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Grade 6

Teacher Guide Sample

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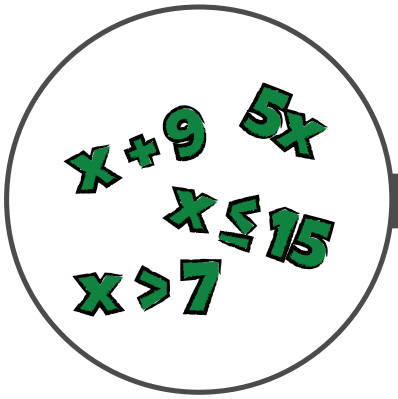


Equations and Inequalities

Scope Introduction

Scope Summary

Students learn how to write a variety of real-world problems for equations and inequalities. Instruction should include problem situations that involve constraints and conditions for equations and inequalities. Students use various processes to identify substituted values for the variables that make the equation true. Students can use manipulatives and pictures (e.g., strip diagrams) to represent equations and their strategies. When writing equations, students learn to be precise in their definition of a variable. They should understand that equations only have one solution, whereas inequalities yield more than one solution. Students need to be able to understand the difference between situations that represent an equation and situations that represent an inequality.

Student Expectations

6.9A

- Write one-variable, one-step equations and inequalities to represent constraints or conditions within problems.

6.9B

- Represent solutions for one-variable, one-step equations and inequalities on number lines.

6.9C

- Write corresponding real-world problems given one-variable, one-step equations or inequalities.

6.10A

- Model and solve one-variable, one-step equations and inequalities that represent problems, including geometric concepts.

6.10B

- Determine if the given value(s) make(s) one-variable, one-step equations or inequalities true

Vertical Alignment

Background Knowledge

In 5th grade, students represent and solve multistep problems involving the four operations with whole numbers using equations with a letter standing for the unknown quantity. Students also simplify numerical expressions that do not involve exponents, including up to two levels of grouping.

Future Expectations

In 7th grade, students write one-variable, two-step equations and inequalities to represent constraints or conditions within problems. They also represent solutions for one-variable, two-step equations and inequalities on number lines. 7th-grade students also model and solve one-variable, two-step equations and inequalities. They write real-world problems given a one-variable, two-step equation or inequality. This learning extends into 8th grade, when students write one-variable equations and inequalities with variables on both sides to represent real-world situations. They also model and solve one-variable equations with variables on both sides of the equal sign.

Engage Activities

Accessing Prior Knowledge

In this activity, students individually evaluate expressions with grouping symbols using a handout, deciding whether they agree or disagree with sample student responses and explaining their reasoning. After completing their initial evaluations, they engage with peers in a dynamic high-five activity to find a discussion partner. This interactive approach facilitates peer learning and helps students articulate their mathematical thinking, allowing them to identify and discuss misconceptions about operations and variable usage.

If your students are struggling with previously taught concepts, use the Foundation Builder activity in this scope to reinforce ideas presented in the APK.

Hook

Students engage in a real-world math scenario where they analyze promotional coupons to determine the best pizza deal using equations. They compare the costs represented by variables in two different equations, then solve these equations to find the price per pizza under each offer. The activity encourages critical thinking and practical application of mathematical concepts in everyday decision-making, culminating in a class discussion to reinforce understanding and explore further real-world applications.

Home

Explore Activities

Explore 1

Write, Model, and Solve Equations

In this activity, students utilize algebra tiles and balance scales to define variables and solve equations related to daily scenarios at an amusement park. They first work in groups to explore the costs of different family popcorn specials using provided materials to visually represent and solve equations. This hands-on approach helps students understand abstract algebraic concepts by modeling them concretely, fostering their ability to write, model, and solve equations in real-world contexts.

Explore 2

Write and Solve Equations

In this educational activity, students work in groups to write and solve equations that explore daily deals at an amusement park. They use provided cards to develop scenarios for each deal, model the equations with algebra tiles, and solve them on a number line. This approach helps students apply mathematical concepts to real-life situations, enhancing their problem-solving skills and understanding of equations. The session concludes with a class discussion, allowing students to share insights and deepen their learning.

Explore 3

Write, Model, and Solve Inequalities

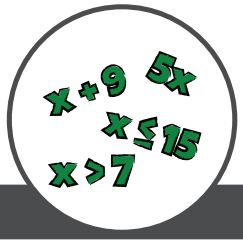
In this activity, students use algebra tiles and inequality mats to write and solve inequalities based on amusement park scenarios. They model these inequalities to determine the number of game plays or purchases needed to achieve various goals, such as winning prizes. The activity emphasizes applying mathematical concepts to real-life situations, enhancing students' understanding of inequalities and their practical applications. Through group discussions and individual reflections, students deepen their comprehension and problem-solving skills.

Explore 4

Write and Solve Inequalities

In this activity, students engage in writing and solving inequalities by analyzing ticket scenarios at an amusement park. They use algebra tiles and number lines to model these inequalities and determine the range of solutions that meet specific conditions. This process helps students understand the application of inequalities in real-life contexts, reinforcing their skills in mathematical reasoning and problem-solving. The activity culminates in a group discussion to enhance understanding and application of the concepts learned.

Notes



Equations and Inequalities

Accessing Prior Knowledge

Activity Preparation

Students read different student responses to a posed question on evaluating expressions with grouping symbols, decide whether they agree or disagree with the student, and explain their reasoning.

Materials

Printed

- 1 Agree or Disagree (per student)

Preparation

- Print one Agree or Disagree for each student.

Procedure and Facilitation

FACILITATION TIP

As students stand, scan their work to see if they are on track. Bring attention to a good answer by pointing out something you notice. For example, "I see that Nikko worked within the parentheses first, nice job!"

FACILITATION TIP

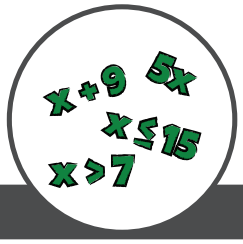
If students disagree with one another, ask them to justify their reasoning in relation to the order of operations. Ask, "Which operation did you perform first, and why?"

1. Instruct students to complete the Agree or Disagree independently.
2. Once students have completed the activity on their own, have them stand up.
3. Instruct all students to walk around the classroom with their hands raised in a high-five position.
4. On your instruction, students will stop and high-five the closest person. This will be their partner.
5. Give students a couple of minutes to discuss their answers and justifications together.
6. Facilitate a discussion about the handout. This provides an opportunity to gather an understanding of prior student knowledge before beginning the lessons. Encourage students to support their answers, and check for understanding and misconceptions. Sample student responses include the following:
   a. I agree with Sanjay
   b. I disagree with Kai because t is equal to 12.
   c. I agree with Miko
7. If students are struggling to complete this task, do the Foundation Builder to fill the gap in prior knowledge before moving on to other parts of the scope.

Identifying Misconceptions

- It may help to remind students of the order of operations when they are doing problems so they do not forget and just do the math from left to right as they read.
- It may help to remind students that a number directly in front of parentheses is performing the operation of multiplication.
- It may help to remind students that a variable is a symbol standing for an unknown value and that to solve for the value the variable must be isolated to one side of the equation.

Notes



Equations and Inequalities

Hook: Pick Your Pizza Promo!

Activity Preparation

Students determine the cost of a pizza using equations. Students compare the costs of pizzas in two different equations to determine the best deal for pizza.

