6-3 Exponential Growth and Decay

Name _____

Date: Feb. 3, 2020

WARM UP

Think back to what you already know about decimals and percents (how to move the decimals!).

(1) Convert from Decimal to Percent:	(2) Convert from Percent to Decimal:	(3) Convert from Decimal to Percent:	(4) Convert from Percent to Decimal:
0.14	12%	0.012	1.3%
14%	.12	1.2%	.013

NOTES

I can... write and evaluate exponential growth and decay functions!

Exponential Growth

Occurs when a quantity increases (GROWS) *by the same rate (%) over time.*

$y = a(1 + r)^t$

a = y-int (initial value)

r = rate (% as decimal)

(x) t = time

1.) The original value of an investment is $1400, and the value increases by 9% each year. Write an exponential function to model this situation. Then, find the value of the investment after 25 years.

9% = .09

$y = 1400(1+.09)^t$

$y = 1400(1.09)^t$

$y = 1400(1.09)^{25} = \$12072.31$

2.) The cost of tuition at a college is $12,000 and it is increasing at a rate of 6% each year. Write an exponential function to model this situation. Then, find the tuition cost after 4 years.

.06

$y = 12000(1+.06)^t$

$y = 12000(1.06)^t$

$y = 12000(1.06)^4 = \$15,149.72$

Exponential Decay

Occurs when a quantity decreases *by the same rate over time.*

$y = a(1 - r)^t$

a = y-int (initial value)

r = rate (% as decimal)

t = time

3.) The population of a town is decreasing at a rate of 1% per year. In 2000, there were 1300 people. Write an exponential function to model this situation. Then, find the population in 2008.

.01

$y = 1300(1-.01)^t$

$y = 1300(.99)^t$

$y = 1300(.99)^8 = 1199.57$

1,200 people

4.) The value of a car is $18,000 and depreciating at a rate of 12% per year. Write an exponential function to model this situation. Then, find the value of the car after 10 years.

.12

$y = 18000(1-.12)^t$

$y = 18000(.88)^t$

$y = 18000(.88)^{10} = 5,013.017...$

$5,013.02

PRACTICE

EXPONENTIAL GROWTH FUNCTION	EXPONETIAL DECAY FUNCTION
$y = a(1 + r)^t$	$y = a(1 - r)^t$

1	Annual sales for a fast food restaurant are $650,000 and are increasing at a rate of 4% per year. Write an exponential function, then find the annual sales after 7 years.	2	The population of a school is 800 students and is increasing at a rate of 2% per year. Write an exponential function, then find the population of the school after 9 years.
3	During a certain period of time, about 70 northern sea otters had an annual growth of 18%. Write an exponential function, then find the number of sea otters after 4 years.	4	The population of a town is 2500 and is decreasing at a rate of 3.5% per year. Write an exponential function to find the population of the town after 5 years.
5	Daniel's Print Shop purchased a new printer for $35,000. Each year it depreciates at a rate of 5%. Write an exponential function to find its approximate value after 8 years.	6	Kathy plans to purchase a car that depreciates at a rate of 12% per year. The initial value of the car is $21,000. Write an exponential function to find the value of the car after 3 years.

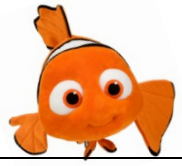
REGENTS QUESTIONS

A	The current population of a town is 10,000. If the population, P, increases by 20% each year, which equation could be used to find the population after *t* years? 1) $P = 10{,}000(0.2)^t$ 2) $P = 10{,}000(0.8)^t$ 3) $P = 10{,}000(1.2)^t$ 4) $P = 10{,}000(1.8)^t$	B	Bob invests $800 in an account at 1.8% interest. He will make no deposits or withdrawals for 3 years. Which formula could be used to find the balance, A, in the account after *t* years? 1) $A = 800\ (1 - .18)^3$ 2) $A = 800\ (1 + .18)^3$ 3) $A = 800\ (1 - .018)^3$ 4) $A = 800\ (1 + .018)^3$	C	Anne invested $1,000 in an account with a 1.3% interest rate. for 2 years. Which equation represents the balance in the account after 2 years? 1) $A = 1000\ (1 - 0.013)^2$ 2) $A = 1000\ (1 + 0.013)^2$ 3) $A = 1000\ (1 - 1.3)^2$ 4) $A = 1000\ (1 + 1.3)^2$

Answers Scrambled:

956	3	2,092	4	855,355.66	2	136	23,219.72	14,310.91

Name: _____ 6-3 Exponential Growth & Decay

Question	Exponential Growth or Decay?	Write a function that represents this situation	Show Work & Answer:
1. You buy a house for $130,000. It **appreciates** 6% per year. How much is it worth in 10 years? 		**Initial Amount =** **Growth/Decay Rate:** Percent = Decimal = Function that represents this situation:	
2. Mrs. Voegler is **losing** 20% of her hair each year ☺ If she currently has 1,546 hairs on her head, about how many hairs will he have left after 10 years?		**Initial Amount =** **Growth/Decay Rate:** Percent = Decimal = Function that represents this situation:	
3. If you **invest** $40 in an account for 10 years at a 3% interest rate, how much money will you have at the end of the ten years?		**Initial Amount =** **Growth/Decay Rate:** Percent = Decimal = Function that represents this situation:	
4. A population of 100 frogs **increases** at an annual rate of 22%. How many frogs will there be in 5 years?		**Initial Amount =** **Growth/Decay Rate:** Percent = Decimal = Function that represents this situation:	
5. A species of extremely rare, deep-water fish are slowly becoming extinct. If there are a total 821 of this type of fish and there are 15% **fewer** fish each month, how many will there be in half a year? 		**Initial Amount =** **Growth/Decay Rate:** Percent = Decimal = Function that represents this situation:	