C++ Exam: Operators (&, ——, ¡¡, ¿¿)

Instructions

- Answer all questions.
- Each question is worth 4 points.
- Write your answers clearly and concisely.
- You may use a C++ compiler to test your code.

Questions

1. **Understanding the & Operator**
   a. What is the purpose of the & operator in C++? Provide two different use cases.
   b. Explain the difference between the & operator when used as a bitwise AND and when used as a reference operator.
   c. Write a C++ program that uses the & operator to check if a number is odd or even.
2. **Understanding the —— Operator**
   a. What is the purpose of the —— operator in C++? Provide an example of its usage.
   b. Explain short-circuit evaluation in the context of the —— operator.
   c. Write a C++ program that uses the —— operator to check if a number is either less than 0 or greater than 100.

3. **Understanding the ¡¡ Operator**

   a. What is the purpose of the ¡¡ operator in C++? Provide two different use cases.

   b. Explain how the ¡¡ operator is used for bitwise left shift and for output streaming.

   c. Write a C++ program that uses the ¡¡ operator to multiply a number by 2 using bitwise operations.

4. **Understanding the ¿¿ Operator**

   a. What is the purpose of the ¿¿ operator in C++? Provide two different use cases.

   b. Explain how the ¿¿ operator is used for bitwise right shift and for input streaming.

   c. Write a C++ program that uses the ¿¿ operator to divide a number by 2 using bitwise operations.

5. **Code Analysis**

   a. Analyze the following code and predict the output:

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

int main() {
    int a = 5, b = 3;
    cout << (a & b) << endl;
    cout << (a || b) << endl;
    cout << (a << 1) << endl;
    cout << (b >> 1) << endl;
    return 0;
}
```

   b. Explain the output of each line of code, focusing on the role of the &, ——, ¡¡, and ¿¿ operators.

Grading

- Each question is worth 4 points.
- Partial credit may be awarded for partially correct answers.
- The total points for the exam are 20.