11/17

Warm Up

Discuss with your group and come up with a final answer:

What does it mean when we say something grows exponentially?
(As x increases by one, y ....) is multiplied by a constant factor.

What is a growth factor?
The # that y is constantly being multiplied by

How do we find the growth factor given a data table? By dividing up the table
~~Divide one y-value by the y-value before it.~~

Problem 2.1 Recap

# of months	sq ft of plant	
0	1000	
1	2000	×2
2	4000	×2
3	8000	×2
4	16000	×2
5	32000	×2
6	64000	×2

How did we come up with the equation?

We know it involves:

2^x

What do now have to do to get our y-values?

$y = 1000(2^x)$

$y = 1000(2)^x$

$y = (1000)2^x$

$y = 1000 \cdot 2^x$

Don't want to use "x" for multiplication

How about this one?

x	y	
0	0	?
1	3	×3
2	9	×3
3	27	

Unknown

Definitely not exponential because:

1. There is no constant Growth Factor
2. You can't grow anything from zero. Any number times zero will always be zero.

Homework Questions?

Page 32, #'s 1, 2

1. If you don't brush your teeth regularly, it won't take long for large colonies of bacteria to grow in your mouth. Suppose a single bacterium lands on your tooth and starts multiplying by a factor of 4 every hour.

a. Write an equation that describes the number of bacteria b in the new colony after n hours.

b. How many bacteria will be in the colony after 7 hours?

c. How many bacteria will be in the colony after 8 hours? Explain how you can find this answer by using the answer from part (b) instead of the equation.

d. After how many hours will there be at least 1,000,000 bacteria in the colony?

e. Suppose that, instead of 1 bacterium, 50 bacteria land in your mouth. Write an equation that describes the number of bacteria b in this colony after n hours.

f. Under the conditions of part (e), there will be 3,276,800 bacteria in this new colony after 8 hours. How many bacteria will there be after 9 hours and after 10 hours? Explain how you can find these answers without going back to the equation from part (e).

hrs. # bacteria

x	y
0	1
1	4
2	16

+1 → ×4

+1 → ×4

$b = 4^n$

$b = 50(4^n)$

Whenever you are asked to write an equation, you can always start with a little table to help yourself.

2. Loon Lake has a "killer plant" problem similar to Ghost Lake in Problem 2.1. Currently, 5,000 square feet of the lake is covered with the plant. The area covered is growing by a factor of 1.5 each year.

a. Copy and complete the table to show the area covered by the plant for the next 5 years.

b. The surface area of the lake is approximately 200,000 square feet. How long will it take before the lake is completely covered?

Growth of Loon Lake Plant

Year	Area Covered (sq. ft)
0	5,000
1	
2	
3	
4	
5	

$y = 5000(1.5)^x$

$y = (5000)1.5^x$

$y = 5000(1.5^x)$

2.2 Growing Mold

Interpreting Equations for Exponential Functions

Mold can spread rapidly. For example, the area covered by mold on a loaf of bread that is left out in warm weather grows exponentially.

Problem 2.2

Students at Magnolia Middle School conducted an experiment. They put a mixture of chicken bouillon (BOOL yahn), gelatin, and water in a shallow pan. Then they left it out to mold. Each day, the students recorded the area of the mold in square millimeters.

The students wrote the equation $m = 50\left(3^d\right)$ to model the growth of the mold. In this equation, m is the area of the mold in square millimeters after d days.

$$m = 50\left(3^d\right)$$

Area of mold (mm^2) after "d" days

# of days mold has been growing

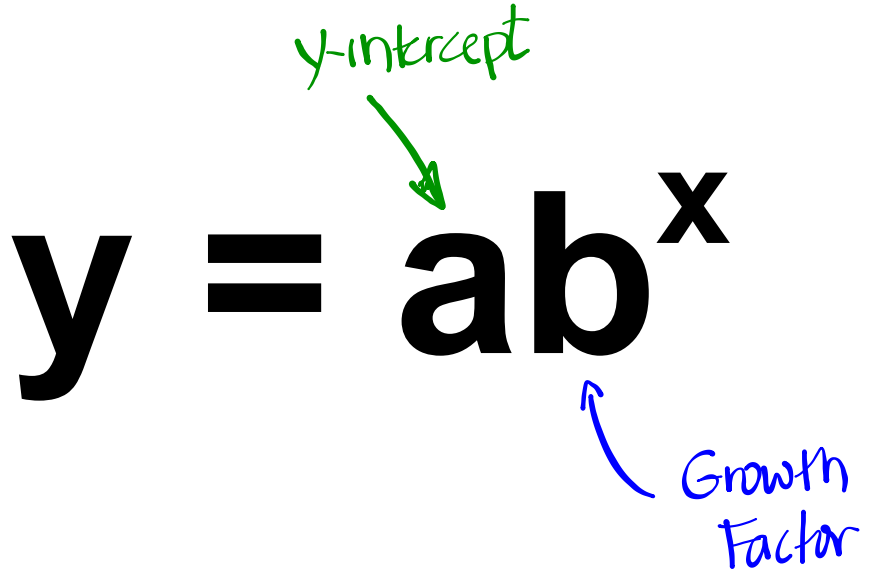
the area of mold is multiplied by 3 each day

We began with 50 mm^2 of mold.

same

There is 50mm^2 of mold on day 0

Exponential Equation



Can we just use text to write an exponential equation?

2 bacteria multiplied by 6 every hour

$y = 2(6^x)$ **Yes!**

A population of flies multiplies by 6 each day. The population begins with 4 flies

$y = 4(6)^x$

Problem 2.2

Students at Magnolia Middle School conducted an experiment. They put a mixture of chicken bouillon (BOOL yahn), gelatin, and water in a shallow pan. Then they left it out to mold. Each day, the students recorded the area of the mold in square millimeters.

The students wrote the equation $m = 50\left(3^d\right)$ to model the growth of the mold. In this equation, m is the area of the mold in square millimeters after d days.

A For each part, answer the question and explain your reasoning.

1. What is the area of the mold at the start of the experiment?
2. What is the growth factor?
3. What is the area of the mold after 5 days?
4. On which day will the area of the mold reach 6,400 mm^2?

B An equation that represents an exponential function can be written in the form $y = a\left(b^x\right)$ where a and b are constant values.

1. What is the value of b in the mold equation? What does this value represent? Does this make sense in this situation? Explain.
2. What is the value of a in the mold equation? What does this value represent?

Homework

No Homework