Fall 2013 Name: _____

C/C++ Programming Test 1

Question 1. (7 points) Why do we need to compile (g++ age.cpp) a program before we can execute it?

ANSWER: The computer only understands machine language (1s and 0s) so the compiler coverts our C++ program to machine language which the computer understands. The compiler also checks for correct C++ syntax first and informs us of syntax errors.

Question 2. (12 points) Indicate the resulting value by evaluating each of the following expressions.

a) `9 / 10 + 2.0 * 5` Result:_____10.0_____

b) `8 % 3 * (5 - 3)` Result:_____4_____

c) `8 <= 5 && (100 > 8)` Result:_____false_____

d) `19 % 2 == 0` Result:_____false_____

Question 3. (10 points) What would be the expected output of the following partial program?

```
int r, c, count;

count = 0;

for (r = 1; r <= 5; r++) {

      for(c = 1; c <= 5; c++) {
            count++;
            if (r <= c) {
                  cout << "*";
            } else {
                  cout << " "; //blank
            } // end if

      } // end for c

      cout << endl;

} // end for r

cout << "count is " << count << endl;
```

```
*****
 ****
  ***
   **
    *
count is 25
```

Question 4. (6 points)

a) Count four more times in the binary number system: 0_2, 1_2, 10_2, 11_2, 100_2, 101_2, 110_2, 111_2, 1000_2

b) The ASCII value for 'A' is 65_{10}. What is the ASCII value for 'E'? 69_{10}

Question 5. (30 points) Below is the beginning of a program that should:

- read three integer values (a, b, c) from the user,
- determine which integer is the highest, and
- display with label the number that is the highest.

You may assume that the three integer values entered are different. For example, if the user enters 20, 40, and 37, then the interaction should look something like:

Sample interaction

Enter three integers: **20 40 37**
The highest number is 40.

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

int main() {
     int a, b, c, highest;

     cout << "Enter three integers: ";
     cin >> a >> b >> c;
```

Complete program:

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

int main() {
  int a, b, c, high;

  cout << "Enter three integers: ";

  cin >> a >> b >> c;

  if (a <= b && c <= b) {
    high = b;
  } else if (b <= a && c <= a) {
    high = a;
  } else {
    high = c;
  } // end if

  cout << "The highest number is " << high << ".\n";

} // end main
```

Question 6. (35 points) Correct the logic errors in the following program that plays a random number guessing game. The program should generate a random number between 1 and 1000 (inclusive), then ask the user to guess the number repeatedly until they get it correct. Each time the user guesses, the program should display an appropriate message: "Too high, try again.", "Too low, try again.", or "Correct guess after ## guesses!" (the "##" should be replaced by the actual number of guesses that the user performed)

Sample Interaction

```
Enter your guess (1 to 1000): 500
Too high, try again.
Enter your guess: 300
Too low, try again.
Enter your guess: 419
Correct guess after 3 guesses!
```

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

int main() {
     int randomNumber, guessCount, guess;


     guessCount = 1;

     cout << "Enter your guess (1 to 1000): ";
     cin >> guess;


     while (guess == guessCount) {


          randomNumber = rand() / 999 + 1000;


          if (guess < randomNumber) {


               cout << "Too high, try again." << endl;


          } else if (guess > randomNumber) {


               cout << "Too low, try again.";


          } else {


               cout << "Correct guess after " << guessCount << "guesses!" << endl;


          } // end if


     } // end while


} // end main
```

(See page 5 for corrected program)

EXTRA CREDIT Question (A modification of Question 5...)

Below is the beginning of a program that should:

- read three integer values (a, b, c) from the user,
- determine which integer is the highest, middle, and lowest, then
- display with label the numbers as the highest, middle, and lowest.

You may assume that the three integer values entered are different. For example, if the user enters 20, 40, and 37, then the interaction should look something like:

Sample interaction

Enter three integers: **20 40 37**
The highest number is 40.
The middle number is 37.
The lowest number is 20.

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

int main() {
     int a, b, c, high, mid, low;

     cout << "Enter three integers: ";
     cin >> a >> b >> c;
```

(See page 6 for completed program)

```
//  Question 6. Corrected code below:
#include <cstdlib>
#include <ctime>
#include <iostream>
using namespace std;

int main() {
  int randomNumber, guessCount, guess;

  srand(time(0));

  //  guessCount = 1;
  guessCount = 0;

  // need randomNumber before the loop
  randomNumber = rand() % 10 + 1;

  cout << "Enter your guess (1 to 1000): ";
  cin >> guess;

  //  while (guess == guessCount) {
  while (guess != randomNumber) {

    // need to increment guessCount
    guessCount++;

    //    randomNumber = rand() / 999 + 1000;

    if (guess < randomNumber) {

      //      cout << "Too high, try again." << endl;
      cout << "Too low, try again." << endl;

    } else if (guess > randomNumber) {

      //      cout << "Too low, try again.";
      cout << "Too high, try again." << endl;


    } // end if

    // need to get next guess by user
    cout << "Enter your guess (1 to 1000): ";
    cin >> guess;

  } // end while

  cout << "Correct guess after " << guessCount << " guesses!" << endl;

  return 0;
} // end main
```

```
// Extra Credit question (Modified question 5) code below:

#include <iostream>
using namespace std;

int main() {
  int a, b, c, high, mid, low;

  cout << "Enter three integers: ";

  cin >> a >> b >> c;

  if (a < b) {

    if (b < c) {
      low = a;
      mid = b;
      high = c;
    } else {
      high = b;
      if (a < c) {
        low = a;
        mid = c;
      } else {
        low = c;
        mid = a;
      } // end if (a < c)
    } // end if (b < c)
  } else {  // (b < a)
    if (b < c) {
      low = b;
      if (a < c) {
        low = a;
        mid = c;
      } else {
        low = c;
        mid = a;
      } // end if (a < c)
    } else {
      low = c;
      mid = b;
      high = a;
    } // end if (b < c)
  } // end if (a < b)

  cout << "The highest number is " << high << ".\n";
  cout << "The middle number is " << mid << ".\n";
  cout << "The lowest number is " << low << ".\n";

} // end main
```