Converting Quadratic Equations between Standard and Vertex Form
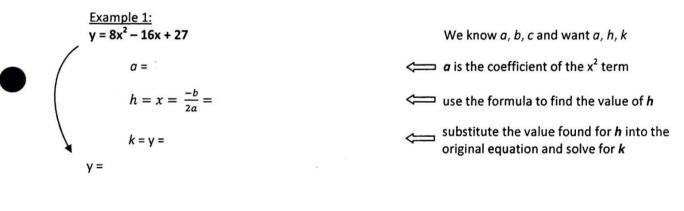
Standard Form: $y = ax^2 + bx + c$ Vertex Form: $y = a(x - h)^2 + k$

<u>Convert from Standard Form to Vertex Form:</u>

$y = ax^2 + bx = c$ $\implies$ $y = a(x - h)^2 + k$

know a, b, c   want a, h, k

$$a \quad = \quad a$$

$$x = \frac{-b}{2a} \quad = \quad h$$

Solve for y   =   k

Substitute the values and rewrite.

<u>Example 1:</u>

$y = 8x^2 - 16x + 27$ We know *a*, *b*, *c* and want *a*, *h*, *k*

$a =$ $\Longleftarrow$ *a* is the coefficient of the x^2 term

$h = x = \frac{-b}{2a} =$ $\Longleftarrow$ use the formula to find the value of *h*

$k = y =$ $\Longleftarrow$ substitute the value found for *h* into the original equation and solve for *k*

$y =$

<u>Example 2:</u>

$y = 5x^2 - 40x + 67$ We know *a*, *b*, *c* and want *a*, *h*, *k*

$a =$ $\Longleftarrow$ *a* is the coefficient of the x^2 term

$h = x = \frac{-b}{2a} =$ $\Longleftarrow$ use the formula to find the value of *h*

$k = y =$ $\Longleftarrow$ substitute the value found for *h* into the original equation and solve for *k*

$y =$

<u>Practice:</u> *Convert the following quadratics from standard to vertex form.*
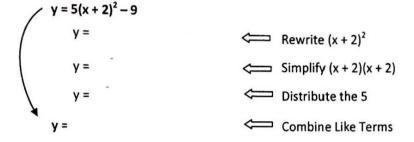
1. $y = 5x^2 - 10x + 37$ 2. $y = 7x^2 + 28x + 19$ 3. $y = -2x^2 - 24x - 75$
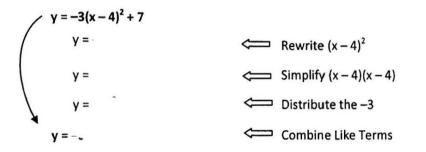
Convert from Vertex Form to Standard Form:

$$y = a(x - h)^2 + k \implies y = ax^2 + bx = c$$

Example 1:

$y = 5(x + 2)^2 - 9$

$y = $ ⇐ Rewrite $(x + 2)^2$

$y = $ ⇐ Simplify $(x + 2)(x + 2)$

$y = $ ⇐ Distribute the 5

$y = $ ⇐ Combine Like Terms

Example 2:

$y = -3(x - 4)^2 + 7$

$y = $ ⇐ Rewrite $(x - 4)^2$

$y = $ ⇐ Simplify $(x - 4)(x - 4)$

$y = $ ⇐ Distribute the −3

$y = $ ⇐ Combine Like Terms

Practice: *Convert the following quadratics from vertex to standard form.*

1. $y = (x - 2)^2 + 6$

2. $y = 3(x - 3)^2 - 12$

3. $y = -2(x + 1)^2 + 3$