Contestant Number: _____

Time: _____

Rank: _____

BUSINESS PROFESSIONALS of AMERICA
Giving Purpose to Potential

C# PROGRAMMING
(330)

REGIONAL 2021

PRODUCTION PORTION:

Program 1: Finance Calculator _____ (470 points)

TOTAL POINTS _____ *(470 points)*

Test Time: 90 minutes

GENERAL GUIDELINES:

Failure to adhere to any of the following rules will result in disqualification:

1. Contestant must hand in this test booklet and all printouts if any. Failure to do so will result in disqualification.
2. No equipment, supplies, or materials other than those specified for this event are allowed in the testing area. No previous BPA tests and/or sample tests (handwritten, photocopied, or keyed) are allowed in the testing area.
3. Electronic devices will be monitored according to ACT standards.

You will have ninety (90) minutes to complete your work.

Your name and/or school name should *not* appear on any work you submit for grading. Remember to use your contestant # where appropriate.

Submit a copy of your entire solution/project to the flash drive provided. You must submit your entire solution/project so that the graders may open your project to review the source code and/or build and execute your solution/project. **Submissions that do *not* contain source code will *not* be graded**.

Development Standards

- Standard name prefixes must be utilized for variables.
- All subroutines, functions, and methods must be documented with comments explaining the purpose of the method, the input parameters (if any), and the output (if any).

Finance Calculator

In this exercise, you will create a C# Windows Form Application that serves as an introductory software package for financial calculations. There will be two tabs in your program-the first tab you will create a standard four-function calculator. In the second tab, you will be creating a compound interest calculator.

Requirements:

1. You must create a C# Windows Form Application named CS _330_ContestantNumber, where ContestantNumber is your BPA assigned contestant number (including dashes). For example, CS_330_01_2345_6789.
2. Your contestant number must appear as a comment at the top of the main source code file.
3. The main form must *not* have minimize or maximize buttons in the Form Handle.
4. The main form must have text "Finance Calculator" for its title. The form must start in the center of the screen and must have a Fixed Dialog setting so the size *cannot* be adjusted.
5. The main form must have a tab control containing two tabs.
    a. The tab control must be named "calculatorTabs", with Dock set to Top.
    b. The first tab must be named "tabCalculator" with text "Calculator." It must have one text box called "outputBox". In addition, it will need buttons for numbers 0 to 9 (10 total), ".", "=", "/", "x", "-", "+", and a button called "Clear". The number buttons, period (.) and = must all be same color, the four operations (+, -, x, /) need to have the same color…and the "Clear" button needs to be a separate color. The buttons must have the following text center aligned in 25-30pt font with button names (Text : ObjectName):
        i. 0 : btn0
        ii. 1 : btn1
        iii. 2 : btn2
        iv. 3 : btn3
        v. 4 : btn4
        vi. 5 : btn5
        vii. 6 : btn6
        viii. 7 : btn7
        ix. 8 : btn8
        x. 9 : btn9
        xi. . : btnPeriod
        xii. = : btnEquals
        xiii. + : btnPlus
        xiv. - : btnMinus
        xv. x : btnMultiply
        xvi. / : btnDivide
        xvii. Clear : btnClear
    c. The second tab must be named "tabInterest" with text "Compound Interest." It must contain the following items:
        i. Three labels (Text : ObjectName):

1. Initial Dollar Amount : lblAmount
2. Rate of Interest : lblRate
3. Number of Years : lblYears

ii. Four textboxes with the following names:
1. txtDollars
2. txtInterest
3. txtYears
4. cmpdOutput

iii. GroupBox with the following name:
1. grpFrequency

iv. Four radio buttons (Text : ObjectName):
1. Monthly : rdoMonthly
2. Quarterly : rdoQtr
3. Semiannually : rdoSemi
4. Annually : rdoAnnually

v. Button with the following: Calculate : btnCalculate

6. When the program loads, the Calculator tab needs the following:
   a. Black background
   b. The "outputBox" needs to be center aligned and 25-30pt font and begin with a "0" as its default text. It should be able to display real numbers.
   c. The following buttons must use a single click event called "click_btn":
      i. 0 to 9, and the period (.)
      ii. This click event should capture the text from the buttons and will be displayed in the "outputBox"
      iii. When any of these buttons are pressed the "outputBox" default "0" text is replaced
      iv. When the period button is pressed, only one period will ever appear in the "outputBox"
   d. The following buttons must use a single click event called "operator_Click"
      i. +, -, x, /
      ii. The method for this event should store which operator was clicked with a variable.
      iii. If an operator is pressed a second time, then the sub total value should display in the "outputBox"; for example: if you press the buttons "5" "x" "5" and then pressed press "+"…the "outputBox" should display 25 temporarily and then you can press which ever number you want to add to 25.
   e. The "=" button will have a click event call equalBtn_Click.
      i. Based upon which operator was clicked, when this event is activated it will perform whichever math operation was selected.
      ii. It will send the correct answer to the "outputBox".
   f. When the "Clear" button is clicked the "outputBox" has its text value set back to "0".

