

Simple and Compound Interest

Lesson 5.1

Comparing Linear and Exponential Functions



5.1 Simple and Compound Interest

Interest: a percentage of the borrowed amount that is owed at the end of a year, in addition to the original amount.

Simple Interest: the same exact amount of interest each year that is added to the original amount borrowed. Think “*Constant Interest Added*”.

Compound Interest: interest that is calculated each year and added to the amount borrowed before calculating the interest for next year. Think “*Calculating Interest on the Interest*”.

Let's say your friend deposits \$100 in a savings account that earns *simple interest* with an annual percentage rate of 12%. At the end of 10 years, you would have \$220 (\$120 in interest plus the \$100 deposit).

Let's say you deposit \$100 in a savings account that earns *compounded interest* with an annual percentage rate of 12%. At the end of 10 years, you would have \$310.58. (You are earning interest on your deposit and the interest you earned.)

Who made the smarter choice?

Vocabulary/Formulas:

P = Principal : P is the original amount borrowed

r = Rate: r is the interest rate as a decimal

t = Time: t is the year

A = Amount: A is the total amount owed (or your balance) after t years

Simple Interest formula for amount owed:

$$A = P + (Pr)t$$

Compound Interest formula for amount owed:

$$A = P + (1 + r)^t$$

Suppose that Nico deposits \$1000 into an account that earns 5% simple interest each year.

Suppose that Raul deposits \$1000 into an account that earns 5% compound interest each year.

Create your formula for each situation.

$$P = 1,000$$

$$r = 0.05$$

Nico (Simple Interest)

$$A = P + (Pr)t$$

$$A = 1000 + (1000 \cdot 0.05)t$$

$$A = 1000 + 50t$$

Raul (Compound Interest)

$$A = P(1 + r)^t$$

$$A = 1000(1 + 0.05)^t$$

$$A = 1000(1.05)^t$$

- Use the simple and compound interest formulas from the situations for Nico's simple interest account and Raul's compound interest account to complete the table. Round the values to the nearest cent.

Quantity	Time	Simple Interest Balance	Compound Interest Balance
Units	<i>years</i>	<i>dollars</i>	<i>dollars</i>
Expression	<i>t</i>	$A = 1000 + 50t$	$A = 1000(1.05)^t$
	0	1000	1000
	1	1050	1050
	2	1100	1102.50
	8	1400	1477.46
	100	6000	131,501.26

1. Use the simple and compound interest formulas from the situations for Nico's simple interest account and Raul's compound interest account to complete the table. Round the values to the nearest cent.

Quantity	Time	Simple Interest Balance	Compound Interest Balance
Units	<i>years</i>	<i>dollars</i>	<i>dollars</i>
Expression	t	$A = 1000 + 50t$	$A = 1000(1.05)^t$
	0	1000	1000
	1	1050	1050
	2	1100	1102.50
	8	1400	1477.46
	100	6000	131,501.26

Which of these interest formulas is arithmetic and which is geometric? Why?

2. Terrell is looking for some financial advice. He has the option to deposit \$1000 into the simple interest account just like Nico's account, or a compound interest account just like Raul's account. The compound interest account would cost him a one-time start-up fee of \$200. The simple interest account is free. Where would you tell Terrell to put his money and why?

Short term - Simple; Long Term - Compound

3. Graph the simple interest and compound interest functions on desmos.com. Then, sketch and label the graphs on the given grid.

