CSC 120
Programming Project #3

Due Date: *10:30am* **Wednesday, March 15, 2017**

Objectives:
- To analyze a problem and implement its solution
- To practice writing a programmer-defined class
- To gain experience writing code to test a programmer-defined class

The Problem:
You have been hired by a school district to write a program for their first grade students who need practice in basic mathematics. The children have learned the following skills:
- addition - two numbers, both in the range 0-12
- subtraction - two numbers, the first in the range 6-12 and the second less than or equal to the first - for example (12-10, 6-2, etc.)

In order for this program to be useful, it must be able to generate all possible equations for both operators. For this project, you will write and test a Question class that could be used in the math game.

Start Eclipse & Create a New Project
Create a new project, ***proj3***, which contains 2 classes, ***Question*** and ***Project3App***. Be sure to name the package proj3 when creating the classes.

Writing Java Statements – The Question Class
The purpose of the Question class is to create a simple mathematical equation that can be used in a math game (which may be written in a future project). The equation can add or subtract two values. If the program generates a subtraction question, it must ensure that the first value is greater than or equal to the second so the answer is not a negative number (the children haven't learned negative numbers yet).

Specifications:
The Question class needs:
- **3 instance variables:** the two operands to be used in the equation and a single character operator (+, -)

- **A default constructor:** the default constructor will generate a random question (it must meet the specifications above)

Answer the questions below to help you think through the logic of what needs to be done.
   1. How do you generate a random number in the range 0 to 12?

2. How do you generate a random number in the range 6 to 12?

3. Given a number x, how do you generate a random number in the range 0 to x?

4. If the program needs to randomly choose one of two operations, how could you do that?

Recall, the purpose of the constructor is to give each of the instance variables initial values. Write the constructor so that it generates an acceptable math problem. It will need to first determine if the question is addition or subtraction. It then needs to generate acceptable values for that operation.

- A *toString* method that returns a String containing the question (but not the answer). The format should be number1, a space, the operator, a space, number2, a space and an equal sign.

For example,
  4 + 6 =

Testing the Question class:
- Once you have the instance variables, default constructor and toString method written, test your code in the application class to make sure it works properly. Running the program once will not give you enough information to let you know if it is working properly - use a for loop (to be discussed in class) to generate and display 15 questions.

Question class also needs:
- A **determineAnswer** method which calculates the answer to the question and returns the answer. The answer should **not** be stored as an instance variable.

Testing the Question class:
- Add a call to the determineAnswer method into your loop so you can verify that the answer is being calculated properly.

Sample output:
```
Question 1: 12 + 0 = 12
Question 2: 6 + 12 = 18
Question 3: 3 + 8 = 11
Question 4: 11 - 0 = 11
Question 5: 8 + 7 = 15
Question 6: 8 - 3 = 5
Question 7: 8 - 2 = 6
Question 8: 12 - 9 = 3
Question 9: 0 + 10 = 10
Question 10: 4 + 5 = 9
Question 11: 2 + 1 = 3
Question 12: 1 + 12 = 13
Question 13: 12 + 0 = 12
Question 14: 10 - 1 = 9
Question 15: 11 - 8 = 3
```

Citation Policy:
This assignment should be worked on individually to help you practice the material covered in class. However, you may work with other students as long as you cite the name(s) of who you worked with and all students understand the assignment submitted. Failure to cite other people is considered plagiarism. You may receive help from your instructor or from the Computer Learning Center in B225.

Grading:
This assignment will be graded in 2 parts.
Part 1: Correctness of both classes (Question and application) of the program submitted. Does the program submitted meet the requirements? Does it display all information? Are the values correct? Have you commented your code? (60 pts)
Part 2: Grade on an in class quiz. On the due date, you will take a 10 minute quiz at the beginning of class based upon the assignment you submit. Bring a printout with line numbers to class with you to use as you take the quiz. The printout must match the program you uploaded to Blackboard and contain your name. Please make sure you are on time for class. Students who are late may not have enough time to complete the quiz or may miss it entirely. (40 pts)

Submission:
Hand in the following at the beginning of class on March 15th
- The answers to the questions on the sheet attached.
- Printout of the source code for the completed Question.java and Project3.java classes (please include line numbers for the quiz).

Upload the Question.java and Project3.java files for grading by 10:30am on March 15th.

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Name: _____

How many hours did it take you to complete this assignment? (circle one)
      < 1
      1-3
      3-5
      5-7
      > 7

Where did you work on this assignment? (circle all that apply)
      home
      school
      work

How did you go about getting help on this assignment? (circle all that apply)
      talked with an assistant in one of the Learning Centers
      talked with my professor
      talked with another student
      read the textbook
      looked at notes from class
      looked at lab exercises
      other _____ (please specify)

Is there anything that doesn't work as you'd like or expect? If so, what?

What was the most challenging part of writing the code?