

Warm-Up

Factor the following trinomials:

$$x^2 + 6x + 5$$

$$x^2 - 12x + 20$$

Completing the Square

Perfect Square Trinomial:

The two factors of the trinomial are the same.

Examples)

$$x^2 + 12x + 36$$

$$(x + 6)(x + 6)$$

$$(x + 6)^2$$

$$x^2 - 10x + 25$$

$$(x - 5)(x - 5)$$

$$(x - 5)^2$$

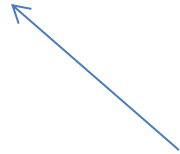
The number inside the factor is always half of b.

$$\frac{12}{2} = 6$$

$$\frac{-10}{2} = -5$$

Completing the square is used to convert from standard to vertex form.

$$y = (x + 3)^2 - 10$$



Forms a perfect square trinomial

Complete the square to convert to vertex form:

$$y = x^2 + 10x + 32 \leftarrow \text{This is not a perfect square trinomial. It would be a perfect square trinomial if we had a 25 (instead of a 32).}$$

$$y = (x^2 + 10x + \underline{25}) + 32 \quad \text{We "complete the square" by adding a 25 to the equation.}$$

$$y = (x^2 + 10x + \underline{25}) + 32 - \underline{25} \quad \text{But you cannot just add 25 to an equation because it makes it unbalanced. If we also subtract 25, then the equation will be balanced.}$$

$$y = (x + 5)(x + 5) + 7$$

$$y = (x + 5)^2 + 7$$

Factor the perfect square trinomial inside the parenthesis and combine like terms outside.

Complete the square:

$$y = x^2 - 16x + 70 \quad \longleftarrow \text{Not a perfect square but it would be if we had } (-8)^2 \text{ instead of } 70$$

$$y = (x^2 - 16x + \underline{\quad}) + 70 - \underline{\quad} \quad \text{Write two blanks: inside+, outside -}$$

$$y = (x^2 - 16x + (-8)^2) + 70 - (-8)^2 \quad \text{Fill the blanks with } \left(\frac{b}{2}\right)^2$$

$$y = (x^2 - 16x + 64) + 70 - 64 \quad \text{Square the parenthesis}$$

$$y = (x - 8)(x - 8) + 6 \quad \text{Factor and simplify}$$

$$y = (x - 8)^2 + 6$$

Complete the square:

$$y = x^2 + 22x + 111 \quad \leftarrow \text{Not a perfect square but it would be if we had } (11)^2 \text{ instead of } 111.$$

$$y = (x^2 + 22x + \underline{\quad}) + 111 - \underline{\quad} \quad \text{Write two blanks: inside+, outside -}$$

$$y = (x^2 + 22x + (11)^2) + 111 - (11)^2 \quad \text{Fill the blanks with } \left(\frac{b}{2}\right)^2$$

$$y = (x^2 + 22x + 121) + 111 - 121 \quad \text{Square the parenthesis}$$

$$y = (x + 11)(x + 11) - 10 \quad \text{Factor and simplify}$$

$$y = (x + 11)^2 - 10$$

Write the equation of the parabola in vertex form.

$$y = x^2 + 3x - 3$$

$$y = (x^2 + 3x + \underline{\quad}) - 3 - \underline{\quad}$$
 Write two blanks: inside+, outside -

$$y = (x^2 + 3x + (1.5)^2) - 3 - (1.5)^2$$
 Fill the blanks with $\left(\frac{b}{2}\right)^2$

$$y = (x^2 + 3x + (1.5)^2) - 3 - 2.25$$
 Square the 1.5

$$y = (x + 1.5)^2 - 5.25$$
 Factor and simplify