

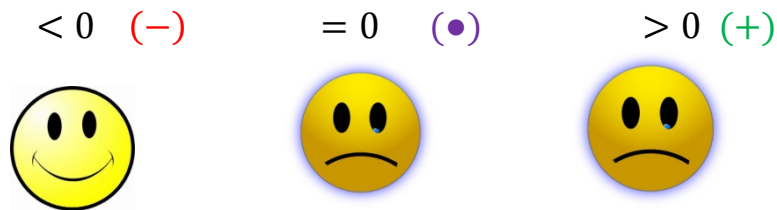
We will use **sign graphs** to help us solve polynomial inequalities.

**Example 1:** Solve  $(x + 5)(x - 2) < 0$

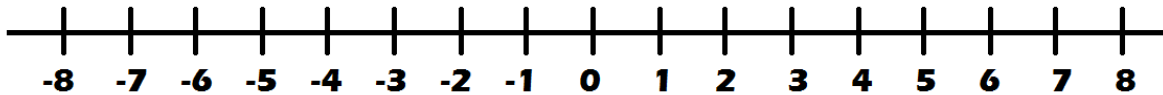
Step 1 - Get all non-zero terms on the left side and 0 on the right side.  
Already done!

Step 2 - Factor the left side completely.  
Also already done!

Step 3 - Are we looking for  $< 0$  ,  $= 0$  , and/or  $> 0$  ?

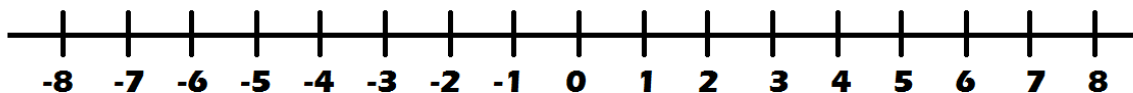
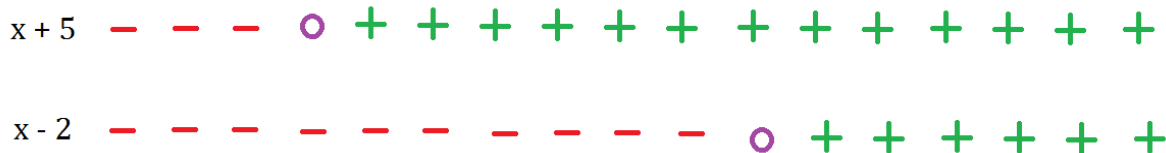


Step 4 - Create a sign graph



For each factor...

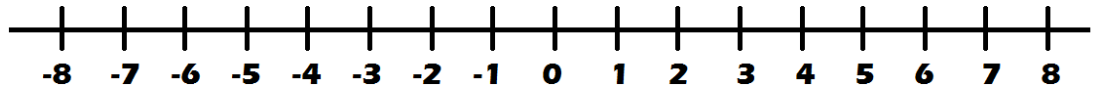
- A) Find where it equals 0 and put a  $\circ$  or  $\bullet$  on the graph above main number line
- B) Put  $-$  symbols to the left and  $+$  symbols to the right



C) Multiply signs vertically for final answer to sign graph - put below main number line

$x + 5$     -   -   -   ○   +   +   +   +   +   +   +   +   +   +   +   +   +

$x - 2$     -   -   -   -   -   -   -   -   -   -   ○   +   +   +   +   +   +   +



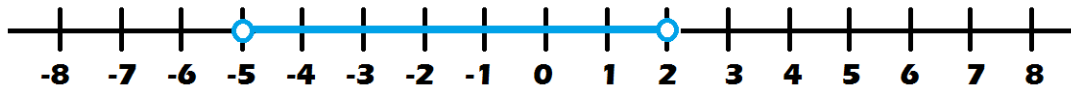
Multiply signs vertically

+   +   +   ○   -   -   -   -   -   -   ○   +   +   +   +   +   +   +

Step 5 - Look back at Step 3 and transfer what we need ( 😊 ) to the main number line.

$x + 5$     -   -   -   ○   +   +   +   +   +   +   +   +   +   +   +   +

$x - 2$     -   -   -   -   -   -   -   -   -   -   ○   +   +   +   +   +   +   +



Multiply signs vertically

+   +   +   ○   -   -   -   -   -   -   ○   +   +   +   +   +   +   +

Step 6 - Write final answer based on graph of main number line.

$-5 < x < 2$

**Example 2:** Solve  $y^3 - 16y \geq 0$

Step 1 - Get all non-zero terms on the left side and 0 on the right side.  
Already done!

Step 2 - Factor the left side completely.

$$\begin{aligned}y^3 - 16y &\geq 0 \\y(y^2 - 16) &\geq 0 \\y(y + 4)(y - 4) &\geq 0\end{aligned}$$

Step 3 - Are we looking for  $< 0$ ,  $= 0$ , and/or  $> 0$ ?

