

Algebra 1 8.9

Factor perfect square trinomials

Solve equations involving perfect squares (square root property)

perfect square  $49$   $100$   $(x+?)^2 = (x+3)^2$

zero product property  $( ) \cdot ( ) = 0$

prime  $13$

square root property  $( )^2 = ( )^2$

Factor each polynomial.  
a.  $5x^5 - 45x$

$5x(x^4 - 9)$

$5x(x^2 - 3)(x^2 + 3)$

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

$(a - b)^2 = (a - b)(a - b)$

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What is the pattern?

$$(x+3)^2 = x^2 + 6x + 9$$

$$(x+4)^2 = x^2 + 8x + 16$$

$$(x-5)^2 = x^2 - 10x + 25$$

$$(x+8)^2 = x^2 + 16x + 64$$

$$(x-10)^2 = x^2 - 20x + 100$$

-10 -10

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$$x^2 + 10x + 25$$

$$(x+5)^2$$

1st thing something squared? What?

2nd thing something squared? What?

Middle term twice their product?

$$25x^2 + 40x + 16$$

$$16x^2 + 24x + 9$$

$$(4x+3)^2$$

$$(5x+4)^2$$

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**Example 1** Recognize and Factor Perfect Square Trinomials

Determine whether each trinomial is a perfect square trinomial. Write *yes* or *no*. If so, factor it.

a.  $4y^2 + 12y + 9$

$$(2y + 3)^2$$

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b.  $9x^2 - 6x + 4$

$$3x \quad 2 \quad \text{no}$$

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**Guided Practice**

**1A.**  $9y^2 + 24y + 16$

**1B.**  $2a^2 + 10a + 25$

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ConceptSummary Factoring Methods		
Steps	Number of Terms	Examples
<b>Step 1</b> Factor out the GCF.	any	$4x^3 + 2x^2 - 6x = 2x(2x^2 + x - 3)$
<b>Step 2</b> Check for a difference of squares or a perfect square trinomial.	2 or 3	$9x^2 - 16 = (3x + 4)(3x - 4)$ $16x^2 + 24x + 9 = (4x + 3)^2$
<b>Step 3</b> Apply the factoring patterns for $x^2 + bx + c$ or $ax^2 + bx + c$ (general trinomials), or factor by grouping.	3 or 4	$x^2 - 8x + 12 = (x - 2)(x - 6)$ $2x^2 + 13x + 6 = (2x + 1)(x + 6)$ <u><math>12y^2 + 9y + 8y + 6</math></u> $= (12y^2 + 9y) + (8y + 6)$ $= 3y(4y + 3) + 2(4y + 3)$ $= (4y + 3)(3y + 2)$

5-2-3

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**Example 2** Factor Completely

Factor each polynomial, if possible. If the polynomial cannot be factored, write *prime*.

a.  $5x^2 - 80$

$$5(x^2 - 16)$$

$$\downarrow$$

$$5(x-4)(x+4)$$

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b.  $9x^2 - 6x - 35$

$$\frac{315}{\quad}$$

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**Guided Practice**

**2A.**  $2x^2 - 32$

**2B.**  $12x^2 + 5x - 25$

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**Example 3** Solve Equations with Repeated Factors

Solve  $9x^2 - 48x = -64$ .

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**Guided Practice**

Solve each equation. Check your solutions.

**3A.**  $a^2 + 12a + 36 = 0$

**3B.**  $y^2 - \frac{4}{3}y + \frac{4}{9} = 0$ 

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$$x^2 - 16 = 0$$

$$x^2 = 16$$

$$x = \pm\sqrt{16}$$

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New (?)

**Example 4** Use the Square Root Property

Solve each equation. Check your solutions.

a.  $(y - 6)^2 = 81$

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**Guided Practice**

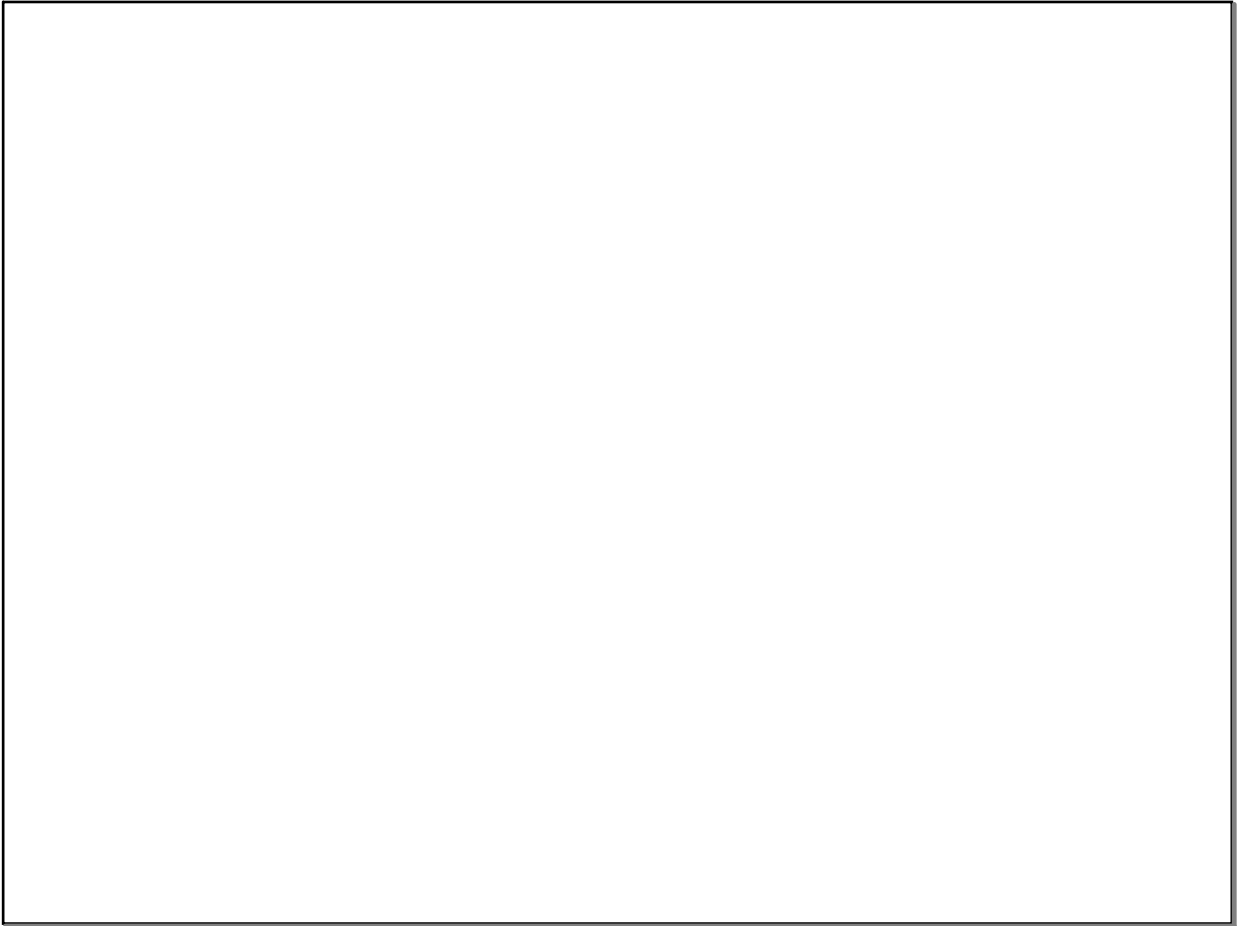
4A.  $(a - 10)^2 = 121$

4B.  $(z + 3)^2 = 26$ 

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