Materials

Printed

- 1 Pick Your Pizza Promo! (per class)

Reusable

- 1 Phenomena (per class)

Preparation

- Plan to show the Phenomena.
- Prepare to project Pick Your Pizza Promo! for the whole class to view.
- Prepare to introduce the scenario and to encourage students to think about how to solve it. Be prepared to move to the Explore activities, returning students to the Hook activity with newly gained knowledge after the Explores have been completed.

Procedure and Facilitation

FACILITATION TIP

Ask students to share which local pizza places they like best. Ensuring that the context is relatable to students' everyday lives increases engagement.

FACILITATION TIP

Emphasize that knowing the unit rate (or cost per pizza) is the determining factor in selecting the best deal.

Part I: Pre-Explore

1. Introduce this activity toward the beginning of the scope. The class will revisit the activity and solve the original problem after students have completed the corresponding Explore activities.
2. Show the Phenomena. Ask students the following questions: What do you notice? Where can you see math in this situation? Allow students to share all ideas.
3. Explain the scenario to the class: *Tony loves the handmade pizza from Giovanni's. He wants to order it for the Romano family dinner on Sunday, but Tony knows it is more expensive than regular pizza, so he looks for coupons. He wonders which promo is the best deal for the price of a pizza. Once Tony has determined the best deal, he will present the coupon to his parents and try to get them to order his favorite pepperoni pizza from Giovanni's.*
4. Allow the students to ask questions and clarify the context as needed. Encourage them to share their thoughts and experiences with the class using the following questions:
    a. Have you ever purchased something with a coupon?
    b. How do coupons affect the price of an object?
5. Project Pick Your Pizza Promo!
6. Explain to students that Tony has narrowed it down to the two promo coupons he thinks best suit the needs of his large family. Now he needs to decide which coupon gives the best deal for the price of a pizza. Discuss the following questions with the class:
    a. **DOK-1** What is important about the pizzas listed in both coupons? Answers will vary. The types and sizes of pizzas are the same on both coupons, so it is fair to compare their prices.
    b. **DOK-1** How would we represent the cost of the pizza in the equations for each coupon? Answers will vary. The cost of the pizza will be a variable such as p.
7. Move on to complete the Explore activities.

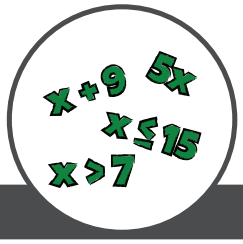
Part II: Post-Explore

1. After students have completed the Explore activities for this topic, show the Phenomena again, and repeat the scenario.
2. Refer to Pick Your Pizza Promo! and discuss the following questions with the class:
   - **a.** **DOK-1** What is important about the pizzas listed in both coupons? Answers will vary. The types and sizes of pizzas are the same on both coupons, so it is fair to compare their prices.
   - **b.** **DOK-1** How would we represent the cost of the pizza in the equations for each coupon? Answers will vary. The cost of the pizza will be a variable such as p.
   - **c.** **DOK-1** How can you determine the cost of the pizza in a coupon? Write an equation with the cost of the pizza represented by a variable. Then solve the equation.
   - **d.** **DOK-2** What is the equation for the first coupon? $3p = 39$
   - **e.** **DOK-2** Describe the process you used to create this equation. We are looking for the cost of one pizza, p, and we know that 3 of the pizzas cost \$39. So if I multiply $3 \times p$, that would equal 39.
   - **f.** **DOK-2** What is the equation for the second coupon? $5p = 70$
   - **g.** **DOK-2** Describe the process you used to create this equation. We are looking for the cost of one pizza, p, and we know that 5 of the pizzas cost \$70. So if I multiply $53 \times p$, that would equal 70.
   - **h.** **DOK-1** Solve both equations. What is the cost of a pizza for each coupon?
     Coupon 1: $3p = 39 \rightarrow 3p \div 3 = 39 \div 3 \rightarrow p = 13$
     Coupon 2: $5p = 70 \rightarrow 5p \div 5 = 70 \div 5 \rightarrow p = 14$
   - **i.** **DOK-1** Which coupon supplies the better deal for large pepperoni pizzas? Why? The first coupon is the better deal because large pepperoni pizzas are \$13 each, and they are \$14 each in the second coupon. \$13 is less than \$14.
3. As time allows, challenge students to generate equations for additional real-world coupon examples from local restaurants or other community experiences.

FACILITATION TIP

The cost per pizza is known as the unit rate.

Notes



Equations and Inequalities

Explore 1: Write, Model, and Solve Equations

Activity Preparation

Students define variables to write, model, and solve equations.

Mathematical Process Standards

- **(A)** Apply mathematics to problems arising in everyday life, society, and the workplace.
- **(D)** Communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate.
- **(E)** Create and use representations to organize, record, and communicate mathematical ideas.

Materials

Printed

- 1 Student Journal (per student)
- 1 Set of Amusement Park Cards (per group)
- 1 Balance Scale (per group)
- 1 Exit Ticket (per student)

Reusable

- 1 Resealable bag (per group)
- 1 Set of algebra tiles (per group)
- 1 Projector or document camera (per class)

Preparation

- Plan to have students work in groups of 4 to complete this activity.
- Print a Student Journal and an Exit Ticket for each student.
- Print a Balance Scale for each group. If desired, print it on card stock, and laminate it for future use.
- Print a set of Amusement Park Cards for each group. If desired, print them on card stock and laminate them for future use. Cut out and place each set of cards in a resealable bag.
- Prepare a set of algebra tiles for each group.
- **Go Digital!** Have students explore or present their solutions using virtual manipulatives! The manipulatives used in this lesson can be found in the Explore drop-down menu and can be digitally assigned to students (Algebra Tiles).

Procedure and Facilitation

FACILITATION TIP

Record key terms on an anchor chart for students to reference as they work (variable, coefficient, equation, zero pair, unit rate).

Part I: Popcorn

1. Read the following scenario to the class: *Four families are looking at the different family popcorn specials that are offered for the day they are at the amusement park. Help them determine how much the family bucket of popcorn costs on different days.*
2. **DOK-2** Ask students to share their experiences with solving equations that have unknown numbers.
3. Project the Monday Popcorn Amusement Park Card for the class. Discuss the following questions:
   a. **DOK-1** What is a variable? A variable is a letter that represents an unknown number.
   b. **DOK-1** What should our variable be for the popcorn scenario? Answers will vary. We could use b to represent the family bucket of popcorn.
   c. **DOK-2** What will the equation be for the Monday popcorn scenario? The equation for the Monday Popcorn scenario will be $10 - b = 6$.
   d. **DOK-1** What is the coefficient of b? There was only one family popcorn bucket purchased, so the coefficient is 1.

