

# CNIT 175: Midterm Exam

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## 1 Program Description

Create a VB program which allows a user to calculate the return on a financial investment.

The user provides a principal amount to invest via a TextBox. They then select the number of years of investment from a ComboBox. Interest rate and how often the interest is compounded is provided by the user via RadioButtons. Finally, the user indicates via CheckBoxes whether they are interested in the total balance of the investment, the interest earned by the investment, or both.

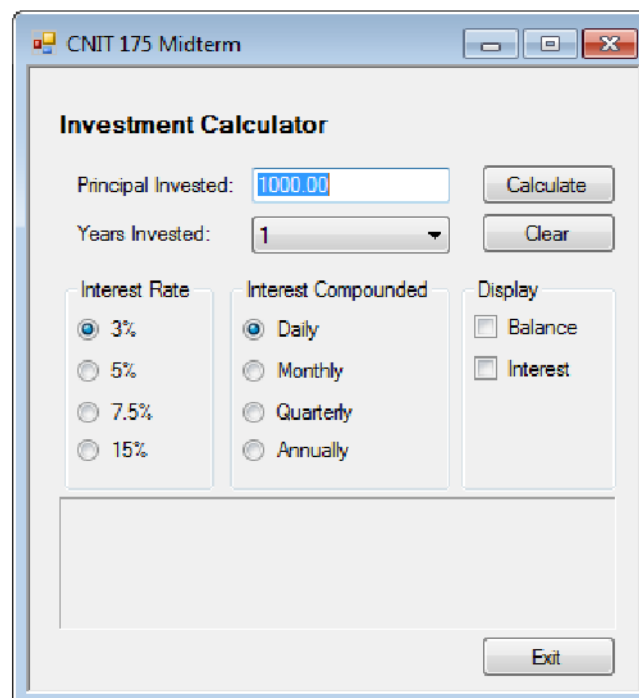
When a button is clicked, the program calculates and subsequently displays the desired information.

In addition, the program keeps track of the number of investments calculated and displays this number along with other output.

As with most programs in this class, there is a button to clear the GUI controls, and a button to exit the program.

**Notice:** you need to perform validation of user inputs as needed.

The following set of figures depict details about the GUI of the program.



The screenshot shows a Windows-style application window titled "CNIT 175 Midterm". Inside the window is a form titled "Investment Calculator". The form contains the following controls:

- Principal Invested:** A text box containing the value "1000.00".
- Years Invested:** A dropdown menu showing the value "1".
- Interest Rate:** A group box containing four radio buttons: "3%", "5%", "7.5%", and "15%". The "3%" radio button is selected.
- Interest Compounded:** A group box containing four radio buttons: "Daily", "Monthly", "Quarterly", and "Annually". The "Daily" radio button is selected.
- Display:** A group box containing two checkboxes: "Balance" and "Interest". Both checkboxes are unchecked.
- Buttons:** There are three buttons: "Calculate" (top right), "Clear" (middle right), and "Exit" (bottom right).

Figure 1: At Start Time

**Note:** the program loads the default values shown via a Form Load event

The screenshot shows a window titled "CNIT 175 Midterm" containing an "Investment Calculator" form. The form has the following fields and controls:

- Principal Invested:** A text box containing "1000.00".
- Years Invested:** A dropdown menu with a list of values: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 15, 20, 25, 50, 100. The value "7" is currently selected and highlighted.
- Interest Rate:** A group of radio buttons with options: 3%, 5%, 7.5%, and 15%. The "3%" option is selected.
- Display:** A group of checkboxes for "Balance" and "Interest", both of which are currently unchecked.
- Buttons:** "Calculate", "Clear", and "Exit" buttons are located on the right side of the form.

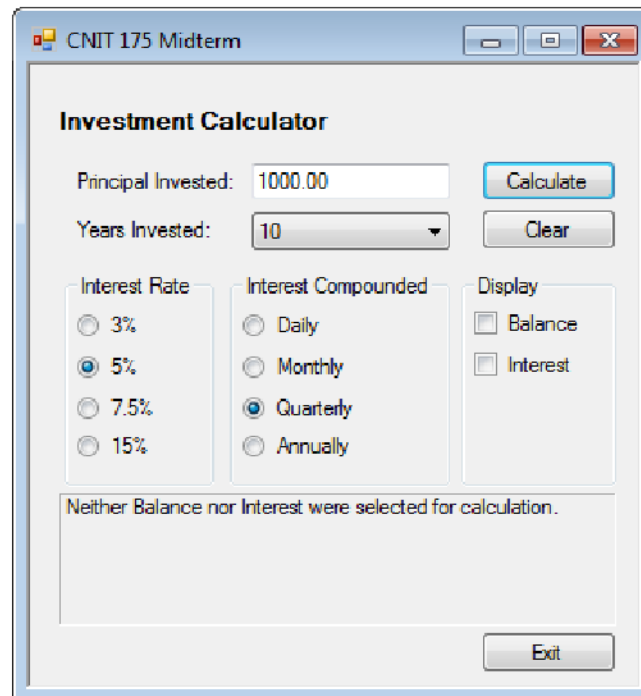
Figure 2: Values listed in the "Years" ComboBox.

