Name _____ Date _____

LESSON 5.5

Study Guide

For use with the lesson "Solve Absolute Value Equations"

GOAL **Solve absolute value equations.**

Vocabulary

An **absolute value equation,** such as $|x| = 3$, is an equation that contains an absolute value expression.

The **absolute deviation** of a number x from a given value is the absolute value of the difference of x and the given value:
absolute deviation $= |x - \text{given value}|$.

EXAMPLE 1 ## Solve an absolute value equation

Solve the equation.

a. $|x| = 3$ **b.** $|x + 2| = 9$

Solution

a. The distance between x and 0 is 3. So, $x = 3$ or $x = -3$. The solutions are 3 and -3.

b. Rewrite the absolute value equation as two equations. Then solve each equation separately.

$\|x + 2\| = 9$	Write original equation.
$x + 2 = 9$ *or* $x + 2 = -9$	Rewrite as two equations.
$x = 7$ *or* $x = -11$	Subtract 2 from each side.

The solutions are 7 and -11. Check your solutions.

CHECK	$\|x + 2\| = 9$	Write original inequality.
	$\|7 + 2\| \stackrel{?}{=} 9$ $\quad$ $\|-11 + 2\| \stackrel{?}{=} 9$	Substitute for x.
	$\|9\| \stackrel{?}{=} 9$ $\quad$ $\|-9\| \stackrel{?}{=} 9$	Add.
	$9 = 9$ ✓ $\quad$ $9 = 9$ ✓	Simplify. The solution checks.

Exercises for Example 1

Solve the equation.

1. $|x| = 0.4$ **2.** $|x - 4| = 13$ **3.** $|2x - 1| = 7$

LESSON 5.5

Study Guide *continued*

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EXAMPLE 2 Rewrite an absolute value equation

Solve $\frac{1}{2}|3x - 6| + 7 = 13$.

Solution

First, rewrite the equation in the form $|ax + b| = c$.

$\frac{1}{2}|3x - 6| + 7 = 13$ Write original equation.

$\frac{1}{2}|3x - 6| = 6$ Subtract 7 from each side.

$|3x - 6| = 12$ Multiply each side by two.

Next, solve the absolute value equation.

$|3x - 6| = 12$ Write absolute value equation.

$3x - 6 = 12$ *or* $3x - 6 = -12$ Rewrite as two equations.

$3x = 18$ *or* $3x = -6$ Add 6 to each side.

$x = 6$ *or* $x = -2$ Divide each side by 3.

The solutions are 6 and -2.

EXAMPLE 3 Decide if an equation has no solution

Solve $|2x - 1| + 4 = 3$, if possible.

Solution

$|2x - 1| + 4 = 3$ Write original equation.

$|2x - 1| = -1$ Subtract 4 from each side.

The absolute value of a number is never negative. So, there are no solutions.

Exercises for Examples 2 and 3

Solve the equation, if possible.

4. $2|x - 1| - 5 = 9$

5. $5|x - 4| + 11 = 8$

6. $\frac{1}{5}|2x - 3| - 4 = 1$