STUDY GUIDE REVIEW

Absolute Value Functions, Equations, and Inequalities

MODULE 2

Essential Question: How can you use absolute value functions to solve real-world problems?

Key Vocabulary

absolute value *(valor absoluto)*
absolute-value equation *(ecuación de valor absoluto)*
coefficient *(coeficiente)*
disjunction *(disyunción)*
domain *(dominio)*
function *(función)*
inequality *(desigualdad)*
parameter *(parámetro)*
range *(rango)*
symmetry *(simetría)*
vertex *(vértice)*

KEY EXAMPLE (Lesson 2.1)

Given the function $g(x) = \left|\frac{1}{3}(x + 6)\right| - 1$, predict what the graph will look like compared to the parent function, $f(x) = |x|$.

The graph of $g(x)$ will be the graph of $f(x)$ translated down 1 unit and left 6 units. There will also be a horizontal stretch of $f(x)$ by a factor of 3.

KEY EXAMPLE (Lesson 2.2)

Solve $6|2x + 3| + 1 = 25$ algebraically.

$6|2x + 3| = 24$ — Subtract 1 from both sides.

$|2x + 3| = 4$ — Divide both sides by 6.

$2x + 3 = 4$ or $2x + 3 = -4$ — Rewrite as two equations.

$2x = 1$ or $2x = -7$ — Subtract 3 from both sides.

$x = \frac{1}{2}$ or $x = -\frac{7}{2}$ — Solve for x.

So, $x = \frac{1}{2}$ or $-\frac{7}{2}$.

KEY EXAMPLE (Lesson 2.3)

Solve $|x + 2| - 4 < 4$ algebraically, then graph the solution on a number line.

$$|x + 2| - 4 < 4$$

$|x + 2| < 8$ — Add 4 to both sides.

$x + 2 < 8$ and $x + 2 > -8$ — Rewrite as two inequalities.

$x < 6$ and $x > -10$ — Subtract 2 from both sides.

The solution is $x < 6$ and $x > -10$.

EXERCISES

Solve. *(Lessons 2.2, 2.3)*

1. $-10|x+2| = -70$

2. $|3x+7| = 27$

3. $\frac{1}{7}|8+x| \leq 5$

4. $|x-2| - 5 > 10$

5. Explain how the graph of $g(x) = \left|\frac{3}{7}(x-4)\right| + 2$ compares to the graph of $h(x) = \frac{3}{7}(x-4) + 2$. *(Lesson 2.1)*

6. Leroy wants to place a chimney on his roof. It is recommended that the chimney be set at a height of at least 25 feet. The height of the roof is described by the function $r(x) = -\frac{4}{3}|x-10| + 35$, where x is the width of the roof. Where should Leroy place the chimney if the house is 40 feet wide? *(Lesson 2.3)*

MODULE PERFORMANCE TASK

What Is the Purity of Gold?

The purity of gold in jewelry is measured in "karats," with 24-karat gold the highest purity (100% pure gold). You have three gold rings labeled 10 karat, 14 karat, and 18 karat, and would like to know if the rings are correctly labeled. The table shows the results of an analysis of the rings.

Ring Label	Actual Percentage of Gold
10-karat	40.6%
14-karat	59.5%
18-karat	71.2%

In the United States, jewelry manufacturers are legally allowed a half karat tolerance. Determine which of the rings, if any, have an actual percentage of gold that falls outside this tolerance.

List any additional information you will need and then complete the task. Be sure to write down all your data and assumptions. Then use graphs, numbers, words, or algebra to explain how you reached your conclusion.

Ready to Go On?

2.1–2.3 Absolute Value Functions, Equations, and Inequalities

- Online Homework
- Hints and Help
- Extra Practice

Solve. *(Lesson 2.2)*

1. $|-2x - 3| = 6$

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

3. $|3x + 8| = 2$

4. $4|x + 7| + 3 = 59$

Solve each inequality using the method indicated. *(Lesson 2.3)*

5. $|5x + 2| \leq 13$ (algebraically)

6. $|x - 2| + 1 \leq 5$ (graphically)

ESSENTIAL QUESTION

7. Write a real world situation that could be modeled by $|x - 14| = 3$.

Assessment Readiness

1. Look at each equation. Tell whether the graph of the equation be will reflected over the x-axis when compared to $f(x) = |x|$.
   - **A.** $g(x) = 3|x - 4|$
   - **B.** $h(x) = -\frac{1}{2}|x|$
   - **C.** $j(x) = |x + 3| - 2$

2. Consider the absolute value equation $\frac{2}{3}|x - 4| + 2 = 5$. Determine if each statement is True or False.
   - **A.** Solving $\frac{2}{3}|x - 4| + 2 = 5$ gives the same x-values as solving $\left|\frac{2}{3}(x - 4)\right| + 2 = 5$.
   - **B.** To solve the equation for x, the first step is to add 4 to both sides.
   - **C.** Before the step to rewrite as two equations, the equation looks like: $|x - 4| = 3$.

3. Describe the domain, range, and vertex of the function $f(x) = 3|x - 4| + 2$. Explain your answers.

4. Laurie wants to put a portable cellular phone mini-tower on her roof. The tower cannot be placed higher than 30 feet. The slant of her roof can be represented by the equation $r(x) = -\frac{1}{4}|x| + 60$. If her house is 40 feet wide, where could she place the tower? Explain.