

Solving Linear Inequalities

Addition Property of Inequality

When you add the same number to each side of an inequality, the inequality remains true.

Multiplication and Division Properties of Inequality (Case 1)

When you multiply or divide each side of an inequality by the same *positive* number, the inequality remains true.

To solve an inequality, isolate the variable.

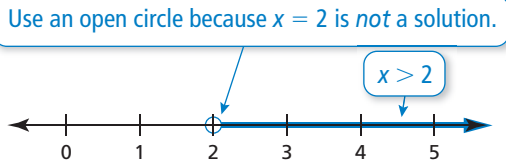
Example 1 Solve each inequality. Graph the solution.

a. $x + 1 > 3$

$$\begin{array}{r} -1 \quad -1 \\ \hline x + 1 > 3 \\ \hline x > 2 \end{array}$$

Subtract 1 from each side.
Simplify.

▶ The solution is $x > 2$.



Subtraction Property of Inequality

When you subtract the same number from each side of an inequality, the inequality remains true.

Multiplication and Division Properties of Inequality (Case 2)

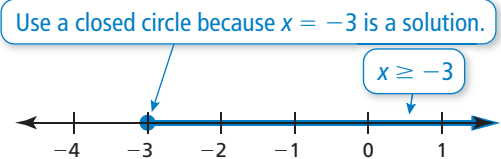
When you multiply or divide each side of an inequality by the same *negative* number, the direction of the inequality symbol must be reversed for the inequality to remain true.

b. $-3x \leq 9$

$$\begin{array}{r} -3x \leq 9 \\ \hline -3x \geq -9 \\ \hline x \geq -3 \end{array}$$

Divide each side by -3 .
Reverse the inequality symbol.
Simplify.

▶ The solution is $x \geq -3$.

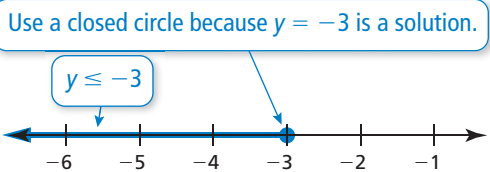


c. $-25 \geq 9y + 2$

$$\begin{array}{r} -2 \quad -2 \\ \hline -25 \geq 9y + 2 \\ \hline -27 \geq 9y \\ \hline -27 \geq 9y \\ \hline -3 \geq y \end{array}$$

Subtract 2 from each side.
Simplify.
Divide each side by 9.
Simplify.

▶ The solution is $y \leq -3$.

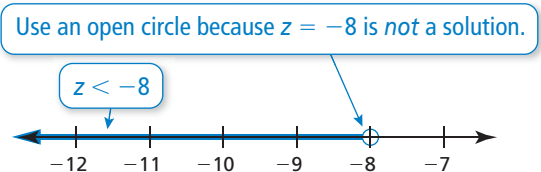


d. $-\frac{z}{2} + 6 > 10$

$$\begin{array}{r} -6 \quad -6 \\ \hline -\frac{z}{2} + 6 > 10 \\ \hline -\frac{z}{2} > 4 \\ \hline -\frac{z}{2} \cdot (-2) < 4 \cdot (-2) \\ \hline z < -8 \end{array}$$

Subtract 6 from each side.
Simplify.
Multiply each side by -2 .
Reverse the inequality symbol.
Simplify.

▶ The solution is $z < -8$.



Practice

Solve the inequality. Graph the solution.

1. $x + 2 > 7$

2. $y - 5 \leq -8$

3. $\frac{t}{-3} > -1$

4. $\frac{2s}{5} \leq 6$

5. $-2q + 1 \geq 15$

6. $3z - 4 < -1$

Check your answers at BigIdeasMath.com.