Names: _____

Compound Interest

Unlike simple interest, you can earn **compound interest** on interest you have already accrued.

1. Suppose you put \$500 in the bank at 4.1% annual interest. The following chart is started for you. Fill in the rest.

Time in years	Interest Calculation	Total Money
0	0	\$500
1	\$500(0.041) = \$20.50	\$520.50
2	\$520.50(0.041) = \$21.34	\$541.84
3		
4		
5		
6		
7		
8		

2. Use the chart above to come up with an equation for how much interest you will be earning in the t^{th} year. Your equation should be only in terms of t.

3. Now, notice that, in the first year, we calculated interest and then added it to what we already had:

   Total money after first year = Interest earned that year + Money already in bank = \$500(0.041)+\$500.

   We can factor out the \$500:

   $$\text{Total money after first year} = \$500(0.041) + \$500 = \$500(0.041 + 1) = \$500(1.041) = \$520.50.$$

   Then we can rewrite the calculations we did for the second year:

   $$\begin{aligned} \text{Total money after second year} &= \$520.50(0.041) + \$520.50 = \$520.50(1.041) \\ &= [\$500(1.041)](1.041) = \$500(1.041)^2 = \$541.84. \end{aligned}$$

   Use this and what you came up with earlier to come up with an equation for the total amount of money you will have in t years.

4. Suppose you have the same \$500 compounded at an annual rate of 4.1%, but the interest is calculated and credited to your account every month. Then, your total rate would 4.1%, but each month, you would only get $\frac{1}{12}$ of that percentage. So, each time you calculate interest, you would calculate it at the **perodic interest rate**:

$$\text{periodic interest rate } = \frac{\text{annual interest rate}}{\text{number of times a year interest is compounded}} = \frac{0.041}{12} = 0.003417.$$

Fill in the chart below to calculate how much money you will have at the end of one year if interest is compounded in this way.

Time in months	Interest Calculation	Total Money
0	0	\$500
1	\$500(0.003417) = \$1.71	\$501.71
2	\$501.71(0.003417) = \$1.71	\$503.42
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		

5. Find an equation for the amount of money you will have at the end of t years, if interest is compounded *monthly*.