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. $x + 3 < 10$ _____

2. $x - 5 > 2$ _____

3. $2x \leq 16$ _____

4. $5x \geq 35$ _____

5. $x + 8 \geq 12$ _____

6. $3x + 2 < 17$ _____

7. $4x - 1 > 19$ _____

8. $2x + 9 \leq 21$ _____

9. $6x - 4 \geq 14$ _____

10. $-x < 5$ _____

11. $-2x > 8$ _____

12. $-3x \leq 12$ _____

13. $-5x \geq 20$ _____

14. $7 - x > 3$ _____

15. $10 - 2x \leq 4$ _____

16. $3(x - 2) > 9$ _____

17. $2(x + 4) \leq 18$ _____

18. $5x + 3 < 2x + 18$ _____

19. $\frac{x}{4} \geq 3$ _____

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

Step-by-Step Explanations

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

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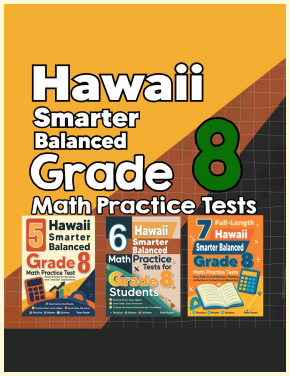

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