

# Compound Inequalities

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

## Quick Review and Helpful Hints

An “and” compound inequality such as  $3 < x \leq 7$  means both parts are true at once – solve it as a double inequality, doing the same operation to all three parts. An “or” inequality means at least one part is true. Remember to flip the signs if you multiply or divide by a negative.

▶ **Example:** Solve  $1 \leq 2x + 3 < 9$ . **Work:** Subtract 3 from all three parts:  $-2 \leq 2x < 6$ . Divide every part by 2:  $-1 \leq x < 3$ .

★ **Answer:**  $-1 \leq x < 3$



$-1 \leq x < 3$ : closed at  $-1$ , open at  $3$ .

### Practice Problems

Solve each compound inequality.

- |                           |       |                           |       |
|---------------------------|-------|---------------------------|-------|
| 1. $2 < x + 1 < 5$        | _____ | 8. $3 \leq 2x - 1 \leq 9$ | _____ |
| 2. $-3 \leq x - 2 \leq 1$ | _____ | 9. $-4 \leq 2x \leq 6$    | _____ |
| 3. $4 < 2x < 10$          | _____ | 10. $5 < x + 3 < 9$       | _____ |
| 4. $6 \leq 3x \leq 18$    | _____ | 11. $4 \leq 4x \leq 12$   | _____ |
| 5. $1 \leq x + 4 \leq 7$  | _____ | 12. $-1 < 3x + 2 < 11$    | _____ |
| 6. $0 < 2x + 2 < 8$       | _____ | 13. $0 \leq 5x \leq 20$   | _____ |
| 7. $-5 < x - 1 < 2$       | _____ | 14. $-6 < 2x - 2 < 4$     | _____ |

### Word Problems

15. A number plus 3 is between 5 and 10. Write and solve a compound inequality. \_\_\_\_\_
16. Twice a number is at least 4 and at most 16. Find the numbers. \_\_\_\_\_
17. A temperature  $x$  satisfies  $10 \leq x - 5 \leq 25$ . Solve for  $x$ . \_\_\_\_\_
18. A storage room sensor reads  $x + 1$  degrees. The safe range is above  $-2$  degrees and at most 4 degrees. Write the solution for  $x$ . \_\_\_\_\_



## Answer Keys

- |                       |                       |                         |
|-----------------------|-----------------------|-------------------------|
| 1. $1 < x < 4$        | 7. $-4 < x < 3$       | 13. $0 \leq x \leq 4$   |
| 2. $-1 \leq x \leq 3$ | 8. $2 \leq x \leq 5$  | 14. $-2 < x < 3$        |
| 3. $2 < x < 5$        | 9. $-2 \leq x \leq 3$ | 15. $2 < x < 7$         |
| 4. $2 \leq x \leq 6$  | 10. $2 < x < 6$       | 16. $2 \leq x \leq 8$   |
| 5. $-3 \leq x \leq 3$ | 11. $1 \leq x \leq 3$ | 17. $15 \leq x \leq 30$ |
| 6. $-1 < x < 3$       | 12. $-1 < x < 3$      | 18. $-3 < x \leq 3$     |

### 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 from all parts:  $1 < x < 4$ . So the final answer is  $1 < x < 4$ .

**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 2 to all parts:  $-1 \leq x \leq 3$ . So the final answer is  $-1 \leq x \leq 3$ .

**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 Divide all parts by 2:  $2 < x < 5$ . So the final answer is  $2 < x < 5$ .

**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 Divide all parts by 3:  $2 \leq x \leq 6$ . So the final answer is  $2 \leq x \leq 6$ .

**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 Subtract 4 from all parts:  $-3 \leq x \leq 3$ . So the final answer is  $-3 \leq x \leq 3$ .

**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 Subtract 2:  $-2 < 2x < 6$ . Divide by 2:  $-1 < x < 3$ . So the final answer is  $-1 < x < 3$ .

**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 Add 1 to all parts:  $-4 < x < 3$ . So the final answer is  $-4 < x < 3$ .

**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 Add 1:  $4 \leq 2x \leq 10$ . Divide by 2:  $2 \leq x \leq 5$ . So the final answer is  $2 \leq x \leq 5$ .

**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 all parts by 2:  $-2 \leq x \leq 3$ . So the final answer is  $-2 \leq x \leq 3$ .

**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 Subtract 3 from all parts:  $2 < x < 6$ . So the final answer is  $2 < x < 6$ .

**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 Divide all parts by 4:  $1 \leq x \leq 3$ . So the final answer is  $1 \leq x \leq 3$ .

**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 2:  $-3 < 3x < 9$ . Divide by 3:  $-1 < x < 3$ . So the final answer is  $-1 < x < 3$ .

**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 Divide all parts by 5:  $0 \leq x \leq 4$ . So the final answer is  $0 \leq x \leq 4$ .

**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 Add 2:  $-4 < 2x < 6$ . Divide by 2:  $-2 < x < 3$ . So the final answer is  $-2 < x < 3$ .

**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 Set  $5 < x + 3 < 10$ . Subtract 3:  $2 < x < 7$ . So the final answer is  $2 < x < 7$ .

**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 Set  $4 \leq 2x \leq 16$ . Divide by 2:  $2 \leq x \leq 8$ . So the final answer is  $2 \leq x \leq 8$ .

**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 Add 5 to all parts:  $15 \leq x \leq 30$ . So the final answer is  $15 \leq x \leq 30$ .

**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 Subtract 1 from all parts:  $-3 < x \leq 3$ . So the final answer is  $-3 < x \leq 3$ .



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