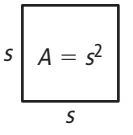
Name _____ Class _____ Date _____

8-7 Reteaching

Factoring Special Cases

The area of a square is given by $A = s^2$, where s is a side length. When the side length is a binomial, the area can be written as a perfect-square trinomial. If you are given the area of such a square, you can use factoring to write an expression for a side length.



Problem

A mosaic is made of small square tiles called tesserae. Suppose the area of one tessera is $9x^2 + 12x + 4$. What is the length of one side of a tessera?

Because the tile is a square, you know the side lengths must be equal. Therefore, the binomial factors of the trinomial must be equal.

$9x^2 + 12x + 4 = (\square\square\square)^2$	This is a perfect square trinomial and can be factored as the square of a binomial.
$9x^2 = (3x)^2$	$9x^2$ and 4 are perfect squares. Write them as squares.
$4 = 2^2$	
$2(3x)(2) = 12x$	Check that $12x$ is twice the product of the first and last terms. It is, so you are sure that you have a perfect-square trinomial.
$9x^2 + 12x + 4 = (3x + 2)^2$	Rewrite the equation as the square of a binomial.

Multiply to check your answer.

$(3x + 2)(3x + 2) = 9x^2 + 6x + 6x + 4 = 9x^2 + 12x + 4$✓

The length of one side of the square is $3x + 2$.

Exercises

Factor each expression to find the side length.

1. The area of a square oil painting is $4x^2 + 28x + 49$. What is the length of one side of the painting?

   $2x + 7$

2. You are installing linoleum squares in your kitchen. The area of each linoleum square is $16x^2 - 24x + 9$. What is the length of one side of a linoleum square?

   $4x - 3$

3. You are building a table with a circular top. The area of the tabletop is $(25x^2 - 40x + 16)\pi$. What is the radius of the tabletop?

   $5x - 4$

4. A fabric designer is making a checked pattern. Each square in the pattern has an area of $x^2 - 16x + 64$. What is the length of one side of a check?

   $x - 8$

Name _____ Class _____ Date _____

8-7 Reteaching (continued)

Factoring Special Cases

Some binomials are a difference of two squares. To factor these expressions, write the factors so the x-terms cancel and you are left with two perfect squares.

Problem

What is the factored form of $4x^2 - 9$?

$4x^2 - 9 = (\square + \square)(\square - \square)$ — Both $4x^2$ and 9 are perfect squares. You know the signs of the factors will be opposite, so the x-terms will cancel out.

$\sqrt{4x^2} = 2x$ — Find the square root of each term.

$\sqrt{9} = 3$

$(2x + 3)(2x - 3)$ — Write each term as a binomial with opposite signs, so the x-terms will cancel out.

Multiply to check your answer.

$$(2x + 3)(2x - 3) = 4x^2 + 6x - 6x - 9$$
$$= 4x^2 - 9\checkmark$$

The factored form of $4x^2 - 9$ is $(2x + 3)(2x - 3)$.

Exercises

Factor each expression.

5. $9x^2 - 4$
(3x + 2)(3x − 2)

6. $25x^2 - 49$
(5x + 7)(5x − 7)

7. $144x^2 - 1$
(12x + 1)(12x − 1)

8. $64x^2 - 25$
(8x + 5)(8x − 5)

9. $49x^2 - 16$
(7x + 4)(7x − 4)

10. $36x^2 - 49$
(6x + 7)(6x − 7)

11. $81x^2 - 16$
(9x + 4)(9x − 4)

12. $16x^2 - 121$
(4x + 11)(4x − 11)

13. $25x^2 - 144$
(5x + 12)(5x − 12)

14. $16x^2 - 9$
(4x + 3)(4x − 3)

15. $x^2 - 81$
(x + 9)(x − 9)

16. $4x^2 - 49$
(2x + 7)(2x − 7)