Solving Inequalities

Use Addition and Subtraction Properties to Solve Inequalities

Words When you add or subtract the same number from each side of an inequality, the inequality remains true.

Example

$5 < 9$ $11 > 6$

$+4 \quad +4$ $-3 \quad -3$

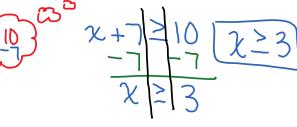$9 < 13$ $8 > 3$

These properties are also true for ≤ and ≥.

Checking Solutions
You can check your solutions by substituting numbers into the inequality and testing to verify that it holds true.

Examples

Tutor

1. Solve $x + 7 \geq 10$. Graph the solution on a number line.

$x+7=10$
$-7 \quad -7$

$x + 7 \geq 10 \quad \boxed{x \geq 3}$
$-7 \quad -7$
$x \geq 3$

number line: 1 2 3 4 5
           x ✓ ✓

2. Solve $x - 3 < 9$. Graph the solution on a number line.

$x - 3 < 9 \quad \boxed{x < 12}$
$+3 \quad +3$
$x < 12$

number line: 10 11 12 13 14
            ✓   ✓   x   x   x

Got It? Do these problems to find out.

a. $n + 2 \leq 5$

$n + 2 \leq 5$
$-2 \quad -2$
$n \leq 3$
$\boxed{n \leq 3}$

number line: 1 2 3 4 5

b. $y - 3 > 9$

$y - 3 > 9$
$+3 \quad +3$
$y > 12$

number line: 10 11 12 13 14
            x   x   x ✓ ✓

Use Multiplication and Division Properties to Solve Inequalities

Words When you multiply or divide each side of an inequality by the same *positive* number, the inequality remains true.

Example

$5 < 10$	$16 > 12$
$5 \times 2 < 10 \times 2$	$\dfrac{16}{2} > \dfrac{12}{2}$
$10 < 20$	$8 > 6$

These properties are also true for $\leq$ and $\geq$.

Examples

Tutor

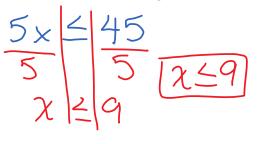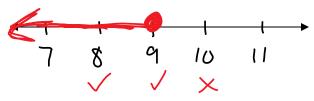**3.** Solve $5x \leq 45$. Graph the solution on a number line.

$$\frac{5x}{5} \leq \frac{45}{5}$$

$$x \leq 9 \qquad \boxed{x \leq 9}$$

4. Solve $\frac{x}{8} > 3$. Graph the solution on a number line.

$$(8)\frac{x}{8} > 3(8) \qquad \boxed{x > 24}$$

$$x > 24$$

Got It? Do these problems to find out.

c. $10x < 80$

$$\frac{10x}{10} < \frac{80}{10}$$

$$x < 8 \qquad \boxed{x < 8}$$

d. $\frac{x}{6} \geq 7$

$$(6)\frac{x}{6} \geq 7(6)$$

$$\boxed{x \geq 42}$$

Solve each inequality. Graph the solution on a number line.

7 $p - \frac{7}{12} > \frac{3}{10}$

$p - \frac{7}{12}$:

$\frac{51}{60}$ $\frac{52}{60}$ $\frac{53}{60}$ $\frac{54}{60}$ $\frac{55}{60}$

$p - \frac{7}{60}$, $\frac{18}{60}$

$+ \frac{35}{60}$ $+ \frac{35}{60}$

$p > \frac{53}{60}$

8. $f + 0.3 < 1.7$

1.2   1.3   1.4   1.5   1.6

$f + 0.3 < 1.7$
$ -0.3 \quad -0.3$
$f < 1.4$

Real World

Example

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5. Laverne is making bags of party favors for each of the 7 friends attending her birthday party. She does not want to spend more than $42 on the party favors. Write and solve an inequality to find the maximum cost for each party favor bag.

$\frac{7b}{7} \leq \frac{42}{7} \qquad b \leq 6$
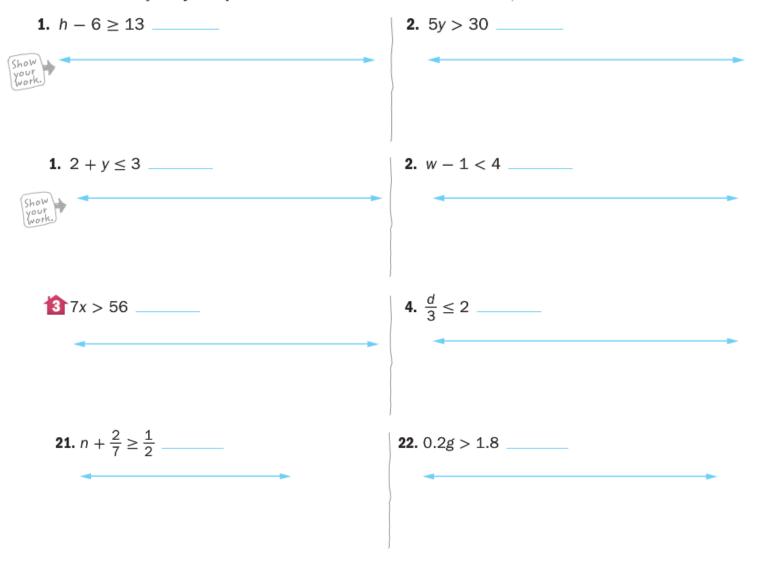
Got It? Do these problems to find out.

3. Johanna's parents give her $10 per week for lunch money. She cannot decide whether she wants to buy or pack her lunch. If a hot lunch at school costs $2, write and solve an inequality to find the maximum number of times per week Johanna can buy her lunch. (Example 5)

4. Tino's Pizza charges $9 for a cheese pizza. Eileen has $45 to buy pizza for the Spanish Club. Write and solve an inequality to find the maximum number of pizzas that

Eileen can buy. (Example 5)

Solve each inequality. Graph the solution on a number line. (Examples 1–4)

1. $h - 6 \geq 13$ _____

Show your work. ⟶

←————————————→

2. $5y > 30$ _____

←————————————→

1. $2 + y \leq 3$ _____

Show your work. ⟶

←————————————→

2. $w - 1 < 4$ _____

←————————————→

3 $7x > 56$ _____

←————————————→

4. $\dfrac{d}{3} \leq 2$ _____

←————————————→

21. $n + \dfrac{2}{7} \geq \dfrac{1}{2}$ _____

←————————————→

22. $0.2g > 1.8$ _____

←————————————→

5 A company charges $0.10 for each letter engraved. Bobby plans to spend no more than $5.00 on the engraving on a jewelry box. Write and solve an inequality to find the maximum number of letters he can have engraved. (Example 5)

20. A sales associate at a computer store receives a bonus of $100 for every computer he sells. He wants to make $2,500 in bonuses next month. Write and solve an inequality to find the minimum number of computers he must sell. _____