Just in Time Quick Check

Standard of Learning 7.PFA.4

Strand: Patterns, Functions, and Algebra

Standard of Learning 7.PFA.4

The student will write and solve one- and two-step linear inequalities in one variable, including problems in context, that require the solution of a one- and two-step linear inequality in one variable.

Students will demonstrate the following Knowledge and Skills:

a) Apply properties of real numbers and the addition, subtraction, multiplication, and division properties of inequality to solve one- and two-step inequalities in one variable. Coefficients and numeric terms will be rational.

b) Investigate and explain how the solution set of a linear inequality is affected by multiplying or dividing both sides of the inequality statement by a rational number less than zero.

c) Represent solutions to one- or two-step linear inequalities in one variable algebraically and graphically using a number line.

d) Write one- or two-step linear inequalities in one variable to represent a verbal situation, including those in context.

e) Create a verbal situation in context given a one or two-step linear inequality in one variable.

f) Solve problems in context that require the solution of a one- or two-step inequality.

g) Identify a numerical value(s) that is part of the solution set of as given one- or two-step linear inequality in one variable.

h) Describe the differences and similarities between solving linear inequalities in one variable and linear equations in one variable.

Just in Time Quick Check

Just in Time Quick Check Teacher Notes

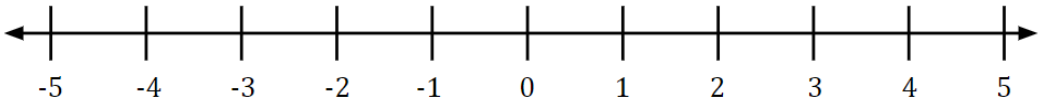
Supporting and Prerequisite SOL: 6.PFA.4

Just in Time Quick Check 7.PFA.4

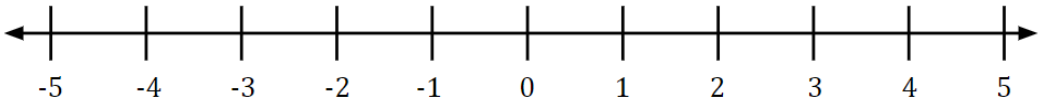
1. Identify each value of *x* that makes $11 + 2x < 13$ true.

2. Determine the solution to each inequality. Graph the solution on the number line.

   a) $-5x \geq -15$



   b) $9 > 13 + 2x$



3. What is the solution to the inequality?

$$18 < \frac{x}{4} - 2$$

4. Solve the inequality and list three values that would make the inequality true.

$$-3 < \frac{3}{4}x$$

5. Translate the sentence below.

   The total of thirteen and *b* is no more than 20.

6. Jordan wants to buy some notebooks that each cost $2.50. Jordan has $20 to spend and wants to have at least $5 left after buying the notebooks. Write a linear inequality that represents how many notebooks*, n*, Jordan can buy. Then solve the inequality.

7. A movie theater charges $8 for a ticket and $5 for a snack. Mia has no more than $35 to spend at the movie theater. Write a linear inequality that represents how many snacks, *s*, Mia can buy if she also buys one ticket. Then solve the inequality.

8. Evan and Lucy each solved the inequality $-3r > 27$. Evan determined that the solution is $r > -9$ while Lucy determined that the solution is $r < -9$. Which student is correct? Justify your reasoning.

9. Create a verbal situation for each inequality below.

   a) $b + 5 > 20$

   b) $3s + 2 < 32$

10. Erica told her teacher that solving the linear inequality $-6t > 42$, is a lot like solving the equation $-6t = 42$. Explain how the process of solving the two are similar and how they are different.

7.PFA.4 Just in Time Quick Check Teacher Notes

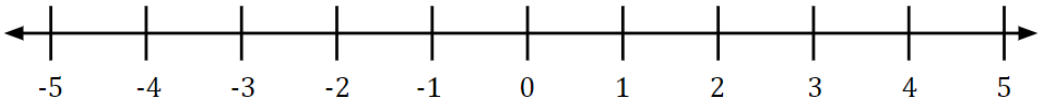
Common Errors/Misconceptions and their Possible Indications

1. Identify each value of *x* that makes $11 + 2x < 13$ true.

A common error is for students to select one as an answer. This may indicate that students do not understand that "less than" does not include the boundary number as part of the solution. Another error is that students may not choose zero because they believe that only negative numbers will make the inequality true. It may be beneficial for students to graph the solution before selecting answers, building the conceptual understanding that an inequality represents an infinite number of possible solutions.

