

## How do we find the y-intercept?

We know the y-intercept is ... *the value of y when x = 0*

**Let's find it using ...**

Expanded Form:  $y = x^2 + 7x + 10$

$$y = (0)^2 + 7(0) + 10 \quad (0, 10)$$

$$y = 10$$

Factored Form:  $y = (x + 2)(x + 5)$

$$y = (0 + 2)(0 + 5) \quad (0, 10)$$

$$y = (2)(5)$$

$$y = 10$$

## How do we find the x-intercept(s)?

We know the x-intercept is ... *the value of x when  $y = 0$ .*

Let's find them using ...

Expanded Form:  $y = x^2 + 7x + 10$

$$0 = x^2 + 7x + 10$$

*Whaaat?!*



Factored Form:  $y = (x + 2)(x + 5)$

$$0 = (x+2)(x+5)$$



*(What do we know about factors of 0?)*

## Zero Product Property

If  $a \cdot b = 0$  ... we know either  $a=0$ ,  
 $b=0$ , or both  $a$  &  $b=0$ .

Let's try this with ...

Expanded Form:  $y = x^2 + 7x + 10$

$$0 = x^2 + 7x + 10$$

Doesn't help here.

Factored Form:  $y = (x + 2)(x + 5)$

$$0 = (x+2)(x+5)$$

$$(-2, 0)$$

$$(-5, 0)$$

$$\begin{array}{r} x+2=0 \\ -2 \quad -2 \\ \hline x=-2 \end{array}$$

$$\begin{array}{r} x+5=0 \\ -5 \quad -5 \\ \hline x=-5 \end{array}$$

Best form for finding x-intercepts?

**FACTORED!**

## How do we find the Line of Symmetry?

We know ... the line of symmetry (LOS)  
is halfway between the x-intercepts.

How can we use what we know to calculate this?

Let's find the average of our x-intercepts.

$$LOS = \frac{-2 + -5}{2} = \frac{-7}{2} = -3.5$$

$$x = -3.5$$

~~~~~  
LOS is a line!

## How do we find the vertex?

We know the vertex is ... *on the line of symmetry.*

Let's find it using ...

$$(LOS: x = -3.5)$$

Expanded Form:  $y = x^2 + 7x + 10$

$$y = (-3.5)^2 + 7(-3.5) + 10$$

$$y = \cancel{-26.75}$$

$$= -2.25$$

Factored Form:  $y = (x + 2)(x + 5)$

$$y = (-3.5 + 2)(-3.5 + 5)$$

$$= (-1.5)(1.5)$$

$$= -2.25$$

Vertex

$$(-3.5, -2.25)$$

It is easier to use the factored form.

## How does the value of 'a' affect the parabola?

Use Desmos to graph the following:

$$y = x^2$$

$$y = -x^2$$

$$y = 3x^2$$

$$y = -3x^2$$

$$y = 0.5x^2$$

$$y = -0.5x^2$$

What about the parabola does 'a' control?

Opens  
up/down:

$$a > 0$$

opens up

$$a < 0$$

opens down

Width  
of parabola:

$|a|$  is large  $\rightarrow$  Narrower

$|a|$  is small  $\rightarrow$  wider

What information can we get about a parabola from the different forms of the equation?

Expanded Form:  $y = ax^2 + bx + c$

up/down      width      y-int

Factored Form:  $y = (x + d)(x + e)$

product  $d \cdot e = y\text{-int}$

with Zero Product,  
can find x-ints.