Algebra 1 9.4
Complete the square to write perfect square trinomials
Solve equations by completing the square

trinomial
perfect square trinomial
quadratic term
linear term
constant term

$$X^2 + 6x + 9$$

$$(x + 3)^2$$

Complete the square. Write in factored form.

**16.** $x^2 - 22x + c + 121$

$(x-11)^2$

**17.** $x^2 - 15x + c \dfrac{225}{4}$

$\left(x - \dfrac{15}{2}\right)^2$

$\dfrac{15}{2} \cdot \dfrac{15}{2}$

**18.** $x^2 + 24x + 144$

$(x+12)^2$

$\sqrt{x^2} = \sqrt{25}$

$x = \pm 5$

$\sqrt{x^2} = \sqrt{81}$

$x = \pm 9$

$\sqrt{(x-2)^2} = \sqrt{16} \Rightarrow x - 2 = \pm 4$

$$\underline{+2 \quad +2}$$

$x = 2 \pm 4$

$2 + 4 = 6$

$2 - 4 = -2$

$\sqrt{(x+5)^2} = \sqrt{49}$

$x + 5 = \pm 7$

$$\underline{-5 \quad -5}$$

$x = -5 \pm 7$

$-5 + 7 = 2$

$-5 + 7 = -12$

How do you solve?

$x =$

$x =$

**2.** Solve $x^2 - 12x + 3 = 8$ by completing the square.

$$-3 \quad -3$$

$$x^2 - 12x + 36 = 5 + 36$$

$$\sqrt{(x-6)^2} = \sqrt{41}$$

$$x - 6 = \pm 6.4$$
$$+6 \quad +6 \qquad 6 + 6.4 = 12.4$$
$$x = 6 \pm 6.4 = 6 - 6.4 = -0.4$$

Clear the construction zone.
What else do I need to
build a perfect square?
What has to happen
(to both sides)?
Write in factored form.
Solve.

**Example 2** Solve an Equation by Completing the Square

Solve $x^2 - 6x + 12 = 19$ by completing the square.

$$-12 \quad -12$$

$$x^2 - 6x + 9 = 7 + 9$$

$$\sqrt{(x-3)^2} = \sqrt{16}$$

$$x - 3 = \pm 4$$
$$\phantom{x}+3 \quad +3$$
$$x = 3 \pm 4 \begin{cases} 3+4 = 7 \\ 3-4 = -1 \end{cases}$$

What do I need to build a perfect square?
What has to happen (to both sides)?
Write in factored form

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

**5.** $x^2 + 4x = 6$

**6.** $x^2 - 8x = -9$

What do I need to build a
perfect square?
What has to
happen (to
both sides)?
Write in factored
form

**(19)** $x^2 + 6x - 16 = 0$

**20.** $x^2 - 2x - 14 = 0$

What do I need to build a perfect square?
What has to happen (to both sides)?
Write in factored form

**21.** $x^2 - 8x - 1 = 8$

**22.** $x^2 + 3x + 21 = 22$ ***

**23.** $x^2 - 11x + 3 = 5$

$$\frac{2}{2}x^2 - \frac{2}{2}x + \frac{7}{2} = \frac{15}{2}$$

$$x^2 - x + \frac{7}{2} = \frac{15}{2}$$
$$-\frac{7}{2} \qquad -\frac{7}{2}$$

$$\frac{1}{2} \cdot \frac{1}{2}$$

$$x^2 - 1x + \frac{1}{4} = \frac{8}{2} + \frac{1}{4}$$

$$\sqrt{\left(x - \frac{1}{2}\right)^2} = \sqrt{\frac{17}{4}}$$

$$\boxed{x - \frac{1}{2} = \pm \frac{\sqrt{17}}{2}}$$

$$\frac{16}{4} + \frac{1}{4}$$

$$\cancel{\frac{8}{2}}$$

$$x - \frac{1}{2} = \pm \frac{\sqrt{17}}{2}$$
$$+\frac{1}{2} \qquad 1 \qquad 2$$
$$x = \frac{1}{2} \pm 2.1$$

$$x = 0.5 + 2.1 = 2.6$$
$$= 0.5 - 2.1 = -1.6$$

$$\frac{3x^2}{3} + \frac{8x}{3} - \frac{15}{3} = \frac{0}{3}$$

$$x^2 + \frac{8}{3}x - 5 = 0$$

$$\phantom{x^2 + \frac{8}{3}x} + 5 \quad + 5$$

$$x^2 + \frac{8}{3}x + \frac{16}{9} = 5 + \frac{16}{9}$$

$$\frac{4}{3} \cdot \frac{4}{3}$$

$$\sqrt{\left(x + \frac{4}{3}\right)^2} = \sqrt{\frac{61}{9}}$$

$$x + \frac{4}{3} = \pm \frac{\sqrt{61}}{3}$$

$$x + \frac{4}{3} = \pm \frac{\sqrt{61}}{3}$$

$$+ \frac{-4}{3} \qquad + \frac{-4}{3}$$

$$x = \frac{-4}{3} \pm \frac{7.8}{3} -$$

$$= \frac{-4 + 7.8}{3} = 1.3$$

$$= \frac{-4 - 7.8}{3} = -3.9$$

9.4    13-290
       33,35