

Section 3-3: Solving Inequalities Using Multiplication or Division

(As we've seen) Solving an inequality is a lot like solving an equation...

Example 1:

$$\frac{x}{3} = -2$$

3 ·

$$x = -6$$

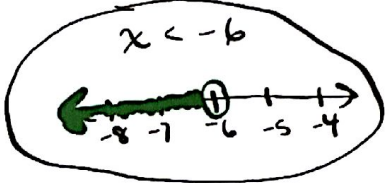
$x = -6$

$$\frac{x}{3} < -2$$

3 ·

$$x < -6$$

$x < -6$



A number line is shown with tick marks at -8, -7, -6, -5, and -4. A solid circle is drawn at -6, and a green arrow points to the left from this circle, indicating the solution set $x < -6$.

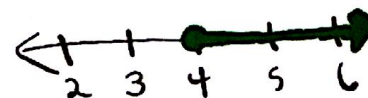
Example 2:

$$\frac{4x}{4} = \frac{16}{4}$$
$$x = 4$$

$x = 4$

$$\frac{4x}{4} \geq \frac{16}{4}$$
$$x \geq 4$$

$x \geq 4$



A number line is shown with tick marks at 2, 3, 4, 5, and 6. A solid circle is drawn at 4, and a green arrow points to the right from this circle, indicating the solution set $x \geq 4$.

Example 3:

$$5 < 10$$

↓ ↓
·(-2) ·(-2)

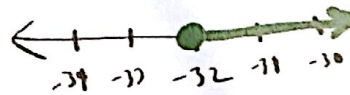
$$-10 > -20$$



$$-\frac{x}{4} \leq 8$$

$$(-4)\left(-\frac{x}{4}\right) \leq (8)(-4)$$

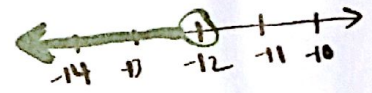
$$x \geq -32$$



$$-9x > 108$$

$$\frac{-9x}{-9} > \frac{108}{-9}$$

$$x < -12$$



You are allowed to multiply or divide any number on BOTH SIDES of an inequality...

BUT

...if you multiply or divide by a negative number, you have to reverse the inequality symbol!

Example 4:

a. $\frac{x}{5} \geq -2$

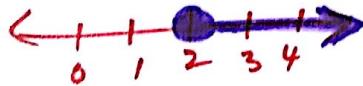
$$5 \cdot \frac{x}{5} \geq -2 \cdot 5$$

$$x \geq -10$$



b. $\frac{3m}{3} \geq \frac{6}{3}$

$$m \geq 2$$



c. $\frac{-5h}{-5} < \frac{65}{-5}$

$$h > -13$$



d. $-\frac{v}{2} \geq 1.5$

$$-2 \cdot \left(-\frac{v}{2}\right) \geq 1.5 \cdot (-2) \quad \left(\frac{3}{7}\right) \frac{7}{3} x \geq -7 \left(\frac{3}{7}\right)$$

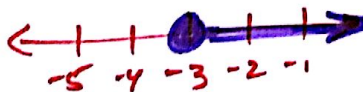
$$v \leq -3$$



e. $-7 \leq \frac{7}{3}x$

$$\left(\frac{3}{7}\right) \frac{7}{3} x \geq -7 \left(\frac{3}{7}\right)$$

$$x \geq -3$$



f. $63 \geq 7q$

$$\frac{7q}{7} \leq \frac{63}{7}$$

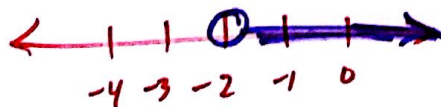
$$q \leq 9$$



g. $-\frac{3}{4} < \frac{3}{8}m$

$$\left(\frac{8}{3}\right) \frac{3}{8} m > -\frac{3}{4} \left(\frac{8}{3}\right)$$

$$m > -2$$



h. $-30 > -5c$

$$\frac{-5c}{-5} < \frac{-30}{-5}$$

$$c > 6$$

