

OER IN MATHEMATICS PROFESSIONAL DEVELOPMENT PROJECT

LESSON PLAN

TOPIC OF THE LESSON:

Solving and graphing inequalities with one unknown.

STANDARD(S)/LEARNING RESULT(S):

ALGEBRA: Students use symbols to represent or model quantities, patterns, and relationships and *use symbolic manipulation to evaluate expressions* and solve equations. Students solve problems using symbols, tables, **graphs**, and verbal rules choosing the most effective representation and converting among representations.

Students *understand and solve linear inequalities* in one unknown.

GOAL(S) OF THE LESSON:

What do you want the students to know and be able to do? What overarching questions do you want them to be able to answer?

We want students to be able to solve and graph inequalities with one unknown.

- Students should understand how to interpret an inequality from a real life context and graph it.
- Students should be able to apply addition and subtraction properties to solve an inequality in one unknown.
- Students should be able to apply multiplication and division properties for both positive and negative numbers to solve an inequality in one unknown.
- Students should be able to solve single and multi-step problems.

CONTEXT

What should students know to engage in the lesson?

Students should have experience in solving single and multi-step equations prior to solving single and multi-step inequalities. They should also have experience graphing points on a number line.

ASSOCIATED STUDENT DIFFICULTIES

Describe known misconceptions (overgeneralizations, common errors, and misunderstandings) associated with the content in this lesson?

Because students have had prior experience with the symmetric property of equality they know that $x=5$ can also be written as $5 = x$. When they work with inequalities they may think they can re-write $7 < x$ as $x < 7$ whereas it is not accurate ... it must be written as $x > 7$ as you read from the variable and the tip of the inequality sign always points to the lesser value.



PLANNING FOR DIFFERENTIATION

Describe how the lesson design incorporates a plan for differentiation.

Students grouped across abilities and degrees of understanding (not same ability groupings) to minimize students with similar misconceptions within the same group.

Use vocabulary cards to reinforce text and meanings of inequality symbols.

Possible pre-activities

- Engage students in talking about temperature “staying above 10 degrees” or “remaining 25 degrees or below” and other common occurrences.

PRE/POST ASSESSMENT

Review what you want students to know and be able to do. How will you determine what they know and don't know? How will you determine that they have met the target? (Describe the pre/post assessment)

Pre Lesson Probe:

- Administer to determine if students recognize can connect common situations in text with the inequality and if they can associate it with a graph.
- Review results to determine specific instructional interventions.

Post Lesson Assessment:

- Administered to determine if students changed their understanding of the inequalities and their graphs from real life situations.

MATERIALS & RESOURCES

Describe any tools and resources that are needed to support the lesson.

- Applet & Student Exploration

TECHNOLOGY TOOLS / APPLETS

What technology tools, applets, and/or resources you will use for this lesson?

- Inequalities on a Number Line Applet : http://mathcasts.org/gg/enliven/ns/numberline/inequality1/inequality1_0.html
- Projector
- Laptops
- Smartboard (optional)

What management strategies will you utilize during the lesson?

- Load the applet on the teacher computer before having students launch the applet
- Put the link on the classroom wiki (or blog, online bookmarks, or other management site)

Teacher Notes:

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LESSON DESCRIPTION

PREPARATION	<p><i>What resources will you need? What type of preparation is needed before you can begin the lesson?</i></p> <ul style="list-style-type: none"> - Clickers, Laptops - Print <i>Lesson Exploration</i> handouts - Print Pre and Post Lesson Probes (Or make sure the probes are in an online administration site) - Approximate Time: 1 1/2 hours
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	LESSON	QUESTIONS FOR LEARNERS	NOTES / REFLECTIONS
INTRODUCTION	<p>Steps of the lesson: learning activities (and time allocation)</p> <ul style="list-style-type: none"> • Students complete the probe for the pre-assessment (10 min). • Students use the clickers to get class results on each question from the probe. Teacher explains the significance of the results (5 min). • Teacher picks out the questions from the probe that have the most discrepancy (5 min). 	<p>What is the significance of the information gathered by using the clickers? What do the percents/numbers represent and mean to the class? How can we use this information?</p> <p>Brainstorm a few other real life situations that could represent inequalities to “warm-up” for the lesson.</p>	<p>1) Review probe prior to instruction, make observations about misconceptions</p> <p>2) Clicker set up, have student data put into graphs</p>
CORE INSTRUCTION	<ul style="list-style-type: none"> • Students answer the first few questions from the exploration (5 min). 	<p>Begin by launching the applet</p> <p>Discuss then model the problem. Discuss the difference between $x > 5$ and $x \geq 5$.</p> <p>Ask what $x \geq 5$ might represent. Brainstorm a real life situation for $x \geq 5$.</p>	<p>Demonstrate use of option key to create \leq and \geq signs.</p> <p>Model labeling the inequality on the graph on the board or smartboard.</p>

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	LESSON	QUESTIONS FOR LEARNERS	NOTES / REFLECTIONS
CORE INSTRUCTION (CONT.)	<ul style="list-style-type: none"> Class discussion on the first few questions from the exploration (5 min). [Page 1] <p>Students use the applet to answer the questions from the second half of page 2 of the exploration (15 min).</p> <ul style="list-style-type: none"> Class discussion about reading inequalities (10 min). Next have them check their work using the applet Extension – Create their own problems with a partner. <p>Have them make up a few examples of their own.</p> <p>Have them do the calculations without using the applet. Then have them state which direction the graph points.</p> <p>Next have them draw the lines on the graph</p> <p>Then check their own in the applet.</p>	<p>How could the statement in # 1 be changed to fit the expression $x \geq 5$?</p> <p>What could the statement in # 2 be if $x < 0$?</p> <p>What if # 3 said there are 10 minutes or more left in class? What would the inequality look like? What would the graph look like?</p> <p>How would you change # 4 if the lowest temperature was -10?</p>	<p>Discuss the differences between solid and open points on the number line.</p> <p>Make sure to clarify that when they work with inequalities they may think they can re-write $7 < x$ as $x < 7$ whereas it is not accurate ... it must be written as $x > 7$ as you read from the variable and the tip of the inequality sign always points to the lesser value.</p>
CLOSURE	<p>Students will retake the probe:</p> <ul style="list-style-type: none"> Students complete the probe again for the post assessment (10 min). (Students will complete on paper first. Students then will complete using clickers. Teacher and students go over the solutions to the probe (10 min). Final wrap up over lesson (10 min). 	<p>Reinforce solid and empty point as well as direction.</p> <p>Reinforce reading $>$, $<$, \geq, \leq</p>	<p>Review data</p> <p>Reflect on remaining areas of difficulty</p> <p>Determine next instructional steps</p>

