Solving Quadratic Equations by Completing the Square

Perfect Square Trinomials

- **Examples**
- $x^2 + 6x + 9$
- $x^2 - 10x + 25$
- $x^2 + 12x + 36$

Creating a Perfect Square Trinomial

- In the following perfect square trinomial, the constant term is missing.
$$X^2 + 14x + \underline{\hspace{2cm}}$$

- Find the constant term by squaring half the coefficient of the linear term.

- $(14/2)^2$
$$X^2 + 14x + \textcolor{red}{49}$$

Perfect Square Trinomials

- Create perfect square trinomials.
- $x^2 + 20x +$ ___   100
- $x^2 - 4x +$ ___   4
- $x^2 + 5x +$ ___   25/4

Solving Quadratic Equations by Completing the Square

Solve the following equation by completing the square:

$$x^2 + 8x - 20 = 0$$

Step 1: Move quadratic term, and linear term to left side of the equation

$$x^2 + 8x = 20$$
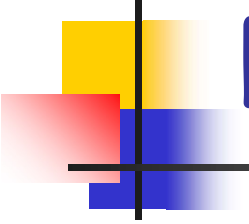
Solving Quadratic Equations by Completing the Square

Step 2: Find the term that completes the square on the left side of the equation. Add that term to both sides.

$$x^2 + 8x + \boxed{} = 20 + \boxed{}$$

$$\frac{1}{2} \cdot (8) = 4 \text{ then square it, } 4^2 = 16$$

$$x^2 + 8x + 16 = 20 + 16$$

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Step 3: Factor the perfect square trinomial on the left side of the equation. Simplify the right side of the equation.

$$x^2 + 8x + 16 = 20 + 16$$

$$(x+4)(x+4) = 36$$

$$(x+4)^2 = 36$$

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Step 4:

Take the square root of each side

$$\sqrt{(x+4)^2} = \sqrt{36}$$

$$(x+4) = \pm 6$$

Solving Quadratic Equations by Completing the Square

Step 5: Set up the two possibilities and solve

$$x = -4 \pm 6$$

$$x = -4 - 6 \text{ and } x = -4 + 6$$

$$x = -10 \text{ and } x = 2$$