

**Math: Grade 6, Lesson 5, Inequalities Have Infinitely Many Solutions**

**Lesson Focus:** Inequalities have infinitely many solutions

**Practice Focus:** Students recognize that inequalities of the form  $x < c$  and  $x > c$ , where  $x$  is a variable and  $c$  is a fixed number, have infinitely many solutions when the values of  $x$  come from a set of rational numbers.

**Objective:** Students will take situations and model them as an inequality and on in a number line diagram

**Key Vocabulary:** Inequality, infinite, rational numbers, variable, number line

**TN Standard:** 6.EE.B.8

**Teacher Materials:**

- Dry erase board,
- different color markers (optional-magnetic number lines),
- projector for Classwork (or drawn on board)

**Student Materials:**

- Paper and pencil

Teacher Do	Student Do
<p><b>Opening (1 minute)</b> <b>Hello! Welcome to Tennessee's At Home Learning Series for math! Today's lesson is for all our 6<sup>th</sup> graders out there, though all children are welcome to tune in. This lesson is the 5<sup>th</sup> in our series.</b></p> <p><b>My name is ____ and I'm a ____ grade teacher in Tennessee schools! I'm so excited to be your teacher for this lesson! Welcome to my virtual classroom!</b></p> <p><b>If you didn't see our previous lesson, you can find it on <a href="http://www.tn.gov/education">http://www.tn.gov/education</a>. You can still tune in to today's lesson if you haven't see any of our others. But, it might be more fun if you first go back and watch our other lessons since we'll be talking about things we learned previously.</b></p> <p><b>Today we will be learning about modeling inequalities to see that they have infinitely many solutions in mathematics! Before we get started, to participate fully in our lesson today, you will need:</b></p> <ul style="list-style-type: none"><li>• Paper and pencil (or other writing instrument)</li></ul> <p><b>Ok, let's begin!</b></p>	<p>Students get materials ready for the lesson.</p>

<p><b>Intro (5 minutes)</b></p> <p><b>Greetings!</b> I am excited to spend time with you today diving into inequalities. Shout out if you remember working with inequalities!</p> <p>We will work with number lines today also, so get your pencil and paper ready to go.</p> <p>We will start out by discussing what each of the following statements means. I want you to think of possible amounts of money that could fit into the given statement. Ready? Let's do this!</p> <p><b>Statement</b> [Pause after reading each statement.]</p> <ul style="list-style-type: none"> <li>a. Caleb has at least \$5.</li> <li>b. Tarek has more than \$5.</li> <li>c. Vanessa has at most \$5.</li> <li>d. Li Chen has less than \$5</li> </ul> <p>I know all of your amounts were centered on \$5. How much money could Caleb have? [Pause] He could have \$5, \$5.01, \$5.90, \$6, \$7, \$8, \$9, .... More simply, he could have \$5 or any amount greater than \$5.</p> <p>How does the statement about Tarek differ from the statement about Caleb? [Pause] Tarek has more than \$5, but he cannot have exactly \$5, where Caleb might have had exactly \$5.</p> <p>What does "at most" mean in Vanessa's example? [Pause] Vanessa could have \$5, but no more than 5. So, she could have less than \$5, including \$4, \$3, \$2, \$1, \$0, or even a negative amount if she owes someone money</p> <p>Li Chen cannot have \$5 exactly.</p> <p>How did you do? Were your answers within the given constraints? We will continue to carefully look at words and phrases that allow us to know we are working with inequalities. Get your number lines ready!</p>	<p>Students respond</p> <p>Students will work on possible amounts of money that could fit into the 4 given statements.</p>
<p><b>Teacher Model ( 15 minutes)</b></p> <p>You did great in brainstorming possible numbers for Caleb, Tarek, Vanessa and Li Chen. We are</p>	<p>Students respond</p>

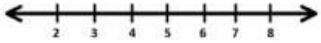
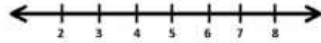
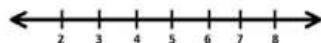
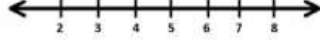
going to take that information and look at ways to organize it. I would like for us to write both an inequality AND draw a number line for the 4 situations we just discussed. I need your help, so please jump in anytime you have your responses.

