Amplify Desmos Math
CALIFORNIA

Grade 6

UNIT 6 | SUB-UNIT 1

Solving Equations

About Amplify

Amplify is dedicated to collaborating with educators to create learning experiences that are rigorous and riveting for all students. Amplify creates K–12 core and supplemental curriculum, assessment, and intervention programs for today's students.

A pioneer in K–12 education since 2000, Amplify is leading the way in next-generation curriculum and assessment. All of our programs provide teachers with powerful tools that help them understand and respond to the needs of every student.

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Amplify Desmos Math
CALIFORNIA

Grade 6

Unit 6: Expressions and Equations

Sub-Unit 1: Solving Equations

Teacher Edition

Unit 6 Expressions and Equations

Students write and solve equations of the form $x + p = q$ and $px = q$ in and out of context. They also learn about exponents and representations of relationships.

UNIT 6

Expressions and Equations

Questions for Investigation

- How do we represent an unknown or changing value in a math problem?
- How can we use expressions and equations to represent different mathematical situations?
- How do independent and dependent variables relate to one another?

Explore: Detecting Counterfeit Coins

Students build curiosity from the beginning of the unit by engaging in a mathematical task that elicits multiple strategies and allows them to apply their own knowledge.

Focus on the Big Ideas

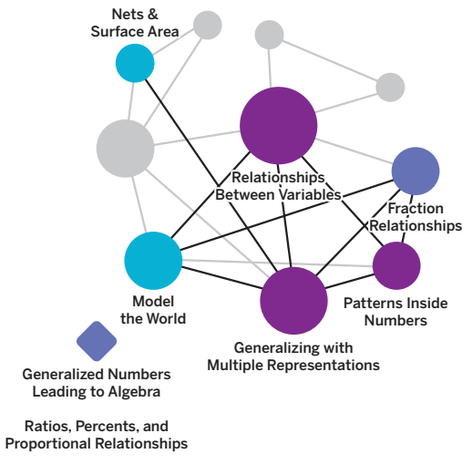
CA CCSSM

Addressing

6.EE.1, 6.EE.2, 6.EE.2.a, 6.EE.2.b, 6.EE.2.c, 6.EE.3, 6.EE.4, 6.EE.5, 6.EE.6, 6.EE.7, 6.EE.9, 6.G.1, 6.G.2, 6.NS.1, 6.RP.1, 6.RP.2, 6.RP.3, 6.RP.3.a

Standards for Mathematical Practices:

SMP.1, SMP.2, SMP.3, SMP.5, SMP.6, SMP.7, SMP.8



Sub-Unit 1

Solving Equations

Sub-Unit 1 Goals

- **Goal:** Write and solve equations in the form of $x + p = q$ and $px = q$.
- **Language Goals:**
  - » Describe a situation that could be represented by an equation of the form $x + p = q$ or $px = q$, for a rational number p and unknown x.
  - » Interpret diagrams that represent equations of the form $x + p = q$ or $px = q$.

Progression of Big Ideas in Sub-unit 1

- **Lessons 1–5:** Students work toward connecting the Big Idea CC2 Generalizing with Multiple Representations to CC2 Relationship Between Variables as they analyze situations using tape diagrams and equations. They calculate the unknown value and interpret it within the context. They connect hanger diagrams to equations to illustrate the concept of balance.
- **Lesson 4:** Students connect CC2 Generalizing with Multiple Representations and CC2 Fraction Relationships by using multiple representations to solve equations of the form $x + p = q$ and $px = q$ in which the solution is a fraction.

