# 10-3 Study Guide and Intervention *(continued)*

## *Solving Quadratic Equations by Completing the Square*

**Complete the Square** Since few quadratic expressions are perfect square trinomials, the method of **completing the square** can be used to solve some quadratic equations. Use the following steps to complete the square for a quadratic expression of the form $ax^2 + bx$.

| | |
|---|---|
| **Step 1** | Find $\frac{b}{2}$. |
| **Step 2** | Find $\left(\frac{b}{2}\right)^2$. |
| **Step 3** | Add $\left(\frac{b}{2}\right)^2$ to $ax^2 + bx$. |

**Example** **Solve $x^2 + 6x + 3 = 10$ by completing the square.**

| | |
|---|---|
| $x^2 + 6x + 3 = 10$ | Original equation |
| $x^2 + 6x + 3 - 3 = 10 - 3$ | Subtract 3 from each side. |
| $x^2 + 6x = 7$ | Simplify. |
| $x^2 + 6x + 9 = 7 + 9$ | Since $\left(\frac{6}{2}\right)^2 = 9$, add 9 to each side. |
| $(x + 3)^2 = 16$ | Factor $x^2 + 6x + 9$. |
| $x + 3 = \pm 4$ | Take the square root of each side. |
| $x = -3 \pm 4$ | Simplify. |

$x = -3 + 4$ or $x = -3 - 4$
$= 1$ $= -7$

The solution set is $\{-7, 1\}$.

**Exercises**

**Solve each equation by completing the square. Round to the nearest tenth if necessary.**

1. $t^2 - 4t + 3 = 0$
   **1, 3**
2. $y^2 + 10y = -9$
   **−1, −9**
3. $y^2 - 8y - 9 = 0$
   **−1, 9**
4. $x^2 - 6x = 16$
   **−2, 8**
5. $p^2 - 4p - 5 = 0$
   **−1, 5**
6. $x^2 - 12x = 9$
   **−0.7, 12.7**
7. $c^2 + 8c = 20$
   **−10, 2**
8. $p^2 = 2p + 1$
   **−0.4, 2.4**
9. $x^2 + 20x + 11 = -8$
   **−19, −1**
10. $x^2 - 1 = 5x$
    **−0.2, 5.2**
11. $a^2 = 22a + 23$
    **−1, 23**
12. $m^2 - 8m = -7$
    **1, 7**
13. $x^2 + 10x = 24$
    **−12, 2**
14. $a^2 - 18a = 19$
    **−1, 19**
15. $b^2 + 16b = -16$
    **−14.9, −1.1**
16. $4x^2 = 24 + 4x$
    **−2, 3**
17. $2m^2 + 4m + 2 = 8$
    **−3, 1**
18. $4k^2 = 40k + 44$
    **−1, 11**

# 10-3 Skills Practice

## *Solving Quadratic Equations by Completing the Square*

**Solve each equation by taking the square root of each side. Round to the nearest tenth if necessary.**

1. $c^2 - 12c + 36 = 4$ **4, 8**

2. $w^2 - 10w + 25 = 16$ **1, 9**

3. $b^2 + 16b + 64 = 9$ **−11, −5**

4. $y^2 + 2y + 1 = 3$ **−2.7, 0.7**

5. $r^2 + 4r + 4 = 7$ **−4.6, 0.6**

6. $a^2 - 8a + 16 = 12$ **0.5, 7.5**

**Find the value of $c$ that makes each trinomial a perfect square.**

7. $g^2 + 6g + c$ **9**

8. $y^2 + 4y + c$ **4**

9. $a^2 - 14a + c$ **49**

10. $n^2 - 2n + c$ **1**

11. $s^2 - 18s + c$ **81**

12. $p^2 + 20p + c$ **100**

**Solve each equation by completing the square. Round to the nearest tenth if necessary.**

13. $x^2 + 4x - 12 = 0$ **2, −6**

14. $v^2 - 8v + 15 = 0$ **3, 5**

15. $q^2 + 6q = 7$ **−7, 1**

16. $r^2 - 2r = 15$ **−3, 5**

17. $m^2 - 14m + 30 = 6$ **2, 12**

18. $b^2 + 12b + 21 = 10$ **−11, −1**

19. $z^2 - 4z + 1 = 0$ **0.3, 3.7**

20. $y^2 - 6y + 4 = 0$ **0.8, 5.2**

21. $r^2 - 8r + 10 = 0$ **1.6, 6.4**

22. $p^2 - 2p = 5$ **−1.4, 3.4**

23. $2a^2 + 20a = -2$ **−9.9, −0.1**

24. $0.5g^2 + 8g = -7$ **−15.1, −0.9**