Grade: 7 **Lesson Title: Use variables to represent quantities and solve word problems leading to inequalities- 7.EE.4b**
Unit: 5 *(Lesson 2 of 4)* **Time Frame:** 6-7 Days
Essential Question:

- When and how are inequalities and graphs applied to real life situations?

Targeted Content Standard(s):

7.EE.4 Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

b) Solve word problems leading to inequalities of the form $px + q > r$ or $px + q < r$, where p, q, and r are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem. *For example, as a salesperson, you are paid $50 per week plus $3 per sale. This week you want your pay to be at least $100. Write an inequality for the number of sales you need to make, and describe the solutions.*

Targeted Mathematical Practice(s):

- ☒ 1 Make sense of problems and persevere in solving them
- ☒ 2 Reason abstractly and quantitatively
- ☐ 3 Construct viable arguments and critique the reasoning of others
- ☒ 4 Model with mathematics
- ☒ 5 Use appropriate tools strategically
- ☒ 6 Attend to precision
- ☒ 7 Look for and make use of structure
- ☐ 8 Look for an express regularity in repeated reasoning

Supporting Content Standard(s): *(optional)*

7.EE.4 Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

a) Solve word problems leading to equations of the form $px + q = r$ *and* $p(x + q) = r$, where p, q, *and* r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. *For example, the perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width?*

7.NS.1 Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.

a) Describe situations in which opposite quantities combine to make 0. *For example, a hydrogen atom has 0 charge because its two constituents are oppositely charged.*

b) Understand $p + q$ as the number located a distance $|q|$ from p, in the positive or negative direction depending on whether q is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts.

c) Understand subtraction of rational numbers as adding the additive inverse, $p – q = p + (-q)$. Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts.

d) Apply properties of operations as strategies to add and subtract rational numbers.

Student Friendly Learning Targets

I can…

- Translate words or real-life situations into variable inequalities.
- Construct inequalities with rational coefficients to solve problems.
- Solve word problems leading to one- and two-step inequalities with rational numbers.
- Graph the solution set of inequalities and interpret it in the context of the problem.

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7.NS.2 Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers. a) Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as (-1)(-1) = 1 and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts. b) Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If *p* and *q* are integers then *– (p/q) = (-p)/q = p/(-q)*. Interpret quotients of rational numbers by describing real-world contexts. c) Apply properties of operations as strategies to multiply and divide rational numbers. d) Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats.	

Purpose of the Lesson:

Students will read, write, interpret, and solve multi-step real life and mathematical problems using inequalities.

Explanation of Rigor: *(Fill in those that are appropriate.)*

Conceptual: Understand that solutions to inequalities can be represented on number line diagrams. Understand that there is a relationship between operations on inequalities and inequality symbols.	**Procedural:** Solve inequalities with positive and negative rational numbers. Graph the solution set of the inequalities.	**Application:** Solve real life inequalities with positive and negative rational numbers. Interpret the solution set in the context of the problem.

Vocabulary:

Linear, coefficient, factored form, combining like terms, inverse operation, solution set

Evidence of Learning (Assessment):

Pre-Assessment: Equations and Inequalities (pre-assessment)

Formative Assessment(s): Inequalities using addition and subtraction (segment 2), Inequalities using multiplication and division (segment 3)

Summative Assessment:

Self-Assessment: Equations and Inequalities (pre-assessment) self-assessment skeleton

Lesson 2 Segments

1. Properties of Operations with Inequalities
2. Solve one-step addition and subtraction inequalities and graph the solution set.
3. Solve one-step multiplication and division inequalities and graph the solution set.
4. Solve multi-step inequalities.

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5. Summative assessment: One-step and multi-step inequalities.

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Lesson 2 Procedures:

Segment 1

Approximate Time Frame:

80-90 min

Lesson Format:

- ☐ Whole Group
- ☒ Small Group
- ☒ Independent
- ☐ Modeled
- ☐ Guided
- ☐ Collaborative
- ☐ Assessment

Resources:

Properties of Operations Teacher Pages/Worksheet

Properties of Operations Independent Practice

7.EE.4b – Die templates

Focus:

Properties of Operations with Inequalities

Modalities Represented:

- ☐ Concrete/Manipulative
- ☐ Picture/Graph
- ☒ Table/Chart
- ☐ Symbolic
- ☐ Oral/Written Language
- ☐ Real-Life Situation

Math Practice Look For(s):

MP 3 – Students will demonstrate their ability to construct viable arguments when they justify the patterns they see when operating with inequalities.

MP 7 – Students look for the patterns that occur when they perform number operations in inequalities.

MP 8 – Students generalize the properties that are utilized when performing number operations in inequalities.

