

# Solving Linear Inequalities

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Score: \_\_\_\_\_ / 24

## 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.

- |                     |       |                          |       |
|---------------------|-------|--------------------------|-------|
| 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

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

### Step-by-Step Explanations

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