

Factoring

Reporting Category Expressions and Operations

Topic Factoring polynomials

Primary SOL A.2c The student will perform operations on polynomials, including factoring completely first- and second-degree binomials and trinomials in one or two variables.

Related SOL A.2a, A.2b

Materials

- Algebra tiles
- Teacher Resource for Factoring Polynomials (attached)
- Factoring Polynomials Using Algebra Tiles activity sheet (attached)
- Graphing calculators
- Scissors
- Squares Factoring Puzzle (attached)

Vocabulary

greatest common factor, dimension, prime, factor, factoring, rectangular area, perimeter, denominator, horizontal axis, vertical axis, quadrant (earlier grades)

trinomial, binomial (A.2)

Student/Teacher Actions (what students and teachers should be doing to facilitate learning)

1. Demonstrate how to factor using algebra tiles and the attached Teacher Resource for Factoring Polynomials. Show and explain that factoring is the inverse of multiplication.
2. Distribute Algebra tiles and copies of the Factoring Polynomials Using Algebra Tiles activity sheet. Encourage students to model each expression with the tiles, factor with the tiles, draw the factored expression, and write the factors mathematically.
3. Discuss the Fundamental Theorem of Algebra with students. Show students the graphs of a wide variety of polynomial functions, and have them discuss the possible number of zeros.
4. Allow students to graph polynomial functions and identify the zeros, using the functions of the graphing calculator.
5. Teachers should distribute copies of the cut out Squares Factoring Puzzle, and have students complete it individually or in small groups.

Assessment

- **Questions**
 - Give an example of a binomial that does not factor using algebra tiles? What is it called and explain why it cannot be factored with algebra tiles?
 - Give an example of a trinomial that does factor using algebra tiles? What is it called and explain why it cannot be factored with algebra tiles?

- **Journal/Writing Prompts**

- Explain why multiplying and factoring are inverse procedures.

- **Other**

- A triangular sign has a base that is 2 feet less than twice its height. A local zoning ordinance restricts the surface area of street signs to be no more than 20 square feet.
 - Write an inequality involving the height that represents the largest triangular sign allowed. (Answer: $h^2 - h - 20 \leq 0$)
 - Find the length of the base and height in feet of the largest triangular sign that meets the zoning ordinance. (Answer: base = 8 ft. and height = 5 ft.)

Extensions and Connections (for all students)

- Have students work in pairs or groups to create quizzes on factoring.
- Have groups of students create game activities to help them learn factoring.
- Have students use a pair-checked activity.

Strategies for Differentiation

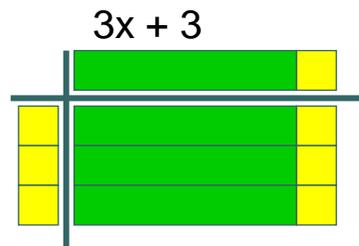
- Color-code the steps in simplifying an expression.
- Reduce the 4 x 4 grid of the Squares Factoring Puzzle to a smaller grid, according to the needs of students.

Teacher Resource for Factoring Polynomials

● ● ● | Factoring Polynomials

- Algebra tiles can be used to factor polynomials. Use tiles and the frame to represent the problem.
- Use the tiles to fill in the array so as to form a rectangle inside the frame.
- Be prepared to use zero pairs to fill in the array.
- Draw a picture.

