Lesson 1.3.4: Solving Inequalities

Targets:

1. I can find the solution set to any inequality using properties of equality.
2. I can represent the solution set of an inequality on a number line.

Warm Up

Let's use what we learned about "Properties of Equality" in Lesson 1.3.3 and see if they apply to Inequalities. Consider the inequality: $x^2 + 4x \geq 5$

a. Find four different values for x that make this inequality a true statement. Find two positive values that work and two negative values that work.

b. Consider this new inequality: $x(x+4) \geq 5$

   i. Is this inequality the same as the <u>original inequality</u>?

   ii. If so, what property was used to change it?

   iii. Should the four values you found for the original inequality be solutions to this inequality? Explain why or why not.

c. Now consider this inequality: $4x + x^2 \geq 5$

   i. Is this inequality the same as the <u>original inequality</u>?

   ii. If so, what property was used to change it?

   iii. Should the four values you found for the original inequality be solutions to this inequality? Explain why or why not.

d. Now consider this inequality: $4x + x^2 - 6 \geq -1$

   i. Is this inequality the same as the inequality from <u>part c</u>?

   ii. If so, what property was used to change it?

   iii. Should the four values you found for the original inequality be solutions to this inequality? Explain why or why not.

e. Now consider this inequality: $12x + 3x^2 \geq 15$

   i. Is this inequality the same as the inequality from <u>part c</u>?

   ii. If so, what property was used to change it?

   iii. Should the four values you found for the original inequality be solutions to this inequality? Explain why or why not.

Practice 1

Find the solution set to the inequality below. Express the solution set as an inequality and graphically on a number line.

$5q+10>20$

Practice 2

Find the solution set to each inequality. Express the solution graphically on a number line.

a. $x+4\le 7$

b. $\frac{m}{3}+8\neq 9$

c. $8y+4<7y-2$

d. $6(x-5)\ge 30$

e. $4(x-3)>2(x-2)$

Practice 3

Recall the discussion on all the strange ideas for what could be done to both sides of an equation. Let's explore some of the same issues here but with inequalities. Recall, in this lesson we have established that adding (or subtracting) and multiplying through by positive quantities does not change the solution set of an inequality. We've made no comment about other operations.

a. <u>Squaring</u>: Consider these two inequalities… Original: $b\le 6$ New: $b^2\le 36$

   i. What happened to the original inequality to get the new inequality?

   ii. Do both have the same solution set?

   iii. If not, give an example of a number that is in one solution set but not the other.

b. <u>Multiplying by a negative</u>: Original: $5-c>2$ New: $-5+c>-2$

   i. What happened to the original inequality to get the new inequality?

   ii. Do both have the same solution set?

   iii. If not, give an example of a number that is in one solution set but not the other.

Practice 4

In Practice 3 we discovered that "multiplying by a negative number" is not a property of inequality. If multiplying by a negative number changes the solution set, how are we supposed to solve an inequality that has a negative variable? Let's explore here. Your goal is to solve the inequality in two different ways: first without ever multiplying or dividing through by a negative number, and then by first multiplying by a negative.

Solve for t in two different ways:

Option 1:
DO NOT Multiply or Divide by a Negative
$-4+2t-14-18t>-6-100t$

Option 2:
Your first step is to multiply both sides by -1
$-4+2t-14-18t>-6-100t$

Exit Ticket

1. Find the solution set to each inequality. Express the solution graphically on a number line.
   a. $6x-5<7x+4$
   b. $x^2+3(x-1)\geq x^2+5$

2. Fergus was absent for today's lesson and asked Mike to explain why the solution to $-5x>30$ is $x<-6$. "Oh! That's easy. When you multiply by a negative, just flip the inequality." Fergus was surprised and wanted to know why that is the rule. Provide an explanation to Fergus about why the direction of the inequality is reversed.