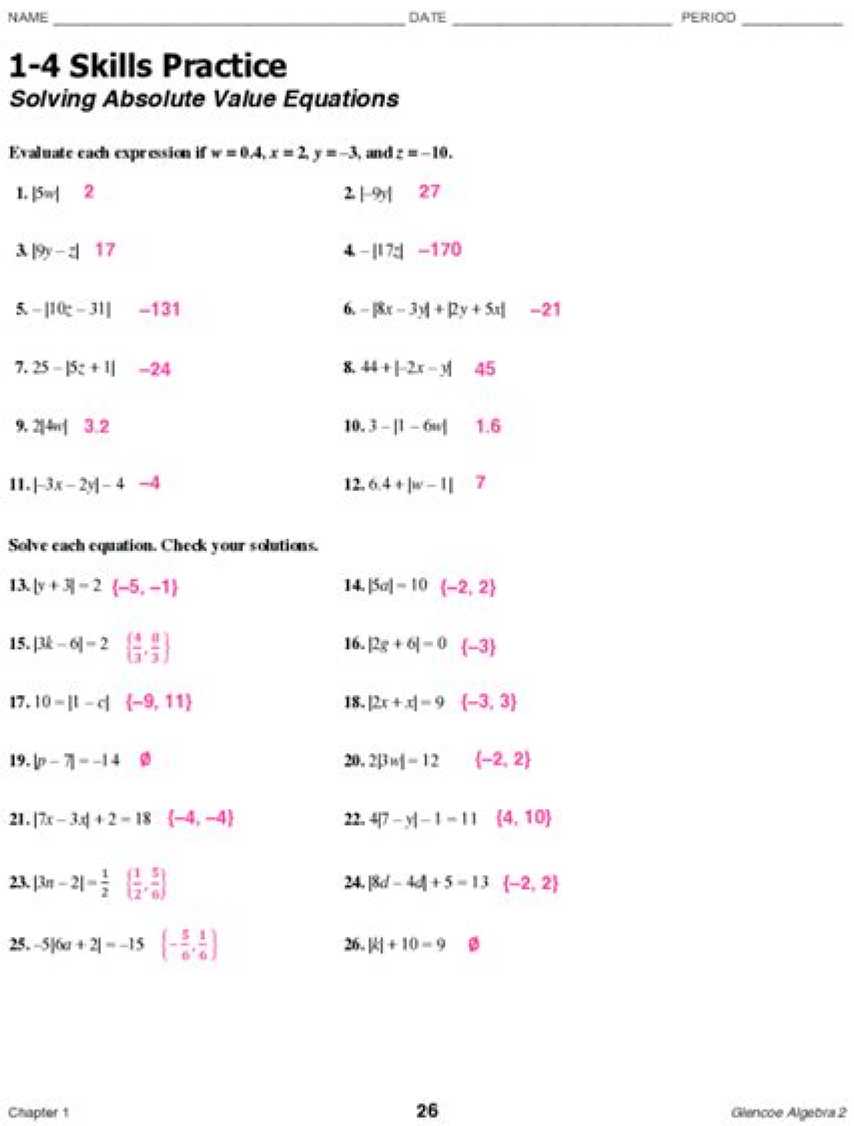
1 4 Skills Practice Solving Absolute Value Equations



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1-4 Skills Practice

Solving Absolute Value Equations

Evaluate each expression if $w = 0.4$, $x = 2$, $y = -3$, and $z = -10$.

1. $|5w|$ 2
2. $|-9y|$ 27
3. $|9y - z|$ 17
4. $-|17z|$ −170
5. $-|10z - 31|$ −131
6. $-|8x - 3y| + |2y + 5x|$ −21
7. $25 - |5z + 1|$ −24
8. $44 + |-2x - y|$ 45
9. $2|4w|$ 3.2
10. $3 - |1 - 6w|$ 1.6
11. $|-3x - 2y| - 4$ −4
12. $6.4 + |w - 1|$ 7

Solve each equation. Check your solutions.

13. $|y + 3| = 2$ $\{-5, -1\}$
14. $|5a| = 10$ $\{-2, 2\}$
15. $|3k - 6| = 2$ $\left\{\frac{4}{3}, \frac{8}{3}\right\}$
16. $|2g + 6| = 0$ $\{-3\}$
17. $10 = |1 - c|$ $\{-9, 11\}$
18. $|2x + x| = 9$ $\{-3, 3\}$
19. $|p - 7| = -14$ $\emptyset$
20. $2|3w| = 12$ $\{-2, 2\}$
21. $|7x - 3x| + 2 = 18$ $\{-4, -4\}$
22. $4|7 - y| - 1 = 11$ $\{4, 10\}$
23. $|3n - 2| = \frac{1}{2}$ $\left\{\frac{1}{2}, \frac{5}{6}\right\}$
24. $|8d - 4d| + 5 = 13$ $\{-2, 2\}$
25. $-5|6a + 2| = -15$ $\left\{-\frac{5}{6}, \frac{1}{6}\right\}$
26. $|k| + 10 = 9$ $\emptyset$

Chapter 1 26 *Glencoe Algebra 2*

1 4 skills practice solving absolute value equations is an essential topic in the realm of algebra, providing students with the fundamental tools to approach problems that involve absolute values. Absolute value equations can initially seem daunting due to the nature of absolute values, which measure the distance of a number from zero on a number line, disregarding the direction. Mastering these equations not only bolsters a student's confidence but also enhances their overall problem-solving abilities. In this article, we will explore the concept of absolute value, how to solve absolute value equations, and provide various practice problems to solidify understanding.

