Name_____ Date _____

1.3 Solving Absolute Value Inequalities

For use with Exploration 1.3

Essential Question How can you solve an absolute value inequality?

1 EXPLORATION: Solving an Absolute Value Inequality Algebraically

Work with a partner. Consider the absolute value inequality $|x + 2| \leq 3$.

a. Describe the values of $x + 2$ that make the inequality true. Use your description to write two linear inequalities that represent the solutions of the absolute value inequality.

b. Use the linear inequalities you wrote in part (a) to find the solutions of the absolute value inequality.

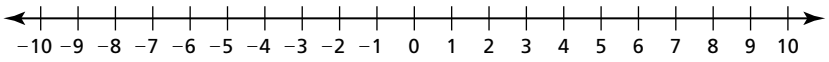
c. How can you use linear inequalities to solve an absolute value inequality?

2 EXPLORATION: Solving an Absolute Value Inequality Graphically

Go to *BigIdeasMath.com* for an interactive tool to investigate this exploration.

Work with a partner. Consider the absolute value inequality $|x + 2| \leq 3$.

a. On a real number line, locate the point for which $x + 2 = 0$.



b. Locate the points that are within 3 units from the point you found in part (a). What do you notice about these points?

c. How can you use a number line to solve an absolute value inequality?

Name _____ Date _____

1.3 Solving Absolute Value Inequalities (continued)

3 EXPLORATION: Solving an Absolute Value Inequality Numerically

Go to *BigIdeasMath.com* for an interactive tool to investigate this exploration.

Work with a partner. Consider the absolute value inequality $|x + 2| \leq 3$.

a. Use a spreadsheet, as shown, to solve the absolute value inequality.

	A	B
1	***x***	**|x + 2|**
2	-6	4
3	-5	
4	-4	
5	-3	
6	-2	
7	-1	
8	0	
9	1	
10	2	
11		

abs(A2 + 2)

b. Compare the solutions you found using the spreadsheet with those you found in Explorations 1 and 2. What do you notice?

c. How can you use a spreadsheet to solve an absolute value inequality?

Communicate Your Answer

4. How can you solve an absolute value inequality?

5. What do you like or dislike about the algebraic, graphical, and numerical methods for solving an absolute value inequality? Give reasons for your answers.

Name_____ Date _____

1.3 Practice

For use after Lesson 1.3

Notes:

Core Concepts

Solving Absolute Value Inequalities

To solve $|ax + b| < c$ for $c > 0$, solve the compound inequality

$$ax + b > -c \quad and \quad ax + b < c.$$

To solve $|ax + b| > c$ for $c > 0$, solve the compound inequality

$$ax + b < -c \quad or \quad ax + b > c.$$

In the inequalities above, you can replace $<$ with $\leq$ and $>$ with $\geq$.

Notes:

Worked-Out Examples

Example #1

Solve the inequality. Graph the solution, if possible.

$|4c + 5| > 7$

$4c + 5 < -7 \quad or \quad 4c + 5 > 7$

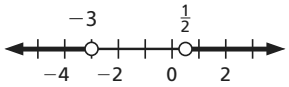
$-5 \quad -5 \qquad -5 \quad -5$

$4c < -12 \qquad 4c > 2$

$\frac{4c}{4} < \frac{-12}{4} \qquad \frac{4c}{4} > \frac{2}{4}$

$c < -3 \quad or \quad c > \frac{1}{2}$

The solution is $c < -3$ *or* $c > \frac{1}{2}$.



Name _____ Date _____

1.3 Practice (continued)

Example #2

Write the sentence as an absolute value inequality. Then solve the inequality.

Twice a number is no less than 10 units from -1.

