Zeros of a Quadratic Function Application

TIMATH.COM: ALGEBRA

TEACHER NOTES

Math Objectives

- Students will use algebraic expressions and quadratic equations to represent the length, width, and area of a rectangle.
- Students will connect the algebraic representation to the graphical representation.
- Students will determine the zeros of quadratic equations in order to find solutions to an application.
- Students will see an example of how quadratic functions can be used to solve real-world problems.

Vocabulary

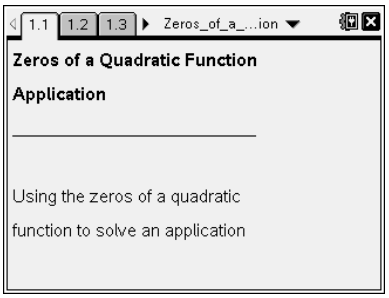
- zeros

About the Lesson

- This lesson is a follow-up lesson to the activity *Zeros of a Quadratic Function*.
- This lesson involves students using quadratic functions to find the width of a deck surrounding a rectangular pool. Given the area of four different pool size options, students will use the graphs of quadratic functions to find zeros and determine solutions for each option.

Related Lessons

- Prior to this lesson: Zeros of a Quadratic Function



TI-Nspire™ Technology Skills:

- Download a TI-Nspire document
- Open a document
- Move between pages
- Click a minimized slider

Tech Tips:

- Make sure the font size on your TI-Nspire handhelds is set to Medium.
- You can hide the function entry line by pressing ctrl G.

Lesson Materials:

Student Activity

- Zeros_of_a_Quadratic_Function_Application_Student.pdf
- Zeros_of_a_Quadratic_Function_Application_Student.doc

TI-Nspire document

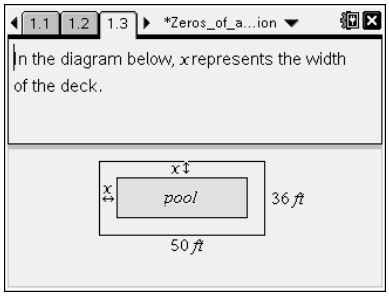
- Zeros_of_a_Quadratic_Function_Application.tns

Visit www.mathnspired.com for lesson updates and tech tip videos.

Discussion Points and Possible Answers

Tech Tip: Press (esc) to hide the entry line if students accidentally click the chevron.

Move to page 1.3.



1. What algebraic expression would be used to represent the longer side of the pool?

   Answer: $50 - 2x$

   Teacher Tip: Students might need to be reminded that an algebraic expression does not include an equal sign.

2. What algebraic expression would be used to represent the shorter side of the pool?

   Answer: $36 - 2x$

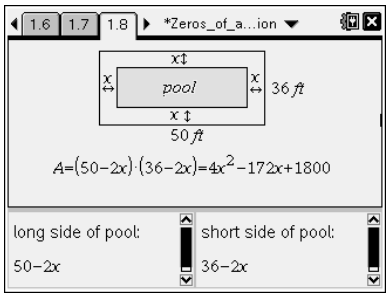
3. Using the answers from Questions 1 and 2, what quadratic expression would be used to represent the area of the pool? Showing your work, write the expression in expanded form.

   Answer: $(50 - 2x)(36 - 2x)$

   $1800 - 100x - 72x + 4x^2$

   $4x^2 - 172x + 1800$

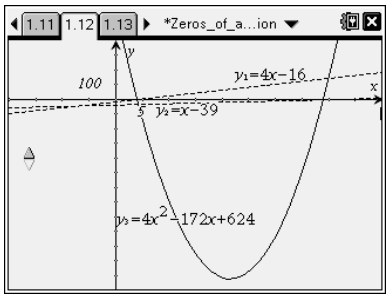
Move to page 1.8.



4. The results from Questions 1–3 are shown in the diagram on page 1.8. Why is $2x$ subtracted from the length and width of the large rectangle?

   Answer: Since x represents the width of the deck surrounding the pool, it must be subtracted twice since it is on both sides of the length and the width of the pool.

Move to page 1.12.



5. On page 1.12, what do the dashed lines labeled y_1 and y_2 represent?

   Answer: The dashed lines represent the linear factors of the quadratic equation.

6. What part of the graphs represents the width of the deck?

   Answer: The zeros of the quadratic function represent the width of the deck. These are the same values as the *x*-intercept of the linear factors.

7. Use the graph on page 1.12 to help you complete the table below to find the deck width for each pool option.

   Answer: Completed table is below.

Area of pool (ft^2)	Area of pool as a quadratic equation in simplest form (show work)	Linear factors of quadratic equation	Zeros	Deck width (ft)
1176	$4x^2 - 172x + 1800 = 1176$ $4x^2 - 172x + 624 = 0$	$4(x - 39)(x - 4)$	39, 4	4
912	$4x^2 - 172x + 1800 = 912$ $4x^2 - 172x + 888 = 0$	$4(x - 37)(x - 6)$	37, 6	6
680	$4x^2 - 172x + 1800 = 680$ $4x^2 - 172x + 1120 = 0$	$4(x - 35)(x - 8)$	35, 8	8
480	$4x^2 - 172x + 1800 = 480$ $4x^2 - 172x + 1320 = 0$	$4(x - 33)(x - 10)$	33, 10	10

Teacher Tip: Encourage students to write the linear factors of the quadratic equations in simplest form by factoring out the GCF. Also, it may be beneficial to point out the difference between the zeros and the deck width. Encourage students to realize that there are two zeros for the quadratic equations, but only one is applicable as a solution to the application.

Wrap Up:

Upon completion of the discussion, the teacher should ensure that students are able to:

- Understand how quadratic functions can be used to solve real-world applications.
- The connections between the algebraic representation and the graphical representation of quadratic functions.
- Determine the zeros of quadratic equations, graphically and algebraically.
- Interpret zeros of a quadratic equation to find a solution that makes sense in the context of an application.