Assignment 1
CALCULATOR WITH MYSTERY BUTTON
Due Tuesday, February 7, 2012

In this assignment, you will design a GUI and code in Java to implement a simple integer arithmetic calculator that also has a mystery function.

**Description of how a calculator works**
Most calculators have a keypad for the digits 0 through 9 and a number of buttons for operations and to clear the calculator.
*   When the user pushes the digit keys, the digits are entered into a display area to represent a number.
*   When the user pushes an operator key, such as + or *, the display number is put into a memory number, the operator is saved, and the display number starts over.
*   When the user pushes the = sign, the saved operator is used to operate on the display number and the memory number. (Note that for subtraction, it does memory number – display number.)
*   When the user pushes the C button, the display and memory numbers are reset.

Unlike many real calculators, this calculator design only works for one operation at a time.

Calculator Problem for this homework

For this assignment, you are to implement a calculator that performs as described above and that has the integer arithmetic operators +, -, *, and /, and the keys for = and C (clear). In addition, there must be a mystery function that is described below. Here is a simple calculator design that has only + and *. Your design must have at least additional buttons for /, *, and the mystery button.
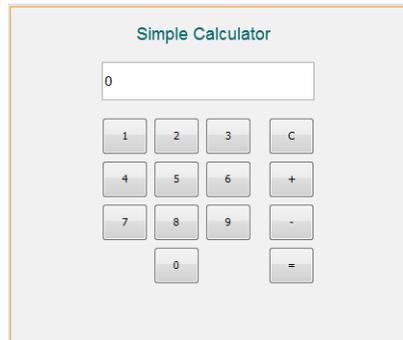
Design a calculator user interface that has buttons for each of the digits 0 through 9 arranged as a keypad and additional buttons for the operators, = and Clear. There should be at least one TextField for the display number, as shown in the example GUI. In addition, you may choose to go beyond a traditional calculator layout and have additional TextFields to show the set operator, the memory number and the result.

Mystery Button

In addition to the traditional calculator operators, we will have one button that computes a function that is unique to this class. Here is what the mystery function should do:

If the current number is larger than the memory number, the result will be the current number divided by 3 plus 1. Otherwise, the result is the memory number minus 1.

Bonus Problems

1. You can earn bonus points for this assignment by implementing additional calculator functions. For ideas of what to implement checkout other calculators, e.g. the Mac calculator app has a Scientific view in which there are operators such as exp, sin, cos, ln, the value of pi and e, etc. Choose 4-5 of these to implement. Your implementation can use the Java functions in the Java class called Math, which has methods for many of the scientific operators. Note that if you implement any of these more scientific operators, you will need to change parts of your calculator to work with numbers of type double, as you will need decimal points to show the results.

2. You can earn bonus points for this assignment by redefining the operations of the calculator so that it works for multiple operations. For example, if you do the sequence of operations 12 + 23 + 34 =, the calculator will keep adding numbers to its previous result.

When you develop the program, follow these steps:
- Design the user interface:
  - Design the layout of the calculator
  - Decide what each button will do and give the button an appropriate name
- Write the program
  - Decide on the names and types of variables and where to declare them
  - Write comments on the top of the program, including **your name** and what the program is for
  - Write comments before each button actionPerformed function with the description of what it does
  - Write other comments on statements as necessary
  - Test your program to make sure that it works correctly

Grading

All programs should have comments that contain the name of the programmer and that explain the role of each button function. Additional comments must be added as necessary to explain the actions of the program.

The following additional items will be included in the grading. The program must

- Run!
- Correctly allow the user to enter numbers by pushing buttons for each digit.
- Correctly compute integer +, -, *, and /.
- The calculator must have a Clear button to allow the user to start over.
- The form must present a good appearance.

How to Submit your Homework:

In your project directory, create a **zip file** of the sub-directory that has your homework project in it. For example, if you name your project "Calculator", there will be a folder named "Calculator" under your projects folder – zip the entire Calculator folder. Go to the blackboard assignment page and submit the zipped file for assignment 1.