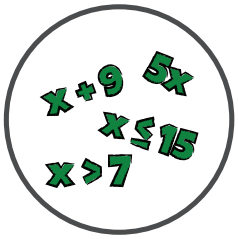
4. Give a Balance Scale and a set of algebra tiles to each group. Instruct students to take out a few algebra tiles to view. Discuss with the class how to use algebra tiles and the Balance Scale for the Monday Popcorn scenario.
    a. These are called algebra tiles. We can use algebra tiles to help us model and solve equations. The ones that look like small squares each have a value of one. We use the yellow side to model positive numbers and the red side to model negative numbers. Note: As you are working through these steps with the class, model how to use algebra tiles with the balance scale.
    b. Find an algebra tile that looks like a rectangle. These tiles model the variable. We use the green side to model positive variables and the red side to model negative variables.
    c. **DOK-1** How many *x* variables do we need to use to model the popcorn buckets with our algebra tiles? We only need one *x* to model.
    d. **DOK-1** What color will the algebra tile *x* be? The algebra tile *x* will be red because the variable is negative.
    e. Explain to students that they will shade negative numbers and variables in red on their Student Journals to model negative values.
    f. **DOK-1** How many ones do we need for the total the family spent on Monday? The total to spend is $10, so we will need 10 ones to represent the total.
    g. Explain to students that they will leave positive values unshaded when they draw them on their Student Journals.
    h. **DOK-2** Would these ones be on the same side of the balance scale as the variable or the other side? They would be on the same side as the variable because they are subtracted to give the remaining money left over.
    i. **DOK-1** What was the amount of money remaining? The amount remaining was $6.
    j. **DOK-1** How many ones should we use? We should use 6 ones.
    k. **DOK-1** Will these go on the same side of the balance scale as the *x* and 10 ones or on the other side of the balance scale? These 6 ones will go on the other side of the balance scale because they are the remaining money after purchasing the bucket of popcorn.
    l. Explain to students that now we need to determine what the value of our variable is.
    m. **DOK-3** How could we determine the value of the variable? Answers will vary. We could add zero pairs to the left side to get the variable by itself. Then we could add the same number to the right side to find the value of the variable. Model with students adding 10 negative ones on the left side to make zero pairs. Then add 10 negative ones to the right side to balance the equation.
    n. **DOK-1** What is the value of one *x*? The value of one *x* is 4.
    o. **DOK-2** What does this mean in our scenario? This means the value of one family bucket of popcorn on Monday is $4.
    p. **DOK-2** What questions do you have about writing and modeling equations? Answers will vary.

FACILITATION TIP

Review proper use of manipulates and your system for clean up and storage so that everyone is accountable for helping maintain them.

FACILITATION TIP

Students may benefit from using pink highlighters for shading.



Equations and Inequalities

Explore 1: Write, Model, and Solve Equations

FACILITATION TIP

Ensure that all students have access to the algebra tiles and that they take turns using them. Working with concrete objects before representing them on paper is essential to the development of conceptual understanding.

FACILITATION TIP

Solidify the process by showcasing one group's work. Pause part way through the activity, and have students gather around one group as they explain and model the process.

5. Have students draw the algebra tiles model on their Student Journals for Monday's popcorn cost.
6. Students continue to work with their groups to determine the cost of the family bucket of popcorn for each day.
7. Monitor students, and check for understanding as needed using the following guiding questions:
   a. **DOK-1** What information is provided in the problem? Answers will vary. Based on the information in Wednesday's card, we know that the family bought 1 slushie that cost $2 and one family bucket of popcorn, but we don't know how much the popcorn cost. We do know that the family spent $10 for both the slushie and the popcorn.
   b. **DOK-2** Based on this information, what is the unknown value that should be represented by the variable b? Answers will vary. The unknown value is how much they spent on the bucket of popcorn.
   c. **DOK-3** Describe the process you used to build your model using the algebra tiles. Answers will vary. For Wednesday's card, I needed to model the equation $2 + b = 10$. I used 1 rectangle to represent b, the bucket of popcorn, and 2 unit squares to represent the $2 spent on the slushie on the left side of the balance. On the right side of the balance, I used 10 unit squares to represent the total cost.
   d. **DOK-3** Describe the process you used to solve the equation using the algebra tiles. Answers will vary. I needed to separate the variable from the units, and I decided the variable would stay on the left side of the balance. To move all of the units to the right side, I needed to create zero pairs by bringing 2 negative units, or squares, to both sides. This created two zero pairs on the left, which canceled out the 2 and left the variable by itself. When I added the 2 negative unit squares to the right, it also created two zero pairs, but there were 8 squares or units remaining. That told me that b = 8.
   e. **DOK-2** What questions do you have about solving equations with algebra tiles? Answers will vary.
8. Give students enough time to complete their work and record their observations and answer the reflection questions on their Student Journals.
9. After Part I, invite the class to a Math Chat to share their observations and learning.

Notes

Math Chat

- **DOK-1** How can you find the value of the variable when using models? The value of the variable can be found by making zero pairs and adding them to both sides of the equation.
- **DOK-1** What operation are you doing to find the value of the variable in the equation for popcorn? You are adding or subtracting the constant from both sides to find the value of the variable.
- **DOK-1** Examine the equations in Part I. What is similar about all of them? All the equations in Part I are addition or subtraction equations.
- **DOK-2** For any addition equation, how can you find the value of *x*? For any addition equation, you subtract the constant from the sum to determine x. If the equation were x + 4 = 24, we would subtract 4 from 24 and get x = 20.
- **DOK-2** For any subtraction equation, how can you find the value of *x*? For any subtraction equation, you add the constant from the difference to determine x. If the equation were x – 4 = 24, we would add 4 to 24 and get x = 28.
- **Choose a Structured Conversation routine to facilitate the following question: DOK-3** Josie says that the equation $x + 9 = 12$ is equal to the equation $9 + x = 12$. Is this true? Explain your reasoning. Both equations are equal. I can subtract 9 from 12 and get 3 in either equation. The commutative property was used to move where the x and the 9 were located in the equation.

  Explain the following to the class: *Mathematicians write the variable first in equations.*

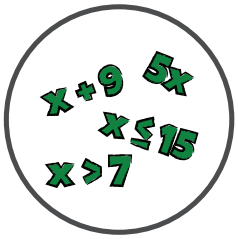
Part II: Tickets

1. Read the following scenario to the class: *Four families want to get the most out of their money. The amusement park offers different admission specials on Mondays, Wednesdays, Saturdays, and Sundays. Help the families determine the cost of tickets for each day with specials.*
2. Project the Monday Tickets Amusement Park Card for the class. Help students access the task by asking the following guiding questions:
   - **a.** **DOK-1** What variable should we use to represent the price per ticket? Answers will vary. We can use p to represent the price per ticket.
   - **b.** **DOK-1** What is a coefficient? A coefficient is a number directly in front of a variable.
   - **c.** **DOK-2** How can I find the coefficient for our variable for the Monday Tickets scenario? Answers will vary. In this scenario, the coefficient is the number of family members who are buying tickets.
   - **d.** **DOK-1** Where is the total in an equation? Answers will vary. The total in an equation is on one side of the equal sign by itself.
   - **e.** **DOK-2** What will the equation be for the Monday Tickets scenario? The equation for the Monday Tickets scenario will be $4p = 24$.

FACILITATION TIP

Give students ample time to think about this scenario individually and then in small groups before discussing with the whole-class.

