Compound Inequalities

Objectives

1. Solve and graph solutions of compound inequalities

Compound Inequalities – AND

Compound inequalities involve inequalities connected by either the word **and** or the word **or**.

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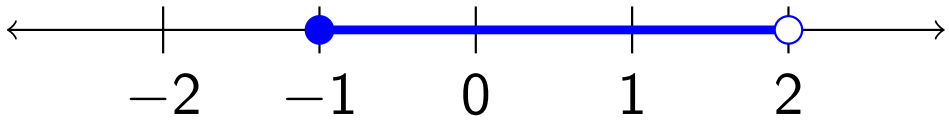
Compound inequalities involve inequalities connected by either the word **and** or the word **or**.

A number is a solution to a compound inequality that involves the word *and* if it is a solution to **both** inequalities.

Visual Interpretation of AND

$x \geq -1$ **and** $x < 2$



If you graph each individual inequality, the solution is the part of the number where they overlap.

Example 1

Solve and graph each.

(a) $-3 < 2x + 1 \leq 3$

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$$x > -2 \qquad x \leq 1$$

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Solve and graph each.

(a) $-3 < 2x + 1 \leq 3$

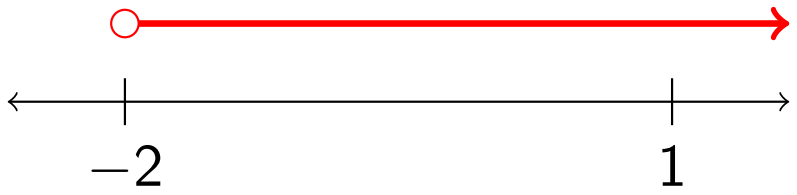
$$
\begin{aligned}
-3 &< 2x + 1 \\
-4 &< 2x \\
2x &> -4 \\
x &> -2
\end{aligned}
\qquad\qquad
\begin{aligned}
2x + 1 &\leq 3 \\
2x &\leq 2 \\
2x &\leq 2 \\
x &\leq 1
\end{aligned}
$$

Example 1

Solve and graph each.

(a) $-3 < 2x + 1 \leq 3$

$$\begin{aligned} -3 &< 2x + 1 \\ -4 &< 2x \\ 2x &> -4 \\ x &> -2 \end{aligned} \qquad \begin{aligned} 2x + 1 &\leq 3 \\ 2x &\leq 2 \\ 2x &\leq 2 \\ x &\leq 1 \end{aligned}$$



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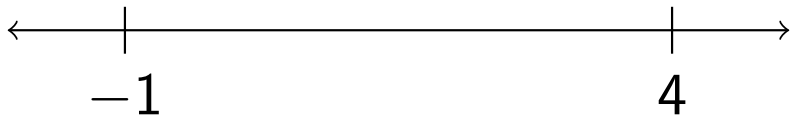

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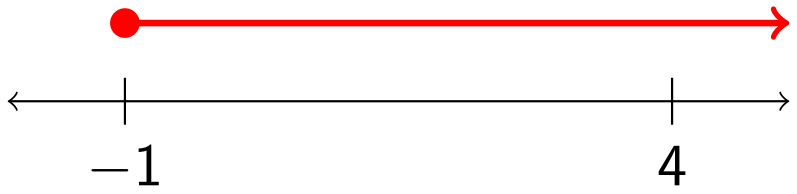

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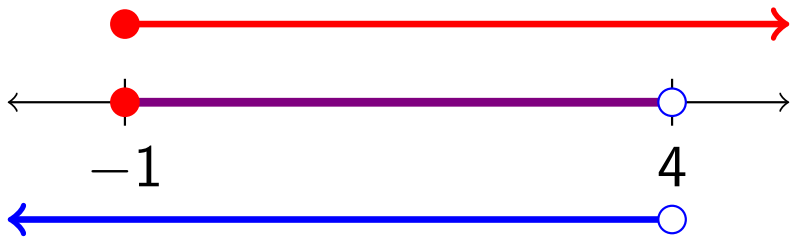

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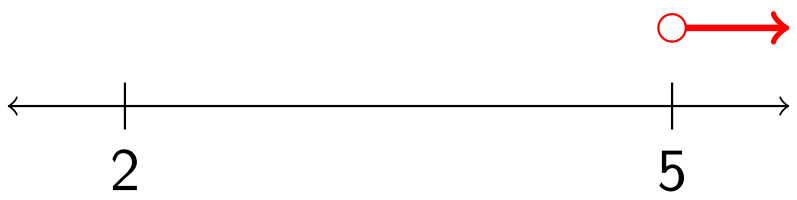

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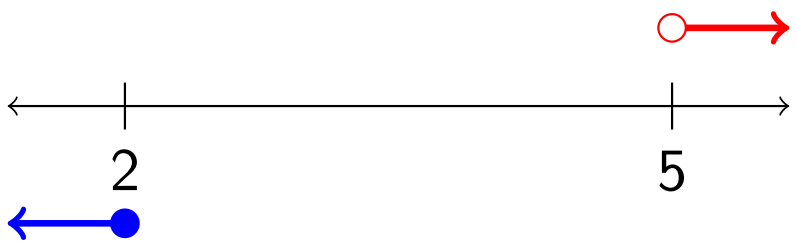

