

**Title:** Absolute Value Inequalities of the form  $|X| > a$

**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 to facilitate your learning and understanding of the process of solving absolute value inequalities of the form  $|X| > a$ .

**Solving Absolute Value Inequalities of the form  $|X| > a$**

If  $a$  is a positive number and  $X$  is an algebraic expression, then  $|X| > a$  is equivalent to  $x > a$  or  $x < -a$ . This property also holds true for the inequality  $|X| \geq a$ .

Note: If  $a$  is 0, then  $|X| > 0$  has every real number as solution except when  $X = 0$ , while  $|X| \geq 0$  has every real number as solution. If  $a$  is negative, then both  $|X| > a$  and  $|X| \geq a$  have every real number as solution.

**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.

**Note:** Before using an absolute value inequality property, isolate the absolute value expression on the left side of the inequality.

1. Solve for  $x$ :  $\left| \frac{5}{2}x - 10 \right| - 3 > 2$

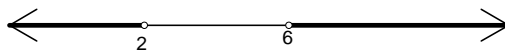
First, isolate absolute value by adding 3 to both sides:  $\left| \frac{5}{2}x - 10 \right| - 3 + 3 > 2 + 3$ .

This simplifies to  $\left| \frac{5}{2}x - 10 \right| > 5$ . From the preceding property,

we see that this is equivalent to  $\frac{5}{2}x - 10 > 5$  or  $\frac{5}{2}x - 10 < -5$ .

Solving each inequality for  $x$ , add 10 to all sides  $\frac{5}{2}x > 15$  or  $\frac{5}{2}x < 5$ .

Multiplying all sides by  $\frac{2}{5}$ , we get  $x > 6$  or  $x < 2$ .



The solution is  $(-\infty, 2) \cup (6, \infty)$  with graph

2. Now it's your turn. Solve for  $t$ :  $|7 - 4t| \geq 8$

This inequality is equivalent to  $7 - 4t \geq \underline{\hspace{1cm}}$  or  $7 - 4t \leq \underline{\hspace{1cm}}$

Now, subtract 7 from both sides:  $-4t \geq \underline{\hspace{1cm}}$  or  $-4t \leq \underline{\hspace{1cm}}$

Divide all three parts by -4, and reverse the inequality symbol:  $t \leq \underline{\hspace{1cm}}$  or  $t \geq \underline{\hspace{1cm}}$

(Why?) The solution set is  $\underline{\hspace{3cm}}$  and the graph is

(Did you get  $(-\infty, -\frac{1}{4}] \cup [\frac{15}{4}, \infty)$  for your solution set? If not, go back and check your work.)

3. Now try this problem. Solve  $|\frac{7}{8}x + \frac{3}{8}| + 9 > 13$

Isolate absolute value:

Equivalent compound inequality without absolute value:

Solve resulting compound inequality:

Write solution set in interval notation:

Graph solution set:

(Did you get  $(-\infty, -5) \cup (\frac{29}{7}, \infty)$  for your solution set? 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  $|6x - 11| \geq 17$ . Express solution set in interval notation and graph.

5. Solve  $|10 - \frac{6}{7}x| + 12 \geq 8$ . Express solution set in interval notation and graph.

6. Solve  $|\frac{3}{4}x - 16| - 2 > 2$ . Express solution set in interval notation and graph.

7. Solve:  $|9x - 1| + 8 > 8$ . Express solution set in interval notation and graph.

**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.