CMPT 130: Week 2 Lab Work

Code Analysis Questions

When you answer the following questions, first answer them on paper without typing the code in a computer. After that type the codes as complete C++ programs, run your programs and see if you get the answers correct. If you don't get the answers correct, analyze the codes on paper again and again until you make sense of the programs and get the output correct.

1. What is the output of the following program?

```
#include <iostream>
using namespace std;
int main()
{
	char a, b, c;
	a = 'b';
	b = 'c';
	c = a;
	cout << a << b << c << 'c' << endl;

	system("Pause");
	return 0;
}
```

bcbc
|

2. **Run Time Errors:** Consider the following C++ program and answer the questions below.

```
#include <iostream>
using namespace std;
int main()
{
	int a, b;
	cout << "Enter an integer ";
	cin >> a;
	int sum = a + b;
	cout << "The sum is " << sum << endl;
	b = 0;
	int quotient = a / b;
	cout << "The quotient is " << quotient << endl;

	system("Pause");
	return 0;
}
```

a. no, b has run time error.
b. error as till step int sum = a + b; b is not defined so, it won't work.
c. We will have 2 run time errors as a/b is not defined.

a. Does the program have any syntax error?
b. Assuming the user input for the variable a is 5, what is the output of the program?
c. Make concluding remarks with regards to the program?

3. **Semantic Errors:** Consider the following program and answer the questions below.

```
/*
This program reads the radius of a sphere from the user and then prints the volume
of the sphere. Recall that the volume of a sphere is given by the formula
(4/3)*PI*r^3
*/
#include <iostream>
using namespace std;
int main()
{
      double radius;
      cout << "Enter the radius of a sphere: ";
      cin >> radius;

      double volume =  (4/3) * 3.14 * radius * radius * radius;
      cout << "The volume of the sphere is " << volume << endl;

      system("Pause");
      return 0;
}
```

a. no
b. 3.14*27= 84.78
c. no
d. semantic error, 4/3=1 so it will print error.

a. Does the program have any syntax error?
b. Assuming the user input for the radius is 3, what is the output of the program?
c. Is this output the correct volume of the sphere?
d. Make concluding remarks with regards to the program?

4. What is the output of the following C++ code fragment assuming it is placed inside a valid C++ program?

```
int a = 5, b = 7;
cout << ++a << ", " << b++ << endl;
cout << a-- << ", " << ++b << endl;
cout << ++a << ", " << --b << endl;
cout << a-- << ", " << b++ << endl;
cout << ++a+ b++ << endl;
cout << a--+ ++b << endl;
int c = a++ + ++b;
cout << c << endl;
c = a-- - --b;
cout << c << endl;
c = c++ - ++a  + --b;
cout << c << endl;
```

6, 7
6, 9
6, 8
6, 8
15
17
17
-5
0

5. What is the output of the following code snapshot assuming it is embedded inside a valid C++ program

```
float x = 3 + 5/7;
cout << x * 7 / 2 << endl;
```

21.0/2=10.5
|

6. What is the out of the following C++ code fragment assuming it is placed inside a valid C++ program.

```
int a = 5;
int b = 3;
int result = a / b;
cout <<  result << endl;
result = a * 1.0 / b;
cout <<  result << endl;
result = a + 1.0 / b;
cout <<  result << endl;
result = (a + 1.0) / b;
cout <<  result << endl;
result = a + (1.0 / b);
cout <<  result << endl;
result = a / 1.0 * b;
cout <<  result << endl;
result = a / 1.0 + b;
cout <<  result << endl;
result = a + 4 / b;
cout << result << endl;
result = a + b * (a – b)  / b % a;
cout << result << endl;
```

```
1
1.67
5  //5.33
2 //2.0
5 //5.33
15.0
8.0
6
7
```

7. What is the output of the following code snapshot assuming it is embedded inside a valid C++ program

```
int a = 25;
int b = 4;
cout << a / b << endl;
cout << static_cast<float>(a) / b << endl;
cout << a / static_cast<float>(b) << endl;
cout << static_cast<float>(a) / static_cast<float>(b) << endl;
cout << static_cast<float>(a / b) << endl;
cout << a  << ", " << b << endl;
float result = a / b;
cout << result << endl;
result = static_cast<float>(a / b);
cout << result << endl;
int c = static_cast<float>(a) / b;
cout << c << endl;
c = a / static_cast<float>(b);
cout << c << endl;
result = static_cast<float>(a) / static_cast<float>(b);
c = static_cast<float>(a) / static_cast<float>(b);
cout << result << "   " << c << endl;
```

```
6
6.25
6.25
6.0
25, 4
6.0
6
6
6.25   6
```

8. Analyze the following program and determine its output

```
#include <iostream>
using namespace std;
int main()
{
	char c1 = 65;
	char c2 = 321;
	char c3 = -191;
	char c4 = 'A';
	cout << c1 << endl;
	cout << c2 << endl;
	cout << c3 << endl;
	cout << c4 << endl;
	system("Pause");
	return 0;
}
```

```
A
A
A
A
```

9. Analyze the following program and determine its output

```
#include <iostream>
using namespace std;
int main()
{
	int a = 144;
	char b = 144;
	cout << a << endl;
	cout << -a << endl;
	cout << +a << endl;

	cout << b << endl;
	cout << +b << endl;
	cout << -b << endl;

	system("Pause");
	return 0;
}
```

```
144
-144
144

É
-112
112
```

10. What is the output of the following program?

```
#include <iostream>
using namespace std;
int main()
{
	char c1 = 'A';
	char c2 = c1 + 5;
	cout << c1 << endl;
	cout << c2 << endl;
	system("Pause");
	return 0;
}
```

```
A
F
```

Programming Questions

11. Write a C++ program that reads in the height and base of a triangle and then prints the area of the triangle. You must decide what data types are appropriate for your variables.

