

Algebra IB

Lesson 6.5

Solve Absolute Value Equations

Warm-Up

Evaluate each of the following Absolute Value expressions.

(a) $|-5|$

5

(b) $|3-7|$

4

(c) $|-2+5|$

3

(d) $|1+5|-7$

-1

Example 1. Solving an Absolute Value Equation

What are the value(s) of x that would make the following equations true?

(a) $|x|=6$ $x=6$ or $x=-6$

(b) $|x|=-8$ No Solution

Solving Absolute Value Equations

For the equation $|ax+b|=c$ you will solve two equivalent equations:

$$ax+b=c \quad \text{OR} \quad ax+b=-c$$

Example 2. Solve an Absolute Value Equation

Solve each of the absolute value equations by setting up and solving the two equivalent equations.

(a) $|x+4|=3$

$$x+4=3 \quad \text{OR} \quad x+4=-3$$

$$x=-1 \quad \text{OR} \quad x=-7$$

(b) $|r-7|=9$

$$r-7=9 \quad \text{OR} \quad r-7=-9$$

$$r=16 \quad \text{OR} \quad r=-2$$

Check: $|1+4|=3$ $|-7+4|=3$
 $3=3$ ✓ $3=3$ ✓

Check: $|16-7|=9$ $|-2-7|=9$
 $|9|=9$ $|-9|=9$
 $9=9$ ✓ $9=9$ ✓

Example 3. Isolating the Absolute Value

Solve each absolute value equation by making sure that the absolute values are isolated (alone).

(a) $|x+2|-1=3$

$$|x+2|=4$$

$$x+2=4 \quad \text{OR} \quad x+2=-4$$

$$x=2 \quad \text{OR} \quad x=-6$$

(b) $3|4x+2|-7=11$

$$\frac{3|4x+2|}{3} = \frac{18}{3}$$

$$|4x+2|=6$$

$$4x+2=6 \quad \text{OR} \quad 4x+2=-6$$

$$4x=4 \quad \quad \quad 4x=-8$$

$$x=1 \quad \text{OR} \quad x=-2$$

Try It!

Solve each equation.

(a) $|2x-7|=5$

$$2x-7=5 \text{ or } 2x-7=-5$$

$$2x=12 \quad 2x=2$$

$$x=6 \quad \text{or} \quad x=1$$

(b) $3|x-5|=6$

$$|x-5|=2$$

$$x-5=2 \quad \text{or} \quad x-5=-2$$

$$x=7 \quad \text{or} \quad x=3$$

(c) $2|3x+1|-3=9$

$$2|3x+1|=12$$

$$|3x+1|=6$$

$$3x+1=6 \quad \text{or} \quad 3x+1=-6$$

$$3x=5 \quad 3x=-7$$

$$x=\frac{5}{3} \quad x=-\frac{7}{3}$$

Example 4. An Absolute Value Equation with No Solution

Solve each equation if possible.

(a) $|x+4|=-2$

No Solution

(b) $|2x-8|+3=2$

$$|2x-8|=-1$$

*No Solution***Assignment:**

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Review:

Solve and Graph

1. $x-3 < 10$

2. $-6 > x+5$

3. $\frac{x}{4} \leq 8$

4. $-32x > 64$

5. $\frac{2}{3}x+2 \leq 4$

6. $3x+5 \leq 2x-1$

7. $(x+6) \geq 2(1-x)$

8. $-2x+8 > 3x+10$