Sub-Unit 1 Progression	Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5
CC2 Generalizing with Multiple Representations	●	●	●	●	●
CC2 Fraction Relationships	○	○	○	●	○
CC2 Relationships Between Variables	○	●	●	○	○
NS Generalized Numbers Leading to Algebra	◆	◆	◆	◆	◆

Coming Up Next

- **Sub-unit 2, Lessons 6–9:** CC2 Generalizing with Multiple Representations NS Generalized Numbers Leading to Algebra
- **Sub-unit 3, Lessons 10–12:** CC2 Generalizing with Multiple Representations CC3 Nets and Surface Area NS Generalized Numbers Leading to Algebra
- **Sub-unit 4, Lessons 13–16:** CC2 Generalizing with Multiple Representations Patterns Inside Numbers Relationships Between Variables CC3 Model the World Nets and Surface Area NS Generalized Numbers Leading to Algebra

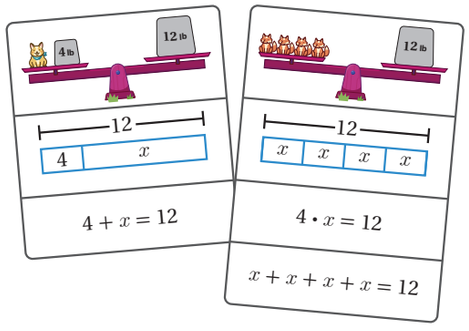
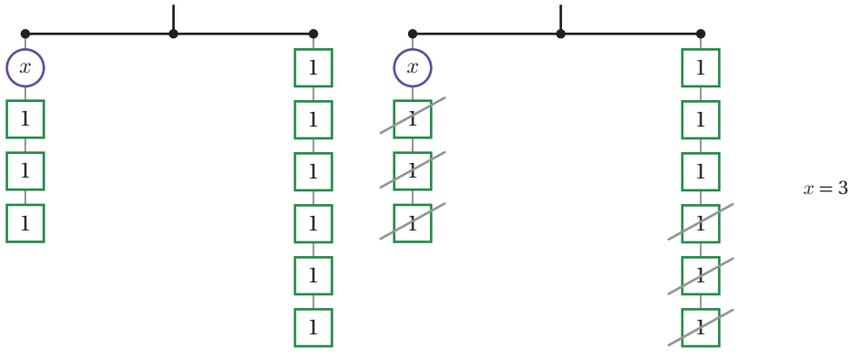
Big Idea Development

CC2 Generalizing with Multiple Representations | Relationships Between Variables | Fraction Relationships

NS Generalized Numbers Leading to Algebra

As students progress through Sub-Unit 1, look for these strategies as they are introduced to variables and begin to solve balanced equations.

Progression of Strategies, Skills, or Language

Progression	For example . . .
Analyzing situations that are represented through multiple representations, including the use of variables and equations.	
Representing mathematical situations with multiple representations, such as tape diagrams, expressions, and equations. Using reasoning to solve and interpret solutions.	Emmanuel needed \$21 to buy a gift. He has \$3 and borrowed the rest from his parents.
Using hanger diagrams to develop the idea of balance in equations. Solving equations that represent hanger diagrams by reasoning about actions on both sides of the hanger.	
Connecting the idea of balance to using inverse operations to solve one-step equations.	$\frac{c}{4} = 1.2$ $\frac{c}{4} \cdot 4 = 1.2 \cdot 4$ $c = 4.8$ $7 = 4x$ $\frac{7}{4} = 4\frac{x}{4}$ $\frac{7}{4} = x$

Equation	Tape Diagrams	Solution to the Equation	Solution's Meaning
$3 + y = 21$	21 y | 3	$y = 18$	Emmanuel borrowed \$18 from his parents.

Unit 6

Lesson

OPTIONAL

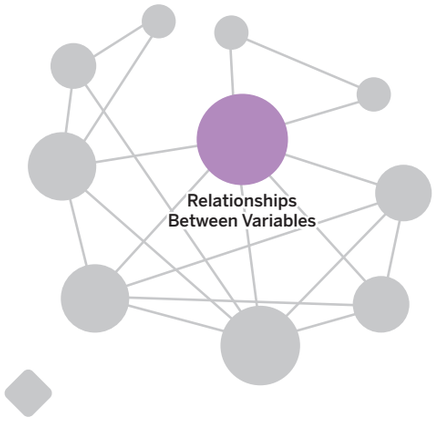
This lesson is optional as the standards are addressed in other lessons within this course.

Explore: Detecting Counterfeit Coins

Using Balance

How can a balance scale help detect a counterfeit coin?

