#9749

ALGEBRA: QUADRATIC ROOTS

$$(a + b)^2 = a^2 + 2ab + b^2$$

CEREBELLUM CORP., 2002
Grade Levels: 11-13+
26 minutes
1 Instructional Graphic Enclosed

DESCRIPTION

What is a factor? How do you find the roots of quadratic equations? When is there a single root? This Indiana Jones parody gives shortcuts and tips on factoring quadratic equations, using several examples that clearly teach the process. Program 5 of 7.

ACADEMIC STANDARDS

Subject Area: Mathematics

★ Standard: Understands and applies basic and advanced properties of functions and algebra

- Benchmark: Understands appropriate terminology and notation used to define functions and their properties (e.g., domain, range, function composition, inverses) (See Instructional Goals #1, 4, and 7.)

- Benchmark: Understands special values (e.g., minimum and maximum values, x- and y-intercepts, slope, constant ratio or difference) of patterns, relationships, and functions (See Instructional Goal #4.)

- Benchmark: Understands basic concepts (e.g., roots) applications (e.g., determining cost, revenue, and profit situations) , and solution methods (e.g., factoring, approximation using sign changes) of polynomial equations (See Instructional Goals #2, 3, 5, and 6.)

INSTRUCTIONAL GOALS

1. To explain what factoring means.
2. To point out how factoring binomials can help solve a quadratic equation.
3. To demonstrate the trial and error process of factoring a quadratic equation.
4. To review how to use the FOIL method when multiplying binomials.
5. To point out tips for factoring a quadratic equation.
6. To state a rule linking factors and roots.
7. To point out the squaring pattern of trinomials composed of binomial squares.

VOCABULARY

1. binomial
2. binomial squares
3. coefficient
4. factoring
5. FOIL method
6. quadratic equation
7. quadratic formula
8. reverse logic
9. roots
10. trial and error process
11. vertex

BEFORE SHOWING

1. Review the themes and plots of the Indiana Jones movies. (*Raiders of the Lost Ark*, *The Temple of Doom*, *The Last Crusade*)
   a. Using the name Indiana Jones, create other names substituting other states and words that rhyme with Jones.
   b. Explain that the video is a spoof of the Indiana Jones movies.
2. Discuss the importance of learning algebra and how it can be applied to real-life situations.
3. Discuss trial and error. List situations where trial and error played a role. (fixing a computer problem, looking for a job, learning a new language)
4. Review the zero product property.

DURING SHOWING

1. View the video more than once, with one showing uninterrupted.
2. Pause at the sections containing the following statements and discuss their meanings:
   a. "Arkansas will not foil me this time!"
   b. "Close, but no cigar."
   c. "Factor and roots are intimately linked like love and marriage, Mork and Mindy, Brick and Brack, and dancing."
3. Pause at the section explaining the tip for deciding the signs inside the factors. Write several examples on the board and determine which signs will be inside the factors for each.
4. Pause at the section explaining how to solve for the roots once the equation is factored. Which property allows each factor to be set to zero?
5. Pause at the section explaining the rule about factors and links. Discuss several examples.
6. Pause at the section on binomial squares. Practice several more examples to see the squaring pattern.

AFTER SHOWING

► Discussion Items and Questions

1. What is factoring?
2. What is meant by trial and error in regards to factoring?
3. What will the signs inside the factors be when the c coefficient of the equation is positive? When the c coefficient of the equation is negative?
4. Once the equation is factored, how are the roots found?
5. How can the roots be determined if the equation can not be factored?
6. How is it possible for a quadratic equation to have only one root?
7. When there is only one root to an equation, where is the vertex located on the graph of the equation?
8. What pattern do quadratic equations made up of binomial squares have?

► Applications and Activities

1. Complete a worksheet that summarizes the content of the video. (See Instructional Graphic.)
2. Design a worksheet consisting of factoring exercises:
   a. Match quadratic equations with roots.
   b. List quadratic equations with roots in multiple-choice format.

c. Draw rectangles with their areas written in quadratic equation format. Find the length and width of each rectangle.
3. Use algebra tiles to model the factoring of simple quadratic equations.
4. Use a spinner to select numerical values for a, b, and c in the quadratic equation $ax^2 + bx + c$ for ten equations. Determine which can be factored and which cannot.
5. Divide into two teams. Set up a factoring competition. Have one person from each team go to the blackboard to factor a given equation. The team that completes the factoring in the least amount of time wins.

RELATED RESOURCES

- Algebra: A Piece of Cake! Part One #9544
- Algebra: A Piece of Cake! Part Two #9545
- Algebra: The Basics #9750
- Algebra: Functions #9745
- Algebra: Linear Equations #9746
- Algebra: Polynomials #9747
- Algebra: Quadratic Equations #9748
- Algebra: The Quadratic Formula #9751

World Wide Web

The following Web sites complement the contents of this guide; they were selected by professionals who have experience in teaching deaf and hard of hearing students. Every effort was made to select accurate, educationally relevant, and "kid safe" sites. However, teachers should preview them before use. The U.S. Department of Education, the National Association of the Deaf, and the Captioned Media Program do not endorse the sites and are not responsible for their content.

- **MATH FORUM**

http://www.mathforum.com/

Contains links to math resources by subject and a question/answer section by Dr. Math. Topics covered in the video are included.

- **SOLVING QUADRATIC EQUATIONS**

http://www.mathgoodies.com/calculators/quadratic_equations.htm

Contains a quadratic solver where values for coefficients are typed into the box and the roots then appear.
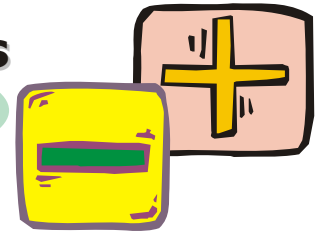
INSTRUCTIONAL GRAPHICS

- FACTORING/QUADRATIC ROOTS

Factoring/Quadratic Roots

$$ax^2 + bx + c = 0$$

$$(x + 3)(x - 4)$$

PRODUCTS AND SUMS

Find the pairs of numbers whose products and sums are listed. An example is given:

Numbers	Products	Sum
Ex. 8,3	24	11
	18	9
	-12	1
	-48	-13
	72	22
	-40	6

FACTORING QUADRATIC TRINOMIALS

Factor the following trinomials if possible:

1. $a^2 + a - 30$

2. $x^2 + 4x - 45$

3. $x^2 + 11x + 24$

4. $x^2 - 14x + 40$

5. $z^2 - 5z - 24$

6. $t^2 - 2t + 35$

7. $2x^2 - 5x - 12$

8. $2x^2 + x - 21$

9. $3c^2 - 3c - 5$

10. $4n^2 - 4n - 35$

SOLVING QUADRATIC EQUATIONS

Factor the equation; then find the roots:

1. $n^2 - 2n - 8 = 0$

2. $x^2 - x - 56 = 0$

3. $x^2 - 36 = 5x$

4. $2a^2 + 18a + 28 = 0$

5. $2p^2 - 9p - 56 = 0$

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