7. The Compound Interest tab needs the following:
    a. Use this formula to calculate compound interest: A = P*(1+(r/n))^(nt)
        i. A = the future value of the investment or loan.
        ii. P = Principal investment amount (this will be a double value).
        iii. r = annual interest rate (this is entered in as a decimal value in the formula; use a double data type).
        iv. n = number of times interest is compounded per unit of t (integer).
        v. t = time the money is invested (we are only using complete years; integers only).
        vi. For example: $5,000 borrowed with annual interest rate of 5%, compounded monthly (12 times), after 10 years, the investment is $8,235.05.
            1. A = 5000(1+ (0.05/12))^(12*10) = 8235.05
        vii. Another example: $755.23 borrowed with annual interest rate of 20% compounded semiannually (2 times), after 7 years, the investment is $2,867.98.
    b. When outputting the answer it needs to be formatted with a "$" symbol and to have only two decimal places (hint there is a currency format in C#).
    c. White background
    d. User will enter in the Initial Dollar Amount (no $ should be included) and can include cents; a message box appears for incorrect data entry.
    e. The Rate of Interest is entered as a whole number (no % should be included); a message box appears for incorrect data entry.
    f. The Number of Years should be whole numbers only (no decimal places); a message box appears for incorrect data entry.
    g. The radio buttons (n values per the formula) should be set to the following:
        i. Monthly: 12
        ii. Quarterly: 4
        iii. Semiannually: 2
        iv. Annually: 1
    h. When the "Calculate" button is pressed, it will initiate an event called "btnCalculateInterest"; this event will perform the calculation of compound interest based upon the variable information received from the text fields and from the radio button that is selected.

Sample Pictures:

Figure 1: This is the layout of the four-function calculator.

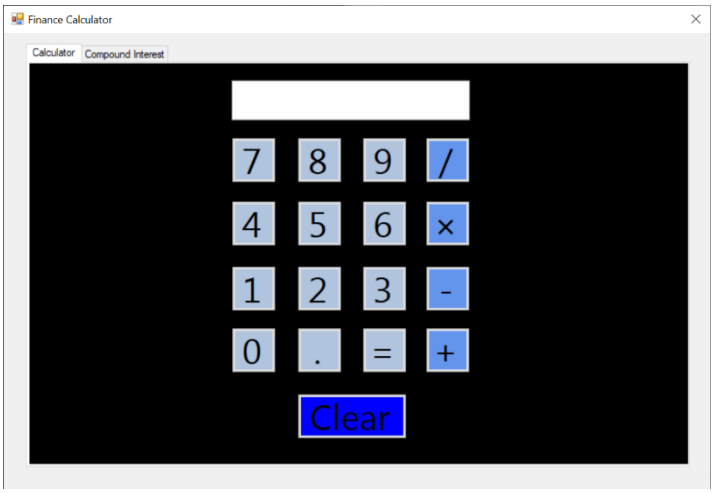
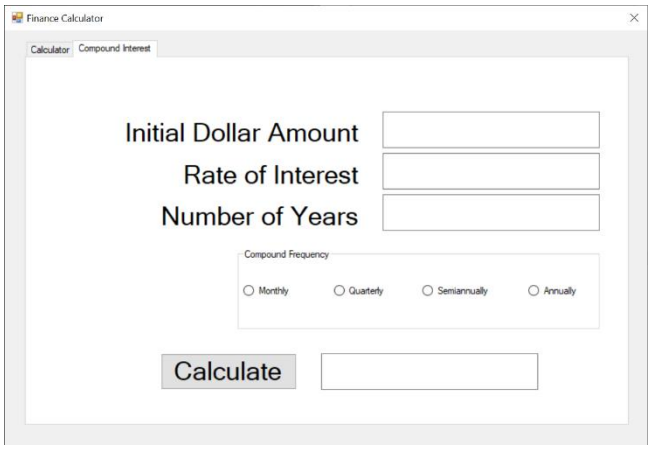


Figure 2: This is the layout of the Compound Interest tab.



