LESSON 5-6

# Success for English Language Learners

## *Solving Quadratic Equations by the Quadratic Formula*

### Steps for Success

**Step I** Make sure that students understand the concepts in the lesson by using procedures such as the following.

- Help students discriminate between real zeros and complex zeros. Write several solutions for $x$, as in Examples 1 and 2, on strips of paper. Create a T-chart on the board with the headings Real Zero and Complex Zero. Students can put the equation strips under the correct heading in the chart.

**Step II** Teach the lesson.

- Draw students' attention to the chart on page 360, being sure to point out that all of these methods will help them solve quadratic equations. Use a sample equation and several of the methods listed to point out to students that, no matter which method is used, the answer is still the same. After demonstrating, divide students into groups. Assign each group to become experts at using one method of solving. Give a sample equation to the class so that groups can explain how to solve the equation, using the given method. Students can present their work to the class, explaining step by step how to solve the equation.

**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. Remind students that, to add fractions, they need to find a common denominator. Point out the example in the sidebar on page 356, and ask students to explain the process for making a common denominator. (Multiply both the numerator and denominator by the same number.)
- Think and Discuss supports the problems on the worksheet.

### Making Connections

- Draw students' attention to the example of firefighting pilots using the Quadratic Formula to figure out when to release water on a fire. Ask students why the Quadratic Formula would yield better results than a linear function. Invite students to think of other practical uses for the Quadratic Formula and explain why that formula is more appropriate than a linear function.

Name _____ Date _____ Class _____

LESSON 5-6

# Success for English Language Learners

## *Solving Quadratic Equations by the Quadratic Formula*

**Problem 1**

Find the zeros of $f(x) = x^2 + 10x + 2$ by using the Quadratic Formula.

| Step | Math |
|---|---|
| 1. Set the function *equal to zero*. | $x^2 + 10x + 2 = 0$ |
| 2. Name the *coefficients*. | $a = 1 \quad b = 10 \quad c = 2$ |
| 3. Write the *Quadratic Formula*. | $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ |
| 4. Put the coefficients in the formula. | $x = \frac{-10 \pm \sqrt{10^2 - (4)(1)(2)}}{2(1)}$ |
| 5. Simplify. | $x = \frac{-10 \pm \sqrt{100 - 8}}{2}$<br>$x = \frac{-10 \pm \sqrt{92}}{2}$<br>$x = \frac{-10 \pm \sqrt{(4)(23)}}{2}$<br>$x = \frac{-10 \pm 2\sqrt{23}}{2}$<br>$x = -5 \pm \sqrt{23}$ |

Factor out a square number.

Divide 10 and 2 by 2.

**Think and Discuss**

**1.** How do you know the zeros of the graph are real?

_____

**2.** If the function were $f(x) = x^2 + 10x$, what would be the value of $c$? How would the solution change?

_____

### Lesson 4-4

1. If $A$ is a matrix it denotes determinant, if $A$ is a number it denotes absolute value.
2. Using Cramer's Rule, the determinant can be used to solve systems of equations.

### Lesson 4-5

1. If it is not square, then $AA^{-1} \neq A^{-1}A$.
2. There is no multiplicative inverse of the matrix.
3. It can be used to solve $A \cdot X = B$, where $A$ is a coefficient matrix, $X$ is a variable matrix, and $B$ is a constant matrix.

### Lesson 4-6

1. Because they are not coefficients of variables.
2. Answers may vary.

## CHAPTER 5

### Lesson 5-1

1. The graph moves right/left.
2. The graph moves up/down.
3. The $y$-coordinates of all points on the graph would change sign.

### Lesson 5-2

1. Because $f(4) = 6$.
2. It opens up when $a > 0$.

### Lesson 5-3

1. If a point on the graph is reflected across the axis of symmetry, the image is also on the graph.
2. Because a quadratic function can go up, then down; a linear function only goes up or down.

### Lesson 5-4

1. Because the square root introduces the plus/minus sign.
2. Because you are changing the equation into a square plus a constant term.

### Lesson 5-5

1. It is the square root of $-1$. It is used to work with negative square roots.
2. You could substitute the answer in the original equation.

### Lesson 5-6

1. Because the square root is positive.
2. $c$ would be 0 and the roots would be 0 and $-10$.

### Lesson 5-7

1. The point $(0, 0)$ involves the least amount of calculation.
2. It is dotted because in the problem it is a less than sign, not a less than or equal to sign.

### Lesson 5-8

1. The difference between the $x$-values is constant.
2. Between 4 and 6 the graph is at 9, goes down, and comes back up to 9. The vertex must be between 4 and 6.
3. It opens up because all the $y$-values are at least 9.

### Lesson 5-9

1. Quadrant II, because it corresponds to the point $(-9, 1)$.
2. The additive inverses of 10 and $-4i$.