Lesson 5.1

Comparing Linear and Exponential Functions

Using Simple and Compound Interest

Simple and Compound Interest

Simple Interest

- The same exact amount of interest calculated each year and added to the original account balance.
- Think "*Constant Interest Added*"

Compound Interest

- Interest that is calculated each year and added to the account balance before calculating the interest for the next year.
- Think "*Calculating Interest on the Interest*"

Annie deposits $100 in a savings account that earns *simple interest* with an annual percentage rate (APR) of 12%.

At the end of 10 years, she will have $220 = $120 in interest + the $100 deposit.

Robert deposits $100 in a savings account that earns *compound interest* with an APR of 12%.

At the end of 10 years, he will have $310.58. Robert is earning interest on his deposit + the interest he earned in previous years.

Who made the smarter choice?

Vocabulary and Formulas

P: Principal = the original amount borrowed or deposited

r: Rate = the interest rate written as a decimal

t: Time = the number of years

A: Amount = the total amount owed or earned. Your balance after t years.

Simple Interest Formula:

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

Compound Interest Formula:

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

Suppose Nico deposits $1,000 into an account that earns 5% simple interest each year.

Suppose Raul deposits $1,000 into an account that earns 5% compound interest each year.

$P = 1{,}000$
$r = 0.05$

Write the formula for each situation.

Nico (Simple Interest)

$A = P + (Pr)t$
$A = 1000 + (1000 \bullet 0.05)t$
$A = 1000 + 50t$

Raul (Compound Interest)

$A = P(1+r)^t$
$A = 1000(1+0.05)^t$
$A = 1000(1.05)^t$

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	*years*	*dollars*	*dollars*
Expression	t	$A = 1000 + 50t$	$A = 1000(1.05)^t$
	0	1,000	1,000
	1	1,050	1,050
	2	1,100	1,102.50
	8	1,400	1,477.46
	100	6,000	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	*years*	*dollars*	*dollars*
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?

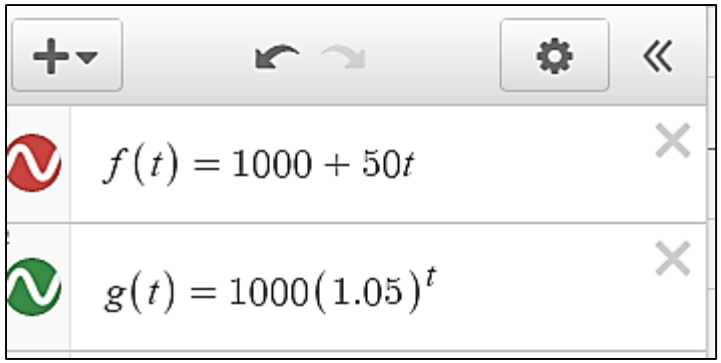
Simple Interest → Arithmetic Compound Interest → Geometric

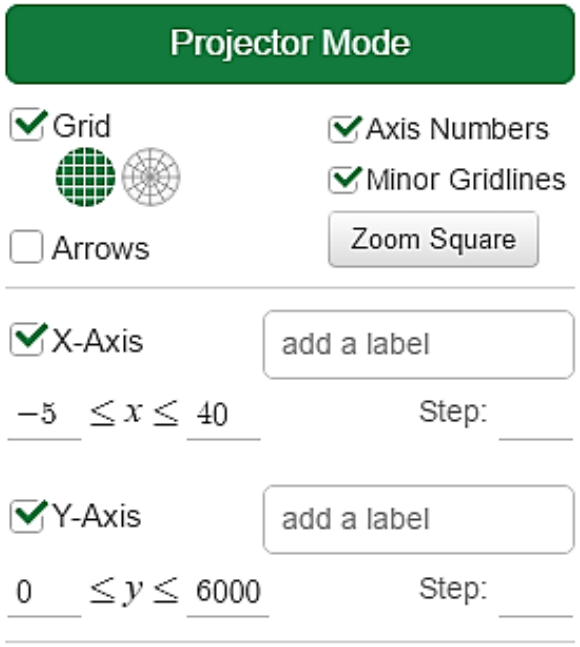
2. Terrell is looking for financial advice. He can deposit $1,000 into a simple interest account like Nico's or a compound interest account like Raul's. The compound interest account costs him a one-time start-up fee of $200. The simple interest account is FREE. Where would you tell Terrell to put his money and why?

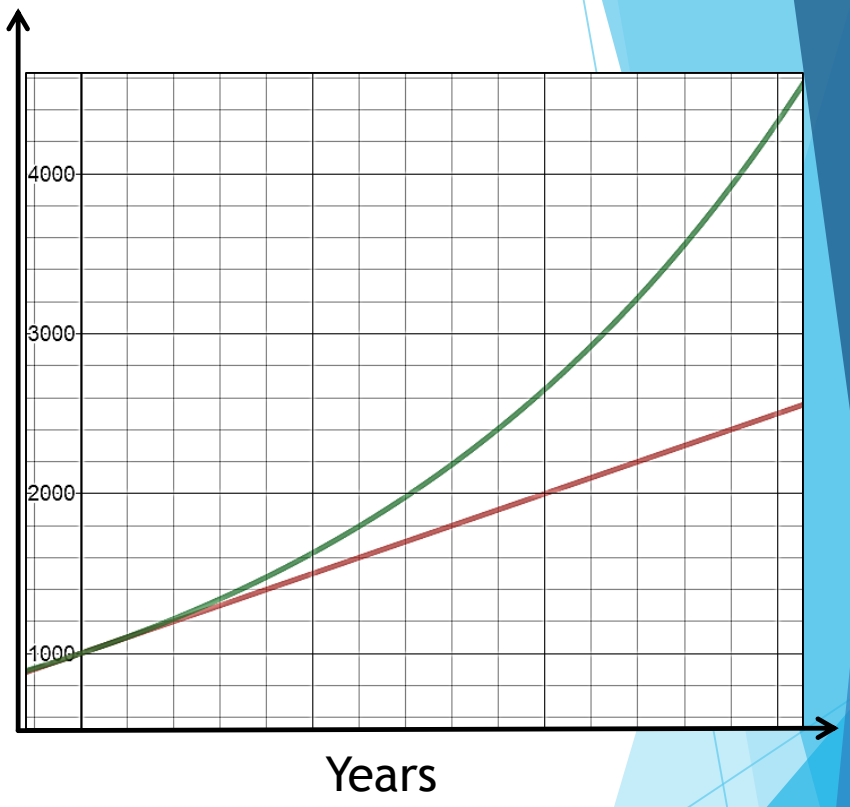
Short term → Simple Interest Account

Long term → Compound Interest Account

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







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

$A = P + (Pr)t$

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

$A = 10000 + 400t$

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

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

$A = 10000(1.04)^t$

	Time	Simple Interest Balance	Compound Interest Balance
Units	*years*	*dollars*	*dollars*
Expression	t	$A = 10000 + 400t$	$A = 10000(1.04)^t$
	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