

Name: \_\_\_\_\_

Date: \_\_\_\_\_

<b>Learning Goal 9.1</b>	Solving linear inequalities.
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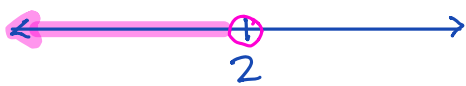

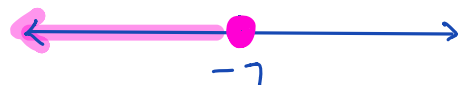
Whether solving an equation or an inequality, the steps are the same

$\xrightarrow{\text{expression - simplifying}}$   
**BEDMAS**  
 $\xleftarrow{\text{equation/inequality - solving}}$

Presentation of the solution will be different.

Every solution will include a number line.

**Example** Solve the following.

Equations	Inequalities
$h + 3 = 5$ $\quad -3 \quad -3$ $h = 2$	$h + 3 < 5$ $\quad -3 \quad -3$ $h < 2$ <p style="text-align: right; color: purple;">TP. <math>h = 0</math></p> 
$6.2 = x - 4.5$ $\quad +4.5 \quad +4.5$ $10.7 = x$ $x = 10.7$	$6.2 \leq x - 4.5$ $\quad +4.5 \quad +4.5$ $10.7 \leq x$ $x \geq 10.7$ <p style="text-align: right; color: purple;">TP <math>x = 0</math>  <del><math>6.2 \leq 0 - 4.5</math></del>  <del><math>6.2 \leq -4.5</math></del></p> 
$2a - 5 = 2 + 3a$ $\quad -2a \quad -2a$ $\quad -5 = 2 + a$ $\quad -2 \quad -2$ $\quad -7 = a$ $a = -7$	$2a - 5 \geq 2 + 3a$ $\quad -2a \quad -2a$ $\quad -5 \geq 2 + a$ $\quad -2 \quad -2$ $\quad -7 \geq a$ $a \leq -7$ <p style="text-align: right; color: purple;">TP. <math>a = 0</math>  <del><math>0 - 5 \geq 2 + 0</math></del>  <del><math>-5 \geq 2</math></del></p> 

Things get a little tricky when we move into multiplication and division.

$$12 > 6$$

$$-36 = 12 \times (-3) < 6 \times (-3) = -18$$

$$-24 = 12 \times (-2) < 6 \times (-2) = -12$$

$$-12 = 12 \times (-1) < 6 \times (-1) = -6$$

$$12 = 12 \times (1) > 6 \times (1) = 6$$

$$24 = 12 \times (2) > 6 \times (2) = 12$$

$$36 = 12 \times (3) > 6 \times (3) = 18$$

$$12 > 6$$

$$-4 = 12 \div (-3) < 6 \div (-3) = -2$$

$$-6 = 12 \div (-2) < 6 \div (-2) = -3$$

$$-12 = 12 \div (-1) < 6 \div (-1) = -6$$

$$12 = 12 \div (1) > 6 \div (1) = 6$$

$$6 = 12 \div (2) > 6 \div (2) = 3$$

$$4 = 12 \div (3) > 6 \div (3) = 2$$

When you multiply by a -ve #, the inequality flips direction

Same for division.

**Example** Solve each inequality. Graph the solution, and use a test point to verify your answer.

a.  $3a + 2 \geq 8$

TP  $a=0$   
 ~~$0+2 \geq 8$~~   
 ~~$2 \geq 8$~~

$$\begin{array}{r} -2 \quad -2 \\ 3a \geq 6 \\ \hline 3 \quad 3 \\ a \geq 2 \end{array}$$

b.  $\frac{b}{2} - 6 < 1$

TP  $b=0$   
 $0-6 < 1$   
 $-6 < 1$  ✓

$$\begin{array}{r} +6 \quad +6 \\ 2 \times \frac{b}{2} < 7 \times 2 \\ b < 14 \end{array}$$

c.  $5(q-7) < -15$

TP  $q=0$   
 $5(0-7) < -15$   
 $-35 < -15$  ✓

$$\begin{array}{r} q-7 < -3 \\ +7 \quad +7 \\ q < 4 \end{array}$$

d.  $-\frac{6}{g} \geq -2, (g \neq 0)$

TP:  $g=1$   
 $\frac{6}{1} \geq -2$   
 $6 \geq -2$  ✓

$$\begin{array}{r} b \leq \frac{2g}{2} \\ 3 \leq g \\ g \geq 3 \end{array}$$

e.  $\frac{5p}{12} - \frac{5}{4} < \frac{p}{3}$

TP  $p=0$   
 $0 - \frac{5}{4} < 0$   
 $-\frac{5}{4} < 0$  ✓

LCM(3, 4, 12) = 12

$$\begin{array}{r} 5p - 15 < 4p \\ -4p \quad -4p \\ p - 15 < 0 \\ +15 \quad +15 \\ p < 15 \end{array}$$