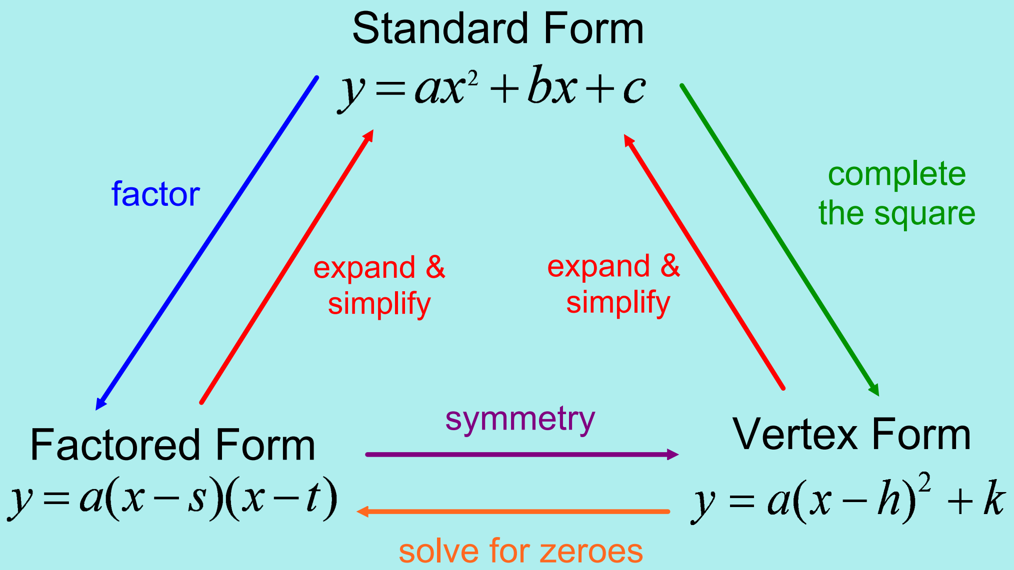
Recall:



Unit 3: Quadratic Functions

Oct

<u>Review: Changing Forms of Quadratic Relations</u>

(1) Standard Form to Factored Form

- common factors
- factor simple trinomials
- factor complex trinomials (decomposition, MAN)
- factor special patterns
  - perfect squares
  - difference of squares

(2) Factored or Vertex Form to Standard Form

- expand and simplify

(3) Factored Form to Vertex Form:

The zeroes of the quadratic relation can be obtained directly from factored form. The axis of symmetry will be located at the midpoint of these zeroes.

The equation of the axis of symmetry (AofS) is x = h, where 'h' is the x-coordinate of the vertex. Substituting this value into the equation will yield the y-coordinate of the vertex.

Ex. Convert to vertex form using symmetry: $y = 4(5-x)(x+3)$

① zeroes: $5-x=0$ and $x+3=0$

$5=x$ $\quad$ $x=-3$

$(5,0)$ $\quad$ $(-3,0)$

② A of S: $x_v = \frac{5+(-3)}{2}$ midpoint of zeroes

$=1$

③ sub $x_v = 1$, $y_v = 4(5-1)(1+3)$

$= 4(4)(4)$

$= 64$

$\boxed{V(1,64)}$

④ $y = a(x-h)^2+k$

$y = a(x-1)^2+64$

sub a point to find a (not vertex)

sub $(5,0)$

$0 = a(5-1)^2+64$

$-64 = a(16)$

$a=-4$

a is the coefficient of x^2

$y = 4(5-x)(x+3)$

$= -4x^2 + \_\_\_\_$

$a=-4$

$\boxed{y=-4(x-1)^2+64}$

(4) Standard Form to Vertex Form

Recall: vertex form is $y = a(x-h)^2 + k$

$(x-h)^2$ is a perfect square

Perfect Squares:

$$a^2+2ab+b^2=(a+b)^2$$
$$a^2-2ab+b^2=(a-b)^2$$

Ex. Complete the square to make a perfect square trinomial.

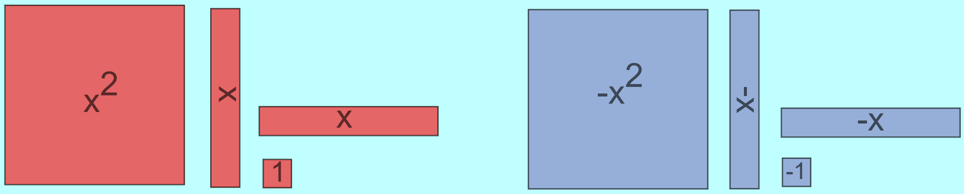
(a) $x^2 + 10x + \underline{25} = (x + 5)^2$