Understanding Absolute Value

Absolute value is defined as the non-negative value of a number regardless of its sign. Mathematically, the absolute value of a number x is denoted as $|x|$. The properties of absolute values can be summarized as follows:

- $|x| = x$ if $x \geq 0$
- $|x| = -x$ if $x < 0$

This means that the absolute value function takes any real number and transforms it into a non-negative number. For example:

- $|5| = 5$
- $|-5| = 5$
- $|0| = 0$

Solving Absolute Value Equations

To solve absolute value equations, it is essential to understand the two scenarios that arise due to the nature of absolute values:

1. The expression inside the absolute value equals a positive value.
2. The expression inside the absolute value equals a negative value.

Given an absolute value equation of the form $|A| = B$, where $B \geq 0$, we can break it down into two separate equations:

- $A = B$
- $A = -B$

For example, to solve the equation $|2x - 3| = 5$, we separate it into two equations:

1. $2x - 3 = 5$
2. $2x - 3 = -5$

We can then solve these equations individually.

Example 1: Solving Absolute Value Equations

Let’s apply the method to our example:

1. First Equation:
$2x - 3 = 5$
$2x = 8$
$x = 4$

2. Second Equation:
$2x - 3 = -5$
$2x = -2$
$x = -1$

Thus, the solutions to the equation $|2x - 3| = 5$ are $x = 4$ and $x = -1$.

Example 2: More Complex Equations

Consider the equation $|x + 2| = 6$. This equation can be solved as follows:

1. First Equation:
$x + 2 = 6$
$x = 4$

2. Second Equation:
$x + 2 = -6$
$x = -8$

The solutions to the equation $|x + 2| = 6$ are $x = 4$ and $x = -8$.

Special Cases in Absolute Value Equations

While the general method for solving absolute value equations applies to most cases, there are special scenarios to consider:

1. No Solution:
If the equation is of the form $|A| = B$ and $B < 0$, there are no solutions. For example, $|x| = -3$ has no solution since absolute values cannot be negative.

2. Identical Solutions:
If $|A| = 0$, then the only solution is $A = 0$. For instance, $|x - 5| = 0$ yields the solution $x = 5$.

Practice Problems

To gain proficiency in solving absolute value equations, practice is crucial. Below are several practice problems, complete with their solutions.

Problem Set

1. Solve $|3x + 4| = 10$
2. Solve $|2x - 5| = 3$

3. Solve $|x - 1| = 7$
4. Solve $|4x + 3| = 0$
5. Solve $|x + 6| = -2$

Solutions

1. Problem 1:
$3x + 4 = 10$ or $3x + 4 = -10$
- First Equation: $3x = 6$ → $x = 2$
- Second Equation: $3x = -14$ → $x = -\frac{14}{3}$
Solutions: $x = 2$ and $x = -\frac{14}{3}$

2. Problem 2:
$2x - 5 = 3$ or $2x - 5 = -3$
- First Equation: $2x = 8$ → $x = 4$
- Second Equation: $2x = 2$ → $x = 1$
Solutions: $x = 4$ and $x = 1$

3. Problem 3:
$x - 1 = 7$ or $x - 1 = -7$
- First Equation: $x = 8$
- Second Equation: $x = -6$
Solutions: $x = 8$ and $x = -6$

4. Problem 4:
$4x + 3 = 0$
- Solution: $4x = -3$ → $x = -\frac{3}{4}$

5. Problem 5:
No solutions, since absolute values cannot equal a negative number.

Conclusion

Mastering the skills needed to solve absolute value equations is a critical component of algebra. By understanding the properties of absolute values and the method for solving these equations, students can tackle a wide range of problems with confidence. Regular practice through problems and exercises will reinforce these skills, leading to greater proficiency in mathematics. Whether in preparation for exams or just to enhance problem-solving abilities, the practice of solving absolute value equations will yield lasting benefits.

Frequently Asked Questions

What is an absolute value equation?

An absolute value equation is an equation that contains an absolute value expression, which represents the distance of a number from zero on the number line.

How do you solve the equation |x - 3| = 5?

To solve |x - 3| = 5, you set up two equations: x - 3 = 5 and x - 3 = -5. Solving these gives x = 8 and x = -2.

What steps should I follow to solve |2x + 1| = 7?

First, split the equation into two cases: 2x + 1 = 7 and 2x + 1 = -7. Solve each case to find x = 3 and x = -4.

Can absolute value equations have no solution?

Yes, an absolute value equation can have no solution. For example, |x| = -5 has no solution since absolute values cannot be negative.

How do you check the solution of an absolute value equation?

To check the solution, substitute the found values back into the original equation and verify if both sides are equal.

What is the graphical representation of an absolute value equation?

The graph of an absolute value equation typically forms a V-shape, where the vertex represents the point where the inside expression equals zero.

What is the role of the absolute value in the equation |x + 2| = 4?

The absolute value indicates that the expression inside can equal either 4 or -4, leading to two separate equations: x + 2 = 4 and x + 2 = -4.

How do you approach solving an absolute value equation with multiple absolute values, such as |x - 1| + |x + 2| = 3?

To solve |x - 1| + |x + 2| = 3, identify the critical points where each absolute value expression changes (x = 1 and x = -2), and then solve the resulting piecewise equations in each interval.

1 4 Skills Practice Solving Absolute Value Equations

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