

Bell Work

Chris saved twice the number of quarters that Nora saved plus 6. The number of quarters Chris saved is also five times the difference of the number of quarters Nora saved and 3. Write and solve an equation to find the number of quarters they each have saved.

Chapter 2.5
Absolute Value Equations

Objectives:

- Evaluate absolute value expressions.
- Solve absolute value equations.

Absolute Value Expressions

Ex. 1 Evaluate $|a - 7| + 15$ if $a = 5$.

$$\begin{aligned} |a - 7| + 15 &= |5 - 7| + 15 && \text{Replace } a \text{ with } 5. \\ &= |-2| + 15 && 5 - 7 = -2 \\ &= 2 + 15 && |-2| = 2 \\ &= 17 && \text{Simplify.} \end{aligned}$$

Practice: Evaluate $|17 - b| + 23$ if $b = 6$.

Absolute Value Equations

Key Concept Absolute Value Equations

Words When solving equations that involve absolute values, there are two cases to consider.

Case 1 The expression inside the absolute value symbol is positive or zero.

Case 2 The expression inside the absolute value symbol is negative.

Symbols For any real numbers a and b , if $|a| = b$ and $b \geq 0$, then $a = b$ or $a = -b$.

Example $|d| = 10$, so $d = 10$ or $d = -10$.

Ex. 1 Solve $|2x - 1| = 7$. Then graph the solution set.

Case 1

$$2x - 1 = 7$$

$$2x - 1 + 1 = 7 + 1 \quad \text{Add 1 to each side.}$$

$$2x = 8 \quad \text{Simplify.}$$

$$x = \frac{8}{2} \quad \text{Divide each side by 2.}$$

$$x = 4 \quad \text{Simplify.}$$

Case 2

$$2x - 1 = -7$$

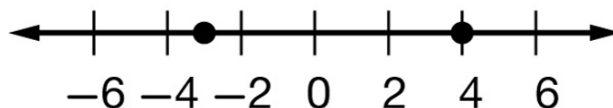
$$2x - 1 + 1 = -7 + 1$$

$$2x = -6$$

$$x = \frac{-6}{2}$$

$$x = -3$$

Answer: $\{-3, 4\}$



Ex. 2 Solve $|p + 6| = -5$. Then graph the solution set.

$|p + 6| = -5$ means the distance between p and 6 is -5 .
Since distance cannot be negative, the solution is the empty set \emptyset .

Practice

A. Solve $|3x + 3| = 15$.

B. Solve $|2x - 14| = -9$.

1. $3w + 2 = 7w$

4. $8s - 10 = 3(6 - 2s)$

2. $\frac{x}{2} + 1 = \frac{1}{4}x - 6$

5. $6(y - 5) = 2(10 + 3y)$

3. $7x + 5(x - 1) = -5 + 12x$

6. $7(n - 1) = -2(3 + n)$

7. Solve $|2x + 3| = 5$.

8. Solve $|x - 3| = -5$.

WEATHER The average January temperature in a northern Canadian city is 1°F . The actual January temperature for that city may be about 5°F warmer or colder. Write and solve an equation to find the maximum and minimum temperatures.

Write $|t - 1| = 5$ as $t - 1 = 5$ or $t - 1 = -5$.

Case 1

$$t - 1 = 5$$

$$t - 1 + 1 = 5 + 1$$

$$t = 6$$

Case 2

$$t - 1 = -5$$

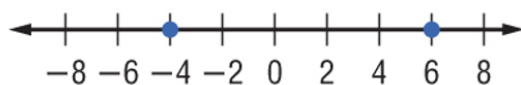
$$t - 1 + 1 = -5 + 1$$

$$t = -4$$

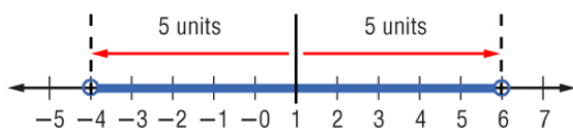
Add 1 to
each side.

Simplify.

Write an equation involving absolute value for the graph.



Find the point that is the same distance from -4 as the distance from 6 . The midpoint between -4 and 6 is 1 .



The distance from 1 to -4 is 5 units.

The distance from 1 to 6 is 5 units.

So, an equation is $|y - 1| = 5$.

Write an equation involving the absolute value for the graph.

