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.

1. $2x + 1 > 7$ _____

2. $3x - 4 < 11$ _____

3. $5x + 2 \geq 17$ _____

4. $4x - 3 \leq 13$ _____

5. $2x + 3x > 20$ _____

6. $7x - 2x \leq 15$ _____

7. $2(x + 1) < 10$ _____

8. $3(x - 2) \geq 9$ _____

9. $-2x > 8$ _____

10. $-3x \leq 12$ _____

11. $2x + 5 > x + 9$ _____

12. $5x - 3 \leq 2x + 9$ _____

13. $-x + 4 < 10$ _____

14. $4 - 2x \geq 10$ _____

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. $x > 3$	**7.** $x < 4$	**13.** $x > -6$
2. $x < 5$	**8.** $x \geq 5$	**14.** $x \leq -3$
3. $x \geq 3$	**9.** $x < -4$	**15.** $x \leq 4$
4. $x \leq 4$	**10.** $x \geq -4$	**16.** $x \leq 5$
5. $x > 4$	**11.** $x > 4$	**17.** $x > 6$
6. $x \leq 3$	**12.** $x \leq 4$	**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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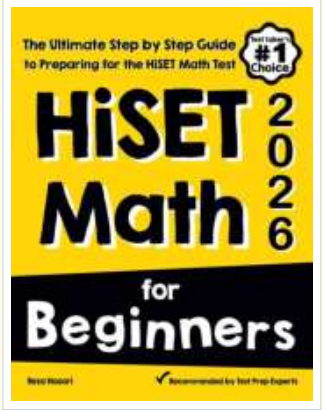

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