Notes



Equations and Inequalities

Explore 1: Write, Model, and Solve Equations

3. Give a Balance Scale and a set of algebra tiles to each group. Instruct students to take out a few algebra tiles to view. Discuss with the class how to use algebra tiles and their Balance Scales for the Monday Tickets scenario.
    a. **DOK-1** What is the coefficient of p? The coefficient is 4.
    b. Because our coefficient is 4, we need to place four green *x* tiles (rectangles) on one side of our Balance Scale.
    c. **DOK-1** What was the total cost of the tickets? The total cost of the tickets was $24.
    d. **DOK-1** How many ones should we use? We should use 24 ones because this is our total.
    e. **DOK-1** Will this go on the same side of the Balance Scale as the *x* variables or on the other side? These 24 ones will go on the other side of the Balance Scale because they represent the total that the family spent on tickets.
    f. Now we need to determine the value of our variable.
    g. **DOK-3** How could we determine the value of the variable? Answers will vary. We could distribute the ones evenly to each *x* to find out what each *x* is worth. Model with students distributing the ones to the variables.
    h. **DOK-2** What is the value of one *x*? The value of one *x* is 6.
    i. **DOK-3** What does this mean in our scenario? This means that the value of one ticket on Monday is $6.
4. Give a Student Journal to each student. Instruct students to work with their groups on the Amusement Park Cards ticket scenarios.
5. Allow time for students to show their work for the algebra tiles model for Monday's ticket cost on their Student Journals.
6. Students continue to work with their groups to determine the cost per ticket for each day.
7. Monitor students, and check for understanding as needed using the following guiding questions:
    a. **DOK-1** What information is provided in the problem? Answers will vary. Based on the information on Wednesday's card, we know that 3 people each got a discount on their tickets, but we don't know what the discount is. We do know that the total discount is $15, which can be represented by –15.
    b. **DOK-2** Based on this information, what is the unknown value that should be represented by the variable, *p*? Answers will vary. The unknown value is how much the discount was.
    c. **DOK-3** Describe the process you used to build your model using the algebra tiles. Answers will vary. I used the rectangle to represent p, so I needed 3 of those on the left side of the balance. On the right side, I used 15 red unit squares to represent the total discount, or –15.
    d. **DOK-3** Describe the process you used to solve the equation using the algebra tiles. Answers will vary. In Wednesday's scenario, the left side of the equation could be written as 3p. I needed to isolate the variable, or get it by itself. I can't make zero pairs here, but I can use the inverse operation. 3p represents multiplication, so I can divide that by 3 to get just 1p value. Because I divided the left side by 3, I also need to divide the right side by 3. –15 divided by 3 equals –5. That means the value of p = –5.
    e. **DOK-2** What questions do you have about solving equations with algebra tiles? Answers will vary.

FACILITATION TIP

Some students might be ready to transition from concrete to representational to abstract at this point. Monitor their work closely and challenge those that are ready to draw the model without use of algebra tiles.

FACILITATION TIP

If students are willing, record a video clip of the students at work as they discuss the process. Then show this video clip to the class during the math chat that follows.

8. Give students time to complete their work and record their observations and answer the reflection questions on their Student Journals.
9. Encourage students to notice the similarities and differences among the strategies they used to solve equations.
10. After Part II, invite the class to a Math Chat to share their observations and learning.

Math Chat

- **DOK-1** What is a coefficient? A coefficient is a number that is multiplied by a variable.
- **DOK-1** How can you find the value of the variable when using models? When the equation is multiplication, the value of the variable can be found by distributing all of the ones (squares) to the *x* rectangles equally until all of the ones have been used. When the equation has division you can multiply the number by the reciprocal to get the variable's value to be one. Then, multiply the other side of the equation by the same number.
- **DOK-1** Examine the equations in Part II. What is similar about all of them? All of the equations in Part II are multiplication or division equations.
- **DOK-1** What operation are you doing to find the value of the variable in the equation for tickets? When the equation is multiplication, you are dividing to find the value of the variable. When the equation is division, you are multiplying to find the variable.
- **DOK-2** How are the equations in the ticket scenarios different from the equations in the popcorn scenarios? The equations in the ticket scenarios are all multiplying a number times the variable. The equations in the popcorn scenarios are all adding a number plus the variable.
- **DOK-2** For any multiplication equation, $px = q$, how can you find the value of x? For any multiplication equation, you divide the product by the coefficient to determine x. If the equation were $4x = 24$, we would divide 24 by 4 and get $x = 6$.
- **DOK-2** For any division equation, $x/p = q$, how can you find the value of x? For any division equation, you multiply the product by the value of p to determine x. If the equation were $x/4 = 4$, we would multiply 4 by 4 and get $x = 16$.
- **Choose a Structured Conversation routine to facilitate the following question:** **DOK-2** Are the expressions $4x$ and $x \cdot 4$ equivalent? Explain your reasoning. Yes, I can put a 2 in for x in each expression: $4(2)$ equals 8, and $2 \cdot 4$ equals 8. When a coefficient is written directly next to a variable, it implies multiplication; therefore, $4x$ is equivalent to $x \cdot 4$, which can also be written as $4 \cdot x$.

Post-Explore

1. Have students complete the Exit Ticket to formatively assess their understanding of the concept.
2. Complete the Anchor Chart as a class.
3. Have each student complete their Interactive Notebook.

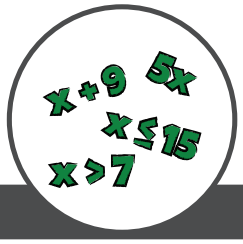
FACILITATION TIP

It is helpful for students to visually see expected outcomes and samples of exemplary student work. Find different strategies used to solve the same problem, and showcase these examples with pictures displayed on a digital slideshow or by printing them and placing them into page protectors.

FACILITATION TIP

This is a great opportunity to feature SMP #7: Look for & make use of structure.

Notes



Equations and Inequalities

Explore 2: Write and Solve Equations

Activity Preparation

Students write and solve equations using properties to find the value of the variable. Students write scenarios for equations and model solutions to equations on a number line.

Mathematical Process Standards

- **(A)** Apply mathematics to problems arising in everyday life, society, and the workplace.
- **(D)** Communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate.
- **(E)** Create and use representations to organize, record, and communicate mathematical ideas.

Materials

Printed

- 1 Student Journal (per student)
- 1 Set of Daily Deals Cards (per group)
- 1 Exit Ticket (per student)

Reusable

- 1 Projector or document camera (per class)
- 1 Resealable bag (per group)

Preparation

- Plan to have students work in groups of 4 to complete this activity.
- Print a Student Journal and an Exit Ticket for each student.
- Print a set of Daily Deals Cards for each group. If desired, print them on card stock, and laminate them for future use. Cut them out, and place them in a resealable bag for each group.
- For students who need more support in recalling information, see our Open Number Lines Supplemental Aids elements in the Intervention section.
- **Go Digital!** Have students explore or present their solutions using virtual manipulatives! The manipulatives used in this lesson can be found in the Explore drop-down menu and can be digitally assigned to students (Algebra Tiles).

Procedure and Facilitation

FACILITATION TIP

Record an example for each operation on chart paper or on the board for students to reference during the activity.

Part I

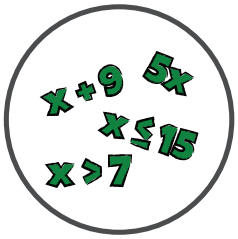
1. Read the following scenario to the class: *The local amusement park offers parking and pizza deals every Tuesday through Friday. Montrell's family wants to see which day has the best deals for parking and pizza. Help Montrell's family determine which day has the better deal by writing and solving equations.*
2. Help students access the task by asking the following guiding questions:
   a. Have you ever visited an amusement park?
   b. Have you ever used a discount offer when making a purchase?
3. If needed, revisit the following Math Chat questions from Explore 1 to review using inverse operations to solve equations.
   a. **DOK-2** For any addition equation, $x + p = q$, how can you find the value of x? For any addition equation, you will subtract p from q to determine x. For example, if the equation were $x + 4 = 24$, we would subtract 4 from 24 and get that $x = 20$.
   b. **DOK-2** For any subtraction equation, $x - p = q$, how can you find the value of x? For any subtraction equation, you will add p to q to determine x. For example, if the equation were $x - 4 = 24$, we would add 4 to 24 and get that $x = 28$.

