Name:

EST. 1899
United for Literacy
Littératie Ensemble

Why ‘Interest’ Should Interest You?

Introductory Practice

Part 1. Graphic Organizer

Fill in the information from the lesson.

Simple Interest	Compound Interest
Relationship:	**Relationship:**
Equations and Variables:	**Equations and Variables:**
Additional Notes (Optional):	**Additional Notes (Optional):**

Part 2. Practice Questions

Using the formulas for simple and compound interest, answer the following questions. You may use a scientific calculator, spreadsheet, or other appropriate tools for the calculations.

1. a) You decided to invest in a 5-year government bond. The face value of the bond, or the present value, is $100. The annual simple interest rate (called coupon rate) is 3%. What is the future value of your bond? Show your work.

   b) How much did you earn in interest?

2. a) Your friend also decided to invest. They deposited $1,500 into a GIC with an annual interest rate of 4.5%, compounding monthly. This GIC matures after 5 years. What is the future value of their GIC? Show your calculation.

   b) How much did your friend earn in interest?

3. Sumi started her investment 7 years ago. Today, her total investment is worth $1,948.72. She has been earning an annual rate of return of 10%, compounded annually. How much was her original investment?

4. Pabita made an investment 10 years ago. The investment yields an annual rate of return of 8%, compounded quarterly. Right now, her total investment is worth $3,000. What was her original investment?

5. Eleni wanted to start investing while she is young, so she deposited $100 in a GIC. The GIC yields an annual rate of 5.25%, compounded annually. Currently, her total investment is worth $150.58. For how long has Eleni invested the money? Solve by substituting different values for n.

6. Harris has investments valued at $239.87 today. His original investment was $150, and he was happy to see how much it has grown. His investment portfolio yields a 9.5% rate of return, compounded quarterly. For how many compounding periods has Harris invested his money? Solve by substituting different values for n.

7. Nadine began her investment with $1,200, and it grew to $1,750.82 after 32 compounding periods. What was the rate of return that she earned per compounding period?

8. a) Lucas holds investments valued today at $1,771.05. He started with $800 and kept his investments for 60 compounding periods. What was the rate of return that he earned per compounding period?

   b) Lucas earned a rate of return that compounded monthly. What was his annual rate of return?

9. Myles wants to invest while he is young and has $200 to start. According to the characteristics of a mutual fund, the future value can be expressed as an exponential function:

$$f(x) = 200\,[1 + \left(\frac{0.04}{12}\right)]^{x}$$

where $f(x) = FV, x = n$

a) Using appropriate tools, graph the exponential function.
(Suggestion for tool: Desmos Online Graphing Calculator)

b) Using the graph, what is the future value at the 120th compounding period?

c) Using the graph, what is the future value at the 500th compounding period?

d) According to the graph, how many compounding periods will it take for the investment to grow to $800?

e) How many compounding periods will it take for the investment to grow to $1,500?

Bonus question: What is the equivalent of your response in 9e) in years?

10. Jorge is applying for a credit card for the first time. He likes to travel, so he researched for credit cards that will earn travel reward points with his purchases. Jorge is deciding between these two options:

- **Credit Card A:** This credit card charges an APR* of 16.99%, compounded daily.
- **Credit Card B:** This credit card charges an APR* of 19.99%, compounded monthly.

**Annual Percentage Rate (APR):* The interest rate for credit cards and some loans are called an APR. The APR includes interest and fees. Some institutions charge hefty fees! The APR gives credit card users and borrowers a better idea of what they will really pay.*

Which option should Jorge choose? Explain your rationale.

Why “Interest” Should Interest You?

Introductory Practice: Tier 1, 2, 3 (Teacher’s Copy)

Part 2. Practice Questions

Question 1a) :

$$A = P(1 + rt)$$
$$A = \$100\big(1 + (0.03)(5)\big)$$
$$\boldsymbol{A = \$115}$$

Question 1b) :

$$I = A - P$$
$$I = \$115 - \$100$$
$$\boldsymbol{I = \$15}$$

Question 2a) :

$$A = P(1 + i)^n$$
$$A = \$1{,}500\left(1 + \frac{0.045}{1}\right)^5$$
$$\boldsymbol{A = \$1{,}869.27}$$