Differentiation for Remediation:

Differentiation for English Language Learners:

Differentiation for Enrichment:

Potential Pitfall(s):

Some students may be inexperienced with working with inequalities.

Independent Practice (Homework):

Example provided -

Steps:

1. Students will complete the Properties of Operations with Inequalities Activity in small groups.
2. Prepare the following materials: 2 number dice, 1 inequality symbol die, properties of inequalities worksheet, properties of inequalities independent practice, and observational checklist.
3. Give each student a Properties of Operations Worksheet and dice. This activity has 4 sections. As students complete the first three sections with their groups, the teacher will use an Observational Checklist to check for understanding.
4. Teacher should bring the students back together to focus on Section 4. This activity can be completed as a whole class, small group, or independent activity.

Teacher Notes/Reflections:

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5. Independent Practice is provided for further practice.	

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Segment 2

Approximate Time Frame:

40 - 50 minutes

Lesson Format:

☒ Whole Group
☒ Small Group
☐ Independent

☒ Modeled
☐ Guided
☒ Collaborative
☐ Assessment

Resources:

Entrance slip- partner cards

Inequalities using addition and subtraction worksheet

Focus:

Solving one-step inequalities using addition and subtraction

Graph the solution set

Modalities Represented:

☐ Concrete/Manipulative
☒ Picture/Graph
☒ Table/Chart
☒ Symbolic
☐ Oral/Written Language
☒ Real-Life Situation

Math Practice Look For(s):

MP 1- Students will be able to explain the different inequality signs and use them for solving problems.

MP 5- Students will be able to graph inequalities.

MP 6- Students will be able to accurately use signs of inequalities.

Differentiation for Remediation:

Differentiation for English Language Learners:

Differentiation for Enrichment:

Potential Pitfall(s):

When graphing inequalities, the solution set line does not always point in the same direction as the inequality sign in the problem.

Be sure that students rewrite inequality solution with the variable on the right side of the inequality sign (check to make sure correct inequality sign is used).

Independent Practice (Homework):

Finish activity/worksheet

Steps:

1. As students enter the room, give each student one of the "Entrance slip- partner cards". Instruct the students to find their match (inequality with the graph representation). The person who has their match will be their partner for the formative assessment activity at the end of the period.

   **If students struggle to find their match, discuss the issues.

2. Review the inequality signs: < and >, and solution set for inequalities.

Teacher Notes/Reflections:

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3. Introduce ≤ (less than or equal to) and ≥ (greater than or equal to). Emphasize the "or equal to" means the number is INCLUDED as part of the solution set. Show how to graph inequalities that include the ≤ and ≥ signs (○ versus ● on the number line).	**Teacher Notes/Reflections:**
4. Review solving one-step equations using addition and subtraction. Make the connection between equations and inequalities (the process for solving one-step inequalities is the same as one-step equations). Remind students of activity from the previous day, when using addition and subtraction, the inequality sign should never change. Once the inequality has been solved, graph the solution set on the number line.	
5. Distribute the "Inequalities using Addition and Subtraction" worksheet. Students should complete the worksheet with their partner. Any problems not completed in class should be finished for independent practice (homework).	

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Essential Question:

- When and how are inequalities and graphs applied to real life situations?

Segment 3

Approximate Time Frame:

40 - 50 min

Lesson Format:

☒ Whole Group
☒ Small Group
☐ Independent

☒ Modeled
☐ Guided
☒ Collaborative
☐ Assessment

Resources:

Entrance slip- partner cards

Inequalities using multiplication and division worksheet

Focus:

Solving one-step inequalities using multiplication and division

Graph the solution set

Modalities Represented:

☐ Concrete/Manipulative
☒ Picture/Graph
☒ Table/Chart
☒ Symbolic
☐ Oral/Written Language
☒ Real-Life Situation

Math Practice Look For(s):

MP 1- Students will be able to explain the different inequality signs and use them for solving problems.

MP 5- Students will be able to graph inequalities.

MP 6- Students will be able to accurately use signs of inequalities.

Differentiation for Remediation:

Differentiation for English Language Learners:

Differentiation for Enrichment:

Potential Pitfall(s):

When graphing inequalities, the solution set line does not always point in the same direction as the inequality sign in the problem.

Be sure that students rewrite inequality solution with the variable on the right side of the inequality sign (check to make sure correct inequality sign is used).

Independent Practice (Homework):

Finish activity/worksheet

Steps:

1. As students enter the classroom, give each student one of the "Entrance slip- partner cards" used during the previous lesson. Instruct the students to find their match in the classroom (inequality with the correct graph representation). The person who has their match will be their partner for the remainder of the class period.
   **If any students struggle to find their match, discuss issues.
2. Review solving one-step equations using multiplication and division. Make the connection between equations and inequalities (the process for solving one-step inequalities is the same as one-step equations). Refer back to the dice activity from segment 1, when multiplying and dividing by a negative number, the inequality sign **changes**. Provide additional instruction if the students are not yet comfortable with this concept.

