

Solving Inequalities Worksheet

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One-step and two-step inequalities · give each answer as x compared with a number

Name _____ Date _____ Score _____

/ 32

HOW AN INEQUALITY DIFFERS FROM AN EQUATION

Solve it exactly as you would an equation — with one exception.

Multiplying or dividing both sides by a negative number reverses the inequality sign. Adding or subtracting a negative does *not*. $-2x > 6 \Rightarrow x < -3$ (divided by -2 , so $>$ became $<$)On a number line, $<$ and $>$ take an open circle; $\leq$ and $\geq$ take a filled one.

SECTION A One-step inequalities

Undo the single operation. Only multiplying or dividing by a negative flips the sign.

1 $x + 7 < 12$

Answer _____

2 $x - 4 \geq 9$

Answer _____

3 $3x \leq 21$

Answer _____

4 $\frac{x}{5} > 4$

Answer _____

5 $-2x > 10$

Answer _____

6 $x + 11 \leq 6$

Answer _____

7 $-\frac{x}{3} \geq 2$

Answer _____

8 $8x < -24$

Answer _____

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Two-step inequalities

SECTION B Two-step inequalities

Undo addition or subtraction first, then the multiplication or division.

9 $2x + 5 > 13$

Answer _____

10 $3x - 7 \leq 8$

Answer _____

11 $5x + 2 \geq -13$

Answer _____

12 $-4x + 1 < 17$

Answer _____

13 $\frac{x}{2} - 6 > 1$

Answer _____

14 $7 - 2x \geq 1$

Answer _____

15 $6x + 9 \leq 9$

Answer _____

16 $\frac{x}{4} + 3 < 5$

Answer _____

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Variables on both sides, and the sign flip

SECTION C Variables on both sides

Collect the variable terms on one side first — moving them to the side where the coefficient stays positive avoids a sign flip.

17 $5x + 3 > 2x + 15$

Answer

18 $7x - 4 \leq 4x + 11$

Answer

19 $2x + 9 \geq 6x - 3$

Answer

20 $8 - 3x < x + 20$

Answer

21 $4(x - 2) > 2x + 6$

Answer

22 $3(x + 5) \leq 5(x - 1)$

Answer

SECTION D Watch the sign flip

Every one of these needs a division by a negative at some point. Flip the inequality sign when you do.

23 $-5x \geq 35$

Answer

24 $12 - x > 4$

Answer

25 $-3x - 6 < 9$

Answer

26 $10 - 4x \leq -14$

Answer

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Word problems · define the variable before you write the inequality

SECTION E Write your own inequality

Define the variable, write the inequality, solve it, then answer in a sentence.

- 27 A taxi charges a \$3 flat fee plus \$2 per mile. Write and solve an inequality for the number of miles you can travel on at most \$25.

Answer _____

- 28 A student has scores of 78 and 85 on two tests. Write and solve an inequality for the score s needed on a third test to average at least 80.

Answer _____

- 29 A lift can carry at most 600 kg. Four people weighing 320 kg in total are already inside. Write and solve an inequality for the weight w that can still be added.

Answer _____

- 30 A rectangle has width 7 cm. Write and solve an inequality for its length ℓ if the perimeter must be less than 40 cm.

Answer _____

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Reasoning · answer in your own words

SECTION F Explain your reasoning

A sentence or two each.

- 31 Explain why dividing both sides of an inequality by a negative number reverses the sign, using $-2x > 6$ as your example.

Answer _____

- 32 How is the solution to $2x + 1 = 9$ different from the solution to $2x + 1 > 9$? Describe both on a number line.

Answer _____

THE MISTAKE TO AVOID

Flipping the sign when you did not need to. Subtracting a negative, or adding one, never flips it — only multiplying or dividing *both sides* by a negative does. When in doubt, test one number from your answer in the original inequality; if it does not hold, the sign is the first place to look.

Answer Key

ANSWER KEY · PAGE 1 OF 3

Each solution tested against the original inequality at build time.

SECTION A

1. $x < 5$ subtract 7
2. $x \geq 13$ add 4
3. $x \leq 7$ divide by 3
4. $x > 20$ multiply by 5
5. $x < -5$ divide by -2 , flip
6. $x \leq -5$ subtract 11
7. $x \leq -6$ multiply by -3 , flip
8. $x < -3$ divide by 8

SECTION B

9. $x > 4$ -5 , then $\div 2$
10. $x \leq 5$ $+7$, then $\div 3$
11. $x \geq -3$ -2 , then $\div 5$
12. $x > -4$ -1 , then $\div -4$, flip
13. $x > 14$ $+6$, then $\times 2$
14. $x \leq 3$ -7 , then $\div -2$, flip
15. $x \leq 0$ -9 , then $\div 6$
16. $x < 8$ -3 , then $\times 4$

Answer Key

ANSWER KEY · PAGE 2 OF 3

Each solution tested against the original inequality at build time.

SECTION C

17. $x > 4$ $3x > 12$

18. $x \leq 5$ $3x \leq 15$

19. $x \leq 3$ $12 \geq 4x$

20. $x > -3$ $-12 < 4x$

21. $x > 7$ expand: $4x - 8 > 2x + 6$

22. $x \geq 10$ expand: $3x + 15 \leq 5x - 5$

SECTION D

23. $x \leq -7$ $\div -5$, flip

24. $x < 8$ -12 , then $\div -1$, flip

25. $x > -5$ $+6$, then $\div -3$, flip

26. $x \geq 6$ -10 , then $\div -4$, flip

Answer Key

ANSWER KEY · PAGE 3 OF 3

Each solution tested against the original inequality at build time.

SECTION E

27. $3 + 2m \leq 25$, so $m \leq 11$. At most **11 miles**.

28. $\frac{78 + 85 + s}{3} \geq 80$, so $163 + s \geq 240$ and $s \geq 77$. At least **77**.

29. $320 + w \leq 600$, so $w \leq 280$. At most **280 kg**.

30. $2\ell + 14 < 40$, so $2\ell < 26$ and $\ell < 13$. Less than **13 cm** (and greater than 0).

SECTION F

31. $-2x > 6$ is true for $x = -4$, since $8 > 6$. Dividing by -2 without flipping gives $x > -3$, which excludes -4 — so that cannot be right. Multiplying by a negative reverses order on the number line: if $a > b$ then $-a < -b$. Flipping the sign keeps the statement true, giving $x < -3$.

32. The equation has exactly one solution, $x = 4$ — a single point. The inequality has infinitely many, every number greater than 4 — an open circle at 4 with the line shaded to the right. The algebra is identical; only the final statement differs.