

SOLVING LINEAR INEQUALITIES

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Solve inequalities just like how we solve equations.

*** CAUTION***: When **multiplying** or **dividing** both sides of an inequality by a **negative number**, **flip** the inequality symbol!

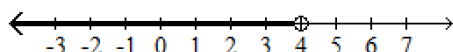
Example: Solve $8x - 5 < 6x + 3$

$$\begin{array}{r} 8x - 5 < 6x + 3 \\ -6x \quad -6x \end{array}$$

$$\begin{array}{r} 2x - 5 < 3 \\ +5 \quad +5 \end{array}$$

$$\frac{2x}{2} < \frac{8}{2}$$

$$x < 4$$



Interval notation: $(-\infty, 4)$

Set-builder notation: $\{x \mid x < 4\}$

Example: Solve $-3t + 1 \leq 19$

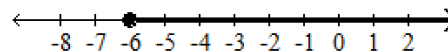
$$\begin{array}{r} -3t + 1 \leq 19 \\ -1 \quad -1 \end{array}$$

$$-3t \leq 18$$

$$\frac{-3t}{-3} \geq \frac{18}{-3}$$

Flip

$$t \geq -6$$



Interval notation: $[-6, \infty)$

Set-builder notation: $\{t \mid t \geq -6\}$

EXERCISE Solve. **Graph** and write the solution in both **interval notation** and **set-builder notation**.

(1) $4 + 5n \leq 4n - 1$

(2) $3(x - 2) - 10 < 5(x + 3) - 9$

(3) $-8x < 24$

(4) $8 - 2t \geq 9$

(5) $4x - 7 < 31$

(6) $5 - 9x \geq 19 + 5x$

(7) $12 - y < 3$

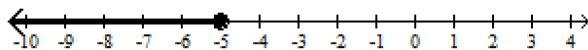
(8) $-\frac{3}{4}x \leq 6$

(9) $\frac{1}{4}x + \frac{4}{3} > \frac{2}{3}x - \frac{3}{4}$

(10) $2(7y - 3) + 6y \geq 4 + 9y - 10$

Answers

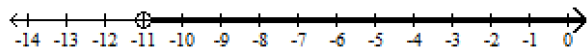
1. $n \leq -5$



Interval notation: $(-\infty, -5]$

Set-builder notation: $\{n \mid n \leq -5\}$

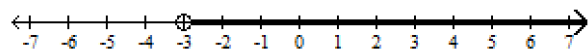
2. $x > -11$



Interval notation: $(-11, \infty)$

Set-builder notation: $\{x \mid x > -11\}$

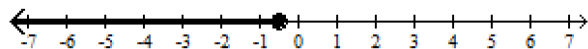
3. $x > -3$



Interval notation: $(-3, \infty)$

Set-builder notation: $\{x \mid x > -3\}$

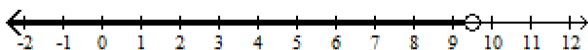
4. $t \leq -\frac{1}{2}$



Interval notation: $(-\infty, -\frac{1}{2}]$

Set-builder notation: $\{t \mid t \leq -\frac{1}{2}\}$

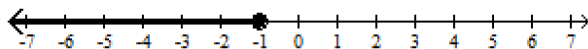
5. $x < \frac{19}{2}$



Interval notation: $(-\infty, \frac{19}{2})$

Set-builder notation: $\{x \mid x < \frac{19}{2}\}$

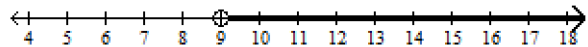
6. $x \leq -1$



Interval notation: $(-\infty, -1]$

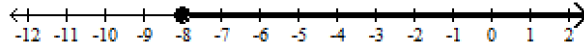
Set-builder notation: $\{x \mid x \leq -1\}$

7. $y > 9$



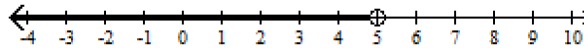
Interval notation: $(9, \infty)$
Set-builder notation: $\{y \mid y > 9\}$

8. $x \geq -8$



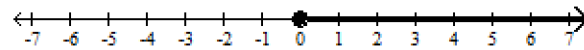
Interval notation: $[-8, \infty)$
Set-builder notation: $\{x \mid x \geq -8\}$

9. $x < 5$



Interval notation: $(-\infty, 5)$
Set-builder notation: $\{x \mid x < 5\}$

10. $y \geq 0$



Interval notation: $[0, \infty)$
Set-builder notation: $\{y \mid y \geq 0\}$