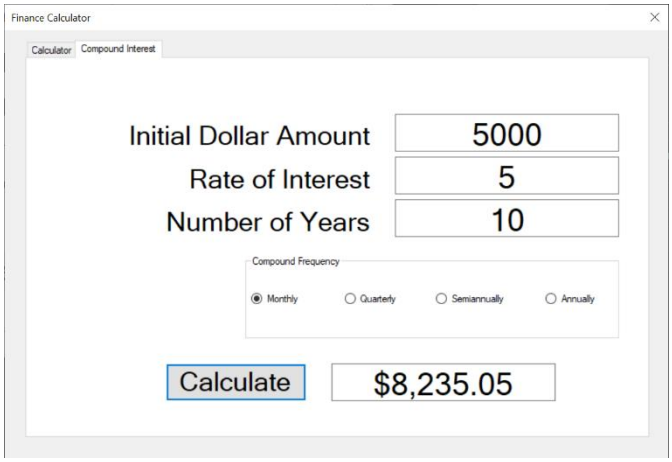


Figure 3: This is the input and output of the Compound Interest. Notice that only the calculated output has formatting.

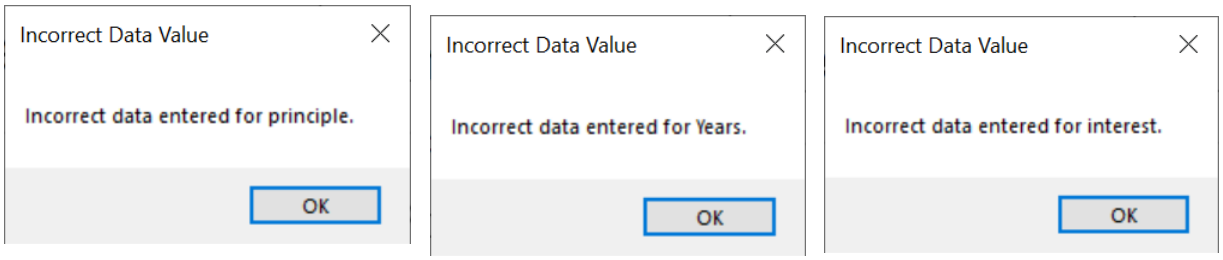


Figure 4: These are the three message boxes for incorrect data entry in the Compound Interest.

Your application will be scored on the following criteria:

Solution and Project

The project is present on the flash drive	____ 10 pts
The project is named according to the naming conventions	____ 10 pts

Program Execution

Code copied to USB drive and program runs from USB	____ 20 pts

If the program does not execute, then the remaining items in the program executive section receive a score of zero.

There are only two tabs with the titles Calculator and Compound Interest	____ 10 pts
The title of the form is present "Finance Calculator	____ 10 pts
The main form does not have minimize or maximize buttons in the Form Handle	____ 10 pts
The main form has a tab control named "calculatorTabs" with Dock set to Top	____ 10 pts
The form's start position is the center of the screen and it cannot be resized	____ 10 pts
Each tab page has the correct buttons, text boxes, radio buttons and labels based upon the Figures	____ 20 pts
Calculator: all number buttons make their value appear in "outputBox"	____ 20 pts
Calculator: user cannot enter more than one period	____ 20 pts
Calculator: default "0" is replaced with the first number button pressed	____ 20 pts
Calculator: calculations are performed properly	____ 30 pts
Calculator: second operator press displays sub total value	____ 30 pts
Compound Interest: message box appears if incorrect data is entered into any text boxes and allows user to renter information	____ 30 pts
Compound Interest: no calculation is performed until proper data is entered	____ 30 pts
Compound Interest: calculations are performed properly when Calculate button is pressed	____ 30 pts

Source Code Review

Code is commented at the top, for each function, and as needed	____ 10 pts
Code uses reasonable and consistent variable naming conventions	____ 10 pts
Calculator: code for "click_btn" method is present with no other methods for number buttons or period button click events	____ 20 pts
Calculator: code for "operator_Click" method is present with no other methods for operator click events	____ 20 pts
Calculator: code for clearing default zero in "outputBox" is present	____ 10 pts
Calculator: code for limiting one period is present	____ 20 pts
Calculator: equal button click event code checks single operator variable for each math operation text value	____ 20 pts
Compound Interest: code to format compound interest output is present	____ 20 pts
Compound Interest: Code to stop calculation until proper data is present	____ 20 pts

Total Points: ____ / 470 pts