   Once the inequality has been solved, graph the solution set on the number line.

Teacher Notes/Reflections:

Grade: 7 **Lesson Title: Use variables to represent quantities and solve word problems leading to inequalities- 7.EE.4b**
Unit: 5 *(Lesson 2 of 4)* **Time Frame:** 6-7 Days
Essential Question:

- When and how are inequalities and graphs applied to real life situations?

3. Distribute the "Inequalities using Multiplication and Division" worksheet. Students should complete the worksheet with their partner. Any problems not completed in class should be finished for independent practice (homework).	**Teacher Notes/Reflections:**

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Unit: 5 *(Lesson 2 of 4)* **Time Frame:** 6-7 Days
Essential Question:

- When and how are inequalities and graphs applied to real life situations?

Segment 4

Approximate Time Frame:

55-70 minutes

Lesson Format:

☐ Whole Group
☒ Small Group
☐ Independent

☒ Modeled
☐ Guided
☒ Collaborative
☐ Assessment

Resources:

Inequality Scavenger Hunt

Observational checklist – Scavenger Hunt

Focus:

Solving multi step inequalities

Modalities Represented:

☒ Concrete/Manipulative
☒ Picture/Graph
☐ Table/Chart
☒ Symbolic
☐ Oral/Written Language
☐ Real-Life Situation

Math Practice Look For(s):

MP 1: Students will work to solve and graph inequalities.

MP 2: Students will be able to accurately solve inequalities.

MP 7: Students will see that inequalities are composed of similar problems.

MP 8: Students will notice that calculations are repeated, look for general methods and shortcuts.

Differentiation for Remediation:

Differentiation for English Language Learners:

Differentiation for Enrichment:

Potential Pitfall(s):

Students may need additional practice in multi-step problems.

Independent Practice (Homework):

Steps:

1. (15-20 min)Teacher needs to review solving two-step equations and discuss similarities between solving these and solving inequalities.

   Review order of operations, multi/dividing inequalities, positive/negative reactions in inequalities.

2. (40-50 min.) Working in pairs, student will complete suggested activity Fraction Scavenger Hunt. Students will need a sheet of paper to show their work.
   Copy the Scavenger Hunt Cards. The cards are divided into two sections. The left/grey side is an answer and the right side is a new problem. Randomly tape the cards around the room.

3. Students will start at different cards around the room. Using their own paper, students solve the inequality and then search the room for the answer card (in grey.) On that card is a new expression. They repeat the process of evaluating (on their paper) and searching for the answer.

4. This activity will allow the teacher to circulate the room and should be an informal way to begin to assess student understanding. Use the Scavenger Hunt checklist as a guide when observing.

Teacher Notes/Reflections:

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Unit: 5 *(Lesson 2 of 4)* **Time Frame:** 6-7 Days
Essential Question:

- When and how are inequalities and graphs applied to real life situations?

Segment 5

Approximate Time Frame:

50-70 minutes

Lesson Format:

☒ Whole Group
☐ Small Group
☐ Independent

☐ Modeled
☐ Guided
☐ Collaborative
☒ Assessment

Resources:

Bingo Game

Bingo sheets

Focus:

Summative Assessment of one and multi-step inequalities.

Modalities Represented:

☐ Concrete/Manipulative
☐ Picture/Graph
☐ Table/Chart
☐ Symbolic
☐ Oral/Written Language
☐ Real-Life Situation

Math Practice Look For(s):

MP 1: Students will work to solve and graph inequalities.

MP 2: Students will be able to accurately solve inequalities.
MP 5- Students will be able to graph inequalities.

MP 6- Students will be able to accurately use signs of inequalities.

MP 7: Students will see that inequalities are composed of similar problems.

MP 8: Students will notice that calculations are repeated, look for general methods and shortcuts.

Differentiation for Remediation:

Differentiation for English Language Learners:

Differentiation for Enrichment:

Potential Pitfall(s):

May not finish in one class period.

Independent Practice (Homework):

May need to complete assessment independently

Steps:

1. This assessment is set up as a game of Bingo. Teacher needs to print or make bingo cards for each student. Students will also need problem sheet and answer document.
2. Complete the assessment in the format of Bingo. There are certain problems that the teacher should set up to do first (noted on the directions).
3. If the assessment is not completed in one sitting, it is suggested to send the additional problems home to be completed.

Teacher Notes/Reflections: