

Exponential Functions

Objective: SWBAT **review Exponential Functions and Compound Interest**

Language Objective: SWBAT **convince group-mates of correct process to assigned problem in a Think... Pair... Share... Activity**

Agenda

- 1) Take out **HW** to be checked
- 2) **DO NOW**
- 3) **Practice Quiz (20 min)**
 - Individual (**Think**)
 - Expert Groups (**Pair**)
 - Present (**Share**)

HW: "518 Exponential Equ. and Compound Interest" worksheet
QUIZ tomorrow

Compound Interest

$$A(t) = P\left(1 + \frac{r}{n}\right)^{(n \cdot t)}$$

A = Accumulated Amount of money P = Principal (initial amount)

r = annual interest Rate n = number of times compounded per year

t = Time (in years)

Growth/Decay Formula

$$A(t) = P(1 \pm r)^t$$

$(1 \pm r) =$ multiplier

A: The population of China was 1, 210, 005, 000 in 1996 and was growing at a rate of about 6% **per year**. Predict the population, to the nearest hundred thousand, of China in 2016.

B: Find the final amount of money for an investment of \$1000 at 6% interest compounded **semiannually** for 20 years.

Name _____

518 Exponential Functions Practice Quiz

1. The average price of a gallon of milk was \$2.00 a gallon in 2005. If now (2014) the average price is \$3.50 a gallon, then the inflation rate is about 6.4%.

a. Find the multiplier per year.	b. Write the equation to model the increasing price of a gallon of milk.	c. Find the average price in 2016?
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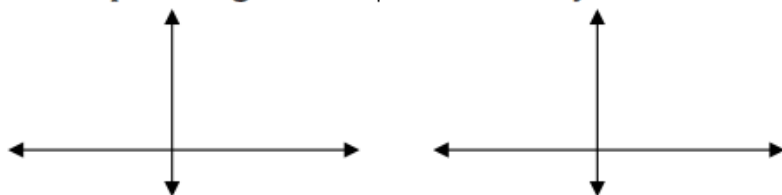
2. Find the balance on a \$500 investment with an APR (this is the r) of 3.75% after 5 years, if compounded...

a. Quarterly	b. Monthly.	c. Daily.
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3. Determine if the functions are growth (g) or decay (d).

a. $y = 1.2(1.2)^x$	b. $f(x) = 9(0.98)^x$	c. $y = 400\left(1 + \frac{0.08}{12}\right)^{12x}$	d. $f(x) = 18\left(\frac{4}{5}\right)^{-x}$
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4. a) Sketch an exponential graph that represents **growth**. b) Sketch a graph that represents that has **decay**.



Name _____

518 Exponential Functions Practice Quiz

1. The average price of a gallon of milk was \$2.00 a gallon in 2005. If now (2014) the average price is \$3.50 a gallon, then the inflation rate is about 6.4%.

<p>a. Find the multiplier per year.</p> <p>1.064</p>	<p>b. Write the equation to model the increasing price of a gallon of milk.</p> <p>$A = 2.00(1.064)^t$</p>	<p>c. Find the average price in 2016?</p> <p>$A = 2.00(1.064)^{11}$</p> <p>$A = \\$3.96$</p>
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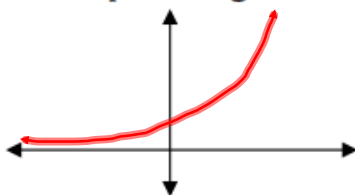
2. Find the balance on a \$500 investment with an APR (this is the r) of 3.75% after 5 years, if compounded...

<p>a. Quarterly</p> <p>$A = 500(1+0.0375/4)^{20}$</p> <p>$A = \\$602.59$</p>	<p>b. Monthly.</p> <p>$A = 500(1+0.0375/12)^{60}$</p> <p>$A = \\602.94</p>	<p>c. Daily.</p> <p>$A = 500(1+0.0375/365)^{1825}$</p> <p>$A = \\603.12</p>
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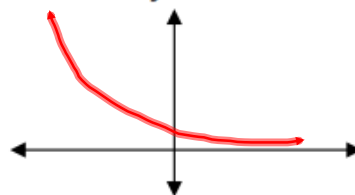
3. Determine if the functions are growth (g) or decay (d).

<p>a. $y = 1.2(1.2)^x$</p> <p><i>Growth</i></p>	<p>b. $f(x) = 9(0.98)^x$</p> <p><i>Decay</i></p>	<p>c. $y = 400\left(1 + \frac{0.08}{12}\right)^{12x}$</p> <p><i>Growth</i></p>	<p>d. $f(x) = 18\left(\frac{4}{5}\right)^{-x}$</p> <p><i>Growth</i></p>
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4. a) Sketch an exponential graph that represents **growth**.



- b) Sketch a graph that represents that has **decay**.



5. Suppose the number of bunnies found on university campus **doubles** every month. Suppose today there is a population of 24.

a) Write the equation that models this. Label your variables.	b) How many bunnies will there be in 4 months ?
c) How many bunnies will there be in a year ?	d) How many bunnies were there 6 weeks ago ?

6. You buy your first car for \$6500 in 2014. The average **rate** of depreciation for this particular car model is 18%. What is the value of the car...

a) After one year?	b) After 4 years and 6 months?	c) When it was new in 2008?
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7. In college you take out a \$1000 loan your freshmen year to buy books and things. The lender gives you a loan at a rate of 18.99% **compounded daily**. You will not make any payments on the loan until you graduate.

a) Write the equation that models this.	b) What is the amount you will owe in 4 years?
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8. Four years ago your Vespa was valued at \$3500. If the rate of depreciation is 10.5% ...

a) Write the equation that models this.	b) How much will it be worth in 2 more years?
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5. Suppose the number of bunnies found on university campus **doubles** every month. Suppose today there is a population of 24.

<p>a) Write the equation that models this. Label your variables.</p> $A = 24(2)^t$	<p>b) How many bunnies will there be in 4 months?</p> $A = 24(2)^4$ $A = 512$
<p>c) How many bunnies will there be in a year?</p> $A = 24(2)^{12}$ $A = 33,554,432$	<p>d) How many bunnies were there 6 weeks ago?</p> $A = 24(2)^{-1.5} \rightarrow 24 = x(2)^{1.5}$ $A = \frac{24}{(2)^{1.5}} \rightarrow A = \frac{24}{(2)^{1.5}}$ $= 8.485 \rightarrow \mathbf{9 \text{ bunnies}}$

6. You buy your first car for \$6500 in 2014. The average **rate** of depreciation for this particular car model is 18%. What is the value of the car...

<p>a) After one year?</p> $A = 6500(.82)^1$ $A = \$5,330$	<p>b) After 4 years and 6 months?</p> $A = 6500(.82)^{4.5}$ $A = \$2,661.19$	<p>c) When it was new in 2008?</p> $A = 6500(.82)^{-6}$ $A = \$21,381.11$
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7. In college you take out a \$1000 loan your freshmen year to buy books and things. The lender gives you a loan at a rate of 18.99% **compounded daily**. You will not make any payments on the loan until you graduate.

<p>a) Write the equation that models this.</p> $A = 1000(1 + 0.1899/365)^{365 \cdot t}$	<p>b) What is the amount you will owe in 4 years?</p> $A = 1000(1 + 0.1899/365)^{365 \cdot 4}$ $A = \$2,137.00$
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8. Four years ago your Vespa was valued at \$3500. If the rate of depreciation is 10.5% ...

<p>a) Write the equation that models this.</p> $A = 3500(0.895)^t$	<p>b) How much will it be worth in 2 more years?</p> $A = 3500(0.895)^6$ $A = \$1,798.90$
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518 Exponential Equations and Compound Interest

1. Suppose you have an initial investment of \$2000 in investment plan that has a rate of growth of 8% compounded daily for 25 years. How much will you have after the 25 years?
 - a. What is the effect of doubling the **initial** investment?
 - b. What is the effect of doubling the investment **rate**?
 - c. What is the effect of doubling the investment **time**?
 - d. Which has most effect on the ending balance?
2. The current value of your car is \$6050 and the rate of depreciation is 17%.
 - a. What is the multiplier?
 - b. Find the value of the car in 3 years.
 - c. Find the value of the car in 5 years and 9 months.
 - d. If the car is already 4 years old, what was the value new?
3. An average price for a can of soda in 1988 was about 50 cents, if now the average price is \$1, then
 - a. Find the rate of inflation per year.
 - b. Write the equation that models the increasing price of soda.
 - c. Suppose the price keeps increasing at this rate, what is the average price in 5 more years

4. The number of students with the flu on Monday was 3. If by Friday the number infected counted is 75, then
- find the multiplier per day.(round to 5th decimal if needed.)
 - Find the infection rate per day.(round to 2nd decimal)
 - Write the equation.
 - How many students were infected on Wednesday?
5. Find the balance on a \$500 investment with an APR(this is the r) of 4% after 8 years, if
- Compounded quarterly
 - Compounded monthly.
 - Compounded daily.
6. My computer 5 years ago was valued at \$2225, if now it is worth \$250,
- Find the multiplier
 - Find the equation that models this.
 - What is the rate of depreciation?
 - How much will it be in 5 more years?

518 Exponential Equations and Compound Interest

1. Suppose you have an initial investment of \$2000 in investment plan that has a rate of growth of 8% compounded daily for 25 years. How much will you have after the 25 years?

$$2000\left(1 + \frac{0.08}{365}\right)^{365 \cdot 25} = \$14,774.87$$

- a. What is the effect of doubling the **initial** investment?

$$4000\left(1 + \frac{0.08}{365}\right)^{365 \cdot 25} = \$29,549.75$$

- b. What is the effect of doubling the investment **rate**?

$$2000\left(1 + \frac{0.16}{365}\right)^{365 \cdot 25} = \$109,100.64$$

- c. What is the effect of doubling the investment **time**?

$$2000\left(1 + \frac{0.08}{365}\right)^{365 \cdot 50} = \$109,148.45$$

- d. Which has most effect on the ending balance?

Doubling the investment TIME has the strongest effect.

2. The current value of your car is \$6050 and the rate of depreciation is 17%.
- What is the multiplier?
 - Find the value of the car in 3 years.
 - Find the value of the car in 5 years and 9 months.
 - If the car is already 4 years old, what was the value new?
3. An average price for a can of soda in 1988 was about 50 cents, if now the average price is \$1, then
- Find the rate of inflation per year.
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