Question 2b) :

$$I = A - P$$
$$I = \$1{,}869.27 - \$1{,}500$$
$$\boldsymbol{I = \$369.27}$$

Question 3:

$$1{,}948.72 = P(1 + 0.10)^7$$
$$\frac{1{,}948.72}{(1.1)^7} = P$$
$$\textit{or}\ \ 1{,}948.72(1.1)^{-7} = P$$
$$\boldsymbol{P = \$1{,}000}$$

Question 4:

$$3{,}000 = P\left(1 + (\frac{0.08}{4})\right)^{40}$$

$$\frac{3{,}000}{(1.02)^{40}} = P$$

or: $3{,}000(1.02)^{-40} = P$

$$\boldsymbol{P = \$1{,}358.67}$$

Question 5:

$$150.58 = 100(1 + 0.525)^{8}$$

$$\boldsymbol{n = 8}$$

Question 6:

$$239.87 = 150\left(1 + \left(\frac{0.095}{4}\right)\right)^{20}$$

$$\boldsymbol{n = 20}$$

Question 7:

$$1{,}750.82 = 1{,}200(1 + i)^{32}$$

$$\frac{1{,}750.82}{1{,}200} = (1 + i)^{32}$$

$$\sqrt[32]{\frac{1{,}750.82}{1{,}200}} = \sqrt[32]{(1 + i)^{32}}$$

$$1.011875 \ldots = 1 + i$$

$$0.011875 \approx \boldsymbol{1.12\% = i}$$

Question 8a) :

$$1{,}771.05 = 800(1 + i)^{60}$$

$$\frac{1{,}771.05}{800} = (1 + i)^{60}$$

$$\sqrt[60]{\frac{1{,}771.05}{800}} = \sqrt[60]{(1 + i)^{60}}$$

$$1.01333 \ldots = 1 + i$$

$$0.01333 \ldots \approx \boldsymbol{1.33\% = i}$$

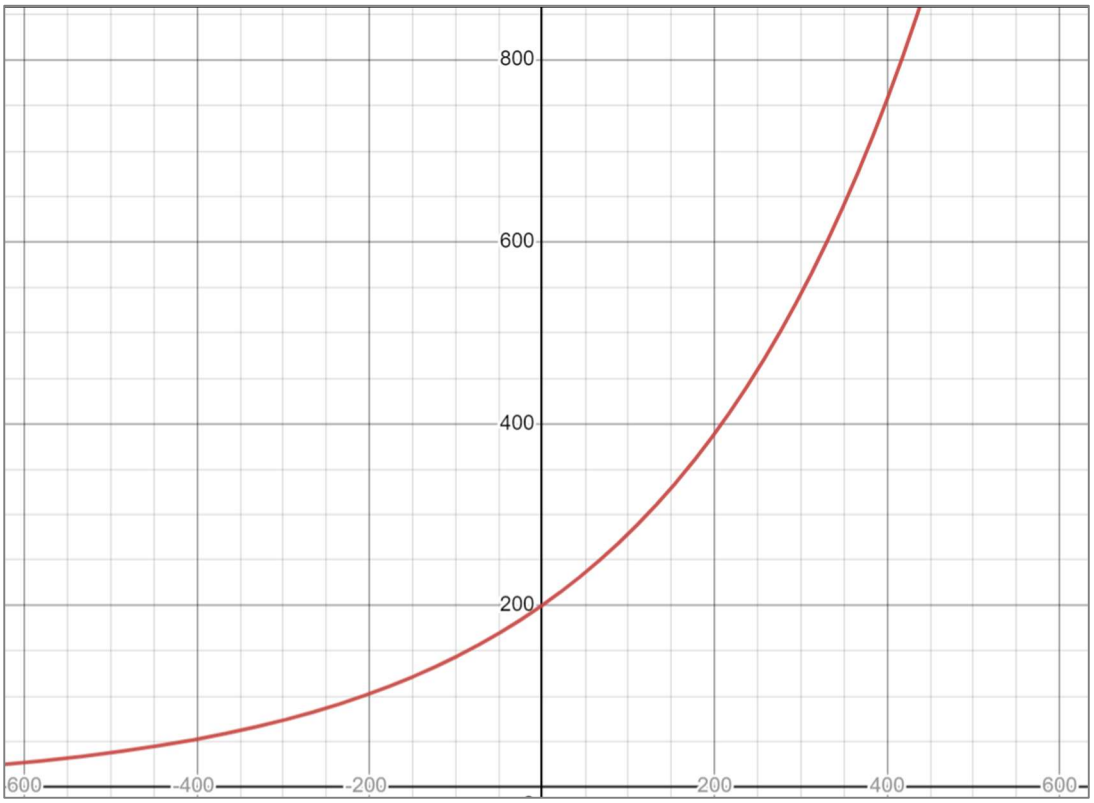
Question 8b) :

i = interest rate per compounding period; in one year, there are 12 compounding periods. Multiply i by 12.