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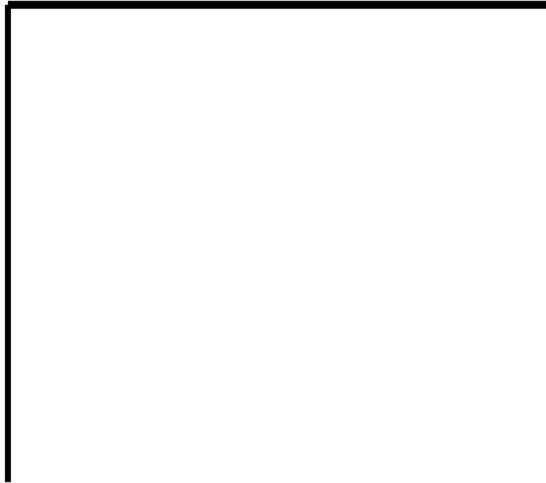
- Factors: $3(x + 1)$

Factoring Polynomials Using Algebra Tiles

Name _____ Date _____

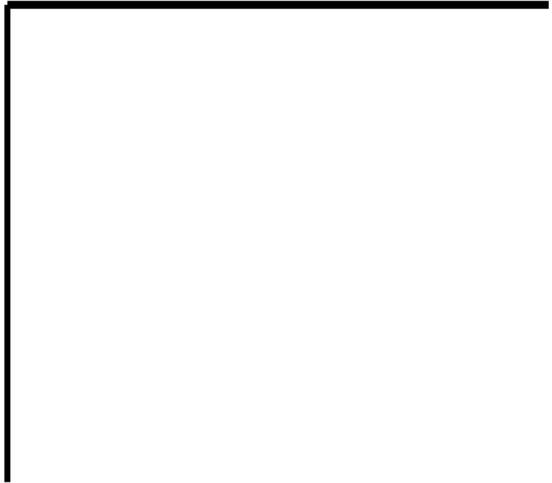
Use algebra tiles to factor each binomial. Draw a picture of your result. Write your answer in the space provided.

1. $3x + 9$



Answer: _____

2. $4x - 10$



Answer: _____

3. $3x^2 + 4x$



Answer: _____

4. $10 - 5x$



Answer: _____

5. $3 - 9x$



Answer: _____

6. $x^2 - 5x$



Answer: _____

7. $2x^2 + 6x$



Answer: _____

8. $x^2 + 5x$



Answer: _____

Squares Factoring Puzzle

Directions

- Below is the solution to the puzzle.
- Copy and cut the squares apart on the dotted lines.
- Students should match each polynomial to its factors by placing them adjacent to each other.
- Have students complete it individually or in small groups. They should get the 4 x 4 square below.

	$(x-2)(x+2)$		$(4x-1)^2$		$(6x+1)(x-2)$		$(x+1)(x-1)$	
$(4-x)^2$		$x^2-4x-12$	$(9-x)(2+x)$		$(4-x)(4+x)$	$6x^2+13x+6$	$(3+x)(2+x)$	$x^2-14x+24$
	x^2+6x+9			$x^2-10x+24$		$25x^2-16$		$6x^2+41x+30$
	$(x+3)^2$		$(x-4)(x-6)$		$(5x-4)(5x+4)$		$(x+6)(6x+5)$	
$(6-x)(2-x)$		$x^2+3x-18$	$(9+x)(3-x)$		$(8+x)(2-x)$	$9x^2+12x+4$	$(2+x)^2$	$x^2+7x-18$
	$4x^2-25$		x^2-9		$16x^2-1$		$x^2-7x+12$	
	$(2x+5)(2x-5)$		$(x+3)(x-3)$		$(4x-1)(4x+1)$		$(x-4)(x-3)$	
$(5+x)(2-x)$		$(x^2-6x-16)$	$(8-x)(2+x)$		$(5-x)(3+x)$	$4x^2+x-5$	$(4x+5)(x-1)$	$6x^2-x-2$
	x^2+4x+3		$7x^2-19x+10$		$9x^2-4$		$x^2-8x+16$	
	$(x+3)(x+1)$		$(7x-5)(x-2)$		$(3x-2)(3x+2)$		$(x-4)^2$	
$(1+x)(2)(5-x)$		$4x^2+20x+25$	$(5+x)^2$		$(1+x)(1-x)$	x^2-x-12	$(4-x)(3+x)$	x^2+16
	$25x^2+20x+4$		x^2+9		$x^2+3x-10$		x^2-15	