Today's Big Ideas



Focus on the Big Ideas

- **Today's Goals** CC2 Relationships Between Variables

1. **Goal:** Recognize how the concept of balance relates to math, both concretely and abstractly.
2. **Language Goal:** Describe connections between the concept of balance and math. **(Speaking, and Listening)**

DI Why? In order to . . .	SMP How? Students will . . .	CC What? While . . .
Make sense of balancing weights **(D1)**	Systematically consider the results and implications of each weighing **(SMP.8)**	Searching for the counterfeit coin **(CC2)**

CA CCSSM

Building Toward

6.EE.5

Understand solving an equation or inequality as a process of answering a question: Which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true.

Mathematical Practices: SMP.2, SMP.3, SMP.8

CA ELD Standards: ELD.PI.6.3, ELD.PI.6.10, ELD.PI.6.11, ELD.PII.6.3, ELD.PII.6.4

Connections and Coherence

Students explore the physical concept of balance as they model weighing different numbers of coins to identify a counterfeit among them. This lesson sets the stage for the important concept of balance as it relates to algebraic expressions and equations, which will be carried into all the lessons that follow.

Integrating Rigor in Student Thinking

Through the detection of counterfeit coins, students generate questions and predictions. They **investigate mathematical concepts,** including possible outcomes of different weighings to answer their questions and compare to their predictions.

Caregiver Connection

Students may enjoy sharing these puzzle-like problems with their families. Polypad balance scale can be used at home for students to create their own puzzles with family members.

Lesson at a Glance

~ 45 min

CA CCSSM: Building Toward 6.EE.5, SMP.2, SMP.3, SMP.8

Why digital?

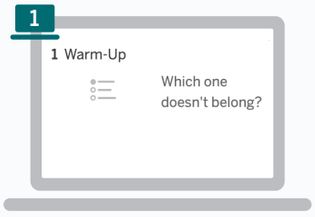
Students use balance scales to make sense of weighings.

Warm-Up

Whole Class | 5 min

Students view images of currency and use the **Which One Doesn't Belong?** routine.

Materials: currency examples, play money examples (optional)



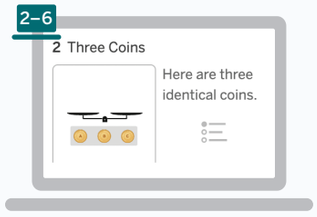
Pacing: Screen 1

Activity

Pairs | 30 min

Students investigate how many weighings are needed to determine which of the given coins is counterfeit.

Materials: coins, counters, or concrete objects (optional)

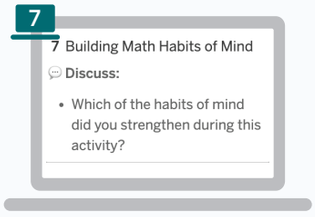


Pacing: Screens 2–3, 4–6

Building Math Habits of Mind

Pairs | 10 min

Students discuss the mathematical habits of mind they strengthened during the Activity.



Pacing: Screen 7

Opportunities For Extension *(optional)*

Students could extend this exploration by thinking about the similarities in their strategies for different numbers of coins. Then they can iterate their strategy for 24 coins and/or odd numbers of coins.

Math Language Development

EL Multilingual / English Learners

Consider using the scaffolds from the *Math Language Development Resources* with the **Building Math Habits of Mind** part of this Explore to support math language acquisition for your students.

Emerging

Students are provided with sentences in English and Spanish. They work together with you to choose the habits of mind they strengthened during the Explore.

Expanding

Students are provided with sentences in English and Spanish. They work with a partner to choose the habits of mind they strengthened during the Explore, using sentence frames for discussion.

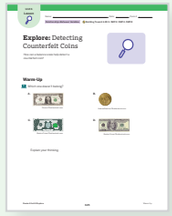
Bridging

Students are provided with sentences in English and Spanish. They work with a partner to choose the habits of mind they strengthened during the Explore and craft their own sentences during discussion.

Whole Class | 5 min Pacing: Screen 1

Warm-Up

Purpose: Students view images of currency and use the Which One Doesn't Belong? routine.



