LESSON 7-1

Success for English Language Learners

Exponential Functions, Growth, and Decay

Steps for Success

Step I Assist students in mastering the important concepts of the lesson by using these ideas.

- Have students discuss the definitions of the vocabulary words *exponential function, base, asymptote, exponential growth,* and *exponential decay*. Have them compare the English words and definitions to those in their native languages.
- There are a number of vocabulary words introduced in this lesson. Suggest that students record them along with definitions of them in their own words in their notebooks.

Step II Teach the lesson.

- Make sure as you teach that students understand that *growth* indicates that something increases or grows larger and that *decay* means that something decreases or becomes smaller.
- To reinforce the idea that the base is constant and the exponent x is a variable, note that if rain is *constant,* the amount of rain coming from the sky does not change, but that if clouds are variable, the clouds change.

Step III Ask English Language Learners to complete the worksheet for this lesson.

- Point out that Example 2 in the student textbook is supported by Problem 1 on the worksheet. Help students understand the process of substituting numbers for variables by using different colors for each variable.
- Point out that Example 3 in the student textbook is supported by Problem 2 on the worksheet. Make sure that students understand that the difference between an exponential growth function and an exponential decay function is the value of b in $f(x) = ab^x$.
- Think and Discuss supports the problems on the worksheet.

Making Connections

- Have students brainstorm other examples of exponential growth or exponential decay. For example, in chemistry, radioactive isotopes, such as carbon-14, will decay exponentially over time with half-lives. Students may be familiar with carbon-14 from its use in archaeology.

Name _____ Date _____ Class _____

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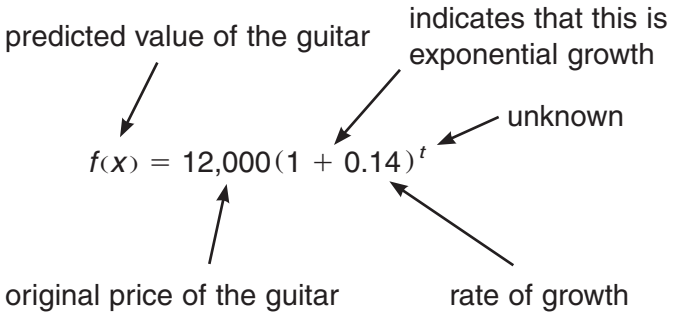
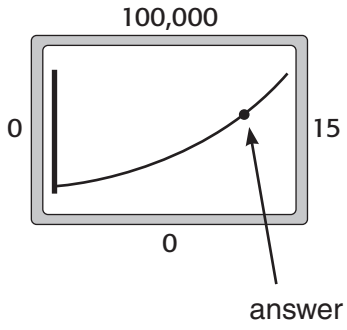
Problem 1

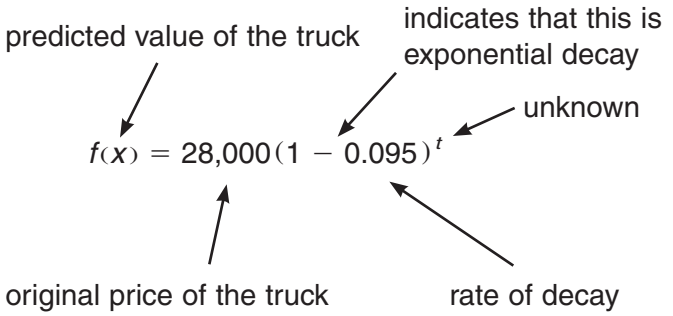
Tony purchased a rare 1959 Gibson Les Paul guitar in 2000 for $12,000. Experts estimate that its value will increase by 14% per year. Use the graph to find when the value of the guitar will be $60,000.

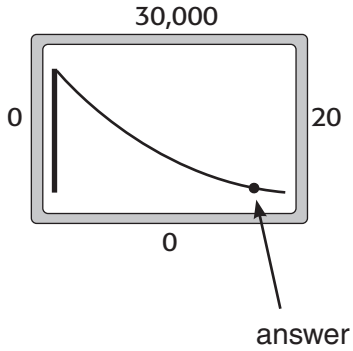




Problem 2

The value of a truck bought new for $28,000 decreases by 9.5% each year. Write an exponential function, and graph the function. Use the graph to predict when the value will fall to $5000.





Think and Discuss

1. How would you tell if the function $f(x) = 12{,}000(1 + 0.14)^t$ is an exponential growth function or an exponential decay function?

_____

2. How would you use 9.5% as r?

_____

3. How would you find the point at which the value of the truck fell to $0?

_____

CHAPTER 6

Lesson 6-1

1. Find monomials then add exponents.
2. It makes it easier to keep track of monomials.

Lesson 6-2

1. Use arrows to keep track of products.
2. Use sums of entries in the row above and start and end with 0.

Lesson 6-3

1. Write remainder over divisor.
2. It saves time writing monomials.

Lesson 6-4

1. I could use the methods in the Know it! Note.
2. It is the greatest number that can be divided into two numbers.

Lesson 6-5

1. It goes up to -4, down, comes back up to 0, flattens out, then goes up.
2. Substitute the root into the equation.

Lesson 6-6

1. A real zero has no imaginary part.
2. No, you can find the real roots when you factor the equation.

Lesson 6-7

1. They describe the end behavior of the polynomial.
2. As $x \to +\infty$, $P(x) \to -\infty$ and as $x \to -\infty$, $P(x) \to -\infty$.

Lesson 6-8

1. Answers may vary. See table on page 460 (Transformations of $f(x)$).

Lesson 6-9

1. Answers may vary and may include reference to arrows or tables.
2. I can look for differences that are almost constant.

CHAPTER 7

Lesson 7-1

1. $1 + 1.4 > 1$, so it displays exponential growth.
2. Use it in decimal form, 0.095.
3. It never really reaches 0.

Lesson 7-2

1. A function $g(x)$ is the inverse of $f(x)$ if $f(g(x)) = g(f(x)) = x$.
2. $f^{-1}(x) = \frac{1}{2}x$
3. Use the opposite of each operation.

Lesson 7-3

1. Exponential form has an exponent in it, and logarithmic form has “log” in it.
2. Look at the number to the right and below “log.”
3. If $\log_b x = 0$, then x has to be 1.

Lesson 7-4

1. If they are added, multiply; if they are subtracted, divide.
2. Use it if the log is of something with an exponent.
3. It is used to change a logarithm in one base to a logarithm in a different base.