

# Study Guide

Student Edition  
Pages 346–352

## Completing the Square

Quadratic equations can be solved by taking the square root of each side. First the expression that contains the variable must be the square of a binomial. If this is not already the case, then you can make it so by using a process called **completing the square**. You find half the coefficient of the linear term, square it, and add the result to each side.

**Example:** Solve  $x^2 - 6x + 4 = 0$  by completing the square.

$$x^2 - 6x + 4 = 0$$

$$x^2 - 6x = -4$$

Isolate the terms with  $x$  on the left.

$$x^2 - 6x + 9 = -4 + 9$$

Add  $\left(\frac{-6}{2}\right)^2$ , or 9, to each side.

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

Factor the left side (now a square).

$$x - 3 = \pm\sqrt{5}$$

Take the square root of each side.

$$x = 3 \pm\sqrt{5}$$

Add 3 to each side.

The solutions are  $3 + \sqrt{5}$  and  $3 - \sqrt{5}$ .

If the equation does not have 1 as the coefficient of  $x^2$ , divide each side by the coefficient of  $x^2$  to get a coefficient of 1 for  $x^2$ . Do this *before* you complete the square.

**Find the exact solution for each equation by completing the square.**

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

2.  $y^2 + 2y - 143 = 0$

3.  $x^2 + 4x + 1 = 0$

4.  $s^2 - 10s + 21 = 0$

5.  $y^2 + 12y + 4 = 0$

6.  $t^2 + 3t - 8 = 0$

7.  $2x^2 - 3x + 1 = 0$

8.  $-2x^2 + 13x + 7 = 0$