

Factor

$$\begin{aligned}
 x^2 + 8x + 16 & \quad b=8 \\
 & \quad c=16 \\
 & = (x+4)(x+4) \\
 & = (x+4)^2
 \end{aligned}$$

$$\begin{aligned}
 b & = -10 \\
 c & = 25
 \end{aligned}$$

$$\begin{aligned}
 x^2 - 10x + 25 & \\
 & = (x-5)(x-5) \\
 & = (x-5)^2
 \end{aligned}$$

***Perfect Square Trinomials**

$$x^2 + 4x + 4$$

$$\begin{aligned}
 x^2 - 6x + 9 \\
 \boxed{(x-3)^2} \\
 \left(\frac{b}{2}\right)^2 = c
 \end{aligned}$$

$$\begin{aligned}
 x^2 - 16x + 64 \\
 (x-8)^2
 \end{aligned}$$

$$b \rightarrow c$$

Relationship between b & c ?

$$\left(x + \frac{b}{2}\right)^2 = x^2 + bx + \left(\frac{b}{2}\right)^2$$

$$\left(x - \frac{b}{2}\right)^2 = x^2 - bx + \left(\frac{b}{2}\right)^2$$

Complete the square

$$\begin{aligned}
 x^2 - 8x + \underline{16} & \leftarrow c = \text{Positive} \\
 b & = -8 & \left(\frac{-8}{2}\right)^2 \\
 c & = \left(\frac{b}{2}\right)^2 & = (-4)^2
 \end{aligned}$$

ex

Complete the square

$$x^2 - 12x + \underline{36}$$

$$x^2 + 18x + \underline{81}$$

Factor $\boxed{(x-6)^2}$

$$\boxed{(x+9)^2}$$

Solve quadratic equations by completing the square

$$x^2 + 4x + 4 = 25$$

$$\begin{array}{r} -25 \quad -25 \\ \hline x^2 + 4x - 21 = 0 \end{array}$$

$$\begin{array}{r} 4 \\ + 7 \quad -3 \\ -21 \end{array}$$

$$(x+7)(x-3) = 0$$

$$x+7=0 \text{ or } x-3=0$$

$$x = -7 \text{ or } 3$$

Solving
by
factoring

$$x^2 + 4x + 4 = 25$$

$$\sqrt{(x+2)^2} = \sqrt{25}$$

$$\begin{array}{r} x+2 = \pm 5 \\ -2 \quad -2 \end{array}$$

$$x = \pm 5 - 2 \rightarrow 5 - 2 = 3$$

$$\rightarrow -5 - 2 = -7$$

$$x = 3 \text{ or } -7$$

* When to solve w/ complete the square

$$a=1 \quad b=\text{even}$$

ex $x^2 + 6x - 3 = 0$

* Not factorable

$$ax^2 + bx + c \quad a=1 \quad b=\text{even}$$

* Separate variables & constants (c)

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

$$\begin{array}{r} +3 \quad +3 \end{array}$$

$$x^2 + 6x + 9 = 3 + 9$$

$$\left(\frac{b}{2}\right)^2 = \left(\frac{6}{2}\right)^2 = \underline{\underline{3}}^2 = 9$$

$$\sqrt{(x+3)^2} = \sqrt{12}$$

$$x+3 = \pm\sqrt{12}$$

$$x+3 = \pm 2\sqrt{3}$$

$$\begin{array}{r} -3 \quad -3 \end{array}$$

$$x = \pm 2\sqrt{3} - 3$$

$$\begin{array}{r} 12 \\ \sqrt{\quad} \\ 2 \quad 6 \\ \quad \sqrt{\quad} \\ \quad \quad 2 \quad 3 \end{array}$$