**CST 8221 – JAP, Assignment #1, Part 1**

**Due Date:** prior or on October 20, 2017

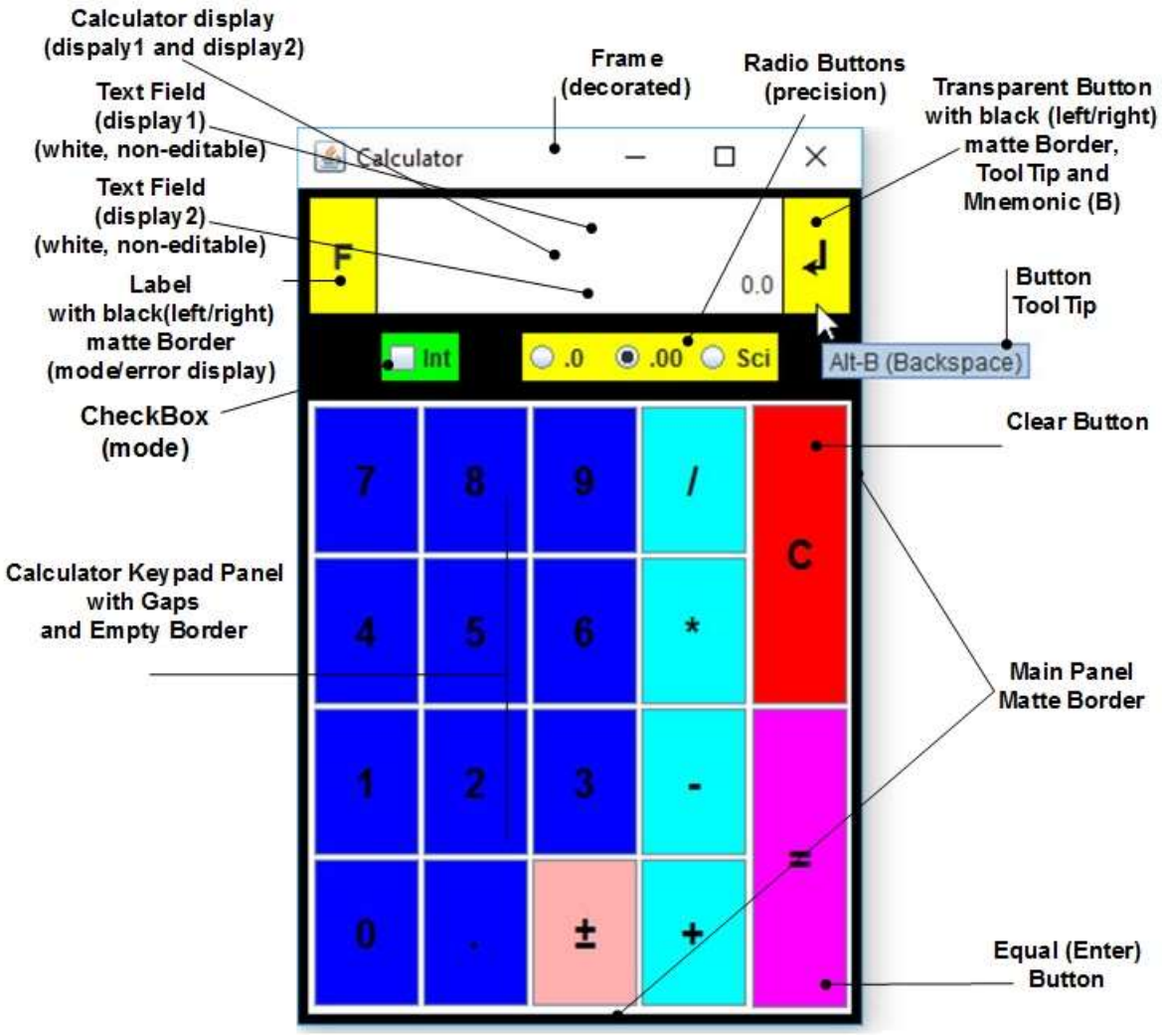
**Earnings:** 7% of your total course mark

**Purpose: Building a pretty GUI using Swing**

The purpose of this simple yet comprehensive assignment is to give you the enjoyment of exercising your programming skills and the delight of applying your knowledge of how to build a relatively simple GUI for a Calculator Application. The Calculator you are to build will be a functional replica of your Windows calculator. The assignment is based on the material covered in lectures, lab exercises, and hybrid activities. You will also find Chapter 12 of Textbook 1 to be very helpful.

