NAME _____ DATE _____ PERIOD _____

4-5 Study Guide and Intervention

Completing the Square

Square Root Property Use the Square Root Property to solve a quadratic equation that is in the form "perfect square trinomial = constant."

Example **Solve each equation by using the Square Root Property. Round to the nearest hundredth if necessary.**

a. $x^2 - 8x + 16 = 25$

$x^2 - 8x + 16 = 25$

$(x - 4)^2 = 25$

$x - 4 = \sqrt{25}$ or $x - 4 = -\sqrt{25}$

$x = 5 + 4 = 9$ or $x = -5 + 4 = -1$

The solution set is $\{9, -1\}$.

b. $4x^2 - 20x + 25 = 32$

$4x^2 - 20x + 25 = 32$

$(2x - 5)^2 = 32$

$2x - 5 = \sqrt{32}$ or $2x - 5 = -\sqrt{32}$

$2x - 5 = 4\sqrt{2}$ or $2x - 5 = -4\sqrt{2}$

$x = \frac{5 \pm 4\sqrt{2}}{2}$

The solution set is $\left\{\frac{5 \pm 4\sqrt{2}}{2}\right\}$.

Exercises

Solve each equation by using the Square Root Property. Round to the nearest hundredth if necessary.

1. $x^2 - 18x + 81 = 49$
{2, 16}

2. $x^2 + 20x + 100 = 64$
{−2, −18}

3. $4x^2 + 4x + 1 = 16$
$\left\{\frac{3}{2}, -\frac{5}{2}\right\}$

4. $36x^2 + 12x + 1 = 18$
$\left\{\frac{-1 \pm 3\sqrt{2}}{6}\right\}$

5. $9x^2 - 12x + 4 = 4$
$\left\{0, \frac{4}{3}\right\}$

6. $25x^2 + 40x + 16 = 28$
$\left\{\frac{-4 \pm 2\sqrt{7}}{5}\right\}$

7. $4x^2 - 28x + 49 = 64$
$\left\{\frac{15}{2}, -\frac{1}{2}\right\}$

8. $16x^2 + 24x + 9 = 81$
$\left\{\frac{3}{2}, -3\right\}$

9. $100x^2 - 60x + 9 = 121$
$-\{0.8, 1.4\}$

10. $25x^2 + 20x + 4 = 75$
$\left\{\frac{-2 \pm 5\sqrt{3}}{5}\right\}$

11. $36x^2 + 48x + 16 = 12$
$\left\{\frac{-2 \pm \sqrt{3}}{3}\right\}$

12. $25x^2 - 30x + 9 = 96$
$\left\{\frac{3 \pm 4\sqrt{6}}{5}\right\}$

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4-5 Study Guide and Intervention *(continued)*

Completing the Square

Complete the Square To complete the square for a quadratic expression of the form $x^2 + bx$, follow these steps.

1. Find $\frac{b}{2}$. → **2.** Square $\frac{b}{2}$. → **3.** Add $\left(\frac{b}{2}\right)^2$ to $x^2 + bx$.

Example 1 **Find the value of c that makes $x^2 + 22x + c$ a perfect square trinomial. Then write the trinomial as the square of a binomial.**

Step 1 $b = 22$; $\frac{b}{2} = 11$

Step 2 $11^2 = 121$

Step 3 $c = 121$

The trinomial is $x^2 + 22x + 121$, which can be written as $(x + 11)^2$.

Example 2 **Solve $2x^2 - 8x - 24 = 0$ by completing the square.**

$2x^2 - 8x - 24 = 0$	Original equation
$\frac{2x^2 - 8x - 24}{2} = \frac{0}{2}$	Divide each side by 2.
$x^2 - 4x - 12 = 0$	$x^2 - 4x - 12$ is not a perfect square.
$x^2 - 4x = 12$	Add 12 to each side.
$x^2 - 4x + 4 = 12 + 4$	Since $\left(\frac{4}{2}\right)^2 = 4$, add 4 to each side.
$(x - 2)^2 = 16$	Factor the square.
$x - 2 = \pm 4$	Square Root Property
$x = 6$ or $x = -2$	Solve each equation.

The solution set is $\{6, -2\}$.

Exercises

Find the value of c that makes each trinomial a perfect square. Then write the trinomial as a perfect square.

1. $x^2 - 10x + c$
25; $(x - 5)^2$

2. $x^2 + 60x + c$
900; $(x + 30)^2$

3. $x^2 - 3x + c$
$\frac{9}{4}$; $\left(x - \frac{3}{2}\right)^2$

4. $x^2 + 3.2x + c$
2.56; $(x + 1.6)^2$

5. $x^2 + \frac{1}{2}x + c$
$\frac{1}{16}$; $\left(x + \frac{1}{4}\right)^2$

6. $x^2 - 2.5x + c$
1.5625; $(x - 1.25)^2$

Solve each equation by completing the square.

7. $y^2 - 4y - 5 = 0$
$-1, 5$

8. $x^2 - 8x - 65 = 0$
$-5, 13$

9. $w^2 - 10w + 21 = 0$
3, 7

10. $2x^2 - 3x + 1 = 0$
$1, \frac{1}{2}$

11. $2x^2 - 13x - 7 = 0$
$-\frac{1}{2}, 7$

12. $25x^2 + 40x - 9 = 0$
$\frac{1}{5}, -\frac{9}{5}$

13. $x^2 + 4x + 1 = 0$
$-2 \pm \sqrt{3}$

14. $y^2 + 12y + 4 = 0$
$-6 \pm 4\sqrt{2}$

15. $t^2 + 3t - 8 = 0$
$\frac{-3 \pm \sqrt{41}}{2}$