The screenshot shows the same "Investment Calculator" window after a calculation. The fields and controls are now as follows:

- Principal Invested:** Still "1000.00".
- Years Invested:** The dropdown menu now shows "5" as the selected value.
- Interest Rate:** The "5%" radio button is now selected.
- Interest Compounded:** A new group of radio buttons with options: Daily, Monthly, Quarterly, and Annually. The "Quarterly" option is selected.
- Display:** The checkboxes for "Balance" and "Interest" are now checked.
- Results:** A text box at the bottom of the form displays the following text: "If \$1,000.00 is invested at an interest rate of 0.050 for 5 year(s), you will earn \$282.04 in interest, and have a new balance of \$1,282.04". Below this, another text box displays "Number of Investments Calculated: 1".
- Buttons:** The "Calculate" button is now highlighted in blue, indicating it was just clicked. The "Clear" and "Exit" buttons remain.

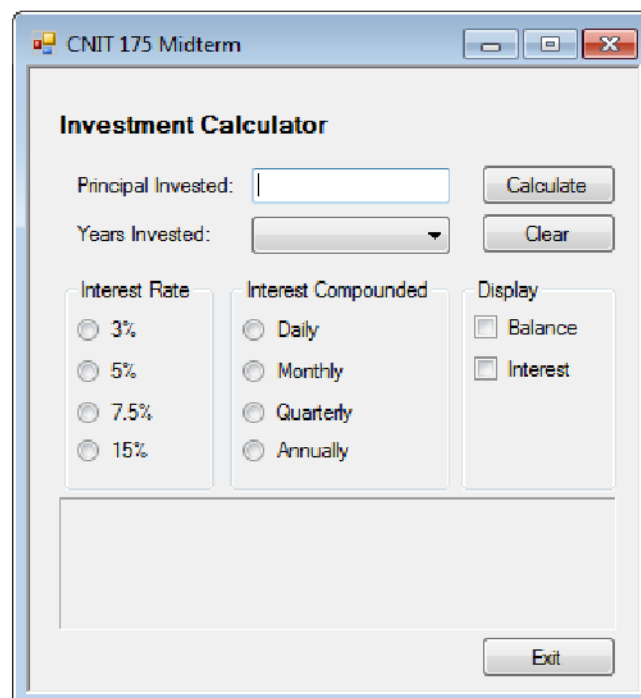
Figure 3: After having calculated Balance and Interest on a 5 year investment of \$1000, compounded quarterly at 5%.

**Note:** the number of investments so far calculated is incremented and displayed!



The screenshot shows a window titled "CNIT 175 Midterm" containing an "Investment Calculator" form. The form has three main sections: "Principal Invested:" with a text box containing "1000.00" and a "Calculate" button; "Years Invested:" with a dropdown menu showing "10" and a "Clear" button; and a section with three columns of radio buttons: "Interest Rate" (3%, 5%, 7.5%, 15%), "Interest Compounded" (Daily, Monthly, Quarterly, Annually), and "Display" (Balance, Interest). The "5%" interest rate, "Quarterly" compounding, and "Balance" display options are selected. Below these sections, a text box contains the message: "Neither Balance nor Interest were selected for calculation." At the bottom right is an "Exit" button.

Figure 4: After failing to select at least one CheckBox: Balance or Interest.  
**Note:** the number of investments so far calculated is NOT incremented or displayed!



The screenshot shows the same "Investment Calculator" form after the "Clear" button was pressed. The "Principal Invested:" text box is now empty. The "Years Invested:" dropdown menu is also empty. The radio buttons for "Interest Rate", "Interest Compounded", and "Display" are all unselected. The text box at the bottom now contains the message: "Neither Balance nor Interest were selected for calculation." The "Exit" button remains at the bottom right.

Figure 5: After pressing the Clear button.  
**Note:** all the GUI elements are cleared, however the module scope counters is NOT reset.

The window is titled "CNIT 175 Midterm" and contains an "Investment Calculator" section. It has the following fields and controls:

- Principal Invested:** A text box containing "2500.00" and a "Calculate" button.
- Years Invested:** A dropdown menu showing "25" and a "Clear" button.
- Interest Rate:** Radio buttons for 3%, 5%, 7.5%, and 15% (selected).
- Interest Compounded:** Radio buttons for Daily (selected), Monthly, Quarterly, and Annually.
- Display:** Checkboxes for Balance (checked) and Interest (checked).

Below the controls, a text box displays the results: "If \$2,500.00 is invested at an interest rate of 0.150 for 25 year(s), you will earn \$103,720.85 in interest, and have a new balance of \$106,220.85". Below this, it says "Number of Investments Calculated: 2". An "Exit" button is at the bottom right.

Figure 6: After again calculating the returns on an investment.  
**Note:** the number of investments so far calculated again increments and is displayed.

