Section 9.2

Solving Single Step Inequalities

Learning Targets:

1. Apply strategies for solving equations to solving inequalities.

2. Recognizing and understanding when the inequality symbol needs to be changed.

How to solve an inequality:

Just like when solving an equation, our goal is to **isolate the variable**. To do that, we perform the same sorts of "undoing" steps that we did with equations.

For the inequalities in this section, there is only **one step** needed to isolate the variable.

The solution to a linear inequality is not a single number like we get when solving an equation. Instead, the solution is a **simpler inequality representing a range of values**.

The solution to a linear inequality is often represented **graphically on a number line**.

Examples:

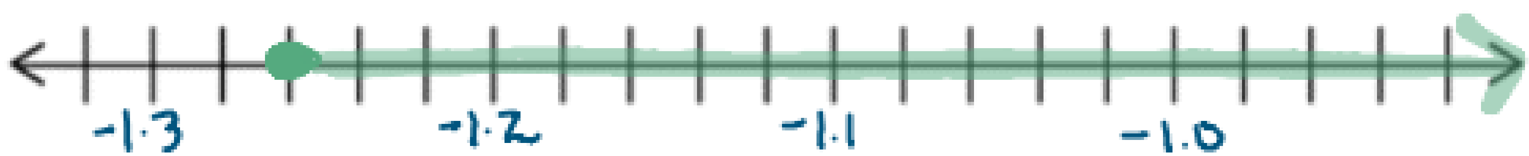
Solve the following inequalities and represent their solutions on a number line.

$$\frac{\cancel{1.2}x}{\cancel{1.2}} < \frac{-3.96}{1.2}$$

$$x < -3.3$$

$$\cancel{0.28}\left(\frac{r}{\cancel{0.28}}\right) \geq \left(-4.5\right)^{0.28}$$

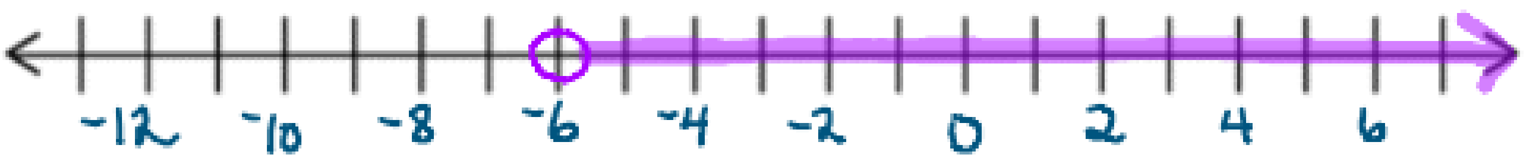
$$r \geq -1.26$$



$$x + \cancel{12} > 6$$

$$\quad \cancel{-12} \qquad -12$$

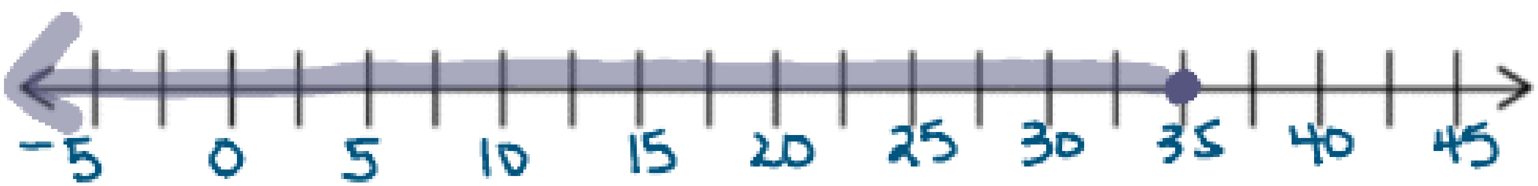
$$x > -6$$



$$y \cancel{- 10} \le 25$$

$$\cancel{+10} \qquad +10$$

$$y \le 35$$



So, before you start thinking that solving linear inequality is ***exactly*** the same as solving a linear equation, we need to add one small change.

Consider this:

$9 > 3$ is a true statement

If we multiply both sides of this by **"2"** we get:

$9(2) > 3(2)$ or

$18 > 6$ which is ***still true***

But if we multiply both sides of this by **"-2"** we get:

$9(-2) > 3(-2)$ or

$-18 > -6$ which is ***no longer true***!

In order to keep the statement true, we need to switch the symbol from ">" to "<":

$-18 < -6$

Now consider this:

$9 > 3$ is a true statement

If we ***divide*** both sides of this by **"3"** we get:

$9/(3) > 3/(3)$ or

$3 > 1$ which is ***still true***

But if we ***divide*** both sides of this by **"-3"** we get:

$9/(-3) > 3/(-3)$ or

$-3 > -1$ which is ***no longer true***!

