Homework#1

CS331 Introduction to C++ & Object-Oriented Programming, Summer 2018

Due: Until Midnight, July 6 (Friday)

- This assignment has two parts, Part I and Part II. Part II includes C++ programming practice.
- Make one file (YourLastName_YourFirstName_CS331_HW1.zip) for your submission, and submit it to Blackboard.
- The zip file will have PartI.doc, and PartII_Q1, PartII_Q2, PartII_Q3, and PartII_Q4 directories for your source code of each question in Part II.
- Each programming question (Part II) directory will include a root directory which contains all the required source code for the assignment including resources (e.g., Visual Studio Project file) but excluding debug directory.
- Your source codes should be properly indented and documented to have professional appearance. You should provide proper comments for the program and variables.
- Part II evaluation is based on correct implementation and execution.

Part I.

1. Show the order of evaluation of the operators in each of the following C++ statements, and write the value of x after each statement is performed.

(1) `x = 7 + 3 * 6 / 2 - 1;`

(2) `x = ( 3 *9 * ( 3 + ( 9 + 3 / ( 3 ) ) ) );`

2. What will the following program print on screen?

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

int main()
{
   int a, x=23;
   a = x % 2;
   cout << x << endl << a <<endl;
   return 0;
}
```

3. What will the following program code display?

```
int integer1=19, integer2=2;
double doubleVal;

doubleVal = integer1/integer2;
cout << doubleVal << endl;

doubleVal = static_cast<double>(integer1) / integer2;
cout << doubleValue << end;

doubleVal = static_cast<double>(integer1 / integer2);
cout << doubleValue << end;
```

4. Rewrite the following code, replacing the `do-while loop` with a `while loop`. When you do this you will no longer need an `if` statement.

```
int number;
cout << "Enter an event number: ";
do
{
   cin >> number;
   if (number % 2 != 0)
         cout << "Number must be even. Reenter number: ";
} while (number %2 != 0);
```

5. Look at the following array definition.

```
int values[10];
```

(1) How many elements does the array have?

(2) What is the subscript of the first element in the array?

(3) What is the subscript of the last element in the array?

(4) If an `int` uses four bytes of memory, how many memory does the array use?

6. Given the variable initializations

```
int a[5] = {0, 10, 20, 30, 40};
int k = 3;
int *p = a + 1;
```

Determine the output from each of the following statements:

(1) `cout << a[k];`

(2) `cout << *(a + k);`

(3) `cout << *a;`

(4) `cout << a[*a];`

(5) `cout << a[*a + 2];`

(6) `cout << *p;`

(7) `cout << p[0];`

(8) `cout << p[1];`

7. Explain the difference between a local variable and a data member.

8. What's a default constructor? How are an object's data members initialized if a class has only a default constructor defined by the compiler?

9. Describe "namespaces" in C++ . Explain how a program could use class `string` without inserting a `using` directive.

10. Explain why a class might provide a *set* function and a *get* function for a data member.

Part II. Programming

1. The monthly payment on a loan may be calculated by the following formula:

$$Payment = \frac{Rate * (1 + Rate)^N}{(1 + Rate)^N - 1} * L$$

- Rate is the monthly interest rate, which is the annual interest rate divided by 12. (A 12 percent annual interest would be 1 percent monthly interest.)
- N is the number of payments
- L is the amount of the loan.

Write a program that asks for these values and displays a report similar to the following:

Loan Amount:	$1000.00
Monthly Interest Rate:	1%
Number of Payment:	36
Monthly Payment:	$ 332.14
Amount Paid Back:	$11957.15
Interest Paid:	$ 1957.15

2. The colors red, blue, and yellow are known as the primary colors because they cannot be made by mixing other colors. When you mix two primary colors, you get a secondary color, as shown here:

When you mix red and blue, you get purple.
When you mix red and yellow, you get orange.
When you mix blue and yellow, you get green.

Write a program that prompts the user to enter the names of two primary colors to mix. If the user enters anything other than "red", "blue" or "yellow", the program should display an error message. Otherwise, the program should display the name of the secondary color that results.

3. A local zoo wants to keep track to how many pounds of food each of its three monkeys eats each day during a typical week. Write a program that stores this information in a two-dimensional 3 x 7 array, where each row represents a different monkey and each column represents a different day of the week. The program should first have the user input the data for each monkey. Then it should create a report that includes the following information:

- Average amount of food eastern per day by the whole family monkeys
- The least amount of food eater during the week by any one monkey
- The greatest amount of food eaten during the week by any one monkey.

4. Consider a class called `Employee` that includes five pieces of information as data members – a first name (type `string`), a last name (type `string`) , a hired year(type `int`), a hired month (type `int`), and a monthly salary (type `int`).

Your class should have a constructor that initializes the five data members. Provide a `set` and a `get` function for each data member. If the monthly salary is not positive, set it to 0. Assume that the value provided for the year is correct, but ensure that the month value is in the range 1 – 12; if it isn't, set the month to 1.

Provide a member function `displayHireDate` that displays the month and year separated by forward slash (/).

(1) Draw an UML class diagram for class `Employee.`

(2) Implement class `Employee,` and write a drive (/test) program that demonstrate class `Employee`'s capabilities which

- creates two Employee objects.
- displays each employee's yearly salary with the employee's fist name and last name. (Note the salary data member indicates the monthly salary of an employee.)
- gives each employee a 10 percent raise and then display each employee's yearly salary again.
- last, displays each employee's hire date with the employee's first and last name.