1-5 Solving Inequalities

p.34!

KeyConcept

Addition Property of Inequality

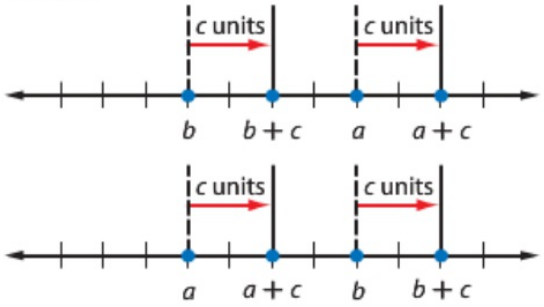
Words

For any real numbers, a, b, and c:

If $a > b$, then $a + c > b + c$.

If $a < b$, then $a + c < b + c$.

Models



Subtraction Property of Inequality

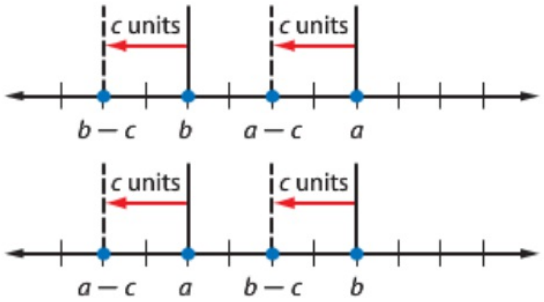
Words

For any real numbers, a, b, and c:

If $a > b$, then $a - c > b - c$.

If $a < b$, then $a - c < b - c$.

Models

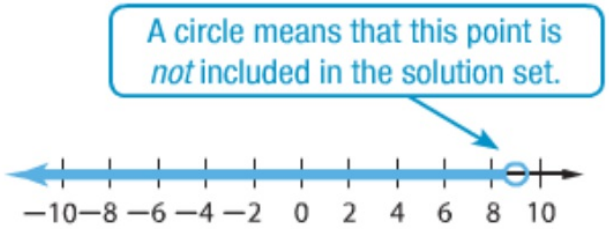


Example 1 Solve an Inequality Using Addition or Subtraction

Solve $y - 6 < 3$. Graph the solution set on a number line.

$y - 6 < 3$	Original inequality
$y - 6 + 6 < 3 + 6$	Add 6 to each side.
$y < 9$	Simplify.

Any real number less than 9 is a solution of this inequality. The graph of the solution set is shown at the right.



CHECK Substitute 8 and then 10 for y in $y - 6 < 3$. The inequality should be true for $y = 8$ and false for $y = 10$. ✓

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Example 2 Solve an Inequality Using Multiplication or Division

Solve $-4.2x \leq -29.4$. Graph the solution set on a number line.

$-4.2x \leq -29.4$ Original inequality

$\frac{-4.2x}{-4.2} \geq \frac{-29.4}{-4.2}$ Divide each side by -4.2, reversing the inequality symbol.

$x \geq 7$ Simplify.

The solution set is $\{x|x \geq 7\}$. The graph of the solution is shown below.

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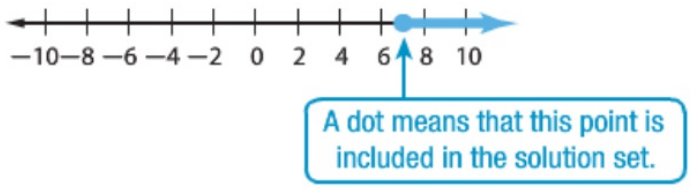

CHECK Substitute 6 and then 8 for x in $-4.2x \leq -29.4$. The inequality should be true for $x = 8$ and false for $x = 6$. ✓

Example 3 Solve Multi-Step Inequalities

Solve $-4c \leq \frac{5c + 58}{6}$. Graph the solution set on a number line.

$-4c \leq \frac{5c + 58}{6}$	Original inequality
$-24c \leq 5c + 58$	Multiply each side by 6.
$-29c \leq 58$	Add $-5c$ to each side.
$c \geq -2$	Divide each side by -29, reversing the inequality symbol.

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The solution set is $\{c|c \geq -2\}$ and is graphed below.

CHECK Substitute -3 and then -1 for x in $-4c \leq \frac{5c + 58}{6}$. The inequality should be true for $x = -1$ and false for $x = -3$. ✓

Additional Answers

1. $b < 8$

2. $d < 20$

3. $x \leq -6$

4. $y \leq 7$

5. $w < 2$

6. $z \geq -\frac{3}{4}$

7. $s \geq \frac{3}{2}$

8. $x \geq -8.5$

Examples 1–3 Solve each inequality. Then graph the solution set on a number line.

1. $b + 6 < 14$
2. $12 - d > -8$
3. $18 \leq -3x$
4. $-5y \geq -35$
5. $-4w - 13 > -21$
6. $8z - 9 \geq -15$
7. $s \geq \frac{s+6}{5}$
8. $\frac{2x-9}{4} \leq x + 2$

1–8. See margin.

(7) $5 \cdot s \geq \frac{s+6}{5} \cdot 5$

$5s \geq s + 6$

$-s \quad -s$

$4s \geq 6$

$\frac{4}{4} \quad \frac{6}{4}$

$s \geq \frac{3}{2}$ or 1.5

8. $x \geq -8.5$

$4 \cdot \left(\frac{2x-9}{4}\right) \leq (x+2)\,4$

$2x - 9 \leq 4x + 8$

$-4x \quad +9 \qquad -4x + 9$

$\frac{-2x}{-2} \leq \frac{17}{-2}$

$x \geq -\frac{17}{2}$

15 + 0.05c ≥ 50

Solve $15 + 0.05c \geq 50$ Original inequality

$0.05c \geq 35$ Subtract 15 from each side.

$c \geq 700$ Divide each side by 0.05.

4 **9.** CCSS **MODELING** Tara is delivering bags of mulch. Each bag weighs 48 pounds, and the push cart weighs 65 pounds. If her flat-bed truck is capable of hauling 2000 pounds, how many bags of mulch can Tara safely take on each trip? **40 bags**

$48x + 65 \leq 2000$

$x =$ # of bags

10. $m > -4$

11. $n \leq -3$

12. $r < -6$

13. $t \leq \frac{1}{2}$

14. $w \geq 28$

15. $k < 27$

Additional Answers

16. $x \leq 9$

17. $z < 3$

18. $z \leq 3.9$

19. $c < 1$

20. $y > \frac{8}{3}$

21. $z < 3$

Practice and Problem Solving

Extra Practice

Examples 1–3 Solve each inequality. Then graph the solution set on a number line.

10–21. See margin.

10. $m - 8 > -12$

11. $n + 6 \leq 3$

12. $6r < -36$

13. $-12t \geq -6$

14. $-\frac{w}{4} \leq -7$

15. $\frac{k}{3} - 14 < -5$

16. $4x - 15 \leq 21$

17. $-6z - 14 > -32$

18. $-16 \geq 5(2z - 11)$

19. $12 < -4(3c - 6)$

20. $\frac{3y - 4}{0.2} - 8 > 12$

21. $\frac{9z + 5}{4} + 18 < 26$

Example 4

22. GYMNASTICS In a gymnastics competition, an athlete's final score is calculated by taking 75% of the average technical score and adding 25% of the artistic score. All scores are out of 10, and one gymnast has a 7.6 average technical score. What artistic score does the gymnast need to have a final score of at least 8.0? **9.2**