

# Multi-Step Inequalities

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Score: \_\_\_\_\_ / 18

### Quick Review and Helpful Hints

Solve an inequality just like an equation: simplify, then undo operations to isolate the variable. The one special rule: whenever you *multiply or divide both sides by a negative number*, flip the inequality sign. The answer is a range of values, not a single number.

▶ **Example:** Solve  $3x + 7 \leq 22$ . **Work:** Subtract 7 from both sides:  $3x \leq 15$ . Divide by 3 (a positive number, so the sign stays):  $x \leq 5$ .

★ **Answer:**  $x \leq 5$



$x \leq 5$ : closed dot at 5, shade left.

### Practice Problems

Solve each inequality.

- |  |   |
|--|---|
| <p>1. <math>2x + 1 &gt; 7</math> _____</p> <p>2. <math>3x - 4 &lt; 11</math> _____</p> <p>3. <math>5x + 2 \geq 17</math> _____</p> <p>4. <math>4x - 3 \leq 13</math> _____</p> <p>5. <math>2x + 3x &gt; 20</math> _____</p> <p>6. <math>7x - 2x \leq 15</math> _____</p> <p>7. <math>2(x + 1) &lt; 10</math> _____</p> | <p>8. <math>3(x - 2) \geq 9</math> _____</p> <p>9. <math>-2x &gt; 8</math> _____</p> <p>10. <math>-3x \leq 12</math> _____</p> <p>11. <math>2x + 5 &gt; x + 9</math> _____</p> <p>12. <math>5x - 3 \leq 2x + 9</math> _____</p> <p>13. <math>-x + 4 &lt; 10</math> _____</p> <p>14. <math>4 - 2x \geq 10</math> _____</p> |
|--|---|

### Word Problems

15. Three more than twice a number is at most 11. What values of the number work? \_\_\_\_\_
16. You have \$20 and tickets cost \$4 each. How many tickets  $x$  can you buy? \_\_\_\_\_
17. A number tripled is greater than 18. Which numbers work? \_\_\_\_\_
18. Twice a number decreased by 5 is less than 9. Which numbers work? \_\_\_\_\_



## Answer Keys

1.  $x > 3$

2.  $x < 5$

3.  $x \geq 3$

4.  $x \leq 4$

5.  $x > 4$

6.  $x \leq 3$

7.  $x < 4$

8.  $x \geq 5$

9.  $x < -4$

10.  $x \geq -4$

11.  $x > 4$

12.  $x \leq 4$

13.  $x > -6$

14.  $x \leq -3$

15.  $x \leq 4$

16.  $x \leq 5$

17.  $x > 6$

18.  $x < 7$

### Step-by-Step Explanations

1. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Subtract 1:  $2x > 6$ . Divide by 2:  $x > 3$ . So the final answer is  $x > 3$ .

2. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Add 4:  $3x < 15$ . Divide by 3:  $x < 5$ . So the final answer is  $x < 5$ .

3. Step by step: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Subtract 2:  $5x \geq 15$ . Divide by 5:  $x \geq 3$ . So the final answer is  $x \geq 3$ .

4. Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Add 3:  $4x \leq 16$ . Divide by 4:  $x \leq 4$ . So the final answer is  $x \leq 4$ .

5. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Combine like terms:  $5x > 20$ . Divide by 5:  $x > 4$ . So the final answer is  $x > 4$ .

6. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Combine:  $5x \leq 15$ . Divide by 5:  $x \leq 3$ . So the final answer is  $x \leq 3$ .

7. Step by step: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Distribute:  $2x + 2 < 10$ . Subtract 2:  $2x < 8$ , so  $x < 4$ . So the final answer is  $x < 4$ .

8. Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Distribute:  $3x - 6 \geq 9$ . Add 6:  $3x \geq 15$ , so  $x \geq 5$ . So the final answer is  $x \geq 5$ .

9. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Divide by  $-2$  and flip the sign:  $x < -4$ . So the final answer is  $x < -4$ .

10. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Divide by  $-3$  and flip the sign:  $x \geq -4$ . So the final answer is  $x \geq -4$ .

11. Step by step: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Subtract  $x$ :  $x + 5 > 9$ . Subtract 5:  $x > 4$ . So the final answer is  $x > 4$ .

12. Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Subtract  $2x$ :  $3x - 3 \leq 9$ . Add 3:  $3x \leq 12$ , so  $x \leq 4$ . So the final answer is  $x \leq 4$ .

13. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Subtract 4:  $-x < 6$ . Divide by  $-1$  and flip:  $x > -6$ . So the final answer is  $x > -6$ .

14. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Subtract 4:  $-2x \geq 6$ . Divide by  $-2$  and flip:  $x \leq -3$ . So the final answer is  $x \leq -3$ .

15. Step by step: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is "At most" means  $\leq$ :  $2x + 3 \leq 11$ . Subtract 3:  $2x \leq 8$ , so  $x \leq 4$ . So the final answer is  $x \leq 4$ .

16. Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Spending must satisfy  $4x \leq 20$ . Divide by 4:  $x \leq 5$  tickets. So the final answer is  $x \leq 5$ .

17. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is "Tripled" is  $3x > 18$ . Divide by 3:  $x > 6$ . So the final answer is  $x > 6$ .

18. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Set up  $2x - 5 < 9$ . Add 5:  $2x < 14$ , so  $x < 7$ . So the final answer is  $x < 7$ .



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