Just in Time Quick Check

Standard of Learning A2.EI.1

Strand: Equations and Inequalities

Standard of Learning A2.EI.1

The student will represent, solve, and interpret the solution to absolute value equations and inequalities in one variable.

Students will demonstrate the following Knowledge and Skills:

a) Create an absolute value equation in one variable to model a contextual situation.

b) Solve an absolute value equation in one variable algebraically and verify the solution graphically.

c) Create an absolute value inequality in one variable to model a contextual situation.

d) Solve an absolute value inequality in one variable and represent the solution set using set notation, interval notation, and using a number line.

e) Verify possible solution(s) to absolute value equations and inequalities in one variable algebraically, graphically, and with technology to justify the reasonableness of answer(s). Explain the solution method and interpret solutions for problems given in context.

Just in Time Quick Check

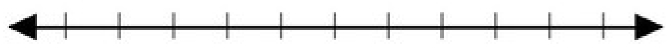
Just in Time Quick Check Teacher Notes

Supporting and Prerequisite SOL: A.EI.1

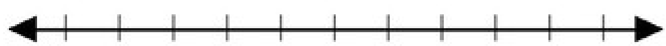
Just in Time Quick Check A2.EI.1

1. What are the solutions to the equation $\frac{1}{3}|4-x|+7=2$?

2. Solve and graph the inequality $8|x-2|+3\geq 19$.



3. Solve and graph the inequality $|-3x-(10-2x)|>5$.



4. Write the solution set for the inequality $|4x+10|\leq 6x$. Write the solution in set or interval notation.

5. A student is practicing for a mile run. Their target time, *t,* is 7 minutes, and the head coach says the actual time should be within 30 seconds of that goal.
    a) Write an absolute value inequality to represent this scenario.
    b) Solve the equation.
    c) Justify your answer.

A2.EI.1 Just in Time Quick Check Teacher Notes

Common Errors/Misconceptions and their Possible Indications

1. What are the solutions to the equation $\frac{1}{3}|4 - x| + 7 = 2$?

   A common misconception that some students may have is to think they must solve the equation $|4 - x| = -15$. This may indicate that some students do not realize that absolute value describes distance and cannot equal a negative value. These same students may not understand that there are no solutions to this equation since there are no values of x that would make the left side of equation have a value of -15. It may be beneficial to show students how to use a graphing utility to graph y = |4 – x| and y = -15 and then look for points of intersection of the two graphs. It may also be helpful to have students solve |4 – x| = -15 and obtain two possible solutions of x = 19 and x = -11. Upon substituting their solutions into the original equation, students will determine that neither of these solutions make the given equation true and will conclude that there are no solutions to this equation.

2. Solve and graph the inequality $8|x - 2| + 3 \geq 19$.

   A common error some students may make is to represent the absolute value inequality using the compound inequality as $8(x - 2) + 3 \geq 19$ and $8(x - 2) + 3 \leq -19$. This may indicate that some students do not understand that the absolute value needs to be isolated before creating the two inequality statements to solve. Teachers may want to have students develop a graphic organizer to help organize the steps needed to solve absolute value inequalities. Another strategy is to encourage students to verify their solution values in the original inequality to determine if they satisfy the condition.

3. Solve and graph the inequality $|-3x - (10 - 2x)| > 5$.

   A common error students may make is to neglect to reverse the inequality sign when they reach these steps in the solving process: $-x > 15$ and $-x < 5$. This might indicate that some students are confused about reversing the inequality symbol when multiplying or dividing by a negative number. Teachers may want to have students use test points to ensure that the solution set on the number line includes values that make the original absolute value inequality true. It may also be helpful for teachers to use inequality such as $10 > 3$ and multiply both sides by negative two and discuss why the inequality symbol must be reversed to establish a true condition.

4. Write the solution set for the inequality $|4x + 10| \leq 6x$. Write the solution in set or interval notation.

   A common error students may make is to not check for extraneous solutions. This may indicate that some students do not understand how to interpret the solution of $\{x|x \geq 5\}$ and $\{x|x \geq -1\}$ and that $\{x|x \geq 5\}$ are the only values of x that satisfy the given inequality. This may indicate that the students did not check to verify if both inequality statements $x \geq 5$ and $x \geq -1$ satisfy the original inequality. Teachers should encourage students to select values from their solution set and values outside of their solution set to substitute into the original inequality to determine their validity. For example, not all values of x within $\{x|x \geq -1\}$ satisfy the original inequality (e.g., using x = 0 results in the inequality $10 \leq 0$).

5. A student is practicing for a mile run. Their target time, *t,* is 7 minutes, the head coach says the target time should be within 30 seconds of that goal.
    a) Write an absolute value inequality to represent this scenario.
    b) Solve the equation.
    c) Justify your answer.

Common errors students make when writing absolute value inequalities is creating an equation instead of an inequality. When they see the word "within," they often think it means only adding or only subtracting, rather than representing the distance from a target value. Students may also incorrectly structure the absolute value inequality by writing expressions such as |7−t|= 0.5, |7|− t = 0.5, or |t| - 7 = 0.5. Students may further struggle when solving absolute value inequalities by solving only one branch, or by incorrectly changing signs when writing the two cases. Teachers can support students by emphasizing that "within" indicates a distance from the target, which should be represented using absolute value. Using number lines, real-world examples, and visual models can help students avoid equation-writing errors. To address solving mistakes, teachers can explicitly teach the two-case method, require students to explain their reasoning in words, and discuss the difference between forming a boundary (the equality) and the resulting range (the inequality) in absolute value situations.