1.4. Advanced Algebra

DATE: 10/3

Solving Absolute Value Equations

Target 2A. Utilize a graph to illustrate the solution set of an absolute value inequality.

Evaluate an Expression with Absolute Value

1. Evaluate $1.4 + |5y - 7|$ if $y = -3$.

$1.4 + |5(-3) - 7|$

$= 1.4 + |-15 - 7|$

$= 1.4 + |-22|$

$= 1.4 + 22 = 23.4$

2. Evaluate $2.7 + |6 - 2x|$ if $x = 4$.

$2.7 + |6 - 2(4)|$

$= 2.7 + |6 - 8|$

$= 2.7 + |-2| = 2.7 + 2 = 4.7$

Solve an Absolute Value Equation

3. Solve $|x - 18| = 5$. Check your solutions.

* Always do the opposite on second eq.

$|x-18| = 5 \Rightarrow x - 18 = 5$ OR $x - 18 = -5$

$+18 \quad +18 \qquad +18 \quad +18$

$x = 23$ OR $x = 13$

∴ the solution is $\{23, 13\}$.

CHECK IN ORIGINAL EQUATION

$|x-18| = 5$

$|13-18| = 5$

$|-5| = 5$

$5 = 5$

True

$|x-18| = 5$

$|23-18| = 5$

$|5| = 5$

$5 = 5$

True ✓

4. Solve $|x + 6| = 3x - 2$. Check your solutions.

Ex:

$|-3| = 3$

$|5| = 5$

* Recall the absolute value of a positive or negative # is always POSITIVE

5

"It's the distance from 0 on # number line

4. Solve $|x+6| = 3x-2$. Check your solutions.

we took opposite

$|x+6| = 3x-2 \Rightarrow$ $x+6 = 3x-2$ OR $x+6 = -3x+2$

$-x \quad -x$ $\qquad$ $+3x \quad +3x$

$6 = 2x-2$ $\qquad$ $4x+6 = 2$

$+2 \quad +2$ $\qquad$ $-6 \quad -6$

$\frac{8}{2} = \frac{2x}{2}$ $\qquad$ $\frac{4x}{4} = \frac{-4}{4}$

$4 = x$ $\qquad$ $x = -1$

only

$\therefore$ Sol is $\{4\}$

OR

CHECK:

$|x+6| = 3x-2$

$|4+6| = 3(4)-2$

$|10| = 12-2$

$10 = 10$ ✓ TRUE

$|x+6| = 3x-2$

$|-1+6| \neq 3(-1)-2$

$|5| \neq -5$

$5 \neq -5$ FALSE ✗

5. Solve $|5x-6|+9 = 0$. Check your solutions.

$-9 \quad -9$

$|5x-6| = -9$? No solution ϕ

Why? B/c the distance (which is always positive) from 0 on the number line cannot be -9.

Evaluate each expression if $a = -5,\ b = 6,\ c = 2.8$.

1. $|-3a|$ $= |-3(-5)|$
   $= |15| = 15$

2. $|2b - 15|$
   $= |2(6) - 15|$
   $= |12 - 15| = |-3| = 3$

3. $6 - |3c + 7|$
   $6 - |3(2.8) + 7|$
   $= 6 - |8.4 + 7| = 6 - |15.4| = 6 - 15.4 = -9.4$

4. $|a - b| - |10c - a|$
   $|-5 - (6)| - |10(2.8) - (-5)|$
   $= |-11| - |28 + 5| = 11 - |33| = 11 - 33 = -22$

Solve each equation. Check your solutions.

5. $|y + 9| = 21$

Solve each equation. Check your solutions.

5. $|y + 9| = 21$ $\Rightarrow$ $y+9=21$ or $y+9=-21$

$-9\ -9$ $\qquad$ $-9\ \ -9$

$y=12$ $\qquad$ $y=-30$

$\therefore$ Solution is $\{12, -30\}$.

CHECK:

$|12+9| = 21$

$|21| = 21$

$21 = 21$ ✓

True

$|-30+9| = 21$

$|-21| = 21$

$21 = 21$ ✓

True

6. $2|b + 4| = 48$ (hint: divide both sides of the equation by two.)

$\frac{}{2} \qquad \frac{}{2}$

$|b+4| = 24$ $\Rightarrow$ $b+4=24$ or $b+4=-24$

$-4\ \ -4$ $\qquad$ $-4\ \ -4$

$b=20$ or $\qquad$ $b=-28$

$\therefore$ Solution is $\{20, -28\}$.

CHECK:

$2|20+4| = 48$

$2 \cdot |24| = 48$

$2 \cdot 24 = 48$

$48 = 48$

True

$2|-28+4| = 48$

$2|-24| = 48$

$2 \cdot 24 = 48$

$48 = 48$ ✓

True