

Solving Linear Inequalities

Name: _____ Date: _____ Score: _____ / 24

Q Quick Review

A **linear inequality** uses $<$, $>$, \leq , or \geq instead of an equals sign, and its solution is a whole *range* of numbers. You solve it almost exactly like an equation — add, subtract, multiply, and divide to isolate the variable. There is just **one special rule**: if you multiply or divide both sides by a *negative* number, you must **flip the inequality sign**. The answer looks like $x > 4$ or $x \leq -2$, describing every value that works.

◊ **Example:** Solve $-3x + 5 \leq 20$.

⇒ We treat this like an equation at first. Start by subtracting 5 from both sides to move the constant: that gives $-3x \leq 15$. Now comes the careful step — we need to divide both sides by -3 , and dividing by a *negative* means we **flip** the inequality sign. So \leq becomes \geq , and we get $x \geq -5$. That means every number from -5 upward is a solution. Forgetting to flip is the most common slip — watch for that negative!

Answer: $x \geq -5$

PRACTICE

Solve each inequality. Remember to flip the sign when dividing by a negative.

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|---------------------|-------|--------------------------|-------|
| 1. $x + 3 < 10$ | _____ | 11. $-2x > 8$ | _____ |
| 2. $x - 5 > 2$ | _____ | 12. $-3x \leq 12$ | _____ |
| 3. $2x \leq 16$ | _____ | 13. $-5x \geq 20$ | _____ |
| 4. $5x \geq 35$ | _____ | 14. $7 - x > 3$ | _____ |
| 5. $x + 8 \geq 12$ | _____ | 15. $10 - 2x \leq 4$ | _____ |
| 6. $3x + 2 < 17$ | _____ | 16. $3(x - 2) > 9$ | _____ |
| 7. $4x - 1 > 19$ | _____ | 17. $2(x + 4) \leq 18$ | _____ |
| 8. $2x + 9 \leq 21$ | _____ | 18. $5x + 3 < 2x + 18$ | _____ |
| 9. $6x - 4 \geq 14$ | _____ | 19. $\frac{x}{4} \geq 3$ | _____ |
| 10. $-x < 5$ | _____ | 20. $8 - 3x \geq -7$ | _____ |

◆ Word Problems

21. A delivery van can carry at most 900 kg. It is already loaded with 300 kg. Each box weighs 50 kg. Write and solve an inequality for the number of boxes b it can still add. _____
22. Jordan has \$60 and wants to buy a \$15 game plus some \$3 snacks. Write and solve an inequality for the number of snacks s he can buy. _____
23. To pass a class, a student needs an average of at least 80 over 2 tests. The first test was 74. What score x on the second test guarantees passing? _____
24. A parking garage charges \$4 to enter plus \$2 per hour. Priya wants to spend no more than \$20. Write and solve an inequality for the hours h she can park. _____



Answer Keys

- | | |
|-----------------|---|
| 1. $x < 7$ | 13. $x \leq -4$ |
| 2. $x > 7$ | 14. $x < 4$ |
| 3. $x \leq 8$ | 15. $x \geq 3$ |
| 4. $x \geq 7$ | 16. $x > 5$ |
| 5. $x \geq 4$ | 17. $x \leq 5$ |
| 6. $x < 5$ | 18. $x < 5$ |
| 7. $x > 5$ | 19. $x \geq 12$ |
| 8. $x \leq 6$ | 20. $x \leq 5$ |
| 9. $x \geq 3$ | 21. $50b + 300 \leq 900; b \leq 12$ |
| 10. $x > -5$ | 22. $3s + 15 \leq 60; s \leq 15$ |
| 11. $x < -4$ | 23. $\frac{74+x}{2} \geq 80; x \geq 86$ |
| 12. $x \geq -4$ | 24. $2h + 4 \leq 20; h \leq 8$ |

Step-by-Step Explanations

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| <p>1. Subtract 3 from both sides: $x < 7$.</p> <p>2. Add 5 to both sides: $x > 7$.</p> <p>3. Divide both sides by 2 (positive, no flip): $x \leq 8$.</p> <p>4. Divide both sides by 5: $x \geq 7$.</p> <p>5. Subtract 8: $x \geq 4$.</p> <p>6. Subtract 2 to get $3x < 15$, then divide by 3: $x < 5$.</p> <p>7. Add 1 to get $4x > 20$, then divide by 4: $x > 5$.</p> <p>8. Subtract 9 to get $2x \leq 12$, then divide by 2: $x \leq 6$.</p> <p>9. Add 4 to get $6x \geq 18$, then divide by 6: $x \geq 3$.</p> <p>10. Divide by -1 and flip the sign: $x > -5$.</p> <p>11. Divide by -2 and flip: $x < -4$.</p> <p>12. Divide by -3 and flip \leq to \geq: $x \geq -4$.</p> <p>13. Divide by -5 and flip: $x \leq -4$.</p> <p>14. Subtract 7: $-x > -4$, then divide by -1 and flip: $x < 4$.</p> | <p>15. Subtract 10: $-2x \leq -6$, divide by -2 and flip: $x \geq 3$.</p> <p>16. Distribute: $3x - 6 > 9$, add 6: $3x > 15$, so $x > 5$.</p> <p>17. Distribute: $2x + 8 \leq 18$, subtract 8: $2x \leq 10$, so $x \leq 5$.</p> <p>18. Subtract 2x: $3x + 3 < 18$, subtract 3: $3x < 15$, so $x < 5$.</p> <p>19. Multiply both sides by 4 (positive, no flip): $x \geq 12$.</p> <p>20. Subtract 8: $-3x \geq -15$, divide by -3 and flip: $x \leq 5$.</p> <p>21. Total weight must stay under 900: $50b + 300 \leq 900$. Subtract 300: $50b \leq 600$, so $b \leq 12$ boxes.</p> <p>22. Spending can't exceed \$60: $3s + 15 \leq 60$. Subtract 15: $3s \leq 45$, so $s \leq 15$ snacks.</p> <p>23. The average must be at least 80: $\frac{74+x}{2} \geq 80$. Multiply by 2: $74+x \geq 160$, so $x \geq 86$.</p> <p>24. Total cost must stay at or below \$20: $2h + 4 \leq 20$. Subtract 4: $2h \leq 16$, so $h \leq 8$ hours.</p> |
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