

Solving Addition and Subtraction Inequalities

(Pages 509–513)

Addition and Subtraction Properties for Inequalities

For all numbers a , b , and c , the following are true.

- If $a > b$, then $a + c > b + c$ and $a - c > b - c$. (Also true for \geq)
- If $a < b$, then $a + c < b + c$ and $a - c < b - c$. (Also true for \leq)

The solutions of an inequality can be graphed on a number line or written using **set-builder notation**.

EXAMPLE

Solve $3m - 7 > 4m + 1$. Check your solution, and graph it on a number line.

$$\begin{aligned} 3m - 7 &> 4m + 1 \\ 3m - 7 - 3m &> 4m + 1 - 3m \\ -7 &> m + 1 \\ -7 - 1 &> m + 1 - 1 \\ -8 &> m \text{ or } m < -8 \end{aligned}$$

In set-builder notation, the solution set is $\{m \mid m < -8\}$, which is read "the set of all numbers m such that m is less than -8 ."

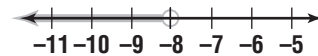
Only numbers less than -8 substituted into the original inequality should yield a true statement.

$$\begin{aligned} 3(0) - 7 &\stackrel{?}{>} 4(0) + 1 && \text{Let } m = 0. \\ -7 &> 1 && \text{false} \end{aligned}$$

$$\begin{aligned} 3(-9) - 7 &\stackrel{?}{>} 4(-9) + 1 && \text{Let } m = -9. \\ -34 &> -35 && \text{true} \end{aligned}$$

Since only the number less than -8 yields a true statement, the solution checks.

Graph the point -8 using an open circle, since -8 is not part of the solution. Then draw a heavy arrow to the left to indicate numbers less than -8 .



Try These Together

- Solve and graph $z - 16 \leq 5$.
- Solve and graph $j + \frac{1}{2} > 9$.

PRACTICE

Solve each inequality. Check your solution.

$$3. x + \frac{1}{3} < \frac{1}{6} \qquad 4. -0.8x - 0.7 < 0.3 - 1.8x \qquad 5. 5x + 7 \geq 4x + 8$$

$$6. 2h - 5 \leq h + 4 \qquad 7. u + 45 \leq -38 \qquad 8. 2x + \frac{1}{3} \leq 3x + \frac{2}{3}$$

Solve each inequality. Graph the solution.

$$9. -6 + m > 6 \qquad 10. 3y \leq 2y + 4 \qquad 11. x - 1 < -14 \qquad 12. -0.05 \leq v - (-0.05)$$

Write an inequality for each statement. Then solve.

- A number decreased by -3 is at least 10 .
- Twice a number is more than the difference of that number and 4 .



15. **Standardized Test Practice** Which number is a solution of $2x \leq x + 8$?

- A 12 B 11 C 9 D 6

Answers: 1–2. See Answer Key for graphs. 1. $\{z \mid z \leq 2\}$ 2. $\{l \mid l < 8\frac{2}{3}\}$ 3. $\{x \mid x < -\frac{6}{1}\}$ 4. $\{x \mid x < 1\}$ 5. $\{x \mid x \geq 1\}$ 6. $\{h \mid h \leq 9\}$
7. $\{u \mid u \leq -83\}$ 8. $\{x \mid x \geq -\frac{8}{3}\}$ 9–12. See Answer Key for graphs. 9. $\{m \mid m < 12\}$ 10. $\{y \mid y \leq 4\}$ 11. $\{x \mid x < -13\}$
12. $\{v \mid v \geq -0.1\}$ 13. $x - (-3) \geq 10$; $\{x \mid x \geq 7\}$ 14. $2x < x - 4$; $\{x \mid x < -4\}$ 15. D