3-7   **Reteaching**

Absolute Value Equations and Inequalities

Both 5 and –5 are solutions of the equation $|a| = 5$. Many absolute value equations have two solutions. The equation $|a| = -7$ has no solution because an absolute value cannot equal a negative number.

Problem

What are the solutions of $|t - 7| = 8$?

The equation $|t - 7| = 8$ is the same as $t - 7 = 8$ or $t - 7 = -8$.

$t - 7 = 8$	or	$t - 7 = -8$	Write the absolute value equation as two equations.
$t - 7 + 7 = 8 + 7$	or	$t - 7 + 7 = -8 + 7$	Add 7 to each side.
$t = 15$	or	$t = -1$	Simplify.

The solutions are 15 and –1.

Problem

What are the solutions of $|5p| + 25 = 15$?

First isolate the absolute value.

$|5p| + 25 = 15$	Original equation
$|5p| + 25 - 25 = 15 - 25$	Subtract 25 from each side.
$|5p| = -10$	Simplify.

The absolute value cannot have a negative value, so there is no solution for the equation.

Exercises

Solve each equation. If there is no solution, write *no solution*.

1. $|m + 8| = 5$

2. $|3b - 1| = 11$

3. $|y + 17| - 25 = -10$

4. $|4s + 1| + 7 = 5$

5. $|2w - 4| + 18 = 15$

6. $\left|\dfrac{h}{3} + 4\right| - 2 = 5$
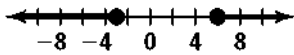
The inequality $|a| < 5$ is the same as $a < 5$ and $a > -5$.

The inequality $|a| > 5$ is the same as $a > 5$ or $a < -5$.

Problem

What are the solutions of $|2n - 3| \le 9$? Graph the solutions.

$2n - 3 \ge 9$	or	$2n - 3 \le -9$	Write the absolute value inequality as two inequalities.
$2n - 3 + 3 \ge 9 + 3$	or	$2n - 3 + 3 \le -9 + 3$	Add 3 to each side.
$2n \ge 12$	or	$2n \le -6$	Simplify.
$\dfrac{2n}{2} \ge \dfrac{12}{2}$	or	$\dfrac{2n}{2} \le \dfrac{-6}{2}$	Divide each side by 2.
$n \ge 6$	or	$n \le -3$	Simplify.

Exercises

Solve and graph each inequality.

7. $|x - 3| > 5$

8. $|d + 4| < 3$

9. $|n + 1| \le 7$

10. $|f - 5| \ge 1$

11. $|2v| > 16$

12. $\left|\dfrac{z}{3}\right| < 2$

13. $|2k - 1| \ge 7$

14. $|4r + 1| \le 9$

15. $\left|\dfrac{2}{3}p\right| < 8$

16. $|8s - 16| > 16$

17. $\left|\dfrac{b}{2} - 1\right| \ge 2$

18. $|5g + 10| \le 40$