Absolute Value Inequalities

Name: _____	Date: _____	Score: _____ / 24

Quick Review

Absolute value inequalities also describe distance. For $|A| < c$ or $|A| \leq c$, the values are **within** c units, so write an **and** inequality: $-c < A < c$. For $|A| > c$ or $|A| \geq c$, the values are **outside** that distance, so write an **or** inequality: $A > c$ or $A < -c$. If $c < 0$, think about distance: distance is never negative.

PRACTICE

Solve each absolute value inequality.

1. $|x| < 5$ _____

2. $|x| \leq 8$ _____

3. $|x| > 3$ _____

4. $|x| \geq 6$ _____

5. $|x - 2| < 4$ _____

6. $|x + 1| \leq 7$ _____

7. $|x - 5| > 2$ _____

8. $|2x| < 10$ _____

9. $|3x - 6| \leq 9$ _____

10. $|2x + 1| > 5$ _____

11. $|x - 3| < 0.5$ _____

12. $|5 - 2k| > 3$ _____

13. $|x| \geq 0$ _____

14. $|x| < 0$ _____

15. $|x - 4| \leq 0$ _____

16. $|x + 6| > 0$ _____

17. $2|x - 1| < 12$ _____

18. $|x/4| \leq 3$ _____

19. $|4x + 8| \geq 16$ _____

20. $|x - 10| > 2.5$ _____

Word Problems

21. A bottle is accepted if its fill amount is within 3 mL of 500 mL. Write and solve an inequality.

_____

22. A room temperature should stay within 4 degrees of $68°$F. Find the acceptable range.

_____

23. A package is flagged if its weight differs from 20 lb by more than 1.5 lb. Write the flagging range.

_____

24. A survey result is considered close to 60% if it is no more than 2% away. What percentages count as close

_____

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Answer Keys

1. $-5 < x < 5$
2. $-8 \leq x \leq 8$
3. $x < -3$ or $x > 3$
4. $x \leq -6$ or $x \geq 6$
5. $-2 < x < 6$
6. $-8 \leq x \leq 6$
7. $x < 3$ or $x > 7$
8. $-5 < x < 5$
9. $-1 \leq x \leq 5$
10. $x < -3$ or $x > 2$
11. $2.5 < x < 3.5$
12. $k < 1$ or $k > 4$
13. all real numbers
14. no solution
15. $x = 4$
16. $x \neq -6$
17. $-5 < x < 7$
18. $-12 \leq x \leq 12$
19. $x \leq -6$ or $x \geq 2$
20. $x < 7.5$ or $x > 12.5$
21. $|v - 500| \leq 3;\ 497 \leq v \leq 503$
22. $64 \leq t \leq 72$
23. $w < 18.5$ or $w > 21.5$
24. $58\% \leq p \leq 62\%$

Step-by-Step Tutor Notes

1. The distance from 0 must be less than 5, so the solution is the open interval between -5 and 5.
2. At most 8 units from 0 includes the endpoints, so use closed boundaries: $-8 \leq x \leq 8$.
3. Greater than 3 means outside the interval from -3 to 3, so the answer is an "or" statement.
4. Take it one clear step at a time and keep the original question in mind. At least 6 units away includes the boundary points -6 and 6, then continues outward. So the answer is $x \leq -6$ or $x \geq 6$.
5. Use the less-than pattern: $-4 < x - 2 < 4$. Add 2 to all three parts to get $-2 < x < 6$.
6. Write $-7 \leq x + 1 \leq 7$, then subtract 1 from all three parts. The endpoints stay included.
7. The center is 5, and values must be more than 2 units away. That means left of 3 or right of 7.
8. Turn it into $-10 < 2x < 10$, then divide all three parts by 2. The solution is $-5 < x < 5$.
9. Use $-9 \leq 3x - 6 \leq 9$. Add 6 to get $-3 \leq 3x \leq 15$, then divide by 3.
10. Use the greater-than pattern: $2x + 1 < -5$ or $2x + 1 > 5$. Solving gives $x < -3$ or $x > 2$.
11. The values must stay within 0.5 unit of 3, so the interval runs from $3 - 0.5$ to $3 + 0.5$.
12. Split into $5 - 2k > 3$ or $5 - 2k < -3$. Dividing by -2 flips the inequality signs, giving $k < 1$ or $k > 4$.
13. Every absolute value is a distance, and every distance is at least 0. So every real number works.
14. Use the clue in the question first, then let the arithmetic finish the job. No distance can be less than 0, so there is no real solution. So the answer is no solution.
15. A distance at most 0 must be exactly 0. Set $x - 4 = 0$, so $x = 4$.
16. The distance from -6 is positive for every value except the center itself. So x can be any real number except -6.
17. Divide by 2 first: $|x - 1| < 6$. Then write $-6 < x - 1 < 6$ and add 1 throughout.
18. Keep the order of operations in view, then simplify without skipping the sign check. Write $-3 \leq \frac{x}{4} \leq 3$, then multiply all three parts by 4. After simplifying, the answer is $-12 \leq x \leq 12$.
19. Use $4x + 8 \leq -16$ or $4x + 8 \geq 16$. These solve to $x \leq -6$ or $x \geq 2$.
20. More than 2.5 away from 10 means outside the interval from 7.5 to 12.5.
21. Within 3 means distance from 500 is at most 3, so the acceptable range is $500 - 3$ to $500 + 3$.
22. Name the quantities first so the model is easy to read. Use $|t - 68| \leq 4$. That gives $68 - 4 \leq t \leq 68 + 4$.
23. More than 1.5 away from 20 means $|w - 20| > 1.5$, which is outside the acceptable interval.
24. No more than 2% away is $|p - 60| \leq 2$, so the interval is 58 to 62 percent.

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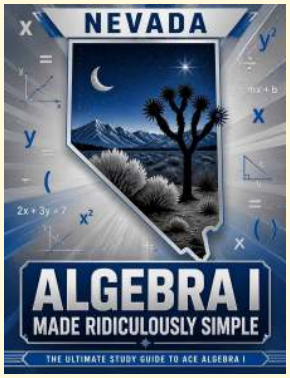

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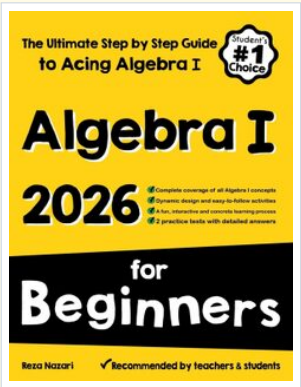

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