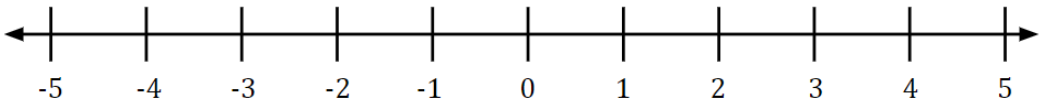
2. Determine the solution to each inequality. Graph the solution on the number line.

   a) $-5x \geq -15$



Students may not reverse the inequality sign when dividing by negative five, resulting in an incorrect solution of $x \geq 3$. This may indicate that students do not understand when dividing both sides of an inequality by a negative number, the inequality symbol reverses. Students may benefit from additional practice solving one-step multiplication and division inequalities with negative coefficients.

   b) $9 > 13 + 2x$



Students may reverse the inequality sign when dividing negative four by two resulting in an incorrect solution of $x > -2$. This may indicate that students do not understand that the inequality symbol reverses only when both sides of the inequality are multiplied or divided by a negative number. Another common error is for students to incorrectly graph the inequality as $x > -2$. This error indicates students do not understand how to graph inequalities when

the variable is on the right side or does not reverse the inequality symbol when moving the variable to the left side of the inequality.

3. What is the solution to the inequality?

$$18 < \frac{x}{4} - 2$$

Students may incorrectly say the solution to the inequality is $x < 80$, which may indicate that students may not understand how to rewrite an inequality when the variable is on the right side. A student may benefit from additional practice with inequalities where the variable is on the right side of the inequality symbol, but the solution is represented with the variable on the left side.

4. Solve the inequality and list three values that would make the inequality true.

$$-3 < \frac{3}{4}x$$

A common error is for students to misinterpret the solution $-4 < x$ and select values that are less than negative four as solutions. This indicates the student may not understand the inequality "negative four is less than x" represents all values of x that are greater than negative four. The student may benefit practice testing possible solutions and determining whether it results in a true statement with the variable on the right side of the inequality.

Another error might be that the student selects negative four as a solution. This would indicate that the student has misinterpreted the meaning of < or > symbols.

5. Translate the sentence below.

   The total of thirteen and *b* is no more than 20.

A common error students may make is translating "no more than" to have the same meaning as "less than" instead of "less than or equal to" resulting in an incorrect answer of $13 + b < 20$. This may indicate that there is confusion about when to include upper and lower limits in an equality. Students would benefit from discussions about translating inequalities when using terms "at least," "at most," "no more than," and "no fewer than."

6. Jordan wants to buy some notebooks that each cost $2.50. Jordan has $20 to spend and wants to have at least $5 left after buying the notebooks. Write a linear inequality that represents how many notebooks, *n*, Jordan can buy. Then solve the inequality.

A common error students may make is to create an equation instead of an inequality. This would result in an incorrect solution where n = 6. This may indicate that students do not recognize that Jordan can buy up to 6 notebooks in the given scenario. Students may benefit from additional practice creating and solving inequalities when given contextual situations.

7. A movie theater charges $8 for a ticket and $5 for a snack. Mia has no more than $35 to spend at the movie theater. Write a linear inequality that represents how many snacks, *s*, Mia can buy if she also buys one ticket. Then solve the inequality.

   A common error students may make is determining that Mia can buy 5.4 snacks or incorrectly interpreting the decimal remainder to determine that Mia can buy 6 snacks. Both errors indicate that students do not understand what the answer means in relation to the context of the problem. Students would benefit from practice interpreting fraction and decimal solutions in relation to contextual problems where they must determine if a fraction or decimal is appropriate or if the solution would realistically be a whole number.

8. Evan and Lucy each solved the inequality $-3r > 27$. Evan determined that the solution is $r > -9$ while Lucy determined that the solution is $r < -9$. Which student is correct? Justify your reasoning.

   A common error students may make is failing to reverse the inequality sign when both sides of the inequality are divided by negative three. Students making this error would benefit from reviewing the impact of multiplying or dividing both sides of an inequality by a negative number. Consider modeling with an inequality such as 4 < 8. This inequality is a true statement. Model how adding two, subtracting two, multiplying by two or dividing by two on both sides of the inequality impacts the inequality, but still results in a true statement. Next, model how multiplying both sides of the inequality by negative two results in -8 < -16 which is no longer a true statement. For the statement to be true, the inequality sign must be reversed. It may be helpful to model with additional examples as needed.

9. Create a verbal situation for each inequality below.

   a) $b + 5 > 20$

   Students may struggle to create a situation in which a number plus five is greater than twenty. Students may create a situation where 20 represents the upper limit. Word choice and language are important when representing verbal situations in context. Choice of language should reflect the situation being modeled. Consider brainstorming a list of words that could be used in contextual situations to represent an inequality, then discuss which ones could indicate "greater than 20" in each scenario.

   b) $3s + 2 < 32$

   Students may confuse "less than" and "less than or equal to" when creating a contextual situation for this inequality. Students making this error would benefit from discussion of how 32 should be considered in the context of the problem. If 32 is representing money that is being spent, could precisely $32 be spent, or must the total be less than 32? If 32 is representing people at an event, could 32 people attend, or must the number of attendees be less than 32?

10. Erica told her teacher that solving the linear inequality $-6t > 42$, is a lot like solving the equation $-6t = 42$. Explain how the process of solving the two are similar and how they are different.

    Students may agree with Erica and describe how the process of solving a linear inequality and a linear equation are similar but have difficulty noting the differences. Students that struggle to describe how dividing both sides of the inequality by negative six will require the inequality symbol to be reversed would benefit from additional practice with problems where this is required. See teacher notes for question 8 for an example of how to address this concept.