12. Write a C++ program that reads the coefficients of the quadratic equation $ax^2 + bx + c = 0$ and then prints the discriminant of the quadratic equation. You must decide what data types are appropriate for your variables.

13. Write a program that reads in the principal amount in a saving account, its interest rate, and the number of years since the account was opened. Your program then should calculate and print the total amount (i.e. the principal amount plus the interest) in the saving account after the time period specified. You must decide what data types are appropriate for your variables. Use simple interest (not compound interest).

14. Write a complete C++ program that reads two integer values in the range [1, 30] representing calendar days from the user and then prints the number of days between the two calendar days. For example if you enter 5 for the first variable and 27 for the second variable, then your program must print "There are 22 days between day 5 and day 27". Of course it is ok if your program prints the days as a negative number such as "There are -22 days between day 5 and day 27". The reason why you may get negative output is that you don't know if you will be subtracting the smaller day from the larger or vice versa; after all you don't know which variable will get the larger day and which one gets the lesser day until you run your program. Assume the input values for the days are valid; i.e. in the range [1, 30].

15. Write a complete C++ program that reads two integer values in the range [1, 12] representing calendar months from the user and then prints the number of days between the two calendar months. Assume a month has 30 days. For example if you enter 5 for the first variable and 1 for the second variable, then your program must print "There are 120 days between month 5 and month 1". Of course it is ok if your program prints the days as a negative number such as "There are -120 days between month 5 and month 1". Assume the input values for the months are valid; i.e. in the range [1, 12].

16. Write a complete C++ program that reads two integer values representing calendar years from the user and then prints the number of days between the two calendar years. Assume a year has 360 days. For example if you enter 1987 for the first variable and 2015 for the second variable, then your program must print "There are 10080 days between year 1987 and year 2015". Of course it is ok if your program prints the days as a negative number such as "There are -10080 days between year 1987 and year 2015". Assume the input values for the years are valid; i.e. they are non-negative integers.

17. Write a C++ program that declares six variables named y1, m1, d1, y2, m2, and d2 all as integer data types. Now read the birth date of a child 1 in y1, m1 and d1 variables where y1, m1 and d1 represent the year, month and day of birth date of child 1. Then read the birth date of child 2 in y2, m2, and d2 variables. Finally print the number of days between the birth dates of the two children. It is ok if your program prints the number of days as negative or positive. Assume the input values for days are in the range [1, 30], the input values for months are in the range [1, 12], and the input values for the years are some positive numbers. This means a month has 30 days and a year has 12 months (= 360 days).

18. Repeat Q17 but this time your program must print the number of years, number of months and numbers of days between the birth dates of the two children. Assume a year has 12 months (= 360 days) and a

month has 30 days. Your output must contain only positive numbers and zero OR only negative numbers and zero. NO MIX OF NEGATIVE AND POSITIVE OUTPUTS IS ALLOWED.

19. Write a program that asks the user to enter a non-negative integer in the range [0, 255] and prints the unsigned binary representation of the number in byte pattern. Hint: calculate eight variables b1, b2, b3,...,b8 corresponding to the eight binary bits. Assume the user will always enter a number in the range [0, 255]. Use modulo operator in order to make the computation easy.

20. Answer Question number #19 above without using modulo operator.

21. In Canadian currency, the available coin denominations are **toonie** (2 dollar coin), **loonie** (one dollar coins), **quarter** (25 cents), **dime** (10 cents), **nickel** (5 cents) and **penny** (1 cent). Write a C++ program that reads an amount of money from the user as a double data type (for example 17.69 to mean seventeen dollars and 59 cents) and prints the number of coins of each denomination such that the number of coins you need is the minimum among all possible combination of coins that give rise to the amount of money the user entered. For example an amount of money 17.69 must print 8 toonies, 1 loonie, 2 quarters, 1 dime, 1 nickel and 4 pennies.

22. Write a C++ program that prints the lyrics of the **99 bottles of water on the wall** song on to the screen. The lyrics of the song is given below.

Ninety-nine bottles of beer on the wall,
Ninety-nine bottles of beer,
Take one down, pass it around,
Ninety-eight bottles of beer on the wall.

Ninety-eight bottles of beer on the wall,
Ninety-eight bottles of beer,
Take one down, pass it around,
Ninety-seven bottles of beer on the wall.

Ninety-seven bottles of beer on the wall,
Ninety-seven bottles of beer,
Take one down, pass it around,
Ninety-six bottles of beer on the wall.

⋮
⋮
⋮

One bottle of beer on the wall,
One bottle of beer,
Take one down, pass it around,
Zero bottles of beer on the wall.