   c. **DOK-2** For any multiplication equation, $px = q$, how can you find the value of x? For any multiplication equation, you will divide q by p to determine x. For example, if the equation were $4x = 24$, we would divide 24 by 4 and get that $x = 6$.
   d. **DOK-2** For any division equation, $x/p = q$, how can you find the value of x? For any division equation, you will multiply p and q to determine x. For example, if the equation were $x/4 = 24$, we would multiply 4 times 24 and get that $x = 96$.
4. Give a Student Journal to each student.
5. Project the Parking on Tuesday Daily Deals Card for the class.
6. Help students access the task by asking the following guiding questions about using fractions and decimals in equations, and model writing and solving equations with students:
   a. **DOK-1** How can I write an equation to represent the price of parking for Tuesday? The equation would be $h/4 = 5$.
   b. **DOK-1** How can I get the variable h by itself? Answers will vary. To get the variable h by itself, we need to multiply by 4 on both sides of the equation.
   c. **DOK-1** What is the price for one hour of parking? The price for one hour of parking is $20.
   d. Project the Pizza on Tuesday Daily Deals Card for the class.
   e. **DOK-1** How can I write an equation to represent the price per pizza on Tuesday? $2.15 + p = 15.42$
   f. **DOK-1** What step should we take to get the variable p by itself? To get p by itself, we need to subtract 2.15 from both sides.
   g. **DOK-1** Does it matter in which order I write the subtraction equation on the other side of the equal sign? Yes, the order matters in how you write the equation. You should write 15.42 – 2.15. If you write 2.15 – 15.42, you will get a different answer.
   h. **DOK-1** What is 15.42 – 2.15? 13.27
   i. **DOK-1** What is the price per pizza on Tuesday? $13.27
7. Give a set of Daily Deals Cards to each group.
8. Students work collaboratively to write and solve an equation for each of the remaining daily deals. Then they model each solution on a number line.

FACILITATION TIP

Take the time to model use of the number line. Ask students what the range of values is and which type of scaled increments are used. Predict where along the number line the first answer will lie. Use prompts to illicit student thinking (Within this context, is it possible for the the answer be negative? Will the answer be to the right of 4, and how do you know?) Demonstrate how to locate and plot points on the number line.

Notes



Equations and Inequalities

Explore 2: Write and Solve Equations

FACILITATION TIP

Ask students to explain the process for plotting points on the number line, and prompt them as needed. For example, "Between which 2 whole numbers does this decimal lie?"

9. Monitor students, and check for understanding as needed using the following guiding questions:
    a. **DOK-1** What operation do you use to solve the Wednesday parking price deal? You divide by the coefficient to solve the parking price deal.
    b. **DOK-1** Why do you need to divide by the coefficient? We have to divide by 1.25 to isolate the variable.
    c. **DOK-1** What is important to remember when you divide by the coefficient 1.25 to keep the equation balanced? Whatever operation we perform on one side of the equation needs to be performed on the other side of the equation, so we have to divide both sides by 1.25.
    d. **DOK-1** What operation do you use to solve the pizza price deal for Wednesday? You add to solve the pizza price deal.
    e. **DOK-2** How did you determine that you needed to add? When looking at the equation, you see $p - 3.25$. To isolate the variable, we need to perform the inverse operation, which in this case is adding 3.25.
    f. **DOK-2** Explain why the process of adding isolates the variable. Adding 3.25 to –3.25 creates a zero pair, meaning they cancel each other out. By creating the zero pair we have isolated the variable.
    g. **DOK-1** What is important to remember when you add 3.25 to the left side of the equation? Whatever operation we perform on one side of the equation needs to be performed on the other side so we have to add 3.25 to both sides.
    h. **DOK-2** What questions do you have about writing and solving equations? Answers will vary.
10. Give students time to work with their groups to complete their work and answer the reflection questions on their Student Journals.
11. After Part I, invite the class to a Math Chat to share their observations and learning.

Notes

Math Chat

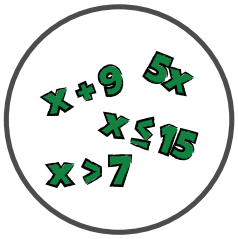
- **DOK-2** Which day had the best parking deal? How do you know? Wednesday had the best parking deal. To determine the best deal, I needed to identify the hourly rate. The best deal would be the lowest hourly rate. Tuesday's hourly rate was $20 an hour, and Wednesday's hourly rate for 1.25 hours was less than that, so it was clearly the best deal.
- **DOK-2** Which day had the best pizza deal? Tuesday had the best pizza deal.
- **DOK-2** How can you solve the equations? To solve the equations, you must use the inverse operation to move numbers from one side of the equal sign to the other. If there is addition, you need to subtract. If there is subtraction, you need to add. If there is multiplication, you need to divide. If there is division, you need to multiply.
- **DOK-1** Can you just use inverse operations on one side of the equation? No, you cannot use inverse operations on just one side of the equation. When solving equations, we need to find the inverse operation and then do the same thing on the other side of the equation to keep the equation equal.
- **Choose a Structured Conversation routine to facilitate the following question: DOK-3** Sam says the equation for the pizza deal on Tuesday is $2.15 + p = 15.42$. Maria says the equation is $p + 2.15 = 15.42$. Who is correct? Explain your reasoning. Both Sam and Maria are correct. The two equations are equivalent. Maria's equation, $p + 2.15 = 15.42$, is the standard form for writing equations. Sam's equation, $2.15 + p = 15.42$, uses the commutative property of addition to write the same equation.

  Explain the following to the class: *Mathematicians write the variable first in equations.*

FACILITATION TIP

Call out each day of the week and have students raise their hand to indicate which day they think had the best deal.

Notes



Equations and Inequalities

Explore 2: Write and Solve Equations

Part II

1. Read the following scenario: *Montrell's family wants to see which day, Thursday or Friday, has the best deals for parking and pizza. Help Montrell's family determine which day has the better deal by writing scenarios for given equations and solving the equations.*
2. Students work collaboratively to write a scenario for each equation on the Part II Daily Deals Cards. Then they solve each equation and model the solution on a number line.
3. Monitor students, and check for understanding as needed using the following guiding questions:
   a. **DOK-1** What scenario could you write for the parking on Thursday? Answers will vary. The price for parking for half an hour is a total of $12.
   b. **DOK-2** Describe what the equation $h/2 = 12$ means mathematically. The variable h represents the cost of parking for 1 hour. It is divided by 2, so $h/2$ represents the cost of $12 for one half hour.
   c. **DOK-2** How will you begin to solve the equation that represents the parking price per hour? Answers will vary. I need to isolate the variable by multiplying both sides of the equation by 2.
   d. **DOK-1** What scenario could you write for pizza on Friday? Answers will vary. With each pizza special, you get an extra-large soft drink for $6.50. The special costs $20 on Fridays. What is the cost of the pizza?
   e. **DOK-1** What operation will you use to solve Friday's pizza equation? Why? I will use subtraction because it is the inverse operation of addition.
   f. **DOK-2** Explain the process you will follow to solve Friday's parking scenario. Answers will vary. $1.5h = 18$ is the equation for Friday's parking scenario. To solve this equation, I begin by dividing $1.5h$ by 1.5 to isolate the variable. I use division because it is the inverse operation of multiplication. Because I divided the left side by 1.5, I also have to divide the right side by 1.5. This leaves $h = 18/1.5$. When the final operation of division is complete, I find that $h = 12$.
4. Give students time to work with their groups to complete their work and answer the reflection questions on their Student Journals.
5. Encourage students to notice the similarities and differences among the strategies they used to solve equations.
6. After Part II, invite the class to a Math Chat to share their observations and learning.

