C and C++ Programming Assessment 2

June 12, 2025

C Multiple Choice

Each question will have four options, with each multiple choice question being worth **Two marks**.

1. What is the size of a `float` on most systems?
   - A) 2 bytes
   - B) 4 bytes
   - C) 8 bytes
   - D) 16 bytes
2. Which of the following is a valid variable name in C?
   - A) 1variable
   - B) variable$_1 C) variable - 1$

- D) variable1

3. What will this code output?

```
        int x = 5;
        printf("%d", x++ * 2);

```

   - A) 10
   - B) 12
   - C) 5
   - D) Undefined Behavior

4. What is wrong with the following code?

```
        char str[10];
        strcpy(str, "Hello World");

```

   - A) Missing include directive
   - B) Buffer overflow
   - C) Incorrect use of strcpy
   - D) Nothing is wrong

5. Which loop is best suited for iterating over an array of known size?
   - A) while
   - B) do-while
   - C) for
   - D) None of the above
6. Which of the following cannot be used to initialize an array in C?
   - A) Static initialization
   - B) Dynamic initialization
   - C) Direct assignment of another array

- D) Element-by-element assignment

7. What is wrong with the following code?

```
        int arr[3] = {1, 2, 3};
        int *ptr = arr;
        printf("%d", *(ptr + 3));

```

   - A) Pointer arithmetic is incorrect
   - B) Out-of-bounds access
   - C) Array initialization is wrong
   - D) Nothing is wrong

8. What is the purpose of the `static` keyword in a function?
   - A) Restricts variable scope to the file
   - B) Preserves variable value between function calls
   - C) Allocates memory dynamically
   - D) Makes the function globally accessible

9. Which of the following correctly declares a pointer to a function?
   - A) int *func();
   - B) int (*func)();
   - C) int *func();
   - D) int func*();

10. What is wrong with this code?

```
        FILE *fp = fopen("data.txt", "w");
        fclose(fp);
        fprintf(fp, "Test");

```

    - A) File opened in wrong mode
    - B) Writing to a closed file
    - C) Missing error checking
    - D) Nothing is wrong

C++ Multiple Choice

1. Which of the following is NOT a C++ access specifier?
   - A) public
   - B) private
   - C) protected
   - D) internal
2. What is wrong with this class definition?

```
        class Demo {
            int value
            void setValue(int v);
        };

```

   - A) Missing semicolon after class
   - B) Missing access specifier
   - C) Function not implemented
   - D) Nothing is wrong
3. What does the `virtual` keyword enable in C++?
   - A) Static binding
   - B) Dynamic binding
   - C) Data hiding
   - D) Encapsulation
4. What is wrong with this constructor?

```
        class Sample {
        public:
            Sample(int x) {
                return x;
            }
        };

```

   - A) Constructors cannot have parameters
   - B) Constructors cannot return values
   - C) Incorrect access specifier
   - D) Nothing is wrong
5. What is the purpose of the `delete` operator in C++?
   - A) Deallocates memory on the stack
   - B) Deallocates memory on the heap
   - C) Deletes a class definition
   - D) Deletes a variable
6. What is the error in this code?

```
        int* arr = new int[5];
        arr[5] = 10;

```

- A) Out-of-bounds access
- B) Memory leak
- C) Incorrect deletion syntax
- D) Nothing is wrong

7. What is the role of a copy constructor in C++?
   - A) Initializes an object with default values
   - B) Creates a copy of an existing object
   - C) Deletes an object
   - D) Allocates memory dynamically
8. Which keyword is used to define a constant member function?
   - A) static
   - B) const
   - C) final
   - D) virtual
9. What are the types of inheritance in C++?
   - A) Single, Multiple, Multilevel, Hierarchical, Hybrid
   - B) Public, Private, Protected
   - C) Static, Dynamic
   - D) Abstract, Concrete

(Last question on the next page)

10. What will be the output of this code?

```
        class A {
        public:
            virtual void display() {
                cout << "Class A";
            }
        };
        class B : public A {
        public:
            void display() {
                cout << "Class B";
            }
        };
        int main() {
            A *a = new B();
            a->display();
            delete a;
        }

```

- A) Class A
- B) Class B
- C) Compilation Error
- D) Undefined Behavior

C Creative Question

C Programming Topic: Binary Search

1. Define an integer array with the following specifications:

   The array should contain 10 elements: `{10, 20, 30, 40, 50, 60, 70, 80, 90, 100}`, sorted in ascending order. Declare this array in the main function and print all its elements to confirm initialization.

   (4 marks)

2. Write a function named `binarySearch` that performs the following tasks:

   Accept the sorted `array`, its `size`, and a search value as arguments. Implement binary search to find the index of the search value. Return the `index` if found; otherwise, return -1.

   (8 marks)

3. Modify the `main` function to use the `binarySearch` function:

   Prompt the user to input a value to search. Call the `binarySearch` function and store the result. Print whether the value was found and its index.

   (8 marks)

4. Write a function named `findSecondLargest` that performs the following:

   Accept the array and its size as arguments. Find and return the second largest value in the array. Print this value in the main function after calling `findSecondLargest`.

   (6 marks)

5. Write a function to calculate the median of the array elements:

   Accept the array and its size as arguments. Calculate the median (average of two middle elements for even-sized array). Return the median and print it in the main function.

   (4 marks)

C++ Creative Question

Be careful with the formatting of your answer; it should be easy to read.

1. Define an `Employee` class with the following specifications:

   Private member variables: `name` (a string) to store the employee's name. `salaries` (an array of 6 floats) to store monthly salaries for half a year. `id` (an integer) to store the employee's ID.

   Public member functions: A constructor to initialize the name, salaries, and ID for each employee.

   (5 marks)

2. Write a member function named `calculateAverageSalary` in the `Employee` class that:

   Computes the average of the salaries stored in the `salaries` array. Returns the calculated average as a `float`.

   (5 marks)

3. Add a member function named `isAboveThreshold` to the `Employee` class that:

   Uses `calculateAverageSalary` to check if the average salary exceeds 5000. Returns `true` if the average salary is above 5000, `false` otherwise.

(5 marks)

4. Write a member function named `displayInfo` in the `Employee` class that:

   Displays the employee's name, ID, salaries, average salary, and threshold status in the following format:

   Name: Alice Johnson
   ID: 201
   Salaries: 4500.0 4700.0 4800.0 4900.0 5000.0 5100.0
   Average Salary: 4833.33
   Status: Below Threshold

Part 4 (final part) on the next page

5. In the main function, perform the following:

   Create two `Employee` objects using the constructor. For example:

   Employee 1: Name: "Alice Johnson", ID: 201, Salaries: {4500.0, 4700.0, 4800.0, 4900.0, 5000.0, 5100.0}
   Employee 2: Name: "Bob Wilson", ID: 202, Salaries: {5500.0, 5600.0, 5700.0, 5800.0, 5900.0, 6000.0}

   Call the `displayInfo` function for both employees to test all functionalities.

   (10 marks)