$< 0$  (-)



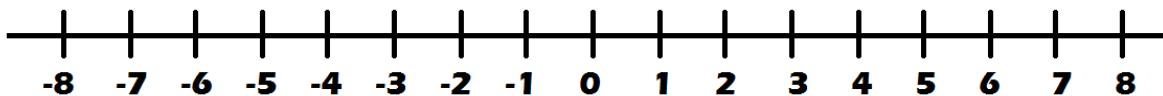
$= 0$  (•)



$> 0$  (+)



Step 4 - Create a sign graph



For each factor...

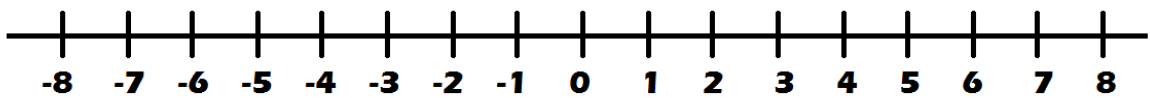
A) Find where it equals 0 and put a  $\circ$  or  $\bullet$  on the graph above main number line

B) Put  $-$  symbols to the left and  $+$  symbols to the right

$y$        $-$   $-$   $-$   $-$   $-$   $-$   $-$   $-$   $\bullet$   $+$   $+$   $+$   $+$   $+$   $+$   $+$   $+$   $+$

$y + 4$      $-$   $-$   $-$   $-$   $\bullet$   $+$   $+$   $+$   $+$   $+$   $+$   $+$   $+$   $+$   $+$   $+$   $+$   $+$

$y - 4$      $-$   $-$   $-$   $-$   $-$   $-$   $-$   $-$   $-$   $-$   $-$   $-$   $\bullet$   $+$   $+$   $+$   $+$

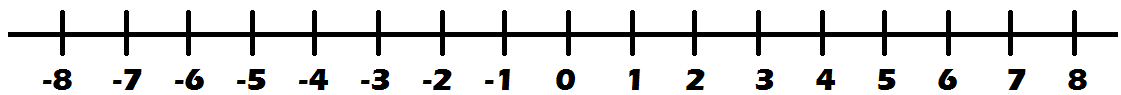


C) Multiply signs vertically for final answer to sign graph - put below main number line

$y$        $-$   $-$   $-$   $-$   $-$   $-$   $-$   $-$   $\bullet$   $+$   $+$   $+$   $+$   $+$   $+$   $+$   $+$   $+$

$y + 4$      $-$   $-$   $-$   $-$   $\bullet$   $+$   $+$   $+$   $+$   $+$   $+$   $+$   $+$   $+$   $+$   $+$   $+$   $+$

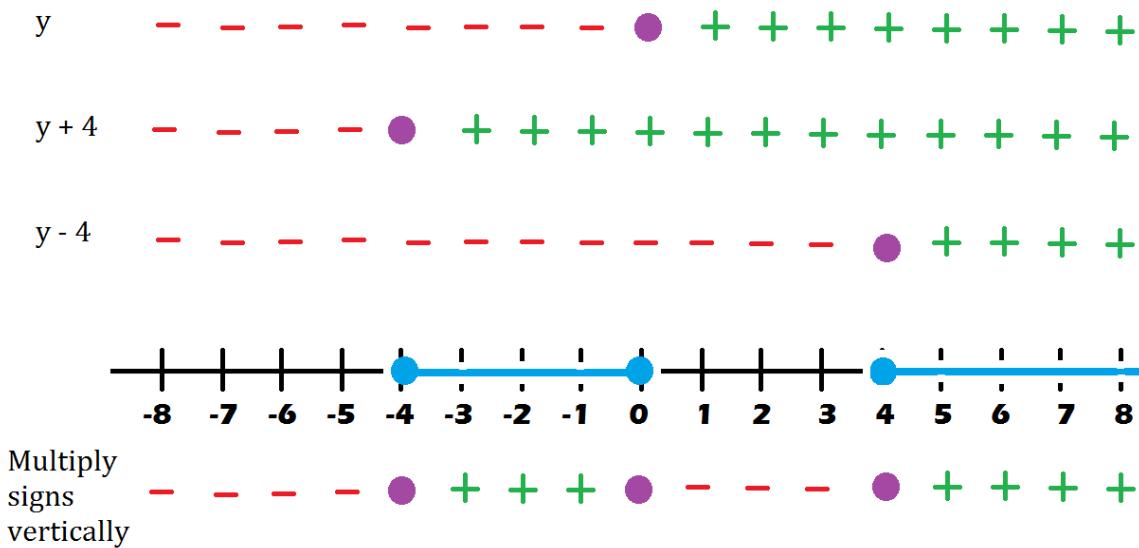
$y - 4$      $-$   $-$   $-$   $-$   $-$   $-$   $-$   $-$   $-$   $-$   $-$   $-$   $\bullet$   $+$   $+$   $+$   $+$



Multiply signs vertically

$-$   $-$   $-$   $-$   $\bullet$   $+$   $+$   $+$   $\bullet$   $-$   $-$   $-$   $\bullet$   $+$   $+$   $+$   $+$

Step 5 - Look back at Step 3 and transfer what we need ( 😊 ) to the main number line.



Step 6 - Write final answer based on graph of main number line.

$$-4 \leq y \leq 0 \text{ or } y \geq 4$$