Solve Quadratics by Completing the Square

Completing the $\boxed{}$

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:

$$ax^2+bx+\boxed{}=-c+\boxed{}$$

☆ If a ≠ 1, divide every term by a. 1st!

In the squares, write $\left(\frac{b}{2}\right)^2$. ← complete the square

Now, you can rewrite the left side as $\left(x \pm \frac{b}{2}\right)^2$. choose + or − based on eq.

what you had before squaring

Take the square root of each side. Don't forget the ±.

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

Solve for x.

EXAMPLE:

Solve by completing the square.

$$x^2-12x+\overset{c}{5}=0$$
$$-5 \quad -5$$

move constant to other side

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

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

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

$(-6)^2$

Factor $(\quad)^2$

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

Sq. Rt each side

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

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

Solve by completing the square (CTS)

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

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

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

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

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

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

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

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

$x+3=\pm 1$

$x=-3\pm 1$

$x=-3+1=-2$

$x=-3-1=-4$

3. $\frac{3x^2}{3}-\frac{6x}{3}+\frac{63}{3}=\frac{0}{3}$ Divide by a 1st!

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

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

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

$x-1=\pm 2i\sqrt{5}$ $\quad \sqrt{-20}=i\sqrt{4\cdot 5}$

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