$|2n - (-1)| \geq 10$

$|2n + 1| \geq 10$

$2n + 1 \leq -10$ *or* $2n + 1 \geq 10$

$-1 \quad -1 \qquad -1 \quad -1$

$2n \leq -11 \qquad 2n \geq 9$

$\frac{2n}{2} \leq \frac{-11}{2} \qquad \frac{2n}{2} \geq \frac{9}{2}$

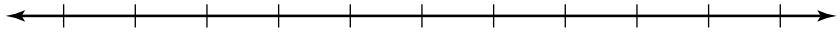
$n \leq -\frac{11}{2}$ *or* $n \geq \frac{9}{2}$

The solution is $n \leq -\frac{11}{2}$ *or* $n \geq \frac{9}{2}$.

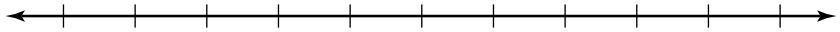
Practice A

In Exercises 1–9, solve the inequality. Graph the solution, if possible.

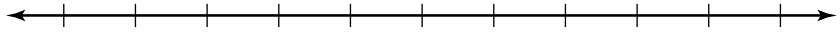
1. $|y + 2| < 8$



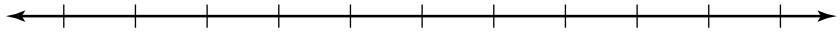
2. $\left|\frac{q}{3}\right| > 2$



3. $3|2a + 5| + 10 \leq 37$



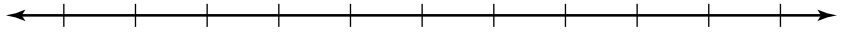
4. $|y - 3| \leq 4$



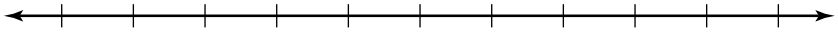
Name_____ Date _____

1.3 Practice (continued)

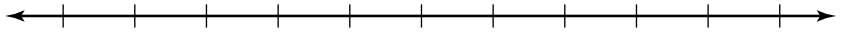
5. $|3 + r| - 4 < 0$



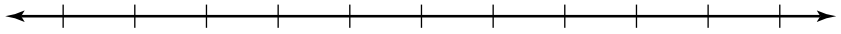
6. $|f + 12| > -4$



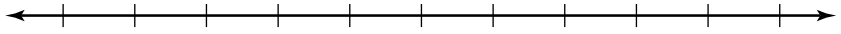
7. $\left|\frac{x}{4} - 7\right| < -2$



8. $|4x - 7| + 8 \geq 17$



9. $6|3 - k| + 14 > 14$



10. At a certain company, the average starting salary s for a new worker is \$25,000. The actual salary has an absolute deviation of at most \$1800. Write and solve an inequality to find the range of the starting salaries.

Name_____ Date _____

Practice B

In Exercises 1–9, solve the inequality. Graph the solution, if possible.

1. $|2x - 9| < -8$

2. $|5q - 1| - 7 \geq 2$

3. $|y - 2| + 11 > 0$

4. $5|12 - r| > 15$

5. $-2|3d - 5| \leq 10$

6. $3|2a + 8| - 11 \leq -5$

7. $-2|1 - 3h| + 9 < -12$

8. $5|-p + 2| + 4 > 4$

9. $\frac{1}{3}|2x + 3| - 1 \leq 8$

10. The thermometer in a freezer is set at $-2°\text{F}$. This temperature varies by up to $3°\text{F}$ throughout the day. Write and solve an absolute value inequality that represents the range of temperatures (in degrees Fahrenheit) of the freezer throughout the day.

11. Describe and correct the error in solving the absolute value inequality.

$$\begin{aligned} |x - 5| + 2 &< 8 \\ -8 &< x - 5 + 2 < 8 \\ -5 &< x < 11 \end{aligned}$$

In Exercises 12–14, write the sentence as an absolute value inequality. Then solve the inequality.

12. A number is more than 12 units from 0.

13. One-third of a number is at least 5 units from 31.

14. Twice a number is no more than 7 units from 13.

15. Write an absolute value inequality that represents the situation. Then solve the inequality. The difference between the perimeters of the figures is not greater than 10.