

**Lesson 2-8 to 2-10 Notes**  
**Inequalities and Their Graphs**

inequality	A mathematical sentence that contains $>$ , $<$ , $\geq$ , $\leq$ , or $\neq$ .	Examples: $5 > 1$ $100 \geq 99$	$-3 < 0$ $x \geq 10$
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How do you read these?

$y > 3$   $y$  is greater than three

$x \leq -2$   $x$  is less than or equal to  $-2$

$y < 6$   $y$  is less than  $6$

$-6 \geq g$  ← This can be re-written as  $g \leq -6$  →  $-6 \geq g$  ← "read it backward"

$g$  is less than or equal to  $-6$

Write an inequality for each situation.

$x$  is less than 5  $x < 5$

The total  $t$  is greater than 7  $t > 7$

$y$  is greater than  $-3$   $y > -3$

A number  $c$  is at least 12  $c \geq 12$

$r$  is not greater than 5  $r \leq 5$

A number  $n$  is positive  $n > 0$

Everyone on the soccer team is under 8 years old. Let  $x$  be the age of a person on the team.  $x < 8$

The speed limit is 45 mph. Let  $s$  be the speed of a car driving within the limit.  $s \leq 45$

You have \$6.50 to spend on lunch. Let  $c$  be the cost of your lunch.  $c \leq 6.50$

**Graphing Inequalities on a Number Line**

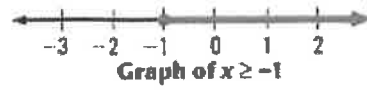
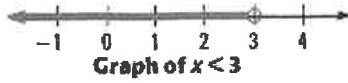


A solid circle is used to represent  $\leq$  and  $\geq$

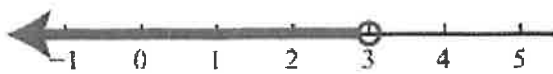


An open circle is used to represent  $<$  or  $>$

Examples:



Write the inequality represented by the graphs below.



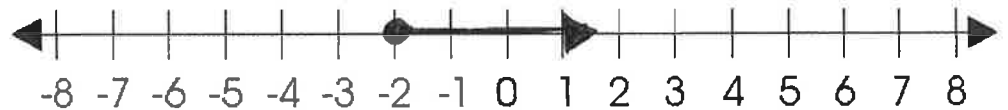
$x < 3$



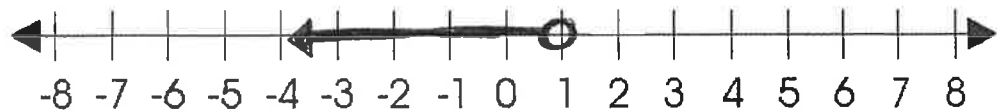
$x \geq 6$

Graph the inequalities.

$a \geq -2$



$m < 1$

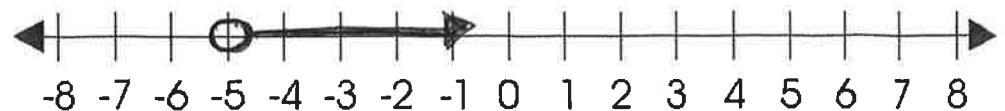


$4 \leq p$

$p \geq 4$



$x > -5$



## Solving One-Step Inequalities with ADDITION and SUBTRACTION

Solve each inequality and graph the solution.

$$\begin{array}{r} n + 8 \geq 19 \\ -8 \quad -8 \end{array}$$

$$\boxed{n \geq 8}$$



Inequalities that involve  
ADDITION or  
SUBTRACTING can be  
solved as you would a  
regular equation.

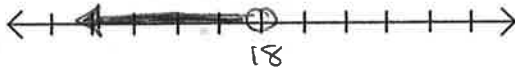
$$\begin{array}{r} -26 > y + 14 \\ -14 \quad -14 \\ \hline -40 > y \end{array}$$

$$\boxed{y < -40}$$



$$\begin{array}{r} n - 15 < 3 \\ +15 \quad +15 \end{array}$$

$$\boxed{n < 18}$$



$$\begin{array}{r} v - 4 \leq 7 \\ +4 \quad +4 \end{array}$$

$$\boxed{v \leq 11}$$



$$\begin{array}{r} 2 > 9 + a \\ -9 \quad -9 \end{array}$$

$$-7 > a$$

$$\boxed{a < -7}$$



Are the solutions to these inequalities the same?

$$\begin{array}{r} x + 5 \leq -2 \\ -5 \quad -5 \\ \hline x \leq -7 \end{array}$$



$$\begin{array}{r} -2 \leq x + 5 \\ -5 \quad -5 \\ \hline -7 \leq x \\ x \geq -7 \end{array}$$



Solving One-Step Inequalities with MULTIPLICATION and DIVISION

If you  $\times$  or  $\div$  by a **positive number**, solve as you would a regular equation.

**STOP!**

If you  $\times$  or  $\div$  by a **negative number**, you must **flip the sign!**

Examples:

$\times$  or  $\div$  by a **positive** number

$$\begin{array}{l} 4x > 40 \\ \cancel{4} \quad \cancel{4} \\ \boxed{x > 10} \end{array}$$

$$\begin{array}{l} \cancel{x} \cdot \frac{y}{2} \leq -15 \quad \times 2 \\ \boxed{y \leq -30} \end{array}$$

$\times$  or  $\div$  by a **negative** number

$$\begin{array}{l} -4x > 40 \\ \cancel{-4} \quad \cancel{-4} \\ \boxed{x < -10} \\ \leftarrow \text{flip the sign} \end{array}$$

$$\begin{array}{l} \cancel{x} \cdot \frac{y}{-2} \leq -15 \quad \times -2 \\ \boxed{y \geq 30} \\ \leftarrow \text{flip the sign} \end{array}$$

Solve each inequality and graph the solution.

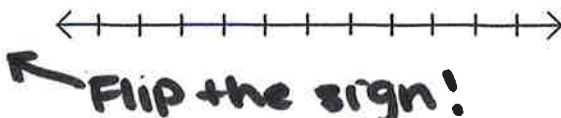
$$\begin{array}{l} 21 > 3m \\ \cancel{3} \quad \cancel{3} \\ 7 > m \\ \boxed{m < 7} \end{array}$$



$$\begin{array}{l} 4x \geq -8 \\ \cancel{4} \quad \cancel{4} \\ \boxed{x \geq -2} \end{array}$$



$$\begin{array}{l} \cancel{x} \cdot \frac{y}{-5} > 7 \quad \times -5 \\ \boxed{y < -35} \end{array}$$



$$\frac{-6n \leq 24}{-6 \quad -6}$$

$$n \geq -4$$



$$5x < 25$$

$$\frac{5x < 25}{5 \quad 5}$$

$$x < 5$$



$$x \cdot \frac{p}{5} < -3 \quad \times 5$$

$$p < -15$$



Are the solutions to these inequalities the same?

$$\frac{-18 \geq -2y}{-2 \quad -2} \quad 9 \leq y \quad y \geq 9$$



$$\frac{-2y < -18}{-2 \quad -2}$$

$$y > 9$$



No!

CHALLENGE: Solve the inequality.

$$\frac{t}{-4} + 3 \leq 5$$

$$\frac{t}{-4} \leq 2$$

$$t \geq -8$$

$$\frac{-2x + 3 < 7}{-3 \quad -3}$$

$$\frac{-2x < 4}{-2 \quad -2}$$

$$x > -2$$

$$\frac{4 - 3y > 13}{-4 \quad -4}$$

$$\frac{-3y > 9}{-3 \quad -3}$$

$$y < -3$$

