

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**.

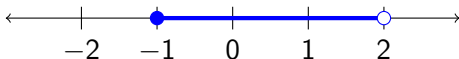
Compound Inequalities – AND

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

$$x \geq -1 \text{ and } x < 2$$



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

Example 1

Solve and graph each.

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

Example 1

Solve and graph each.

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

$$-3 < 2x + 1$$

$$2x + 1 \leq 3$$

Example 1

Solve and graph each.

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

$$-3 < 2x + 1$$

$$-4 < 2x$$

$$2x + 1 \leq 3$$

$$2x \leq 2$$

Example 1

Solve and graph each.

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

$$-3 < 2x + 1$$

$$-4 < 2x$$

$$2x > -4$$

$$2x + 1 \leq 3$$

$$2x \leq 2$$

$$2x \leq 2$$

Example 1

Solve and graph each.

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

$$-3 < 2x + 1$$

$$-4 < 2x$$

$$2x > -4$$

$$x > -2$$

$$2x + 1 \leq 3$$

$$2x \leq 2$$

$$2x \leq 2$$

$$x \leq 1$$

Example 1

Solve and graph each.

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

$$-3 < 2x + 1$$

$$-4 < 2x$$

$$2x > -4$$

$$x > -2$$

$$2x + 1 \leq 3$$

$$2x \leq 2$$

$$2x \leq 2$$

$$x \leq 1$$



Example 1

Solve and graph each.

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

$$-3 < 2x + 1$$

$$-4 < 2x$$

$$2x > -4$$

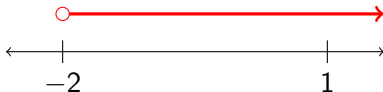
$$x > -2$$

$$2x + 1 \leq 3$$

$$2x \leq 2$$

$$2x \leq 2$$

$$x \leq 1$$



Example 1

Solve and graph each.

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

$$-3 < 2x + 1$$

$$-4 < 2x$$

$$2x > -4$$

$$x > -2$$

$$2x + 1 \leq 3$$

$$2x \leq 2$$

$$2x \leq 2$$

$$x \leq 1$$



Example 1

Solve and graph each.

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

$$-3 < 2x + 1$$

$$2x + 1 \leq 3$$

$$-4 < 2x$$

$$2x \leq 2$$

$$2x > -4$$

$$2x \leq 2$$

$$x > -2$$

$$x \leq 1$$



Example 1

$$(b) \quad 1 \leq 2x + 3 < 11$$

Example 1

$$(b) \quad 1 \leq 2x + 3 < 11$$

$$1 \leq 2x + 3$$

$$2x + 3 < 11$$

Example 1

$$(b) \quad 1 \leq 2x + 3 < 11$$

$$1 \leq 2x + 3$$

$$2x + 3 < 11$$

$$-2 \leq 2x$$

$$2x < 8$$

Example 1

$$(b) \quad 1 \leq 2x + 3 < 11$$

$$1 \leq 2x + 3$$

$$2x + 3 < 11$$

$$-2 \leq 2x$$

$$2x < 8$$

$$2x \geq -2$$

$$2x < 8$$

Example 1

$$(b) \quad 1 \leq 2x + 3 < 11$$

$$1 \leq 2x + 3$$

$$-2 \leq 2x$$

$$2x \geq -2$$

$$x \geq -1$$

$$2x + 3 < 11$$

$$2x < 8$$

$$2x < 8$$

$$x < 4$$

Example 1

$$(b) \quad 1 \leq 2x + 3 < 11$$

$$1 \leq 2x + 3$$

$$2x + 3 < 11$$

$$-2 \leq 2x$$

$$2x < 8$$

$$2x \geq -2$$

$$2x < 8$$

$$x \geq -1$$

$$x < 4$$



Example 1

$$(b) \quad 1 \leq 2x + 3 < 11$$

$$1 \leq 2x + 3$$

$$2x + 3 < 11$$

$$-2 \leq 2x$$

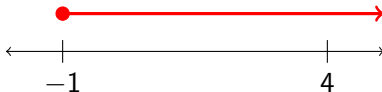
$$2x < 8$$

$$2x \geq -2$$

$$2x < 8$$

$$x \geq -1$$

$$x < 4$$



Example 1

(b) $1 \leq 2x + 3 < 11$

$$1 \leq 2x + 3$$

$$2x + 3 < 11$$

$$-2 \leq 2x$$

$$2x < 8$$

$$2x \geq -2$$

$$2x < 8$$

$$x \geq -1$$

$$x < 4$$



Example 1

(b) $1 \leq 2x + 3 < 11$

$$1 \leq 2x + 3$$

$$2x + 3 < 11$$

$$-2 \leq 2x$$

$$2x < 8$$

$$2x \geq -2$$

$$2x < 8$$

$$x \geq -1$$

$$x < 4$$



Example 1

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

Example 1

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

$$2x - 7 > 3$$

$$5x - 4 \leq 6$$

Example 1

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

$$2x - 7 > 3$$

$$5x - 4 \leq 6$$

$$2x > 10$$

$$5x \leq 10$$

Example 1

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

$$2x - 7 > 3$$

$$5x - 4 \leq 6$$

$$2x > 10$$

$$5x \leq 10$$

$$x > 5$$

$$x \leq 2$$

Example 1

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

$$2x - 7 > 3$$

$$5x - 4 \leq 6$$

$$2x > 10$$

$$5x \leq 10$$

$$x > 5$$

$$x \leq 2$$



Example 1

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

$$2x - 7 > 3$$

$$2x > 10$$

$$x > 5$$

$$5x - 4 \leq 6$$

$$5x \leq 10$$

$$x \leq 2$$



Example 1

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

$$2x - 7 > 3$$

$$2x > 10$$

$$x > 5$$

$$5x - 4 \leq 6$$

$$5x \leq 10$$

$$x \leq 2$$



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

Example 1

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

$$2x - 7 > 3$$

$$2x > 10$$

$$x > 5$$

$$5x - 4 \leq 6$$

$$5x \leq 10$$

$$x \leq 2$$

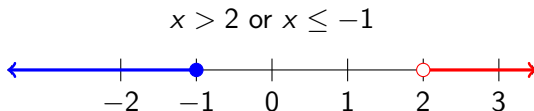


Do not overlap

No solution

Compound Inequalities – OR

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



Example 2

Solve and graph each.