Students using print

1 Launch

1 **Use the Which One Doesn't Belong? routine** to support students in comparing and contrasting different currencies and justifying their thinking. (SMP.3) ELD.PI.6.3.Em, Ex, Br

Consider sharing that each currency does not belong in some way. Encourage students to look for more than one possibility.

EL **Multilingual/English Learners** Consider paraphrasing that the currency refers to the system of money that a country uses. Invite students from other countries to describe their country's currency or show examples of currency from other countries. **(Speaking and Listening)**

A **Accessibility: Visual-Spatial Processing** Students who are familiar with U.S. currency may be able to identify the image in Choice C as "play money," or not real currency. Students from other countries may benefit from the showing of examples of real U.S. currency and examples of "play money" from a board game.

2 Connect

Invite students to share at least one reason why each currency doesn't belong.

Consider asking:

- "How is C the same as the other currencies? How is it different?"
- "Is there another reason why C doesn't belong?"

Math Identity and Community Invite students to share how hearing the way different people think is valuable to everyone.

Note: If it doesn't come up naturally, consider discussing that only real money is actually worth its stated value. Money that has been created for the purpose of a board game, for example, has no real value, but also was not intended to. However, pieces of currency created to imitate the real object identically and pass off as real are called *counterfeit*.

EL **Multilingual/English Learners** The term counterfeit will be used in the upcoming activities. Consider paraphrasing that the term counterfeit means more than just something that is "fake" or "not real." When using the term counterfeit, it is implied that the intention behind creating or using the fake object was to pass it off as real. Counterfeit currency often looks identical to real currency. **(Reading, Speaking and Listening)** ELD.PII.6.4.Em, Ex, Br

ELD.PI.6.3.Em, Ex, Br

1

Warm-Up

Which one doesn't belong?

Responses and explanations vary.

- A doesn't belong because it is the only paper real money.
- B doesn't belong because the other three are paper bills.
- C doesn't belong because it's not real money.
- D doesn't belong because it has a different amount.

Pairs | 30 min Pacing: Screens 2–3, 4–6

Activity Counterfeit Coin

Purpose: Students investigate how many weighings are needed to determine which of the given coins is counterfeit.

Short on time? Consider omitting Screen 6.

Students using print

1 Launch

2 **To encourage playfulness,** ask students if they have ever seen or used a balance scale before. Demonstrate how a balance scale works using the coins.

Consider asking, "What are the two possible outcomes of each weighing?" Highlight responses that mention *balanced* and *unbalanced*.

Use the Think-Pair-Share routine to help students shape their ideas about *weighing coins*. Invite students to think independently and then take turns sharing with a partner.

EL **Multilingual/English Learners** Clarify the meaning of the term weighing as it is used in this activity. Tell students that one weighing is the actual act of weighing the coins. If they need to weigh two coins one time, and then two different coins another time, this means there are two weighings. **(Reading, Speaking, and Listening)**

ELD.PII.6.3.Em, Ex

2 Monitor

3 **Select and sequence** a variety of responses using the Snapshot tool.

D Differentiation

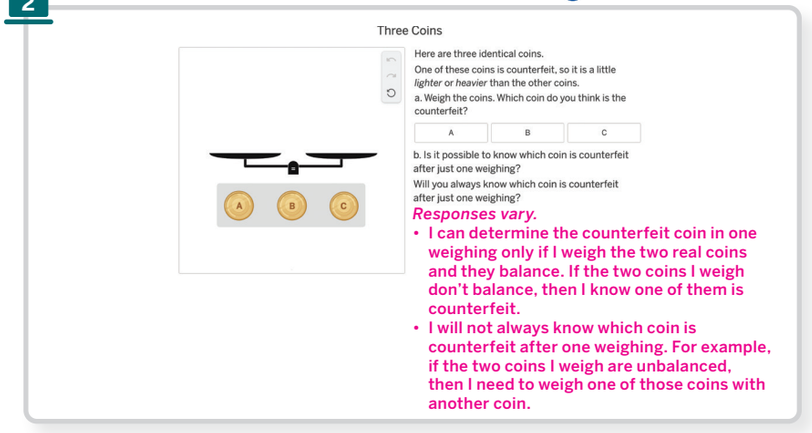
Look for students who:	Respond to Student Thinking
Need support in distinguishing a single trial from a generalization.	**Support** Encourage students recount and record their weighings that lead to an identification. Consider asking, "What if one of those weighings had a different result? Could you still identify the counterfeit coin after the same number of weighings?"
Double counting different possible weighings.	**Support** Consider discussing that each weighing has two possible results (balanced or unbalanced), each of which leads to a different next weighing. But only one result will happen at any given time, so only one next weighing should be counted.

