BCIT
Comp 3951
Technical Programming Option
Option Head Mirela Gutica
Winter 2022

Mark: _____ /100

Lab 2 Calculator C#

This is an peer **assignment**. Submit only one project per peer group. Indicate your partner. **No late assignments will be accepted**.

Readings:

CLR and executing managed code:

https://docs.microsoft.com/en-us/dotnet/standard/clr
https://docs.microsoft.com/en-us/dotnet/standard/managed-execution-process?redirectedfrom=MSDN

Button Class:

https://docs.microsoft.com/en-us/dotnet/api/system.windows.forms.button?view=netframework-4.8

TextBox Class:

https://docs.microsoft.com/en-us/dotnet/api/system.windows.forms.textbox?view=netframework-4.8

EventArgs Class:

https://docs.microsoft.com/en-us/dotnet/api/system.eventargs?view=netframework-4.8

SendKeys Class:

http://msdn.microsoft.com/en-us/library/system.windows.forms.sendkeys(v=vs.110).aspx

Event Handlers:

https://docs.microsoft.com/en-us/dotnet/desktop/winforms/creating-event-handlers-in-windows-forms?view=netframeworkdesktop-4.8

Arithmetic operations exceptions:

https://docs.microsoft.com/en-us/dotnet/api/system.dividebyzeroexception?view=net-6.0

Requirements:

1. Implement a calculator similar to a scientific calculator, with the following requirements:
    a. The application is a control box (no minimization/maximization or full screen options).

b. Use containers (group boxes and panels)
c. Create your icon (use Visual Studio or the editor of your choice to create icons)
d. "On" button starts the calculator.
e. The calculator performs minimum the following operations: addition, subtraction, multiplication, division, square root, %, 1/x and x^2.
f. You can use **CE** to clear only the current operand. It does not clear previous calculations.
g. **C** deletes all. Backspace deletes the last digit.
h. Implement multiple operations.
i. Implement the keyboard functionality
    i. use the Form's KeyDown or KeyPress events
    ii. use SendKeys

    Use the **sender** and/or the **SendKeys** to implement Button events.
    Hints: use the Sender object to identify the key. SendKeys class is used to send keystrokes to the active application.
    Important: use the same handler for several keys.
j. Create a picture box that loads an image or paint a rectangle.
k. Identify what exceptions are needed and add them to your code.
l. Implement memory functions.
m. You can add a calculation into memory by clicking the **M+** button. Then you recall it later with the **MR** button. You clear the memory with the **MC** button.
n. Note that **M+** will add whatever you have on the display to whatever is already in the memory, so it is good to click **MC** before adding with **M+**, unless you have recently started the calculator.
o. **Bonus 20%:** implement brackets and order of operations.

2. Test your calculator.
3. **Use good programming style:**
    a. Include headers.
    b. Meaningful naming: e.g., buttonStart, formCalculator, etc.
    c. Comments /// and //
    d. Do not repeat code; use functions instead.
    e. Do not leave unused code in your final submission.

Example: You want to add 1 + 2 and then multiply that by the sum of 9 - 2
Click **C** to clear all.
Add **1 + 2** and click =
Click **MC** to clear the memory, then click **M+** to add the value to memory.
Click **CE** to clear previous addition.
Then enter **9 - 2 =**
Click ***** to multiply by another number.
Click **MR** to recall what is in memory. Then click **=**
You should get a total of 21.

Code example 1:

```
/// <summary>
/// Click event digit button
/// </summary>
/// <param name="sender"></param>
/// <param name="e"></param>
```

```
        private void buttonDigit_Click(object sender, EventArgs e)
        {
            if (start == true)
            {
                Button buttonDigit = (Button)sender;

                this.textBoxNumber.Text += buttonDigit.Text;
            }
        }
```

Code example 2:

```
        /// <summary>
        /// Event when a digit 0 - 9 or the decimal point are clicked
        /// Use the sender to find what button was selected
        /// </summary>
        /// <param name="sender"></param>
        /// <param name="e"></param>
        private void ButtonDigit_Click(object sender, EventArgs e)
        {
            {
                Button b = (Button)sender;
                SendKeys.Send(b.Text);
            }
        }

        /// <summary>
        /// Sendkeys sends keystrokes to the active application
        /// Keypad add      {ADD}
        /// </summary>
        /// <param name="sender"></param>
        /// <param name="e"></param>
        private void ButtonAdd_Click(object sender, EventArgs e)
        {
            // addition
            SendKeys.Send("{ADD}");
        }
```

Math Calculator

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Off | MC | MR | MS | M+

7	8	9	/	sqrt	CE
4	5	6	*	%	C
1	2	3	-	1/x	<--
0	.	+/-	+	X^2	=