LESSON **8-6**

# Success for English Language Learners

## *Radical Expressions and Rational Exponents*

**Steps for Success**

**Step I** Make sure students understand the important concepts of the lesson by discussing the following.

- Students must understand the terms *index* and *radicand* in order to follow the rules for evaluating radical expressions. Have students write definitions in their own words in their notebooks.
- Emphasize to students that every positive perfect square number has both a positive root and a negative root.

**Step II** Teach the lesson.

- Emphasize to students that they need to identify the index and the radicand of a number in order to find the numbers and types of real roots.
- Encourage students to examine the Properties of *n*th Roots and of Rational Exponents carefully when they rewrite each expression. Tell students that it is important to find a property to apply that will simplify the expression.

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

- Point out that Example 1 in the student textbook is supported by Problem 1 on the worksheet. Emphasize to students that they need to determine whether the index is even or odd and whether the radicand is positive or negative in order to find the number of real roots.
- Point out that Example 4 in the student textbook is supported by Problem 2 on the worksheet. Help students visualize how to write each expression using rational exponents by showing them how to change from an index and a radicand with a power to a number with a fractional exponent.

**Making Connections**

- Real roots are roots that are real numbers. This may seem simplistic or obvious to students, but tell them that they will learn about imaginary numbers later.

Name ________________________ Date ____________ Class ____________

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## *Radical Expressions and Rational Exponents*

**Problem 1**

Find all real roots.

Index of 4 → fourth roots of 81 ← Radicand of 81

Index of 3 → cube roots of $-125$ ← Radicand of $-125$

Index of 6 → sixth roots of $-729$ ← Radicand of $-729$

**Problem 2**

Write each expression by using rational exponents.

$n$ → $\sqrt[4]{7^3} = 7^{\frac{3}{4}}$ ← $m$

$n$ → $\sqrt[3]{11^6} = 11^{\frac{6}{3}}$ ← $m$

Understand that

$\sqrt[n]{a^m} = a^{\frac{m}{n}}$.

**Think and Discuss**

1. How do you know how to identify the radicand?

_______________________________________________

2. How do you know how many roots a number has with an odd index?

_______________________________________________

3. How do you know how to write a fractional exponent as a root?

_______________________________________________

**Lesson 8-6**

1. The radicand is the number under the radical sign.
2. An odd index indicates 1 real root.
3. Use the rule that $\sqrt[n]{a^m} = a^{\frac{m}{n}}$.

**Lesson 8-7**

1. In the function $f(x) = a\sqrt{\frac{1}{b}(x - h) + k}$, the value of $a$ tells you if the function is stretched or compressed.
2. In the function $f(x) = a\sqrt{\frac{1}{b}(x - h) + k}$, the value of $k$ tells you how the function is shifted up or down.
3. In the function $f(x) = a\sqrt{\frac{1}{b}(x - h) + k}$, if the value of $b$ is less than 0, the function is reflected across the $y$-axis.

**Lesson 8-8**

1. Raise a radical equation to the power equal to the index of the radical.
2. Substitute the solution into the original equation to see if it is true.
3. Square both sides of the equation. Then simplify.

## CHAPTER 9

**Lesson 9-1**

1. It has a negative slope because $h$ decreases as $t$ increases.
2. If Kurt was climbing, it would have a positive slope.
3. A reasonable domain would be $0 \le t \le 83\frac{1}{3}$. After $83\frac{1}{3}$ seconds, Kurt would be "underground."

**Lesson 9-2**

1. It should be solid because the point $(5, 22)$ is included.
2. That should be an open circle because the point is not included.
3. Because each stage of the triathlon begins where the previous stage ended.

**Lesson 9-3**

1. $m = \frac{3}{2}$
2. A horizontal compression (or stretch) does not affect a point whose $x$-coordinate is zero.

**Lesson 9-4**

1. It isn't used because it converts dollars to euros.
2. $D$ takes euros to dollars, but $E$ needs an input of euros, so $E(D(x))$ doesn't make sense.

**Lesson 9-5**

1. If a horizontal line passes through more than 1 point of the graph of a relation, then the inverse is not a function.
2. I could find the inverse of the inverse, since the inverse of the inverse of a relation is the original relation.

**Lesson 9-6**

1. I would look for the set of finite differences or ratios that was closest to constant. That might provide a good model.
2. If the correlation coefficient is close to 1, the model is a good fit.
3. Not necessarily. Maybe a model we have not studied might work.