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

Example 2

Solve and graph each.

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

$$2x - 3 < 7$$

$$35 - 4x \leq 3$$

Example 2

Solve and graph each.

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

$$2x - 3 < 7$$

$$2x < 10$$

$$35 - 4x \leq 3$$

$$-4x \leq -32$$

Example 2

Solve and graph each.

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

$$2x - 3 < 7$$

$$2x < 10$$

$$x < 5$$

$$35 - 4x \leq 3$$

$$-4x \leq -32$$

$$x \geq 8$$

Example 2

Solve and graph each.

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

$$2x - 3 < 7$$

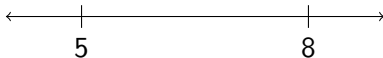
$$2x < 10$$

$$x < 5$$

$$35 - 4x \leq 3$$

$$-4x \leq -32$$

$$x \geq 8$$



Example 2

Solve and graph each.

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

$$2x - 3 < 7$$

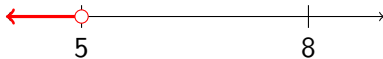
$$2x < 10$$

$$x < 5$$

$$35 - 4x \leq 3$$

$$-4x \leq -32$$

$$x \geq 8$$



Example 2

Solve and graph each.

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

$$2x - 3 < 7$$

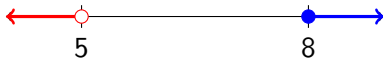
$$2x < 10$$

$$x < 5$$

$$35 - 4x \leq 3$$

$$-4x \leq -32$$

$$x \geq 8$$



Example 2

$$(b) \quad 3x - 5 \leq 13 \text{ or } 5x + 2 > -3$$

Example 2

$$(b) \quad 3x - 5 \leq 13 \text{ or } 5x + 2 > -3$$

$$3x - 5 \leq 13$$

$$5x + 2 > -3$$

Example 2

$$(b) \quad 3x - 5 \leq 13 \text{ or } 5x + 2 > -3$$

$$3x - 5 \leq 13$$

$$5x + 2 > -3$$

$$3x \leq 18$$

$$5x > -5$$

Example 2

$$(b) \quad 3x - 5 \leq 13 \text{ or } 5x + 2 > -3$$

$$3x - 5 \leq 13$$

$$5x + 2 > -3$$

$$3x \leq 18$$

$$5x > -5$$

$$x \leq 6$$

$$x > -1$$

Example 2

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

$$3x - 5 \leq 13$$

$$5x + 2 > -3$$

$$3x \leq 18$$

$$5x > -5$$

$$x \leq 6$$

$$x > -1$$



Example 2

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

$$3x - 5 \leq 13$$

$$5x + 2 > -3$$

$$3x \leq 18$$

$$5x > -5$$

$$x \leq 6$$

$$x > -1$$



Example 2

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

$$3x - 5 \leq 13$$

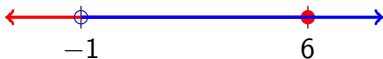
$$5x + 2 > -3$$

$$3x \leq 18$$

$$5x > -5$$

$$x \leq 6$$

$$x > -1$$



Example 2

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

$$3x - 5 \leq 13$$

$$5x + 2 > -3$$

$$3x \leq 18$$

$$5x > -5$$

$$x \leq 6$$

$$x > -1$$



All Real Numbers

Example 2

$$(c) \quad 2x + 5 \leq 3 \text{ or } 2x + 3 < 3$$

Example 2

$$(c) \quad 2x + 5 \leq 3 \text{ or } 2x + 3 < 3$$

$$2x + 5 \leq 3$$

$$2x + 3 < 3$$

Example 2

$$(c) \quad 2x + 5 \leq 3 \text{ or } 2x + 3 < 3$$

$$2x + 5 \leq 3$$

$$2x \leq -2$$

$$2x + 3 < 3$$

$$2x < 0$$

Example 2

$$(c) \quad 2x + 5 \leq 3 \text{ or } 2x + 3 < 3$$

$$2x + 5 \leq 3$$

$$2x \leq -2$$

$$x \leq -1$$

$$2x + 3 < 3$$

$$2x < 0$$

$$x < 0$$

Example 2

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

$$2x + 5 \leq 3$$

$$2x \leq -2$$

$$x \leq -1$$

$$2x + 3 < 3$$

$$2x < 0$$

$$x < 0$$



Example 2

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

$$2x + 5 \leq 3$$

$$2x \leq -2$$

$$x \leq -1$$

$$2x + 3 < 3$$

$$2x < 0$$

$$x < 0$$



Example 2

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

$$2x + 5 \leq 3$$

$$2x \leq -2$$

$$x \leq -1$$

$$2x + 3 < 3$$

$$2x < 0$$

$$x < 0$$



Example 2

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

$$2x + 5 \leq 3$$

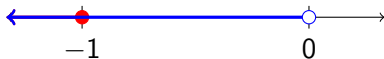
$$2x \leq -2$$

$$x \leq -1$$

$$2x + 3 < 3$$

$$2x < 0$$

$$x < 0$$



$$x < 0$$