FACILITATION TIP

Take pictures or record different scenarios written for the same provided equation, and showcase them during the math chat.

Notes

Math Chat

- **DOK-2** Which day had the best parking deal? Friday had the best parking deal.
- **DOK-2** Which day had the best pizza deal? Friday had the best pizza deal.
- **DOK-2** How can you write a scenario that involves multiplying by a variable? You can give the amount per one of the variables as well as the total in the scenario.
- **DOK-1** How can you show a solution on the number line? You can mark the point where the answer is located on the number line.
- **Choose a Structured Conversation routine to facilitate the following question: DOK-3** Where outside of the classroom would you use an equation or inequality? You can find how much you can spend on one item if you know the total money you had and how much you have spent.

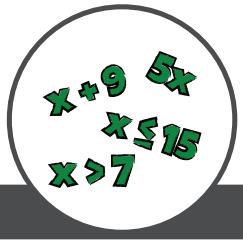
Post-Explore

1. Have students complete the Exit Ticket to formatively assess their understanding of the concept.
2. Complete the Anchor Chart as a class.
3. Have each student complete their Interactive Notebook.

FACILITATION TIP

Ask students why plotting the solution is valuable. (It allows us to see the magnitude of the number and its relationship to other numbers).

Notes



Equations and Inequalities

Explore 3: Write, Model, and Solve Inequalities

Activity Preparation

Students write and model inequalities with algebra tiles to solve for variables.

Mathematical Process Standards

- **(A)** Apply mathematics to problems arising in everyday life, society, and the workplace.
- **(D)** Communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate.
- **(E)** Create and use representations to organize, record, and communicate mathematical ideas.

Materials

Printed Material

- 1 Student Journal (per student)
- 1 Balloon Darts Prize Menu (per group)
- 1 Set of Scenario Cards (per group)
- 1 Algebra Inequality Mat (per group)
- 1 Exit Ticket (per student)

Reusable

- 1 Projector or document camera (per class)
- 2 Resealable bags (per group)
- 1 Set of algebra tiles (per group)

Preparation

- Plan to have students work in groups of 4 to complete this activity.
- Print a Student Journal and an Exit Ticket for each student.
- Print a set of Scenario Cards for each group. If desired, print them on card stock, and laminate them for future use. Cut out and place each set in a resealable bag.
- Print a Balloon Darts Prize Menu for each group. If desired, print it on card stock and laminate it for future use.
- Print an Algebra Inequality Mat double-sided for each group. If desired, print it on card stock, and laminate it for future use.
- Prepare a set of algebra tiles for each group, and place them in a resealable bag.
- Prepare a projector or document camera to model the player 1 scenario with the class.
- For students who need more support in recalling information, see our Open Number Line Supplemental Aids elements in the Intervention section.
- **Go Digital!** Have students explore or present their solutions using virtual manipulatives! The manipulatives used in this lesson can be found in the Explore drop-down menu and can be digitally assigned to students (Algebra Tiles).

Procedure and Facilitation

FACILITATION TIP

Consider prompting students to record each symbol and its name along the margin of their student journal.

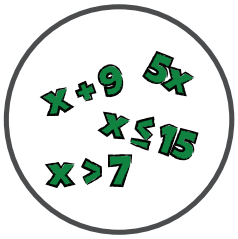
1. Read the following scenario to the class: *Balloon Darts is one of the most popular games at the amusement park. People throw darts at balloons to try to pop them.*
2. *Each color is worth a different number of tickets. Help players determine how many tickets they need to win different prizes!*
3. Help students access the task by asking the following guiding questions:
   a. **DOK-1** What is an inequality?
   b. **DOK-2** How is an inequality different from an equation?
   c. **DOK-2** Why might you need an inequality?
   d. **DOK-1** What do the symbols <, ≤, >, and ≥ mean?
   e. **DOK-2** Display the Algebra Inequality Mat. What is the purpose of the Algebra Inequality Mat?
   f. **DOK-1** Why is the Algebra Inequality Mat double-sided?

4. Give a Balloon Dart Prize Menu to each group.
5. Project the player 1 Scenario Card. Ask the class the following questions:
   - **a.** **DOK-1** How many tickets will player 1 receive when he pops one green balloon? Player 1 will receive two tickets for every green balloon he pops.
   - **b.** **DOK-1** How many tickets does player 1 need in total to win the ball prize? Player 1 needs five or more tickets to win the ball prize.
   - **c.** **DOK-1** How can we write an inequality to show how many green balloons player 1 needs to pop to be able to win the ball? Two times g, green balloons, is greater than or equal to five.
   - d. Use algebra tiles to model the inequality. **DOK-1** What will go on the left side of the greater than or equal to side? Two green rectangles will go on the left.
   - **e.** **DOK-1** What will go on the right side of the greater than or equal to side? Five yellow squares will go on the right side.
   - **f.** **DOK-1** What can we do to determine the value of g? We can solve the same way as we did with equations, but the sides won't be equal. One side will be greater than or equal to the other side.
   - **g.** **DOK-1** How much is each rectangle worth? Each rectangle is worth 2.5 squares.
   - **h.** **DOK-1** What operation do we need to use to determine the exact value of g, green balloons? Use the inverse operation to solve. For this scenario, $2g$ shows multiplication, so we need to divide by two to get our solution.
   - **i.** **DOK-1** What is the exact value of g, green balloons? The exact value of g, green balloons, is 2.5.
   - **j.** **DOK-2** Does it make sense to say that player 1 needs to pop part of a balloon? No, this does not make sense. When you look at the solution in terms of the scenario, sometimes it does not make sense to have a decimal number. It would make more sense to say that player 1 needs to pop 3 or more green balloons because popping two green balloons will not get enough tickets to purchase the ball prize.
6. Give a Student Journal to each student.
7. Give a set of Scenario Cards to each group.
8. Students use the Scenario Cards to write and model each inequality. Then they solve each inequality for the value of the variable.

FACILITATION TIP

If using the digital algebra tiles, project your screen as you point to, drag, and name each tile type.

Notes



Equations and Inequalities

Explore 3: Write, Model, and Solve Inequalities

9. Monitor students, and check for understanding as needed using the following guiding questions:
    a. **DOK-2** How did you determine which inequality symbols to use for players 1 and 2 ? To have enough tickets for the prize, the players must have either the exact amount of tickets or more than what each prize costs. Therefore, they need to be greater than or equal to.
    b. **DOK-2** Why do you use inequalities instead of equations for these types of problems? The number of tickets doesn't need to be exact. Each player can earn more than the number of tickets needed; therefore, an inequality is best.
    c. **DOK-1** How did you determine which inequality symbol to use for the food purchase scenarios? Answers will vary. If the guest wants to spend less than a certain dollar amount, you would use the less than symbol. If the guest wants to use no more than a dollar amount, you would use the less than or equal to symbol.
    d. **DOK-2** What questions do you have about writing and modeling inequalities? Answers will vary.
10. Give students enough time to complete their work for each scenario and answer the reflection questions on their Student Journals.
11. Encourage students to notice the similarities and differences between the strategies used to solve inequalities.
12. After the Explore, invite the class to a Math Chat to share their observations and learning.

