

# S308 Assignment 3 – Retirement Plan

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## Important!

This is an individual assignment. Students are NOT allowed to work together or seek help from anyone else including current and former S308 students. Any questions about the assignment should be sent to the instructor. Anyone found to have received help from another person will receive a zero (0) for the assignment and will be reported for academic misconduct.

A retirement plan (e.g. 401(k)) can be one of your best tools for creating a secure retirement. All contributions and earnings to your 401(k) are tax-deferred. You only pay taxes on contributions and earnings when the money is withdrawn. If you invest a certain amount of money and reinvest the return, you get an additional return on top of the return. This is called compounding. For details, please see a Wikipedia article about compounding here: [http://en.wikipedia.org/wiki/Compound\\_interest](http://en.wikipedia.org/wiki/Compound_interest)

The formula to calculate the amount you will have by the end of the  $n^{\text{th}}$  year of your investment is:

$$FV = PV(1 + i)^n$$

Where  $FV$  and  $PV$  are future and present values and  $i$  is the interest rate. For example, if you deposit \$1,000 into an account with an annual interest rate of 5%, you will have  $\$1000.00 * (1 + 0.05)^1 = \$1,050.00$  at the end of the year. If you keep all \$50 of the return in the account, it will earn interest in the second year and you will have  $\$1000.00 * (1 + 0.05)^2 = \$1102.50$  at the end of the second year.

Your task in this assignment is to create a retirement plan calculator. The calculator should allow the user to enter the following information: annual salary, annual contribution %, current age, retired age, and annual return %.

- (1) Each year, an individual would contribute the following amount: Annual Salary x Contribution %.
- (2) Current Age is the starting year of the investment.
- (3) Retired Age is the ending year of the investment.
- (4) Annual return % is the percentage of expected return (i.e., annual interest rate).

The screenshot below provides a general example for this assignment and is provided to better understand the functional requirements. It is meant to be a guide for how to design your form and you are encouraged to make the design your own.

### Retirement Plan Calculator

Please enter your annual salary, current age, and expected retired age below.

Please also enter your contribution of your salary, and expected annual return. All these numbers should be between 0 and 1.

Annual Salary

Contribution Rate

Current Age

Retired Age

Return Rate

Year	Age	Accumulated Principal	Start Balance	Accumulated Interest	End Balance
2020	30	\$1,000.00	\$1,000.00	\$50.00	\$1,050.00
2021	31	\$2,000.00	\$2,050.00	\$152.50	\$2,152.50
2022	32	\$3,000.00	\$3,152.50	\$310.13	\$3,310.13
2023	33	\$4,000.00	\$4,310.13	\$525.63	\$4,525.63
2024	34	\$5,000.00	\$5,525.63	\$801.91	\$5,801.91
2025	35	\$6,000.00	\$6,801.91	\$1,142.01	\$7,142.01
2026	36	\$7,000.00	\$8,142.01	\$1,549.11	\$8,549.11
2027	37	\$8,000.00	\$9,549.11	\$2,026.56	\$10,026.56
2028	38	\$9,000.00	\$11,026.56	\$2,577.89	\$11,577.89
2029	39	\$10,000.00	\$12,577.89	\$3,206.79	\$13,206.79
2030	40	\$11,000.00	\$14,206.79	\$3,917.13	\$14,917.13
2031	41	\$12,000.00	\$15,917.13	\$4,712.98	\$16,712.98
2032	42	\$13,000.00	\$17,712.98	\$5,598.63	\$18,598.63
2033	43	\$14,000.00	\$19,598.63	\$6,578.56	\$20,578.56
2034	44	\$15,000.00	\$21,578.56	\$7,657.49	\$22,657.49
2035	45	\$16,000.00	\$23,657.49	\$8,840.37	\$24,840.37

### Requirements:

- All the input should not be empty.
- Current Age, Retired Age should be validated as numbers.
  - The values should be between 1 and 120.
  - Retired Age should be greater than Current Age.
- Annual salary should be validated as a double number, and should not be negative.
- Contribution %, and return % should be validated as double number. The value should be between 0 and 1.
- You need to properly display your output. You can use the `String.PadRight(n)` function or just add spaces. You can also consider adding tab (`\t`) among all the columns.
- The output values should be evenly spaced and **formatted** as in the screenshot provided.
- Your output should contain the following information.
  - Year: starting from 2020.
  - Age: starting from current age, end in the retired age.
  - Accumulated principal: accumulated contribution.
  - Start balance: last year's end balance + this year's new contribution.
  - Accumulated interest.
  - End balance: current year's starting balance x (1+ return rate).
- **You must use a loop to solve this problem.**

Note: If you have problem showing proper output, you can find the example below.

- Sample code to set up title.

```
txtOutput.Text = "Year".PadRight(5, ' ')+ "\t" + "Age".PadRight(5, ' ')+ "\t" +  
"Accumulated Principal".PadRight(25, ' ')+ "\t" + "Start Balance".PadRight(25, ' ')+ "\t"  
+ "Accumulated Interest".PadRight(25, ' ')+ "\t" + "End Balance".PadRight(25, ' ')+  
Environment.NewLine;
```

- Sample code to set up each year (inside the loop).

Assume you have the following variables: year, age, dAccumulatedPrincipal, dStartBalance, dAccumulatedInterest, and dEndBalance

```
txtOutput.Text += year.ToString().PadRight(5, ' ') + "\t" + age.ToString().PadRight(5, '  
' ) + "\t" + dAccumulatedPrincipal.ToString("C2").PadRight(25, ' ') + "\t" +  
dStartBalance.ToString("C2").PadRight(25, ' ') + "\t"+  
dAccumulatedInterest.ToString("C2").PadRight(25, ' ') + "\t" +  
dEndBalance.ToString("C2").PadRight(25, ' ') + Environment.NewLine;
```

If you still have problems showing the output, you should consider changing the values of 5 and 25 to other numbers.

#### Grading Notes:

- All applicable grading criteria from previous assignments will be applied to this assignment. Including but not limited to:
  - Name your file \*\*\*\*\_A3.zip where \*\*\*\* is your IU Username
  - Include proper comments in your code, and thoroughly test all output.