LESSON MAKER PRO

Start and Change

Read what an exponential model tells you.

HIGH SCHOOL · MT.CORE.ALG.EXP.2

MT.CORE.ALG.EXP.2 "Understand a as the initial value and b as the growth/decay factor for an exponential function written in standard form, y = a · b^x."

NAME _____ DATE _____

THE STARTING VALUE AND FACTOR

In $y = a \cdot b^x$, a is the value when x = 0 because $b^0 = 1$. The factor b multiplies the value each time x increases by 1. A factor greater than 1 means growth, while a factor between 0 and 1 means decay.

WORKED EXAMPLE

For $y = 35 \cdot (4/5)^x$, find the starting value and the value when x = 1.

1. At x = 0, $y = 35 \cdot (4/5)^0 = 35$.
2. At x = 1, $y = 35 \cdot 4/5 = 28$.

Answer: The starting value is 35, and the value at x = 1 is 28.

PRACTICE 6 problems

1 For $y = 18 \cdot (5/4)^x$, find the starting value and the growth factor.

ANSWER _____

2 For $y = 64 \cdot (3/4)^x$, find the starting value and the percent decrease each time x increases by 1.

ANSWER _____

3 For $y = 11 \cdot 2^x$, find y when x = 0 and when x = 2.

ANSWER _____

4 The table shows values of an exponential function. Find a and b in $y = a \cdot b^x$.

EXPONENTIAL FUNCTION VALUES

x	y
0	9
1	12
2	16

ANSWER _____

5 An exponential function has y = 50 when x = 0 and y = 45 when x = 1. Find a and b.

ANSWER _____

6 For $y = a \cdot (1/2)^x$, the value of y is 6 when x = 2. Find a.

ANSWER _____

APPLY IT Show your work

1 A school's music club video has 120 total views when tracking begins. A model predicts that total views will rise by 50% each day. Write a model in the form $y = a \cdot b^x$ for the total views after x days. How many views does it predict after 2 days?

WORK SPACE

ANSWER _____

2 A pair of headphones has a resale value of $80. Its value decreases by 25% each year. Write a model in the form $y = a \cdot b^x$ for its value after x years. What is its value after 2 years?

WORK SPACE

ANSWER _____

CHALLENGE One step up

The modeled daily plays for two playlists are $P = 12 \cdot (3/2)^x$ and $Q = 27 \cdot (2/3)^x$, where x is the number of days since tracking began. Which playlist starts with more daily plays? On which whole-number day do their modeled daily plays first match? Explain using the factors.

WORK SPACE AND ANSWER

ANSWER KEY

Start and Change

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	For $y = 18 \cdot (5/4)^x$, find the starting value and the growth factor.	**Starting value: 18; growth factor: 5/4.**
2	For $y = 64 \cdot (3/4)^x$, find the starting value and the percent decrease each time x increases by 1.	**Starting value: 64; decrease: 25%.**
3	For $y = 11 \cdot 2^x$, find y when x = 0 and when x = 2.	**When x = 0, y = 11. When x = 2, y = 44.**
4	The table shows values of an exponential function. Find a and b in $y = a \cdot b^x$.	**a = 9; b = 4/3.**
5	An exponential function has y = 50 when x = 0 and y = 45 when x = 1. Find a and b.	**a = 50; b = 9/10.**
6	For $y = a \cdot (1/2)^x$, the value of y is 6 when x = 2. Find a.	**a = 24.**

PART 2 · APPLY IT

1. **$y = 120 \cdot (3/2)^x$; 270 views after 2 days.** The initial value is 120, and a 50% increase gives a factor of 3/2. Then $120 \cdot (3/2)^2 = 270$.
2. **$y = 80 \cdot (3/4)^x$; $45 after 2 years.** The initial value is 80, and a 25% decrease gives a factor of 3/4. Then $80 \cdot (3/4)^2 = 45$.

CHALLENGE

Q starts with more daily plays: 27 compared with 12. They first match at x = 1, when both models give 18. P grows by a factor of 3/2 each day, while Q decays by a factor of 2/3.

Accept equivalent fractions or decimals for factors. For the word problems, accept equivalent exponential models with the same initial values and factors.