$= 0.01333 \times 12$

$= 0.15996 \approx \mathbf{16.0\%\ annual\ rate}$

Question 9a) :



Source: Desmos

Question 9b): $\mathbf{\$298.17}$

Question 9c): $\mathbf{\$1,055.97}$

Question 9d): **Approximately 416 compounding periods**

Question 9e): **Approximately 605 compounding periods**

Bonus question: Because the mutual fund compounds monthly, to find the number of years, we will divide n by 12:

$\frac{605}{12} = \mathbf{50\ years}$

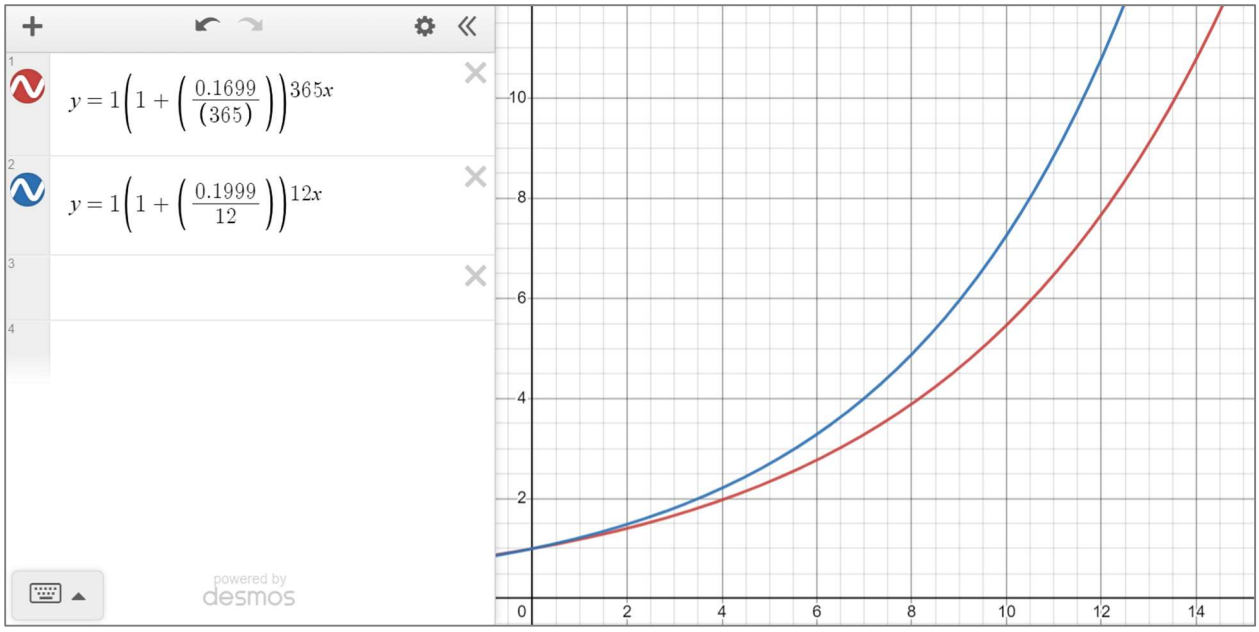
Question 10:

Student answers will vary. Students may use different strategies to solve the problem. This question requires students to express the growth of both credit cards as exponential functions:

Credit Card A $A = P\left(1 + \left(\frac{0.1699}{365}\right)\right)^{365n}$

Credit Card B $A = P\left(1 + \left(\frac{0.1999}{12}\right)\right)^{12n}$

1. By graph:



Source: Desmos

Note for Teachers: In this graph, $P = 1$. Students can select any value for P to make comparisons between the two credit cards.

As the graph shows, Credit Card B (in blue) will always grow faster than Credit Card A (in red). **Jorge should choose Credit Card A.**

2. By using tables of values:

Students may create tables of values by substituting values for P and n. **Comparing the two tables of values, Jorge should choose Credit Card A.**