**FINANCE PROJECT #1 – SIMPLE VS COMPOUND INTEREST**

**NAME:**

**CLASS:**

**DATE**:

**PART A – SIMPLE INTEREST**

A1 Go to <https://www.mathsisfun.com/money/interest.html> and review.

What is the formula for simple interest?

>

What do the following stand for?

I:

P:

r:

t:

A2 Using the simple interest formula to calculate interest (I). Show all work. Note that for this and future problems, you can work on scratch paper, take a pic, then insert image.

1. Find the interest you pay if you borrow $5000 for 1 year at 43/4%. Note that you need to covert the percent to a decimal.

>

2) Find the interest you pay if you borrow $2500 for 3 years at 5.25%.

>

1. This formula works for saving as well as borrowing. Find the interest you earn if you put $10k in a 3-year CD that pays 2% interest.

>

A3 Modify the simple interest formula to calculate rate (r). Note that you will have to convert your answer to a percent. Show all work.

1. You paid $55 interest for a 1 year $1000 loan. What was the rate?

>

1. You paid $650 interest for a 3-year $5000 loan. What was the rate?

>

1. You earned $350 on a 2 year $10k CD. What was the rate?

>

A4 The formula to describe how much money you owe/have in the future (A) is given by

A=P + I

Since I=Prt, we have

A=P + Prt

If we factor out the P, we have

A=P(1 + rt)

This formula can be used to calculate the Future Value (A) if you know P (sometimes referred to as Present Value), r and t.

A5 Use the formula from A4 to find the Future Value (A).

1. How much (total) do you owe if you borrowed $5000 for 3 years at 6%.

>

How much of that total is interest?

>

1. How much (total) do you have if you put $2500 into a 2-year CD paying 17/8%. Note that this is sometimes referred to as the maturity value.

>

How much of that total is interest?

>

A6 Modify the formula from A4 to find the Present Value (P).

1. How much do you need to deposit into a 1-year CD earing 2% to mature to $5000?

>

1. How much do you need to put into a 3-year CD earing 2.5% to mature to $10k?

>

**PART B – COMPOUND INTEREST**

B1 Go to <https://www.mathsisfun.com/money/compound-interest.html> and review. Scroll down to the summary section.

What is the formula for compound interest?

>

What do the following stand for?

P:

A:

r:

n:

B2 I like to use the following formula.

A=P(1 + r)t

Which do you like best?

>

B3 If we are compounding more than once per period (typically a period is a year), we need to modify my formula to:

A=P(1 + r/n)nt

Where n stands for the number of compounding per period.

Complete the table for different values of n and their names.

|  |  |
| --- | --- |
| **n value** | **Name** |
| 1 |  |
| 2 |  |
| 4 |  |
|  | monthly |
|  | daily |
| ∞ |  |

B4 Use the formula from B2 to calculate the Future Value (A).

1. You deposit $5000 into an account that pays 2% compounded **annually**. How much do you have in 40 years? Show all work.

>

1. You deposit $5000 into an account that pays 4% compounded **annually**. How much do you have in 40 years? Show all work.

>

We doubled the interest. Did we double the Future Value?

>

B5 Use the formula from B3 to calculate the Future Value (A).

1. You deposit $5000 into an account that pays 2% compounded **quarterly**. How much do you have in 40 years? Careful when using your calculator. Note that a common mistake is to not make sure the exponent is 12\*40 or 480. In other words, x^a\*b is different than x^(a\*b) due to order of operations. Show all work.

>

How does your answer compare to B4 1) above?

>

1. You deposit $5000 into an account that pays 2% compounded **monthly**. How much do you have in 40 years? Show all work.

>

How does this answer compare to your answer above?

>

1. You deposit $5000 into an account that pays 2% compounded 1000 times per year. How much do you have in 40 years? Show all work.

>

How does your answer compare to your answer above?

>

We went from 12 times per year to 1000 times per year. Does the change in Future Value surprise you? Why or why not?

>

B6 Modify the formulas from B2 and B3 to calculate the Present Value (P).