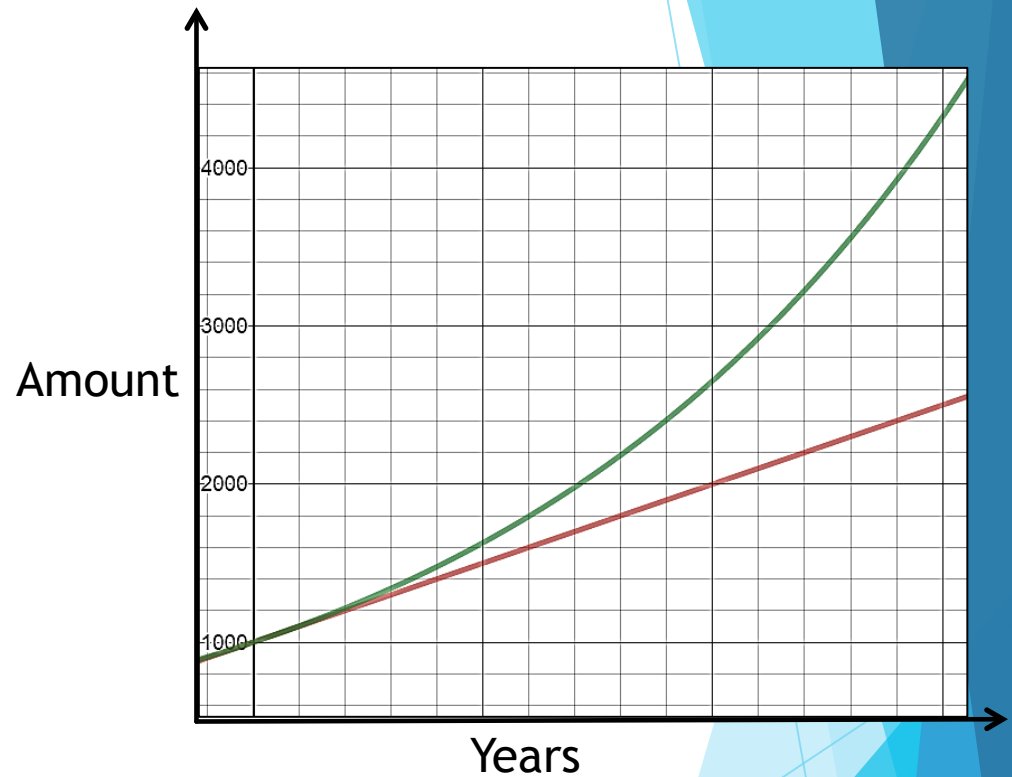
The screenshot shows the Desmos graphing calculator interface. At the top, there are navigation icons: a plus sign with a dropdown arrow, undo and redo arrows, a settings gear, and a double left arrow. Below these are two function input boxes. The first box contains a red sine wave icon, a close button (X), and the function $f(t) = 1000 + 50t$. The second box contains a green sine wave icon, a close button (X), and the function $g(t) = 1000(1.05)^t$.

Projector Mode

- Grid Axis Numbers
- Minor Gridlines
- Arrows

X-Axis
 $-5 \leq x \leq 40$ Step:

Y-Axis
 $0 \leq y \leq 6000$ Step:



What kind of functions are these? Linear? Absolute Value? Exponential? Quadratic?

Simple Interest - Linear

Compound Interest - Exponential

Check for Students' Understanding

Suppose that your family deposited \$10,000 in an interest bearing account for your college fund that earns 4% simple interest each year and a friend's family deposited \$10,000 in an interest bearing account for their child's college fund that earns 4% compound interest each year.

Use the simple and compound interest formulas to complete the table and round the values in the table to the nearest cent.

$$P = 10,000$$

$$r = 0.04$$

$$A = P + (Pr)t$$

$$A = 10000 + (10000 \cdot 0.04)t$$

$$A = 10000 + 400t$$

$$A = P(1 + r)^t$$

$$A = 10000(1 + 0.04)^t$$

$$A = 10000(1.04)^t$$

	Time	Simple Interest Balance	Compound Interest Balance
Units	<i>years</i>	<i>dollars</i>	<i>dollars</i>
Expression	<i>t</i>	$A = 10000 + 400t$	$A = 10000(1.04)^t$
	0	10,000	10,000
	1	10,400	10,400
	2	10,800	10,816
	3	11,200	11,248.64
	10	14,000	14,802.44

How much money will you and your friend have in the college funds when you each turn 18 years old?

You - \$17,200; Your friend - \$20,258.17