

What do you remember about quadratics?

Standard Form

Vertex Form

Factored Form

Completing the Square

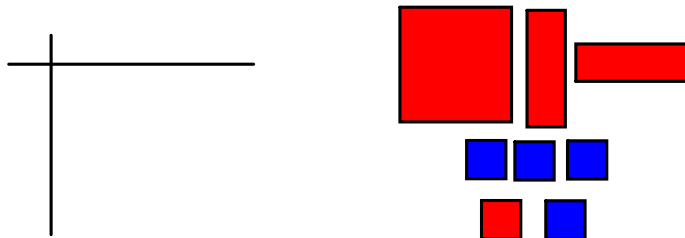
What it is:

What it is not:

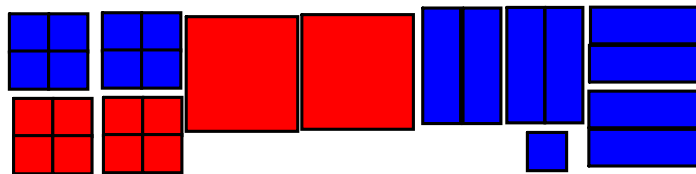
Why do we need this process?

RECALL: Completing the Square with Algetiles

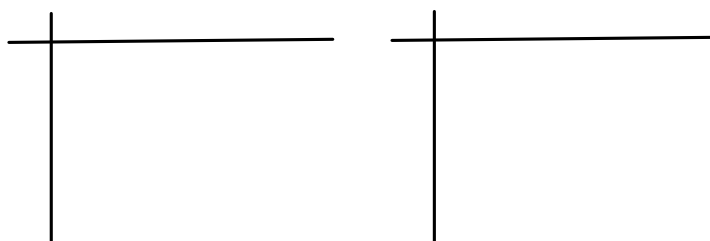
$$x^2 + 2x - 3$$



You are forcing part of the trinomial to be a perfect square which can then be factored to a binomial squared.



$$2x^2 - 8x - 1$$



$$y = ax^2 + bx + c \xrightleftharpoons[\text{expand or simplify}]{\text{complete the square}} y = a(x-h)^2 + k$$

- hard to graph
- easy to graph

- vertex unknown
- vertex & transformations known

What information can you read from vertex form? $y = a(x-h)^2 + k$

- direction of opening and stretch factor 'a'
- the vertex (h,k)
- max/min value & when it occurs

Ex. 1 Find the value of **c** that makes a perfect square trinomial.

a) $x^2 + 8x + c$ b) $x^2 - 10x + c$ c) $x^2 + 3x + c$

Ex. 2 Change to vertex form by completing the square.

a) $y = x^2 - 12x + 8$

Process

- ⇒ **Identify the coefficient of the x term**
- ⇒ **Divide the coefficient of the x term by 2**
- ⇒ **Add and subtract the number that will make a perfect square trinomial**
- ⇒ **Remove the completed square from the brackets**
- ⇒ **Factor the perfect square and collect the remaining terms**

b) $y = 2x^2 - 12x + 23$

Ex. 3 Determine the max/min value and when it occurs.

a) $y = 3x^2 - 9x + 2$

b) $y = -4x^2 - 5x - 3$

c) $y = \frac{2}{3}x^2 + 7x - \frac{1}{2}$

Ex. 4 A football player kicks a ball off a football tee. The height of the ball, h , in metres after t seconds, can be modelled using the formula: $h = -5t^2 + 20t$. What is the maximum height of the ball?

Ex. 5 Rachel is selling scarves at a craft show. Each scarf costs \$6 to make. She wants to sell, at \$10 per scarf, the same amount as last year, when they sold 40 scarves. For every 50 cent increase in the price, she expects to sell four fewer scarves. What selling price will **maximize their profit** and what will the profit be?

Understand the Problem

What was Rachel's profit last year?

$$\begin{aligned} \text{Profit} &= (\text{Selling Price} - \text{Cost})(\text{Quantity Sold}) \\ &= (\quad) (\quad) \\ &= \$ \end{aligned}$$

$\text{Profit with respect to increase} = (\text{Profit Price})(\# \text{ Sold})$