$(x+5)(x+5)$

$= x^2+5x+5x+25$

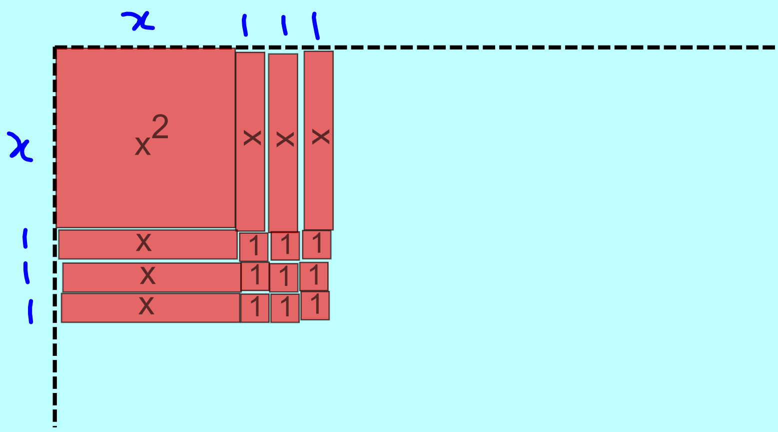
(b) $x^2 - 18x + \underline{81} = (x - 9)^2$

$-\frac{18}{2} = -9$ $\quad (-9)^2$



Identify the missing constant so that the trinomial is a perfect square trinomial, then factor it.

$x^2 + 6x + \underline{9} = (x+3)^2$



To go from standard form to vertex form, we force a perfect square into our equation.

(c) $y = x^2 + 12x - 7$

$x^2 + 12x + 36$

$= (x+6)^2$

$y = \underbrace{x^2 + 12x + 36}\, - 36 - 7$

$y = (x+6)^2 - 43$

(d) $y = x^2 - 20x + 15$

$y = (x-10)^2 - 85$

	x	-10
x	x^2	$-10x$
-10	$-10x$	100

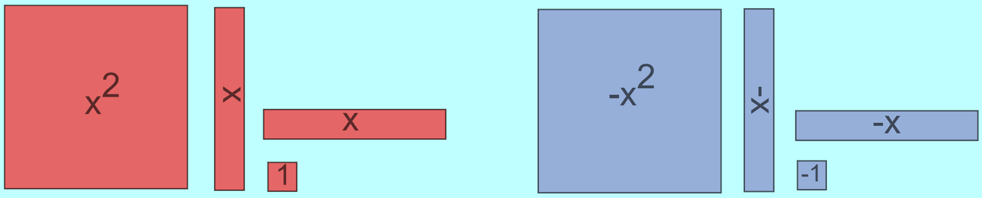
$-100 + 15$

$y = \underbrace{x^2 - 20x + 100}\, - 100 + 15$

$\frac{-20}{2} = -10$

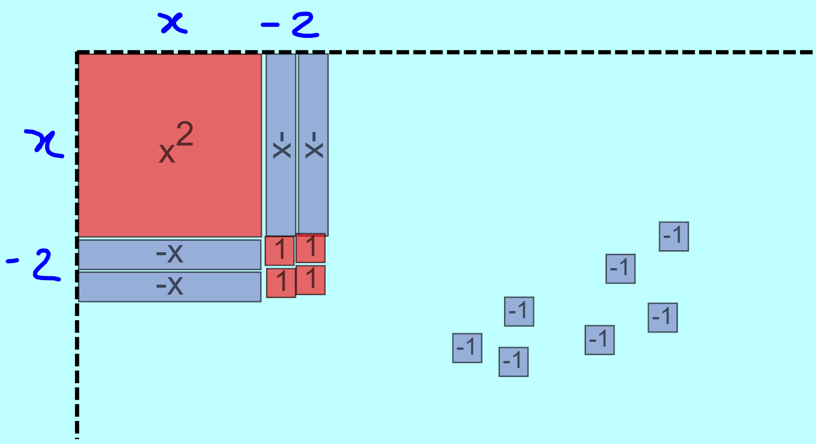
$(-10)^2 = 100$

$y = (x-10)^2 - 85$



Identify the missing constant so that the trinomial is a <u>perfect square trinomial</u>. You will have some tiles "left over".

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



For complex trinomials, where a≠1, factor the a value out of the variable terms (x^2 and x) first.

(e) $y = -x^2 + 6x + 13$

$y = -[x^2 - 6x] + 13$

$y = -[\underbrace{x^2 - 6x + 9}\ - 9] + 13$

$y = -[(x-3)^2 - 9] + 13$

$y = -(x-3)^2 + 9 + 13$

$y = -(x-3)^2 + 22$

$x^2 - 6x$

$= x^2 - 6x + 9 - 9$

(f) $y = 3x^2 + 12x + 11$

$y = 3[x^2 + 4x] + 11$

$y = 3[\underbrace{x^2 + 4x + 4}\ - 4] + 11$

$y = 3[(x+2)^2 - 4] + 11$

$y = 3(x+2)^2 - 12 + 11$

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

Assigned Work:

worksheet

- vertex form using symmetry
- creating perfect square trinomials
- vertex form by completing the square on simple quadratics
- vertex form by completing the square on complex quadratics