C++ 2022/2023

Question One
List the basic entities in C++ and write extensively but coherently on any four (4) of them

Answer
Variables, Functions, classes, objects, Operators, Data types, control Structure, Arrays, Pointers, reference

Variable: Variables in C++ serve as containers for storing data values. They are fundamental entities used extensively in programming to hold different types of information such as numbers, characters, and objects. Before using a variable, it needs to be declared with a specific data type, such as int, float, double, char, etc. This informs the compiler about the type of data the variable will store and allocates memory accordingly.

Functions: Functions are blocks of code that encapsulate a specific task or set of tasks. They provide modularity and reusability to programs by allowing the same block of code to be executed multiple times with different inputs. In C++, functions can take parameters as inputs, which are variables passed to the function and can return a value as output. Functions are declared with a return type (if applicable), a name, and parameters (if any).

Data Types: Data types specify the type of data that a variable can hold. In C++, data types define the size and layout of variables in memory and determine the operations that can be performed on them. C++ supports several built-in data types, including integers (int), floating-point numbers (float, double), characters (char), Boolean values (bool), and void.

Operators: Operators in C++ are symbols that perform specific operations on operands. They are used to manipulate data, perform arithmetic calculations, compare values, and control the flow of program execution. C++ supports a wide range of operators, including arithmetic, assignment, logical operators and among others. E,g (+, -, *, /, %, =, <,>, &+=. <<,>>),

Question two:

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

int main() {
   int integers[15];
   float real_values[10];
   int i;
   int sum_integers = 0;
   float sum_real_values = 0;

   // Prompt user to enter 15 integers
   cout << "Enter 15 integers:\n";
```

```
    for (i = 0; i < 15; i++) {
        cin >> integers[i];
        sum_integers += integers[i];
    }

    // Prompt user to enter 10 real values
    cout << "Enter 10 real values:\n";
    for (i = 0; i < 10; i++) {
        cin >> real_values[i];
        sum_real_values += real_values[i];
    }

    // Calculate the result of addition and division operations
    float result = (sum_integers + sum_real_values) / 130;

    // Display the set of values read in
    cout << "Set of integers entered:\n";
    for (i = 0; i < 15; i++) {
        cout << integers[i] << " "; // Print each integer
    }
    cout << "\n";

    cout << "Set of real values entered:\n";
    for (i = 0; i < 10; i++) {
        cout << real_values[i] << " "; // Print each real value
    }
    cout << "\n";

    // Display the results of addition and division operations
    cout << "Result of addition and division: " << result << endl;

    return 0; // Return 0 to indicate successful completion
}
```

Question Three

a. Which of the following will cause a semantic error, if you are trying to compare x to 5?

i. if(x=5) ii. if (x >= 5)   iii. if (x = 5)   iv. if(x<=5)

Answer: if(x=5)

Reason: there is a difference between = and == in programming. = assign value to the variable while == compares value e,g if a == 10 then c

b. Convert Mathematical expression to C++ expression

1. w+y+((4gh - 2fy) x 100) / 30ab+c=0

double result = w + y + ((4 * g * h - 2 * f * y) * 100) / (30 * a * b + c);

2. Z = sr^2 x ab / ………………

double Z = (s * 7 * 7 * ab) / (sqrt(pow(c, 3) + s) / 7);

3. 3b × ac = ayb + 100b + 50 × xy^2

double result = (3 * b * ac) - (ayb / (100 * b)) + (50 * pow(xy, 2));

Question Five:
Write a detailed note on input and output statements that can be used to read data from the keyboard and write to the screen.

Answer:
Input and output operations in C++ are essential for interacting with the user and processing data.

Input Statements:

Cin: cin is the standard input stream in C++ that reads data from the keyboard.
It is used with the extraction operator >> to read different types of data like integers, floating-point numbers, characters, etc.
Example

```
 int num;
cin >> num;
```

Getline**:** getline is used to read a line of text from the keyboard. It reads characters until it encounters a newline.
Example:

```
string name;
getline(cin, name);
```

Output Statements:

cout:

cout is the standard output stream in C++ that writes data to the screen. It is used with the insertion operator << to display different types of data like integers, floating-point numbers, characters, strings, etc.
Example: cout << "Hello, World!" << endl;

Printf: printf is a C-style output function that can also be used in C++. It provides more formatting options compared to cout.
Example: printf("The value of is", 3.14);

Question Six

a. Write an interactive C program to determine if a point is on top of a rectangle given your own coordinates of the point and that of the rectangle.

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

int main() {
    float point_x, point_y;
    float rectTop, rectBot, rectLeft, rectRight;

  //getting input for point

cout << "Enter the point x" << endl;

cin >> point_x;

cout << "Enter the point y" << endl;

cin >> point_y;

//getting input for rectangle

cout << "Enter the rectangle top" << endl;

cin >> rectTop;

cout << "Enter the rectangle bottom" << endl;

cin >> rectBot;

cout << "Enter the rectangle left" << endl;

cin >> rectLeft;
cout << "Enter the rectangle right" << endl;

cin>> rectRight;

    if (point_x >= rectTop && point_x <= rectLeft && point_y >= rectBot && point_y <= rectRight) {
        cout << "The point (" << point_x << ", " << point_y << ") is on top of the rectangle." << endl;
    } else {
        cout << "The point (" << point_x << ", " << point_y << ") is not on top of the rectangle." << endl;
    }

    return 0;
}
```

Note: All Program are tested and working perfectly

the comment in the program that starts with the “//” sign is not compulsory to be in your program so you wont get confuse