Success for English Language Learners
Multiple Representations of Functions

Steps for Success

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

- Have students discuss the definitions of the vocabulary words *multiple representation, function, monitor, sketch, rappelling, arrow, archer, track, laps, intercept, acre, mature, additional, annually, yield, finite differences*. Compare the English words and definitions to those in their native languages.
- List all four types of representations and create a visual example of each. Allow students to complete the tables, graphs, or verbal models with words and illustrations as needed.

Step II Assign the Think and Discuss questions to assess student mastery of the material and to give students a chance to clarify any questions they might have about the lesson concepts.

- Allow students to work in small groups in order to master the construction of the four types of representations. Pairs can explain or demonstrate each of them to classmates.
- Use a physical model with a stopwatch, such as a tennis ball on an incline, to demonstrate how change in height relates to time.

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 recognize that one representation can help them to create another and that all representations support one another.
- Think and Discuss supports the problems on the worksheet.

Making Connections

- Have students look at the word *function*. Then show words related to *function,* such as *functional*. Have students compare the differences in translating between representations and translating between languages.

Name ________________________________ Date ___________ Class ___________

LESSON 9-1

Success for English Language Learners

Multiple Representations of Functions

Problem 1

Kurt is rappelling down a 500-foot cliff at a rate of 6 feet per second. Create a table, equation, and graph to represent Kurt's height from the ground with relation to time. When will Kurt reach the ground?

t	h
0	500
1	494
2	488
3	482
4	476
5	470
t	$500 - 6t$

After 1 second, Kurt is 6×1 feet below the top of the cliff.

After 2 seconds, Kurt is 6×2 feet below the top of the cliff.

After 3 seconds, Kurt is 6×3 feet below the top of the cliff.

After 4 seconds, Kurt is 6×4 feet below the top of the cliff.

After t seconds, Kurt is $6 \times t$ feet below the top of the cliff.

Think and Discuss

1. Explain why the graph in Problem 1 has a negative slope.

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2. How would the graph look different if Kurt were climbing the cliff?

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3. What would be a reasonable domain of the function? Why?

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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.