Math Chat

- **DOK-1** How did you determine which inequality symbol to use for a scenario? To have enough tickets for the prize, the players must have either the exact amount of tickets or more than what each prize costs. Therefore, they need to be greater than or equal to. If the guest wants to spend less than a certain dollar amount, you would use the less than symbol. If the guest wants to use no more than a dollar amount, you would use the less than or equal to symbol.
- **Choose a Structured Conversation routine to facilitate the following question: DOK-2** How do you determine when to use an inequality and when to use an equation? Equations are used when finding exact amounts. Inequalities are used when finding more than a number, when finding less than a number, or when it can be some number or less than the number or some number and greater than that number.
- **DOK-2** Si wrote Brit's inequality as $h + 3 \leq 10$. Demi wrote Brit's inequality as $3 + h \geq 10$. Who is correct? Explain your reasoning. Both Si and Demi are correct about Brit's inequality because both inequalities add h to 3.

Explain the following to the class: *Mathematicians write the variable as the first term in an inequality.*

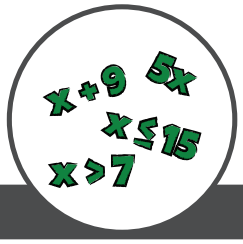
FACILITATION TIP

Have students write each symbol on a mini whiteboard. Read aloud each scenario and have students point to the symbol used. Then call on individual students to explain their reasoning.

Post-Explore

1. Have students complete the Exit Ticket to formatively assess their understanding of the concept.
2. Complete the Anchor Chart as a class.
3. Have each student complete their Interactive Notebook.

Notes



Equations and Inequalities

Explore 4: Write and Solve Inequalities

Activity Preparation

Students write and solve inequalities, write scenarios for inequalities and model the solutions on number lines, and determine whether a given value falls in the range of solutions for each inequality.

Mathematical Process Standards

- **(A)** Apply mathematics to problems arising in everyday life, society, and the workplace.
- **(D)** Communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate.
- **(E)** Create and use representations to organize, record, and communicate mathematical ideas.

Materials

Printed

- 1 Student Journal (per student)
- 1 Set of Ticket Scenario Cards (per group)
- 1 Number Line (per student)
- 1 Exit Ticket (per student)

Reusable

- 1 Dry-erase marker (per student)
- 1 Sheet protector (per student)
- 1 Projector or document camera (per class)
- 1 Resealable bag (per group)

Preparation

- Plan to have students work in groups of 4 to complete this activity.
- Print a Student Journal and an Exit Ticket for each student.
- Print a set of Ticket Scenario Cards for each group. If desired, print them on card stock and laminate them for future use. Cut them out, and place them in a resealable bag.
- Print a Number Line for each student. Laminate it, or put it in a sheet protector for use with a dry-erase marker.
- Have a projector or document camera ready to model an example with students.
- For students who need more support in recalling information, see our Open Number Lines Supplemental Aids elements in the Intervention section.
- **Go Digital!** Have students explore or present their solutions using virtual manipulatives! The manipulatives used in this lesson can be found in the Explore drop-down menu and can be digitally assigned to students (Algebra Tiles).

Procedure and Facilitation

FACILITATION TIP

Prior to stating the scenario, discuss student experience using tickets for rides or games. Ensuring that the context is relatable to students' everyday lives increases engagement.

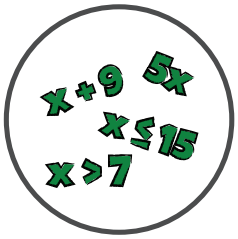
Part I

1. Read the following scenario to the class: *Emily and Sam just got tickets for the amusement park. They want to determine how many tickets they will use on different rides and make sure they purchased enough tickets. Help Emily and Sam write inequalities to represent how many tickets they want to use in each scenario.*
2. **DOK-2** Ask students to share the experiences they have had working with inequalities and inequality symbols.
3. Give a Number Line and a dry-erase marker to each student.

4. Project Emily's circular rides scenario (Ticket Scenario Card 1) for the class. Monitor students, and check for understanding as needed using the following guiding questions:
   a. **DOK-1** Can Emily use more or less than 15 tickets? She can use less than 15 tickets.
   b. **DOK-1** Would she use exactly 15 tickets? She cannot use exactly 15 tickets.
   c. **DOK-1** How can we write an inequality to show she will use less than 15 tickets? We can write t, for tickets, is less than 15: $t < 15$.
   d. Model 15 on your Number Line. We want to show that Emily can use less than 15 tickets but not exactly 15 tickets.
   e. **DOK-1** How would I represent exactly 15 tickets being used? Answers will vary. There would be a dot at 15 if I wanted to represent exactly 15.
   f. **DOK-2** If a dot represents 15, how could we represent up to 15 but not exactly 15 tickets? Answers will vary. We can use an unshaded circle at 15.
   g. **DOK-1** Which way should my arrow go for this scenario? The arrow should point left because she wants to use less than 15.
5. Give a set of Ticket Scenario Cards to each group.
6. Students work collaboratively to read each Ticket Scenario Card and determine whether the number of tickets in the scenario is less than, greater than, less than or equal to, or greater than or equal to a given number. Then students write an inequality, graph the inequality on a number line to describe the scenario, and answer a question related to the model.
7. Monitor students, and check for understanding as needed using the following guiding questions:
   a. **DOK-1** How do you represent greater than or equal to on a number line? To represent greater than or equal to on a number line, we put a closed circle at the number and then an arrow pointing to the right of the number.
   b. **DOK-1** How do you represent less than or equal to on a number line? To represent less than or equal on the number line, we put a closed circle at the number and then an arrow to the left of the number.
   c. **DOK-2** Based on the solution for this scenario, what are four possible numbers that are part of the solution set? Answers will vary. In the equation $w \geq 35$, the numbers 4, 18, 25, and 35 are all part of the solution set.
   d. **DOK-2** Describe the process you used to represent the solution set to the inequality on the number line. Answers will vary. To represent $t \leq 42$, because the solution set includes 42, I needed to use a closed circle to mark 42 on the number line. Then because the solution includes all numbers that are less than or equal to 42, I drew a ray pointing to the left, covering numbers that are all less than or equal to 42.
8. Allow students enough time to work with their groups to complete each scenario and the reflection questions on their Student Journals.
9. After Part I, invite the class to a Math Chat to share their observations and learning.

FACILITATION TIP

Provide access to a reference sheet showing each comparison symbol with corresponding rays/endpoints along the number line and shaded/unshaded circles.



Equations and Inequalities

Explore 4: Write and Solve Inequalities

FACILITATION TIP

Identify and list real-world scenarios that utilize inequalities (weight limits on an elevator, speed limits, or height requirements to ride a rollercoaster).

FACILITATION TIP

Record an example for each applied operation for students to reference during the activity.

Math Chat

- **DOK-1** When do you use an open circle to model an inequality, and when do you use a closed circle to model an inequality? Open circles are when the variable will not equal that amount, only more or less than that amount. Closed circles are used for when the variable will equal that amount or more or less.
- **Choose a Structured Conversation routine to facilitate the following question: DOK-1** How are inequalities different from equations? Equations equal one number, but inequalities represent a solution set and include more than one number.