In order to keep the statement true, we need to switch the symbol from ">" to "<":

$-3 < -1$

Important Conclusion:

When solving a linear inequality, you may do any of the following without having to change the inequality symbol:

- add the same value to both sides of an inequality
- subtract the same value from both sides of an inequality
- multiply both sides of an inequality by a positive number
- divide both sides of an inequality by a positive number

But anytime you multiply or divide by a negative number, you must switch the inequality symbol.

Examples:

Solve the following inequalities and represent their solutions on a number line.

$$\frac{\cancel{-8}x}{-8} \le \frac{-24}{-8}$$

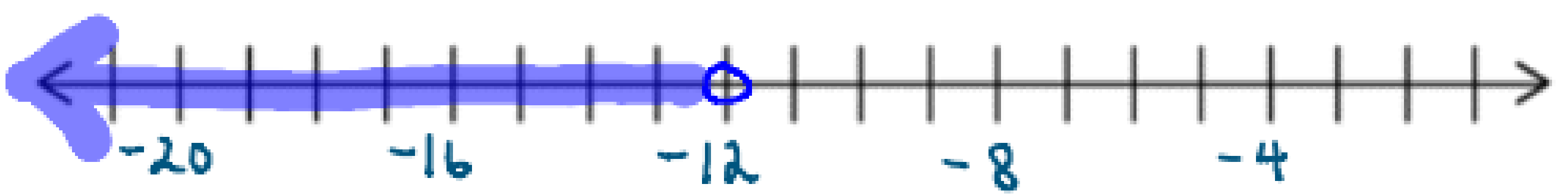
flip

$$x \ge 3$$

$$\cancel{-2}\left(\frac{x}{\cancel{-2}}\right) > (6)\,{-2}$$

flip

$$x < -12$$



$$x - \cancel{1.6} \le -5.6$$

$$\cancel{+1.6} \qquad +1.6$$

no flip

$$x \le -4$$

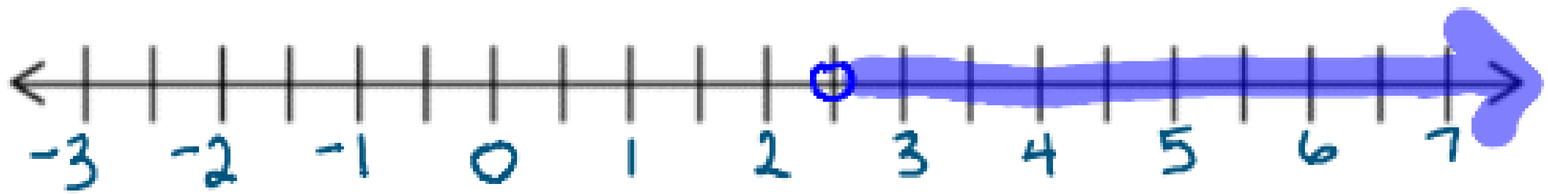
$$\frac{-10}{-4} > \frac{-\cancel{4}x}{\cancel{-4}}$$

flip

$$\frac{5}{2} < x$$

(2.5)

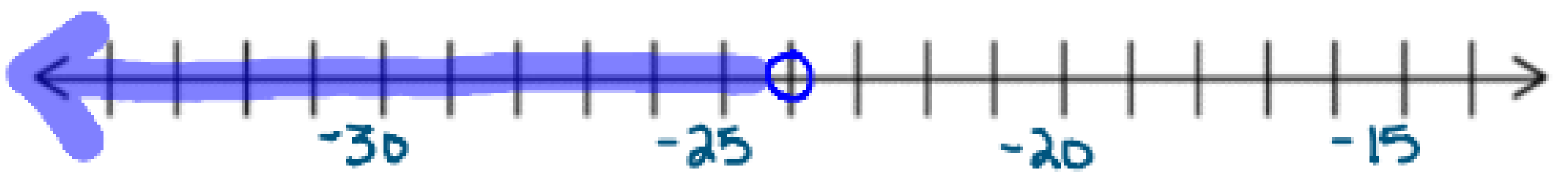
Same as $x > \frac{5}{2}$



$$\cancel{-8}\left(\frac{x}{\cancel{-8}}\right) > (3)(-8)$$

flip

$$x < -24$$



You try:

Solve each inequality.

a) $-2x < 8$

b) $x - 3 \geq 2$

c) $-5 > \frac{x}{3}$

You try:

Solve each inequality.

a) $\frac{\cancel{-}2x}{\cancel{-}2} < \frac{8}{-2}$

$x > -4$

flip sign.

b) $x \cancel{-3} \geq 2$

$\quad \cancel{+3} \quad\quad +3$

$x \geq 5$

no flip

c) $3(-5) > \left(\frac{x}{\cancel{3}}\right)\cancel{3}$

$-15 > x$

no flip

Check your understanding:

Pg. 356-359 #5, 6, 7

Handout *(solve and graph)*:

One-Step Inequalities: #1 - 24