Solving Inequalities

Inequality

- An inequality is a statement that compares two expressions by using the symbols <, >, ≤, ≥, or ≠.
- It says that two quantities are not equal.

$<$	$>$	$\leq$	$\geq$	$\neq$
$A < B$	$A > B$	$A \leq B$	$A \geq B$	$A \neq B$
A is less than B.	A is greater than B.	A is less than or equal to B.	A is greater than or equal to B.	A is not equal to B.

Trichotomy Property

- For any two real numbers, a and b, exactly one of the following statements is true:
- $a < b$ $a = b$ $a > b$
- Adding or subtracting the same number on each side of an inequality does not change the truth of the inequality.

Phrases of Inequality

- The chart shows some common phrases that indicate inequalities in word problems.

Inequalities			
<	>	≤	≥
less than	greater than	at most	at least
fewer than	more than	no more than	no less than
		less than or equal to	greater than or equal to

Properties of Inequality

KEY CONCEPT — *Properties of Inequality*

Addition Property of Inequality

Words For any real numbers, a, b, and c:
If $a > b$, then $a + c > b + c$.
If $a < b$, then $a + c < b + c$.

Example
$3 < 5$
$3 + (-4) < 5 + (-4)$
$-1 < 1$

Subtraction Property of Inequality

Words For any real numbers, a, b, and c:
If $a > b$, then $a - c > b - c$.
If $a < b$, then $a - c < b - c$.

Example
$2 > -7$
$2 - 8 > -7 - 8$
$-6 > -15$

Examples

- Solve $t - 45 \leq 13$. Check your solution.

Examples

- Solve $t - 45 \leq 13$. Check your solution.

- $t - 45 \leq 13$
- $t - 45 + 45 \leq 13 + 45$
- $t \leq 58$

- Check: use 58, a number greater than 58, and a number less than 58

Examples

- Solve $s + 19 > 56$. Check your solution.

Examples

- Solve $s + 19 > 56$. Check your solution.

- $s + 19 > 56$
- $s + 19 - 19 > 56 - 19$
- $s > 37$

- Check: a number greater than 37, and a number less than 37

Properties of Equality

- If you multiply or divide both sides by a negative number, you must ***reverse*** the inequality symbol.

Properties of Inequality

KEY CONCEPT — *Properties of Inequality*

Multiplication Property of Inequality

Words	For any real numbers, a, b, and c, where	Examples
c is positive:	if $a > b$, then $ac > bc$.	$-2 < 3$ $4(-2) < 4(3)$
	if $a < b$, then $ac < bc$.	$-8 < 12$
c is negative:	if $a > b$, then $ac < bc$.	$5 > -1$ $(-3)(5) < (-3)(21)$
	if $a < b$, then $ac > bc$.	$-15 < 3$

Division Property of Inequality

Words	For any real numbers, a, b, and c, where	Examples
c is positive:	if $a > b$, then $\frac{a}{c} > \frac{b}{c}$.	$-18 < -9$
	if $a < b$, then $\frac{a}{c} < \frac{b}{c}$.	$\frac{-18}{3} < \frac{-9}{3}$
		$-6 < -3$
c is negative:	if $a > b$, then $\frac{a}{c} < \frac{b}{c}$.	$12 > 8$
	if $a < b$, then $\frac{a}{c} > \frac{b}{c}$.	$\frac{12}{-2} < \frac{8}{-2}$
		$-6 < -4$

Examples

- Solve $\frac{1}{4}n > 750$.

Examples

- Solve $\frac{1}{4}n > 750$.

- $\frac{1}{4}n > 750$
- $4 * \frac{1}{4}n > 4 * 750$
- $n > 3000$

Examples

- Solve $-\frac{2}{5}p < -14$.

Examples

- Solve $-\frac{2}{5}p < -14$.

- $-\frac{2}{5}p < -14$
- $-\frac{5}{2} * -\frac{2}{5}p > -\frac{5}{2} * -14$
- $p > 35$

Examples

- Solve 14h > 91

Examples

- Solve 14h > 91
- 14h > 91
- $\frac{14h}{14} > \frac{91}{14}$
- h > 6.5

Examples

- Solve -5t ≥ 275
- -5t ≥ 275
- $\frac{-5}{-5} \leq \frac{275}{-5}$
- t ≤ -55

Examples

- Solve $-m \leq \frac{m+4}{9}$

Examples

- Solve $-m \leq \frac{m+4}{9}$
- $-m \leq \frac{m+4}{9}$
- $-m * 9 \leq \frac{m+4}{9} * 9$
- $-9m \leq m + 4$
- $-9m - m \leq m - m + 4$
- $-10m \leq 4$
- $\frac{-10m}{-10} \geq \frac{4}{-10}$
- $m \geq -\frac{2}{5}$