

2.5 A Absolute Value Equations and Inequalities

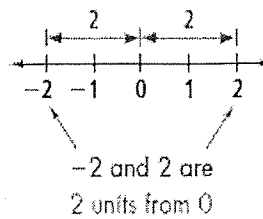
Vocabulary Builder

absolute value (noun) AB suh loot VAL yoo

Definition: The absolute value of a real number x is its distance from zero on the number line.

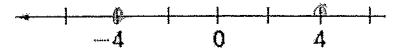
Main Idea: If x is positive, then $|x| = x$. If x is negative, then $|x| = -x$.

absolute value



Complete each graph.

6. $|x| = 4$ ± 4



Problem 1 Solving an Absolute Value Equation

Got It? What is the solution of $|3x + 2| = 4$? Graph the solution.

$$\begin{array}{l} 3x+2=-4 \\ -2 \quad -2 \\ \hline 3x=-6 \\ x=-2 \end{array} \qquad \begin{array}{l} 3x+2=4 \\ -2 \quad -2 \\ \hline 3x=2 \\ x=2/3 \end{array}$$

Problem 2 Solving a Multi-Step Absolute Value Equation

Got It? What is the solution of $2|x + 9| + 3 = 7$? Graph the solution.

$$\begin{array}{l} 2|x+9| = 4 \\ \hline |x+9| = 2 \\ \begin{array}{l} x+9=-2 \\ -9 \quad -9 \\ \hline x=-11 \end{array} \qquad \begin{array}{l} x+9=2 \\ -9 \quad -9 \\ \hline x=-7 \end{array} \end{array}$$

Problem 3 Solving for Extraneous Solutions

Got It? What is the solution of $|5x - 2| = 7x + 14$? Check for extraneous solutions.

$$\begin{array}{l} 5x-2=-7x-14 \\ 12x=-12 \\ x=-1 \end{array} \qquad \begin{array}{l} 5x-2=7x+14 \\ -16=2x \\ -8=x \\ \text{extraneous} \end{array}$$

Problem 4 Solving the Absolute Value Inequality $|A| < b$

Got It? What is the solution of $|3x - 4| \leq 8$? Graph the solution.

$$\begin{array}{l} -8 \leq 3x-4 \leq 8 \\ +4 \qquad \qquad +4 \quad +4 \\ \hline -4 \leq 3x \leq 12 \\ \hline -4/3 \leq x \leq 4 \\ [-4/3, 4] \end{array}$$

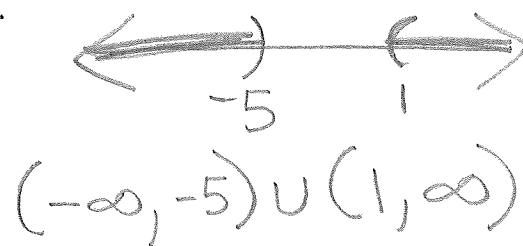
2.2, 2.4, 2.5, 2.5A



Problem 5 Solving the Absolute Value Inequality $|A| \geq b$

Got It? What is the solution of $|5x + 10| > 15$? Graph the solution.

$$\begin{array}{r} 5x + 10 < -15 \quad \text{or} \quad 5x + 10 > 15 \\ \hline -10 \quad -10 \quad \downarrow \quad \hline \frac{5x < -25}{5} \quad \downarrow \quad \frac{5x > 5}{5} \\ x < -5 \quad \text{OR} \quad x > 1 \end{array}$$



Solve each equation. Check your answers.

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

6. $|4 - 2y| + 5 = 9$

Solve each equation. Check for extraneous solutions.

7. $|x + 5| = 3x - 7$

8. $|2t - 3| = 3t - 2$

Solve each inequality. Graph the solution.

11. $5|y + 3| < 15$

12. $|2t - 3| \leq 5$

13. $|4b| - 3 > 9$

14. $\frac{1}{2}|2w - 1| - 3 \geq 1$

15. $2|4x + 1| - 5 \leq 1$

16. $|3z - 2| + 5 > 9$