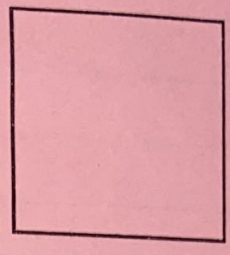


# Solve Quadratics by Completing the Square

## Completing the



WHY?

$$ax^2 + bx + c = 0$$

This method allows us to use the square root method to solve quadratics that cannot be rewritten as  $ax^2 + c = 0$

HOW?

Rearrange your equation so it looks like:

$$ax^2 + bx + \square = -c + \square$$

★ If  $a \neq 1$ , divide every term by  $a$ . 1st!

In the squares, write  $\left(\frac{b}{2}\right)^2$ . ← complete the square choose + or - based on eq.

Now, you can rewrite the left side as  $\left(x \pm \frac{b}{2}\right)^2$ . what you had before squaring

Take the square root of each side. Don't forget the  $\pm$ .

$$\sqrt{(\quad)^2} = \sqrt{\#}$$

Solve for x.

## EXAMPLE:

Solve by completing the square.

$$x^2 - 12x + 5 = 0$$

move constant to other side

$$x^2 - 12x + \boxed{36} = -5 + \boxed{36}$$

$\left(\frac{b}{2}\right)^2$

$$\left(\frac{-12}{2}\right)^2$$
$$(-6)^2$$

$$\sqrt{(x-6)^2} = \pm\sqrt{31}$$

Factor  $(\quad)^2$   
Sq. Rt. each side

$$x - 6 = \pm\sqrt{31}$$

$$x = 6 \pm \sqrt{31}$$

Solve by completing the square (CTS)

1.  $x^2 + 8x + 19 = 0$

$$x^2 + 8x + 16 = -19 + 16 \quad \left(\frac{8}{2}\right)^2 = (4)^2 = 16$$

$$\sqrt{(x+4)^2} = \pm\sqrt{-3}$$

$$x+4 = \pm i\sqrt{3}$$

$$x = -4 \pm i\sqrt{3}$$

2.  $x^2 + 6x + 8 = 0$

$$x^2 + 6x + 9 = -8 + 9 \quad \left(\frac{6}{2}\right)^2 = (3)^2 = 9$$

$$\sqrt{(x+3)^2} = \pm 1$$

$$x+3 = \pm 1$$

$$x = -3 \pm 1$$

$$x = -3 + 1 = -2$$

$$x = -3 - 1 = -4$$

3.  $3x^2 - 6x + 63 = 0$

$$\frac{3x^2}{3} - \frac{6x}{3} + \frac{63}{3} = 0$$

Divide by a 1st!

$$x^2 - 2x + 21 = 0$$

$$x^2 - 2x + 1 = -21 + 1 \quad \left(\frac{-2}{2}\right)^2 = (-1)^2 = 1$$

$$\sqrt{(x-1)^2} = \pm\sqrt{-20}$$

$$x-1 = \pm 2i\sqrt{5}$$

$$\sqrt{-20} = i\sqrt{4 \cdot 5}$$

$$x = 1 \pm 2i\sqrt{5}$$