Pause and invite students to share their strategies for determining the counterfeit coin. Start with students who use more weighings and work toward students with more efficient strategies. **(SMP.2)**

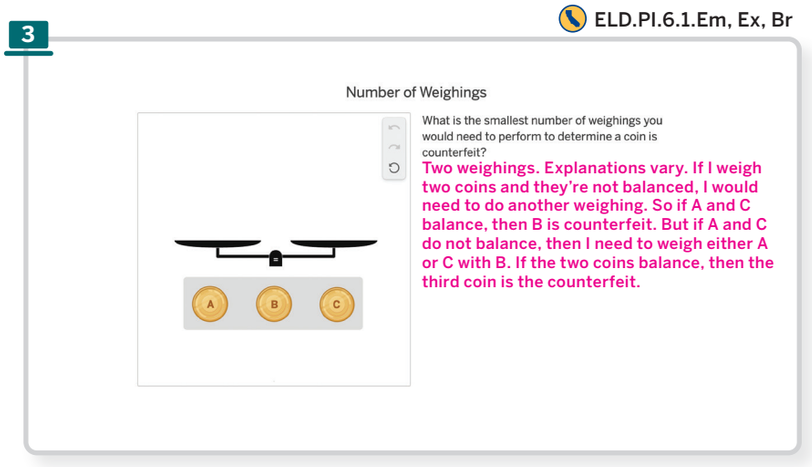
Consider demonstrating and clarifying the steps to determine the counterfeit coin by using the scale before increasing the total number of coins for the rest of the activity.

Students using digital

2 ELD.PI.6.1.Em, Ex, Br



3 ELD.PI.6.1.Em, Ex, Br

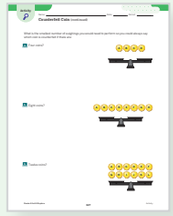


Pairs | 30 min Pacing: Screens 2–3, 4–6

Activity Counterfeit Coin (continued)

Purpose: Students investigate how many weighings are needed to determine which of the given coins is counterfeit.

Short on time? Consider omitting Screen 6.



Students using print

2 Monitor

4 **Encourage students** to make several trials and share their reasoning with their partner. They should work together to reach an agreement about the least number of weighings in each case.

A **Accessibility: Visual-Spatial Processing**
Provide coins, counters, or concrete objects that students can physically hold to help them simulate the weighings.

4-6 **Listen for** partner discussions that deepen their understanding as they move from four coins to 12 coins to highlight in the Connect.

D **Differentiation**

Look for students who:	Respond to Student Thinking
Only weighing two coins at a time.	**Support** Consider asking, "Can you think of a different way to eliminate more coins at the same time?"
Systematically and simultaneously considering the results and implications of each weighing. **(SMP.8)**	**Strengthen** Encourage them to create their own set of statements using diagrams to share during the Connect.
Concluding that the counterfeit coin can be determined with only three weighings up to 12 coins. **(SMP.8)**	**Stretch** Consider asking, "How many coins would there have to be for the number of weighings needed to be four?" 13 coins

3 Connect

Invite students to share their strategies and explanations to determine the counterfeit coin. Start with students who used the most weighings, and work toward students with more efficient strategies. **(SMP.8)**

Demonstrate or invite students to demonstrate the least number of weighings in each case using the balance scale.

