Completing the square:

Ex. $\sqrt{x^2} = \sqrt{36}$

$x = \pm 6$

Ex $\sqrt{(x-2)^2} = \sqrt{36}$

$x - 2 = \pm 6$

$x = 2 \pm 6$ → $x = 8$, $x = -4$

Ex $(x-2)^2 - 36 = 0$ → $(x-2)^2 = 36$ (see previous)

$((x-2) - 6)((x-2) + 6)$

$(x - 8)(x + 4) = 0$

$x = 8$, $x = -4$

$x^2 - 4x + 4 - 36 = 0$

$x^2 - 4x - 32 = 0$

Ex $(x-2)^2 - 35 = 0$

$\sqrt{(x-2)^2} = \sqrt{35}$

$x - 2 = \pm\sqrt{35}$

$x = 2 \pm \sqrt{35}$

b, half it, squared

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

Ex. $x^2 - 6x - 17 = 0$

$x^2 - 6x + 9 = 17 + 9 = 26$ — I put this here

$(x-3)^2$

$(x-3)^2 = 26 \Rightarrow x = 3 \pm \sqrt{26}$

Ex.

$3x^2 + 24x - 10 = 0$

complete the □ & solve ....

① $3x^2 + 24x = 10$

② $3(x^2 + 8x + (16)) = 10 + 16 \cdot 3$ $\left(\frac{b}{2}\right)^2$

$a = 1$

$b = 8$

$3(x+4)^2 = 58$

$(x+4)^2 = \frac{58}{3}$

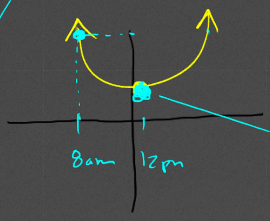
So $x + 4 = \pm\sqrt{\frac{58}{3}}$

$x = -4 \pm \sqrt{\frac{58}{3}}$

2 Main Reasons Why we're learning this

① The intermediate step reveals the vertex of the parabola.

Quadratic ↔ Parabola



vertex: (x, y)

$(x-h)^2 + k$ $\quad$ (h, k)

② The reason the quadratic formula works is b/c of completing the square.

Ex via complete the □.

$$x^2 - 12x - 100 = 0$$

$$x^2 - 12x + 36 = 100 + 36$$

$$(x-6)^2 = 136 \Rightarrow x - 6 = \pm\sqrt{136} \Rightarrow x = 6 \pm \sqrt{136}$$

$$= 6 \pm 2\sqrt{34}$$

Ex $5x^2 + 10x + 2 = 0$ (via Quadratic formula)

$$x = \frac{-10 \pm \sqrt{100 - 4 \cdot 5 \cdot 2}}{2 \cdot 5} = \frac{-10 \pm \sqrt{60}}{10} = \frac{-10 \pm 2\sqrt{15}}{10}$$

$$= \frac{-5 \pm \sqrt{15}}{5}$$

$$\frac{2(-5 \pm \sqrt{15})}{5 \cdot 2}$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Any quadratic equation:
3 possibilities

$\sqrt{-1} \neq$ real

$b^2 - 4ac$

< 0 $\quad$ > 0 $\quad$ $= 0$