**Problem Specification:**

In this part of Assignment #1 you are to build a relatively simple Swing GUI for a Calculator Application. Your GUI must have exactly the same appearance as the posted on Blackboard screen capture **CalculatorSW_A1_F17_W10**. The image is captured with a screen resolution 1366X768 under Windows 10. The screen capture of the GUI with some implementation details is shown below:




**Note:** If you are running Windows 7 or 8.1, the frame borders and decoration may look differently but the rest of GUI should look the same as the one above. See the screen captures on BB.

**Requirements:**

- The initial and the minimum size of the application frame must be (300, 460). The initial frame location on the screen must be set by the platform.

- The mode/error display label must have a dimension (35,55). It must be yellow at launch. It must have a black left/right black matte border with thickness 1. And must display the letter **F** in the middle of the label. Later the background color and the text will change depending on the mode of operation (floating-point or integer) or when an error occurs as a result of some calculation.

- The backspace button must have a dimension (35,55) and it must yellow. It must be **transparent** with a black left/right black matte border with thickness 1. You must use Unicode (Arrows chart (code page 21XX)) to display the text symbol ↲ on the face of the backspace button. The button must have a tool tip (see the image above). It must also react to the Alt-B key combination (mnemonic).

- All numeric keypad buttons must have a black text. All calculator numeric keypad buttons and the . (dot) button must have a blue background. The calculator arithmetic operator buttons must have a cyan background. The sign(±) button must have a pink background. The Clear button (C) must be red in color with a black text; the Equal (Enter) button (=) must be magenta in color with a black text. You must use Unicode (Latin 1 supplement code page) to display the plus-minus sign symbol ±.

- The calculator display consists of two text fields – display1 and dispaly2. Both text fields must have 16 columns and height of 30. Both text fields must have a white background and must be non-editable. The displayed text must be right aligned. The display2 text field must display 0.0 when the GUI is made visible for the first time. The panel containing the calculator display, the mode/error label, and the backspace button must have a yellow background.

- The mode panel consist of a check box (mode) and three floating-point precision radio buttons. They checkbox and the radio buttons must be included in a *button group*. The radio buttons mast be yellow. The **.00** radio button must be selected by default at launch. The checkbox must be green. The panel containing the box container with the radio buttons group and the check box must be black. The radio buttons must be equal in size.

- There must be a gap between the calculator keypad buttons. The calculator keypad panel must be surrounded by an empty border and it must be white.

- To layout the GUI components you should use only the following layout managers: BorderLayout, FlowLayout, GridLayout, and a Box (horizontal box). You may need struts to align properly the components in the box container which is insude the mode panel.

- When the application frame is resized your GUI must have exactly the same behavior (appearance) as the posted on Blackboard screen capture **CalculatorSW_A1_F17_W10_RS**.

- The GUI may look a little bit different on your screens because you may have different operating system, screen resolution or different default “Look and Feel”, but relative locations, proportionally and colors must same as on the screen captures.

**Tasks:**

The Object-Oriented analysis of the problem shows that, to solve the problem as stated in the problem specifications, you must design and implement several Java classes as outlined below. All clasess must be placed in a package called ***calculator***.

## Class *CalculatorViewController*

The class *CalculatorViewController* is responsible for building the calculator GUI. It must extend JPanel (not JFrame). The GUI must be build inside a constructor with no-parameters (the default constructor). The *CalculatorViewController* panel must be surrounded by a black matte border with the following insets (5, 5, 5, 5).