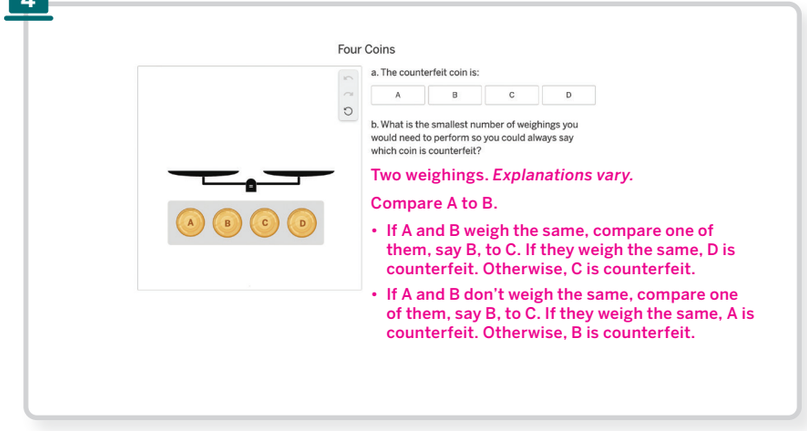
To surface the Key Takeaway, ask, "How does the idea of balance relate to math?"

Key Takeaway: The balance is an important mathematical concept, which was obvious with weighing the coins, but also as a more abstract representation of the concept of equality. In either case, there are many possible moves to determine the unknown!

Students using digital

ELD.PI.6.1.Em, Ex, Br

4



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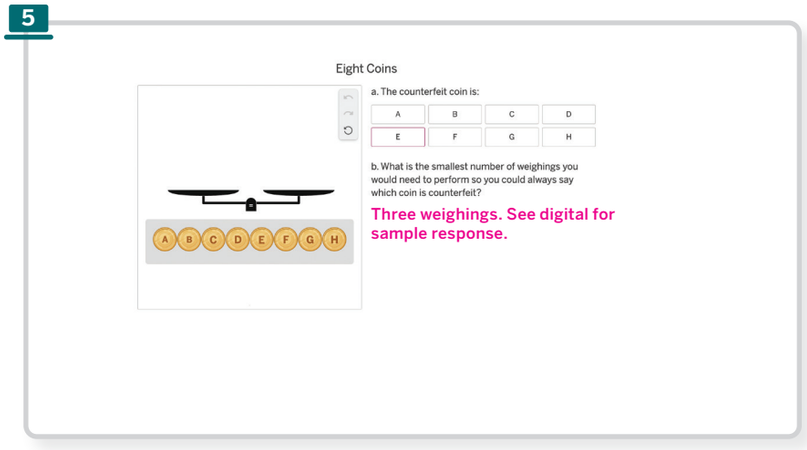

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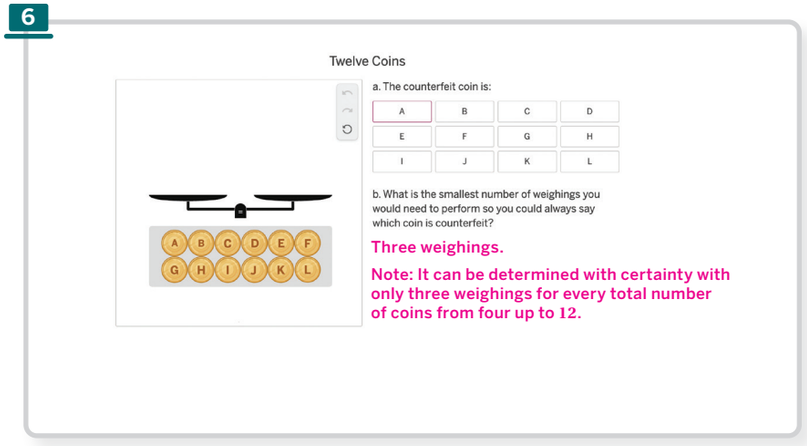


Pairs | 10 min Pacing: Screen 7

Building Math Habits of Mind

Purpose: Students discuss the mathematical habits of mind they strengthened during the Activity.