1. You want to have $20k in an account that pays 3.5% compounded **annually**. How much do you have to put in today to make that happen in 7 years? Show all work

>

1. You want to have $5000 in an account that pays 21/8% compounded **monthly**. How much do you have to put in today to make that happen in 3 years? Show all work

>

**PART C – EFFECTIVE RATES, RULE OF 72 AND RULE OF 70**

C1 Go to <https://www.investopedia.com/terms/e/effectiveinterest.asp> and review.

What is a nominal rate? Note that this is sometimes called the stated or named rate.

>

What is an effective rate? Note that sometimes the effective rate is called the APR (borrowing) or APY (savings).

>

Fill in the blanks.

The more \_\_\_\_\_\_\_\_\_ the compounding periods, the \_\_\_\_\_\_\_\_\_\_ the return.

What is the formula for effective rate?

>

What do the following stand for?

i:

n:

C2 I like to use the following formula for the Effective Rate (Re).

Re=(1 + r/n)n – 1

where r is the nominal rate and n is the number of compoundings.

What formula do you like better?

>

C3 Calculate the Effective Rate (Re) for the following cases using my formula from C2.

1. A bank advertises 2% interest compounded **quarterly**.

>

1. A bank advertises 2% interested compounded **monthly**.

>

1. A bank advertises 2% interest compounded **annually**.

>

What is surprising about 3) above? Explain.

>

C4 Search the internet using keywords “rule of 72”.

What is the Rule of 72?

>

Website URL:

Search the internet using keywords “rule of 70”.

What is the Rule of 70?

>

Website URL:

When do we use the Rule of 72 vs the Rule of 70?

>

Website URL:

C5 Complete the following table calculating how long it takes to double your money for the interest rates given using the Rules found above.

|  |  |  |
| --- | --- | --- |
| **Interest Rate** | **Years for Rule of 72** | **Years for Rule of 70** |
| 2% |  |  |
| 4% |  |  |
| 7% |  |  |
| 9% |  |  |

C6 Complete the following table calculating what interest rate you need to double your money in the amount of time given using the Rules found above.

|  |  |  |
| --- | --- | --- |
| **Time to Double** | **Rate for Rule of 72** | **Rate for Rule of 70** |
| 3 years |  |  |
| 7 years |  |  |
| 10 years |  |  |
| 12 years |  |  |

**PART D – SIMPLE VS COMPOUND GROWTH USING Google Sheets (Tomorrow)**

D1 Open up the Excel file named Simple vs Compound Interest Spreadsheet. Only change blue cells.

D2 Enter your name, class and date in cells A2, C2 and E2 on the first sheet named “Interest”.

D3 Make sure the values in cells A5 and B5 are $1000 and 3%.

Look at the values in column B. What do you notice? In particular, what is the change from B10 to B11, and the change from B30 to B31?

>

Based on your answer, what can you say about simple interest growth?

>

D4 Look at the values in column C. What do you notice? In particular, what is the change from C10 to C11, and the change from C30 to C31?

>

Based on your answer, what can you say about compound interest growth?

>

D5 Go to the second sheet named “Graphs” and review.

What do you notice about the compound graphs vs. the simple interest graph?

>

Is there much of a difference between the compound interest graphs?

>

Why do you suppose that is?

>

D6 Go back to the first sheet “Interest” and change cells A5 and B5 to $10000 and 15%.

What is the value of cell B70?

>

What does this value represent?

>

What is the value of cell E70?

>

What does this value represent?

>

D7 Go to the second sheet named “Graphs” and review.

What do you notice about the compound graphs vs. the simple interest graph?

>

Is there much of a difference between the compound interest graphs?

>

Why do you suppose that is?

>

D8 Your turn. Go back to the first sheet named “Interest” and change cell A5 to a value between $2000 and $9000 and change cell B5 to a value between 4% and 10%.

What is the value of cell B70?

>

What does this value represent?

>

What is the value of cell D70?

>

What does this value represent?

>

D9 Go to the second sheet named “Graphs”. Modify the Chart Title and Axes Title to appropriate names. Feel free to “beautify” the chart. The more creative the better.

D10 Fill in the blanks with the most appropriate mathematical terms. This is an IMPORTANT concept!

Simple interest is \_\_\_\_\_\_\_\_\_\_ growth

whereas

compound interest is \_\_\_\_\_\_\_\_\_\_\_\_ growth.

D11 Save this Word document and the Excel spreadsheet **with the values you put in D8** and submit via Canvas.