Part II

1. Read the following scenario: *Emily and Sam want to determine the number of tickets used for the different rides and to purchase food. Help Emily and Sam write scenarios for the given inequalities. Then determine the number of tickets in each scenario, and model the solution on a number line.*
2. Help students access the task by asking the following guiding questions:
   a. **DOK-1** What observations can you make from the Ticket Scenario Cards for Part II? Answers will vary. I see that all four operations are represented in the cards.
   b. **DOK-2** How will you use the operations indicated in each inequality to create scenarios? Answers will vary. The multiplication and division inequalities will include groups, while the addition and subtraction inequalities will include adding or removing quantities.
3. Students work collaboratively to read each Ticket Scenario Card and write a scenario for that inequality. Then they solve the inequality, graph the inequality on a number line to describe the scenario, and answer a question related to the model.
4. Monitor students, and check for understanding as needed using the following guiding questions:
   a. **DOK-1** What scenario could represent $2f \geq 4$? Answers will vary. $2f \geq 4$ can represent 2 food items that cost a total of 4 or more dollars.
   b. **DOK-1** How can you represent a negative number of tickets? To represent a negative number of tickets, Emily or Sam could have used tickets or owe more tickets.
   c. **DOK-2** Based on the solution for this scenario, what are four possible numbers that are part of the solution set? Answers will vary. In the equation $f - 15 \leq -40$ the numbers –27, –35, –50, and –128 are all part of the solution set because $f \leq -25$.
   d. **DOK-2** Describe the process you used to represent the solution set to the inequality on the number line. Answers will vary. To represent $r + 20 \geq 70$, I first needed to solve for r, which I found was $r \geq 50$. Because the solution set includes 50, I needed to use a closed circle to mark 50 on the number line. Then because the solution includes all numbers that are greater than or equal to 50, I drew a ray pointing to the right, covering numbers that are all greater than or equal to 50.
5. Give students time to work with their groups to complete each scenario and the reflection questions on their Student Journals.

6. Encourage students to notice the similarities and differences among the strategies used to solve inequalities.
7. After the Explore, invite the class to a Math Chat to share their observations and learning.

Math Chat

- **DOK-2** Why are both $f \geq 2$ and $2 \leq f$ acceptable for writing the inequality solution for Emily's tickets in scenario 5? Both represent the inequality for Emily's food tickets because they both show that each food item must be 2 or more tickets.
- **DOK-2** What is a number of tickets that Sam could not have used in scenario 7? Explain your reasoning. Sam could not have used 10 tickets because he must have used more than or equal to 70 tickets, and 10 + 20 is only 30.
- **Choose a Structured Conversation routine to facilitate the following question: DOK-3** Where might you use inequalities in the real world? Inequalities could be used when determining the amount of paint needed for a room when given the amount in one can of paint.

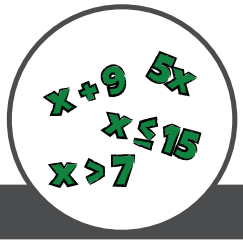
Post-Explore

1. Have students complete the Exit Ticket to formatively assess their understanding of the concept.
2. Complete the Anchor Chart as a class.
3. Have each student complete their Interactive Notebook.
4. Return to the Hook and instruct students to use their newly acquired skills to successfully complete the activity.

FACILITATION TIP

Use guiding prompts to facilitate conversation (Did you use the same strategy as others in your group? If not is one strategy more efficient than another? Explain your reasoning.)

Notes



Equations and Inequalities

Additional Scope Resources

Explain Elements

ELEMENT USE KEY ● Can be assigned digitally ■ Contains printable handouts ★ Can be done independently

Picture Vocabulary
A slide presentation of important vocabulary terms along with a picture and definition

● ■ ★

Anchor Chart
A guide to facilitating the creation of a chart with students for each scope.

● ■

Interactive Notebook
A cut-and-glue activity to process learning that can be added to a notebook for future reference

■ ★

Interactive Vocabulary
Students form definitions of mathematical vocabulary words used throughout the scope.

● ■ ★

Language Connections
Language Connections

An opportunity to use linguistic and cultural background knowledge to support connections to new skills, vocabulary, and concepts at different proficiency levels and linguistic domains.

● ■

Show What You Know, Part 1
Write, Model, and Solve Equations

Independent practice assignment that gives students an opportunity to demonstrate their learning

● ■ ★

Show What You Know, Part 2
Write and Solve Equations

Independent practice assignment that gives students an opportunity to demonstrate their learning

● ■ ★

Show What You Know, Part 3
Write, Model, and Solve Inequalities

Independent practice assignment that gives students an opportunity to demonstrate their learning

● ■ ★

Show What You Know, Part 4
Write and Solve Inequalities

Independent practice assignment that gives students an opportunity to demonstrate their learning

● ■ ★

Notes

Elaborate Elements

ELEMENT USE KEY ● Can be assigned digitally ■ Contains printable handouts ★ Can be done independently

Spiraled Review

Mike's Gas Station

A quick story to engage student interest along with four problems over previously learned skills.

●■★

Fluency Builder

Equations and Inequalities

Independent and partner games and other activities that provide students with an engaging way to practice the new concept

PhET

Equality Explorer: Balancing Equations with Inverse Operations

Student activities using the PhET Interactive Simulations from the University of Colorado Boulder.

●★

PhET

Equality Explorer: Introduction to Inequalities

Student activities using the PhET Interactive Simulations from the University of Colorado Boulder.

●★

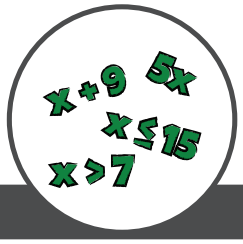
PhET

Equality Explorer: Linear Equations with One Variable

Student activities using the PhET Interactive Simulations from the University of Colorado Boulder.

●★

Notes



Equations and Inequalities

Intervention and Assessment

Student Intervention

1 *Use the Skill Review and Practice under the Intervention section to assess student mastery after this scope's content has been taught. Distribute a copy of Quick Check to each student. Each student should complete the Quick Check independently.*

	How to Use the Review	Students	Notes & Comments
Students who are still acquiring the concept and need remediation	❑ *Distribute a copy of the Review to these students.* ❑ *Meet with students individually or in a small group to assist them in working through the Review's concepts.* ❑ *Talk individually with each student about their thoughts in order to highlight strengths and roadblocks.* ❑ *Look out for possible misconceptions.*		
Students who are approaching mastery and need review	❑ *Distribute a copy of the Review to these students.* ❑ *Meet with students in a small-group to answer questions and identify areas where students are struggling.* ❑ *Look out for moments of possible reteaching.* ❑ *Release students to work independently once you see they're nearing mastery of the concept.*		
Students who have mastered the concept and need extension	❑ *Distribute a copy of the Review to these students.* ❑ *Confirm that students are on the right track.* ❑ *Direct students to work on materials in the Acceleration section, such as the Choice Board, while you work with the other students.*		

2

3 *Distribute a copy of Checkup to each student. Students should complete the Checkup independently. Watch out for students who need additional help.*

Assessment Planner

Evaluate Resources

- ❑ *Standards-Based Assessment*
- ❑ *Skills Quiz*
- ❑ *Mathematical Modeling Task*
- ❑ *Technology-Enhanced Questions*
- ❑ *Heat Map*

Use this template to decide how to assess your students for concept mastery. Depending on the format of the assessment, you can identify prompts and intended responses that would measure student mastery of the expectation. See the beginning of this scope to identify standards and grade-level expectations.

Fundamental Questions	*What prompts will be used?*	*What does mastery look like?*
I can write one-variable, one-step equations.		
I can write one-variable, one-step inequalities.		
I can use number lines to represent solutions for one-variable, one-step equations.		
I can use number lines to represent solutions for one-variable, one-step inequalities.		
I can write real-world problems when given one-variable, one-step equations.		
I can write real-world problems when given one-variable, one-step inequalities.		
I can model and solve one-variable, one-step equations.		
I can model and solve one-variable, one-step inequalities.		
I can determine if the given value(s) make(s) one-variable, one-step equations true.		
I can determine if the given value(s) make(s) one-variable, one-step inequalities true.		

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