: 5
Enter 1th number: 4
Enter 2th number: 5
Enter 3th number: 4
Enter 4th number: 2
Enter 5th number: 5

Frequencies :
2 => 1
4 => 2
5 => 2
```

12. Merge Two Arrays

This program takes two arrays and merges them into a third array, then prints the result.

Code

```cpp
int main12() {
    int n1, n2;
    cout << "Enter the size of the array 1 : ";
    cin >> n1;
    cout << "Enter the size of the array 2 : ";
```

```cpp
    cin >> n2;

    int arr1[n1];
    int arr2[n2];
    int arr3[n1 + n2];
    int idx = 0;

    cout << "Enter the Elements of array 1:\n";
    for (int i = 0; i < n1; i++) {
        cout << "Enter " << i + 1 << "th element of 1st Array : ";
        cin >> arr1[i];
    }

    cout << "Enter the Elements of array 2:\n";
    for (int i = 0; i < n2; i++) {
        cout << "Enter " << i + 1 << "th element of 2nd Array : ";
        cin >> arr2[i];
    }

    // Merge arrays
    for (int i = 0; i < n1; i++) arr3[idx++] = arr1[i];
    for (int i = 0; i < n2; i++) arr3[idx++] = arr2[i];

    // Print merged array
    cout << "Merged Array: ";
    for (int i = 0; i < n1 + n2; i++) cout << arr3[i] << " ";
    cout << endl;
    return 0;
}
```

Sample Output

```
Enter the size of the array 1 : 3
Enter the size of the array 2 : 2
Enter the Elements of array 1:
Enter 1th element of 1st Array : 1
Enter 2th element of 1st Array : 2
Enter 3th element of 1st Array : 3
Enter the Elements of array 2:
Enter 1th element of 2nd Array : 4
Enter 2th element of 2nd Array : 5
Merged Array: 1 2 3 4 5
```