In this implementation the class must contain the following fields only:

```
private JTextField display1; // the calculator display1 field reference
private JTextField display2; // the calculator display2 field reference
private JLabel error; // the mode/error display label reference
private JButton dotButton; the decimal point (dot) button reference
```

If you like you can add some **final** fields to define constants like sizes, text, and colors used in the GUI.

The class must contain the following private method:

```
private JButton  createButton (String text, String ac, Color fg, Color bg,
                               ActionListener handler)
```

The method is responsible for the creation of group of related buttons with the same basic properties (for example, the calculator keypad buttons). The first parameter ***text*** is the button text label (for example, 8 or +). The second parameter ***ac*** represents the *action command* string for that button. The third parameter ***fg*** is the foreground color of the button. The fourth parameter ***bg*** is the background color of the button. The fifth parameter ***handler*** is a reference to instance of the event handler class (for example, object of type Controller). The method performs the following actions:

- Creates a new button with a specified ***text*** label;
- Sets the background and foreground colors of the button;
- Set the action command for the button. If *ac* parameter is *null*, the action command property of the button need not to be set;
- Set the size of the button font to 20. Do not change the default font name and style.
- Registers the handler as an Action event listener for the button;
- Returns a reference to the created button.

**Note:** If the text of some of the created buttons displays as …, Mac OS users may need to surround each button with an empty border and may need to set a button preferred size.

When creating the calculator keypad you **must call this method in a loop** in order to create all of the numeric and arithmetic operation buttons and add them to the calculator keypad panel. If the created button is the **decimal point (·) button** you must assign the reference returned by the method to the *dotButton* field before adding it to the panel.
You can use the same method to create other buttons (=, C), but not for the backspace button.

## Class *Controller*

In this implementation (Part 1) this class is responsible for handling all the events generated by the GUI. In the Part 2 of the assignment implementation you will be allowed to add more controller classes. The class must implement the *ActionListener* interface. The class must be implemented as a **private inner class** of the *CalculatorViewController* class. In this implementation, the actionPerformed() method should implement the following only: if the check box or any button (including the radio buttons and the backspace button) is clicked the code of the method must get the action command string from the event and display it on the calculator display text field *display2*.

## Class *Calculator*

This class is responsible for launching the application. The class must contain a main method only. Inside the main method you must first create a *CaclculatorSplashScreen* object and call its *showSplashWindow()* method and display the splash screen for 5 s. Then the main method must call *EventQueue.invokeLater()* method with a *Runnable* instance the *run()* method of which creates a JFrame object; sets the frame title and minimum size; sets the default close operation for the frame; sets the content pane of the frame to *a CalculatorViewController* object; sets the application location at launch; and finally, makes the frame visible.

## Class *CalculatorSplashScreen*

This class is responsible for displaying a splash screen before the launch of the application. The splash screen must display an image, and must contain your name and student number at the bottom of the screen. The class must implement a method called *showSplashWindow()* that is responsible for building the splash screen and making it visible. It must contain a constructor which has as a parameter the duration time of the splash screen.

In Part 2 you will add a class *CalculatorModel* which will be responsible for the actual calculations.

## What to Submit:

No paper submission is required for this Part 1 of Assignment 1.
Code submission:

Compress in one **.zip** file all **.java** files, **.class** files, and **image** file(s)**.** Upload the assignment **zip** file to Blackboard prior to or on the due date. The name of the zip file must have the following structure: Student's family name followed by the last three digits of the student ID number followed by _JAP_A1P1 , and finally, followed by your lab section number (s301, s302, s303). For example, *Ranev007_JAP_A1P1_s301.zip*.

The submission must follow the course submission standards. The ***Java Assignment Submission Standard*** and the ***Java Assignment Marking Guide*** are posted on BB in the Getting Started folder. Test Plan is not required for this assignment.

Enjoy the assignment. And do not forget that:

*"A picture is worth a thousand words, but not all pictures are Swinging equally."* Anonymous Swing Programmer

CST8221 –JAP, 25 September, 2017, S^R