The window is titled "CNIT 175 Midterm" and contains an "Investment Calculator" section. It has the following fields and controls:

- Principal Invested:** A text box containing "2500.00" and a "Calculate" button.
- Years Invested:** A dropdown menu showing "25" and a "Clear" button.
- Interest Rate:** Radio buttons for 3%, 5%, 7.5%, and 15% (selected).
- Interest Compounded:** Radio buttons for Daily (selected), Monthly, Quarterly, and Annually.
- Display:** Checkboxes for Balance (checked) and Interest (unchecked).

Below the controls, a text box displays the results: "If \$2,500.00 is invested at an interest rate of 0.150 for 25 year(s), you will have a new balance of \$106,220.85". Below this, it says "Number of Investments Calculated: 3". An "Exit" button is at the bottom right.

Figure 7: Calculating only the Balance.

Figure 8: Calculating only the Interest.

## 2 Program Specifications

1. The Visual Basic solution (e.g., the solution) should be named: CNIT175\_Midterm
2. The GUI you create should be as close as possible in design to the one depicted in the screenshots above.
3. All GUI components should be appropriately named, and have their properties set as per the course standards.
4. The following introductory comment should be placed at the top of the program's code:

```
' Programmer:   YOUR_NAME
' Course:      CNIT 175
' Semester:    Summer 2023
' Assignment:  Midterm - Programming Component

' Academic Honesty:
' * I attest that this is my original work.
' * I have not used unauthorized source code, either modified or
'   unmodified.
' * I have not given other fellow student(s) access to my program.
```

5. A module scope variable should be used to keep track of the number of investments calculated. This counter should only increment when an investment is actually calculated, not simply when the Calculate button is clicked.

This means it should NOT increment if user has NOT selected either the Balance or Interest CheckBox!

6. The ComboBox should contain the following values for “year”: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 15, 20, 25, 50, and 100. The user should NOT be able to enter any other value.
7. A Form Load event procedure should load the following default values:
  - (a) Principal Invested: 1000.00
  - (b) Years Invested: 1
  - (c) Interest Rate: 3%
  - (d) Interest Compounded: Daily
8. The calculate button should:
  - (a) Declare, populate, and use variables as per the course assignments and exercises.
  - (b) All data type conversion should be performed explicitly. That is: you should use the .Parse() and .ToString() methods when converting data between types!
  - (c) Format monetary amounts as currency when displaying them.
  - (d) If the user has indicated that **Balance** should be calculated, then it should be calculated using the following formula:
 
$$A = P \left( 1 + \frac{r}{n} \right)^{nt}$$

where,  
 $A$  = Balance after  $t$  years  
 $P$  = Principle amount invested  
 $r$  = annual nominal interest rate (the actual value, not in percentage)  $n$  = number of times the interest is compounded per year (for daily compound = 365)  
 $t$  = number of years
  - (e) If the user has indicated that **Interest** should be calculated, then it should be calculated using the following formula:
 
$$\text{Interest} = \text{Balance} - \text{Principal}$$
  - (f) If **Balance, Interest, or both** are selected, display the results exactly as shown in the screenshots and the demo program (provided)  
 Also, increment and display the number of investments calculated as shown in the screenshots and demo program (provided).
  - (g) If **neither Balance nor Interest** is selected, then output the following message to the user:  
 Neither Balance nor Interest was selected for calculation.  
 In this case, do NOT increment the counter. And do NOT display the counter.
9. The Clear button should clear the contents of all GUI controls. Do NOT reset the module scope counter, however.
10. When clicked, the Close button should close the program.
11. When you have completed the program, compress (e.g., zip up) the entire **CNIT175\_Midterm** solution and name the compressed file: **CNIT175\_Midterm.zip**. Then submit the .zip file for credit.

### 3 Grading Criteria

Visual Basic solution/project is properly named, properly archived (.zip), and submitted	2
GUI Components are properly names and have properties set as per the course standards.	10
Introductory comments (name, semester, assignment) are included at the top of the code.	3
Module Scope variable correctly declared.	2
Module Scope variable maintains an accurate count of investments calculated.	3
<b>Calculate Button</b> is correct	
Variables used appropriately	2
Appropriate data types used	3
Data types explicitly converted using .Parse() and .ToString()	5
Number of Years correctly identified	2
Interest Rate correctly identified	4
Interest Compounding Number correctly identified	4
What to calculate (Balance, Interest, both, neither) correctly identified	5
Balance correctly calculated	10
Interest correctly calculated	5
Balance (only): Output displayed is appropriate / matches the demo	5
Interest (only): Output displayed is appropriate / matches the demo	5
Balance and Interest: Output displayed is appropriate / matches the demo	5
Counter (number of investments calculated) is displayed	2
Appropriate output displayed if neither Balance nor Interest are selected	3
<b>Form Load</b> event correctly sets initial / default program values	10
<b>Clear button</b> functionality is correct	8
<b>Close button</b> functionality is correct	2
Total	100