

**Title:** Absolute Value Equations

**Time expected to complete:**

**Intended course level:** Math 125 (Intermediate Algebra)

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**Instructions to tutor:** Read instructions and follow all steps for each problem exactly.

**Purpose:**

This activity is intended facilitate your learning and understanding of the process of solving absolute value equations, where there may be 2, 1 or no solutions.

Recall that an absolute value equation is an equation involving one or two absolute value expressions. A solution to an equation is a number that satisfies the equation.

**Solving Absolute Value Equations:**

Suppose X and Y represent algebraic expressions. It is necessary that the absolute value expression is isolated on one side of the equation before applying one of the following absolute value properties.

$$|X| = a \begin{cases} \text{If } a \text{ is positive, then solve } X = a \text{ and } X = -a. \\ \text{If } a \text{ is 0, solve } X = 0. \\ \text{If } a \text{ is negative, then the equation } |X| = 0 \text{ has no solution.} \end{cases}$$

$$|X| = |Y| \text{ Solve } X = Y \text{ and } X = -Y$$

**Activity:** Work through the following activity/problems. You may use your textbook or notes to help you, but do not consult a tutor until you have completed problem #3.

1. Solve  $|3x - 2| - 3 = 4$

First, isolate the absolute value expression by adding 3 to both sides:  $|3x - 2| = 7$ .

This last equation is equivalent to  $3x - 2 = 7$  or  $3x - 2 = -7$ . Solving each equation, you should obtain  $x = 3$  or  $x = -\frac{5}{3}$ . To check, substitute  $x = 3$  and

$x = -\frac{5}{3}$  to original equation:  $|3 \cdot 3 - 2| - 3 = 4$  and  $|3 \cdot (-\frac{5}{3}) - 2| - 3 = 4$  are both true.

The solutions are 3 and  $-\frac{5}{3}$ .

2. Now it's your turn. Solve  $|5 - 4x| + 2 = 11$

Isolate absolute value expression:  $|5 - 4x| = \underline{\hspace{2cm}}$

This last equation is equivalent to  $5 - 4x = \underline{\hspace{2cm}}$  or  $5 - 4x = \underline{\hspace{2cm}}$

Solve each equation separately.

$x = \underline{\hspace{2cm}}$  or  $x = \underline{\hspace{2cm}}$

(Did you get  $-1$  and  $\frac{7}{2}$  for your solutions? If not, go back and check your work.)

3. Now try this problem. Solve  $|7x+3|=|2x-2|$

This equation is equivalent to  $7x+3=2x-2$  or  $7x+3=-(2x-2)$

Now solve each equation separately.

$x = \underline{\quad}$  or  $x = \underline{\quad}$

(Did you get -1 and  $-\frac{1}{9}$  for your solutions? If not, go back and check your work.)

**You can now ask the tutor for some questions/clarifications regarding the previous problems, if any. Afterwards, try the following problems on your own. Then check with the tutor to make sure you did them correctly.**

4. Solve  $|6x+5|+2=7$

5. Solve  $|9-7x|+10=5$

6. Solve  $|8-6x|=0$

7. Solve:  $|2x-8|=|5x+7|$

**Review:** Meet with the tutor to verify your work on this worksheet and discuss some of the areas that were more challenging for you.

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For tutor use: Please check appropriate box:

- Student has completed worksheet but may need further assistance.
- Student has mastered topic.