Essential Question 4/15/2021

How can I use exponential functions to solve compound interest problems?

Standard:

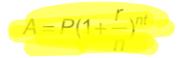
MGSE9-12.A.CED.2

Create exponential equations in two or more variables to represent relationships between quantities. (The phrase "in two or more variables" refers to formulas like the compound interest formula, in which $A = P(1 + r/n)^{nt}$ has multiple variables.)

Compound Interest

- As you get older, you will come to learn a great deal about investing your money...savings accounts, stock market, mutual funds, bonds, etc. Today, we are going to learn about compound interest, which is a form of saving and earning money by letting it sit in an account over time.
- **Compound Interest** is interest earned or paid on both the principal and previously earned interest.
- In middle school, you learned about **simple interest**, which is interest that is only earned on the principal. It's formula is I = Prt, where P represents principal, r represents rate, t represents time, and I represents interest.

Compound Interest



A = balance after t years

P = Principal (original amount)

r = interest rate (as a decimal)

n = number of times interest is compounded per year

t = time (in years)

annually - n = 1Semi-annually - n = 2Monthly - n = 12Quarterly - n = 4

Example 1

Example 1: Write a compound interest function that models an investment of \$1000 at a rate of 3% compounded quarterly. Then find the balance after 5 years.

$$P = 1000
r = 0.03
n = 4
t = 5$$

$$A = 1000 (1 + 0.03
A = 1010 ($$

Example 2

Example 2: Write a compound interest function that models an investment of \$18,000 at a rate of 4.5% compounded annually. Then find the balance after 6 years.

$$P = 18,000$$
 $r = 0.045$
 $n = 1$
 $t = 6$
 $A = 18000(1 + 0.045)$
 $A = 12$
 $A = 18000(1 + 0.045)$
 $A = 12$

Example 3

Example 3: Write a compound interest function that models an investment of \$4,000 at a rate of 2.5% compounded monthly. Then find the balance after 10 years.

r= 0.025

n = **[]**

t = **10**

A=4000(1+0.025)

Quick Check - 1
$$y = a(1 \pm r)^{t}$$

A pot of soup, currently at 84 C is left out to cool. If that temperature decreases by 5% per minute, what will the temperature be in 5 minutes?

$$y = 84(1-0.05)$$

$$y = 64.99$$

$$y = 650$$

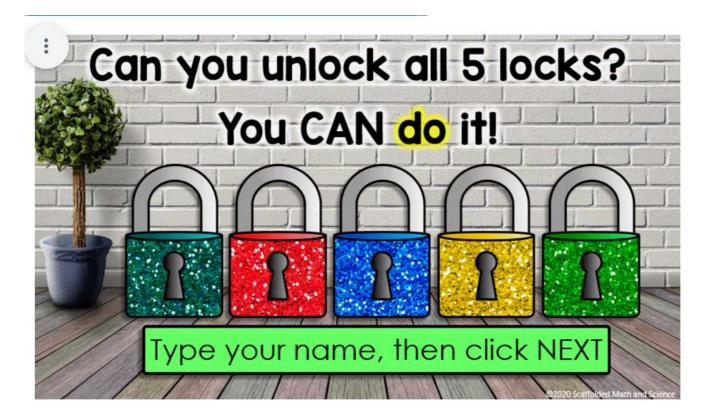
Quick Check - 2

The population of a small town started at 233 people in 1999. If the population grows at a rate of 16% per year, how many people are now in the town in 2006?

$$y = 233(1+0.16)^{7}$$

 $t = 2006 - 1999 = 7$
 $y = 233(1.16)^{7}$
 $y = 658$ people

Growth & Decay Digital Escape Activity



Closing:

If there is a % change, the base for growth is (1+1) and for decay is (1-1).

What's going to be the base of the exponential function in the following cases?

6. 2

1, 20% increase

$$|+6.2|$$

3.8% increase

5. 12.5% increase

0.15

2. 15% decrease

4. 4% decrease

6. 42.5% decrease

$$0.425$$
 $1-0.425$
 $= 0.515$