

12.4 Inequalities

An **inequality** states that two quantities either are not equal or may not be equal. An inequality uses one of the following symbols:

Symbol	Meaning	Word Phrases
$<$	is less than	Fewer than, below
$>$	is greater than	More than, above
\leq	is less than or equal to	At most, no more than
\geq	is greater than or equal to	At least, no less than

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Write an inequality for each situation.

A. There are at least 15 people in the waiting room.
 $x \geq 15$ people

B. The tram attendant will allow no more than 60 people on the tram.
 $x \leq 60$ people

A. There are at most 10 gallons of gas in the tank.
 $x \leq 10$ gal

B. There is at least 10 yards of fabric left.
 $x \geq 10$ yd

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An inequality that contains a variable is an **algebraic inequality**. A value of the variable that makes the inequality true is a solution of the inequality.

An inequality may have more than one solution. Together, all of the solutions are called the **solution set**.

You can graph the solutions of an inequality on a number line. If the variable is "greater than" or "less than" a number, then that number is indicated with an open circle.

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This open circle shows that 5 is not a solution.

If the variable is "greater than or equal to" or "less than or equal to" a number, that number is indicated with a closed circle.

This closed circle shows that 3 is a solution.

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Graph each inequality.

A. $n < 3$

B. $a \geq -4$

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Graph each inequality.

A. $p \leq 2$

B. $e > -2$

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Write an inequality for each situation.

- No more than 220 people are in the theater.
 $x \leq 220$ people
- There are at least a dozen eggs left.
 $x \geq 12$ eggs
- Fewer than 14 people attended the meeting.
 $x < 14$ people

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A **compound inequality** is the result of combining two inequalities. The words *and* and *or* are used to describe how the two parts are related.

$x > 3$ or $x < -1$ $-2 < y < 4$
 x is either greater than 3 or less than -1. $-2 < y$ and $y < 4$
 y is both greater than -2 and less than 4.
 y is between -2 and 4.

Writing Math
 The compound inequality $-2 < y$ and $y < 4$ can be written as $-2 < y < 4$.

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Graph each compound inequality.

$m \leq -2$ or $m > 1$
 First graph each inequality separately.

$m \leq -2$ $m > 1$

Then combine the graphs.

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Graph each compound inequality

$-3 < b \leq 0$
 $-3 < b \leq 0$ can be written as the inequalities $-3 < b$ and $b \leq 0$. Graph each inequality separately.

$b > -3$

Reading Math
 $-3 < b$ is the same as $b > -3$.

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Graph each compound inequality.

$w < 2$ or $w \geq 4$

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Graph the inequalities.

4. ~~$x > -1$~~ $-3 \leq w < 4$

5. ~~$x \geq 4$ or $x < -1$~~ $-1 < x < 3$

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