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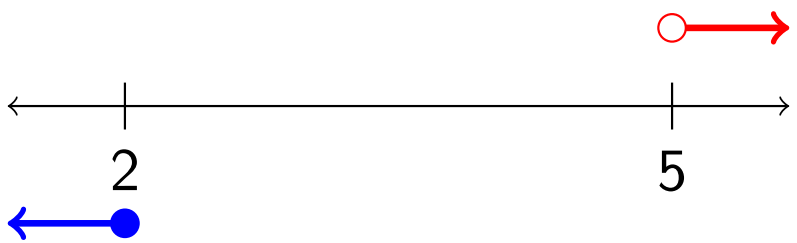


Do not overlap

Example 1

(c) $2x - 7 > 3$ and $5x - 4 \leq 6$

$2x - 7 > 3$

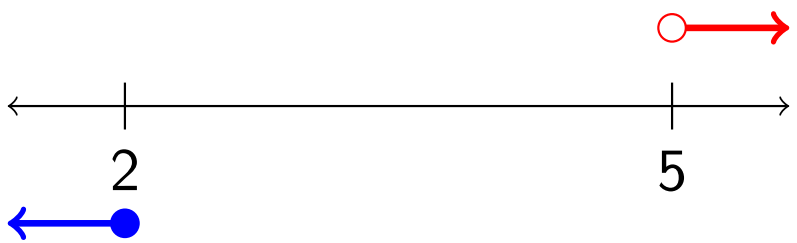
$2x > 10$

$x > 5$

$5x - 4 \leq 6$

$5x \leq 10$

$x \leq 2$

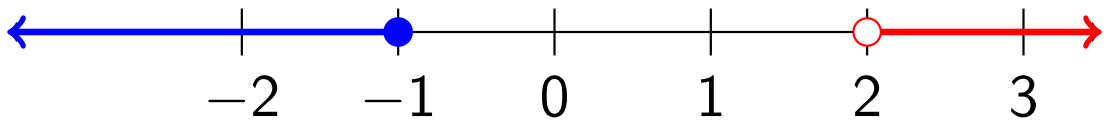


Do not overlap **No solution**

Compound Inequalities – OR

The word or indicates the solution be in **either** inequality (or both).

$x > 2$ or $x \leq -1$



Example 2

Solve and graph each.

(a) $2x - 3 < 7$ or $35 - 4x \leq 3$

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(a) $2x - 3 < 7$ or $35 - 4x \leq 3$

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$$2x < 10 \qquad\qquad -4x \leq -32$$

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$$x < 5 \qquad\qquad x \geq 8$$

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(b) $3x - 5 \leq 13$ or $5x + 2 > -3$

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$$3x - 5 \leq 13 \qquad\qquad 5x + 2 > -3$$

$$3x \leq 18 \qquad\qquad 5x > -5$$

$$x \leq 6 \qquad\qquad x > -1$$

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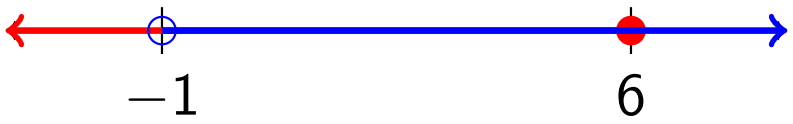

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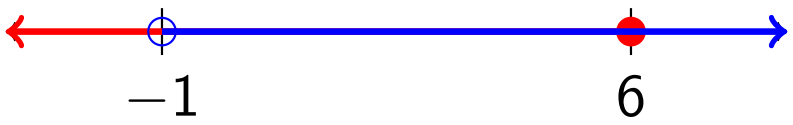

All Real Numbers

Example 2

(c) $2x + 5 \leq 3$ or $2x + 3 < 3$

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$2x + 5 \leq 3$ $\qquad$ $2x + 3 < 3$

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(c) $2x + 5 \leq 3$ or $2x + 3 < 3$

$$2x + 5 \leq 3 \qquad\qquad 2x + 3 < 3$$

$$2x \leq -2 \qquad\qquad 2x < 0$$

Example 2

(c) $2x + 5 \leq 3$ or $2x + 3 < 3$

$$2x + 5 \leq 3$$
$$2x \leq -2$$
$$x \leq -1$$

$$2x + 3 < 3$$
$$2x < 0$$
$$x < 0$$

Example 2

(c) $2x + 5 \leq 3$ or $2x + 3 < 3$

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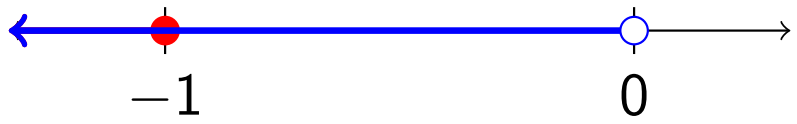

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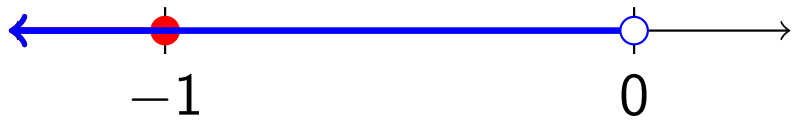

$$x < 0$$