

Solving Inequalities using Addition and Subtraction

2.2

Equivalent Inequalities are inequalities that have the same solutions.

Addition Property of Inequality:

Adding the same number to each side of an inequality produces an equivalent inequality.

$$\begin{array}{r} -3 < 2 \\ +4 \quad +4 \\ \hline 1 < 6 \end{array}$$

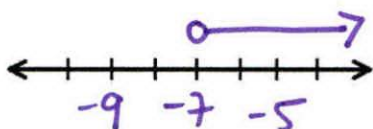
$$\begin{array}{r} -3 \geq -10 \\ +3 \quad +3 \\ \hline 0 \geq -7 \end{array}$$

If $a > b$, then $a + c > b + c$. If $a \geq b$, then $a + c \geq b + c$.
If $a < b$, then $a + c < b + c$. If $a \leq b$, then $a + c \leq b + c$.

Example 1: Solve each inequality then graph the solution.

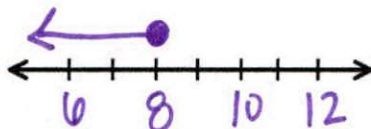
a. $b - 2 > -9$

$$\begin{array}{r} +2 \quad +2 \\ \hline \boxed{b > -7} \end{array}$$



b. $m - 3 \leq 5$

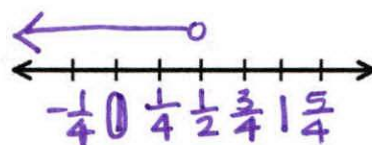
$$\begin{array}{r} +3 \quad +3 \\ \hline \boxed{m \leq 8} \end{array}$$



c. $\frac{1}{4} > y - \frac{1}{4}$

$$\begin{array}{r} +\frac{1}{4} \quad +\frac{1}{4} \\ \hline \frac{1}{2} > y \end{array}$$

$\frac{1}{4} + \frac{1}{4} = \frac{2}{4}$
simplifies to $\frac{1}{2}$
Rewrite with the inequality pointing at y
 $\boxed{y < \frac{1}{2}}$



Subtraction Property of Inequality:

Subtracting the same number to each side of an inequality produces an equivalent inequality.

$$\begin{array}{r} -3 \leq 1 \\ -5 \quad -5 \\ \hline -8 \leq -4 \end{array}$$

$$\begin{array}{r} 7 > -20 \\ -7 \quad -7 \\ \hline 0 > -27 \end{array}$$

If $a > b$, then $a - c > b - c$. If $a \geq b$, then $a - c \geq b - c$.
If $a < b$, then $a - c < b - c$. If $a \leq b$, then $a - c \leq b - c$.



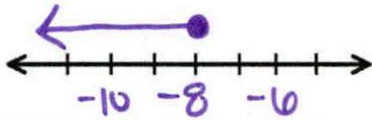
$$\frac{5}{6} - \frac{1}{6} = \frac{4}{6}$$

Example 2: Solve each inequality then graph the solution.

simplifies to $\frac{2}{3}$

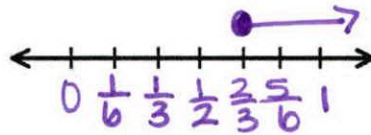
a. $k + 5 \leq -3$

$$\begin{array}{r} -5 \quad -5 \\ \hline k \leq -8 \end{array}$$



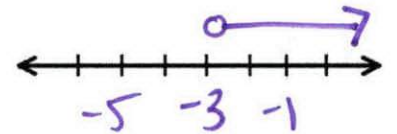
b. $\frac{5}{6} \leq z + \frac{1}{6}$

$$\begin{array}{r} -\frac{1}{6} \quad -\frac{1}{6} \\ \hline \frac{2}{3} \leq z \end{array}$$



c. $p + 0.7 > -2.3$

$$\begin{array}{r} -0.7 \quad -0.7 \\ \hline p > -3 \end{array}$$



Solving Real-Life Problems

Example 3: A circuit overloads at 1800 watts of electricity. You plug a microwave oven that uses 1100 watts of electricity into the circuit.

- a. Write and solve an inequality that represents how many watts you can add to the circuit without overloading the circuit.

microwave + appliance < 1800

$$\begin{array}{r} 1100 + a < 1800 \\ -1100 \quad \quad -1100 \\ \hline a < 700 \end{array}$$

- b. In addition to the microwave oven, which of the following appliances can you plug into the circuit at the same time without overloading the circuit?

$$1100 + 50 + 300 = 1450$$

Appliance	Watts
Clock Radio	50
Blender	300
Hot plate	1200
Toaster	800

- c. If you replace the microwave oven with one that uses 1000 watts of electricity, does this allow you to have both the microwave oven and the toaster plugged into the circuit at the same time? Explain.

$1000 + 800 = 1800$ which is not less than 1800 so **NO**