**Example 1:** Below are the situations, we now want to write as an inequality and graph.

**Statement**





- a. Caleb has at least \$5
- b. Tarek has more than \$5
- c. Vanessa has at most \$5
- d. Li Chen has less than \$5

[Allow students time to respond to the discussion. Prompt them to tell you if it is an open or closed circle on a number line. Also, emphasize values in each direction as they graph.]

Inequality	Graph
_____	
_____	
_____	
_____	

[Discuss each of these with the students. Below are the solutions with commentary to guide this discussion]:

Allow time for student responses to your questioning.

Inequality	Graph
$c \geq 5$	
$t > 5$	
$v \leq 5$	
$L < 5$	

**For Caleb:**  
 How would we show this as an inequality?  
 [Pause]  $c \geq 5$ , where  $c$  is the amount of money that Caleb has in dollars.

- What numbers on the graph do we need to show as a solution? [Pause] 5 is a solution and everything to the right.
- Because we want to include 5 in the solution, we will draw a solid circle over the 5 and then an arrow to the right to show that all the numbers 5 and greater are part of the solution.

**For Tarek:**  
 So, how would we show this as an inequality?  
 [Pause]  $t > 5$ , where  $t$  is the amount of money Tarek has in dollars.


- When we graph the inequality for Tarek, we still want a circle on the 5, but this time it will not be solid to show that 5 is not included in the solution.

**For Vanessa:**  
 How would we write this as an inequality?  
 [Pause]  $v \leq 5$ , where  $v$  is the amount of money Vanessa has in dollars.

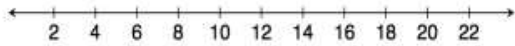
- How would you show this on the graph? [Pause] We would put a circle on the 5 and then an arrow towards the smaller numbers.
- Would we have a solid or open circle? [Pause] It would be solid to show that 5 is part of the solution.

**For Li Chen:**

- Would the inequality and graph for Li Chen be the same as Vanessa's solution? Why or why not? [Pause] No, they would

<p>be similar but not exactly the same. Li Chen cannot have \$5 exactly. So, the circle in the graph would be open, and the inequality would be <math>L &lt; 5</math>, where <math>L</math> represents the amount of money Li Chen has in dollars.</p> <p><b>Example 2:</b> Kelly works for Quick Oil Change. If customers have to wait longer than 20 minutes for the oil change, the company does not charge for the service. Show the possible customer wait times in which the customer has to pay for the services.</p> <p>How is this example different than the first one? [Pause] It does describe a real-world situation!</p> <p>What does the 2<sup>nd</sup> sentence tell us about the wait time for paying customers? [Pause] The oil change must take 20 minutes or less!</p> <p>How would we show this on a number line? [Pause] Because 20 minutes is part of the acceptable time limit, we will use a solid circle and shade to the left.</p>  <p>How many solutions are in our solution set? [Pause] YES! Infinitely many!</p> <p>What are 3 sample wait times that would be acceptable for Kelly to change oil? [Pause. Answers may vary. Possible answers- 7 minutes, 10 minutes, 15 minutes]</p> <p>That's right, any number less than 20 will work!</p>	
<p><b>Guided Practice (5-7 minutes)</b> Let's try some together! We will need to read the given situation, interpret what is going on and then write an inequality and draw a graph. Remember- the number line is a visual way for us to "see" the solution and confirm the numbers make sense.</p>	<p>Students work alongside teacher</p>

Jamal has been mowing lawns to save money for a concert. Jamal will need to work for at least six hours to save enough money. Write an inequality to represent this situation, and then graph the solution.



How would we represent Jamal working at least 6 hours? [Pause]

You're right. "At least" tells us that Jamal must work 6 hours or more. |

$$x \geq 6$$



What are 4 possible number of hours that Jamal needs to mow? [Pause. Answers will vary, but encourage students to include decimals and fractions, alongside whole numbers. Infinite number of answers. Possible answers are 8 hours, 7.5 hours, 6 ¼ hours, 10 hours. Discuss reasonableness of large number of hours so that students can further understand real-world situations.]

### Independent Practice

Great work! Today, we learned about modeling inequalities to see that they have infinitely many solutions in mathematics. I hope you're seeing both similarities and differences in equations and inequalities! You sure did a great job with your number line diagrams! After the video, you will have some problems to practice on your own. Good luck and do your best!"

### Closing (1 minute)

- I enjoyed learning about solutions to inequalities with you today! Thank you for inviting me into your home. I look forward to seeing you in our next lesson in Tennessee's At Home Learning Series!
- Bye!

**PBS Lesson Series**

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