Students using print

Building Math Habits of Mind

7

Invite students to pair with a different partner than the one they worked with during the Activity. Read aloud the discussion prompt and invite partners to discuss which habits of mind they utilized and strengthened during the Activity.

EL **Multilingual/English Learners** If possible, pair students together who speak the same primary language and allow them to discuss their responses in their primary language. Emerging, Expanding, and Bridging scaffolds and supports are also available in the ***Math Language Development Resources.***

Invite pairs of students to share the different habits of mind they selected and how they used them during the Activity. Consider asking (if these do not come up during the discussion):

- "How did you improve your reasoning as the number of coins increased?" **(SMP.2, SMP.8)**
- "How did you construct viable arguments when discussing the number of weighings with your partner?" **(SMP.3)**

Math Identity and Community Invite students to share strategies they found helpful and give credit to the students who shared them.

7

Building Math Habits of Mind

Discuss:

- Which of the habits of mind did you strengthen during this activity?
- How did you use the one(s) you selected?

Unit 6

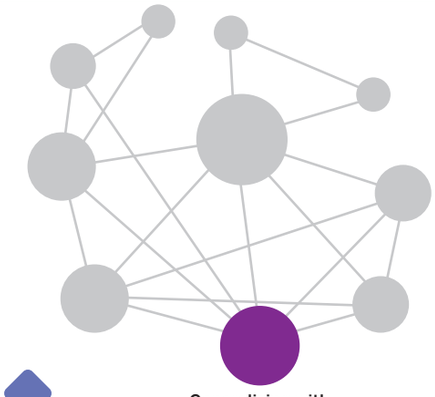
Lesson 1

Weight for It

Reasoning About Unknown Values

Let's use a seesaw to determine the weights of different animals.

Today's Big Ideas



Focus on the Big Ideas

Today's Goals CC2 Generalizing With Multiple Representations NS Generalized Numbers Leading to Algebra

1. **Goal:** Use reasoning and tape diagrams to determine unknown values.
2. **Language Goal:** Describe connections between diagrams that represent equations of the form $x + p = q$ or $px = q$. **(Writing, Speaking, and Listening)**

DI Why? In order to . . .	SMP How? Students will . . .	CC What? While . . .
Make sense of writing equations **(DI1)**	Connect situations, and tape diagrams **(SMP.2)**	Reasoning about what the variable represents in each situation **(CC2)**

Connections and Coherence

Students use reasoning, equations, and tape diagrams to determine unknown weights on a seesaw. They are introduced to variables as letters that represent unknown quantities. Students make connections between the visuals of the seesaw, equations, and tape diagrams. **(SMP.2)**

Prior Learning CC2 Number and Shape Patterns Generalizing With Multiple Representations

In Grade 4, students used letters to represent unknown amounts. In Unit 3, students used tape diagrams to reason about percentages and determine unknown values.

Future Learning CC2 Generalizing With Multiple Representations

In Lesson 2, students will use tape diagrams to write and solve equations with a variable and describe what solutions mean in context.

Integrating Rigor in Student Thinking

Students develop **conceptual understanding** of a variable and **apply** their understanding when they solve equations using a seesaw and a tape diagram.

Vocabulary

New Vocabulary

variable

Review Vocabulary

equation

CA CCSSM

Addressing

6.EE.6

Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; **understand that a variable can represent an unknown number,** or, depending on the purpose at hand, any number in a specified set.

6.EE.7

Solve real-world and **mathematical problems by writing and solving equations of the form $x + p = q$ and $px = q$ for cases in which p, q and x are all nonnegative rational numbers.**

Mathematical Practices: SMP.1, SMP.2

Building On	Building Toward
4.OA.3	6.EE.5

CA ELD Standards: ELD.PI.6.1, ELD.PI.6.2 ELD.PI.6.5, ELD.PI.6.10, ELD.PI.6.12

Lesson at a Glance

~ 45 min

CA CCSSM: 6.EE.6, 6.EE.7, SMP.1, SMP.2

Why digital?

Challenge Creator supports students in creating and sharing challenges with classmates.

Warm-Up

Whole Class | 5 min

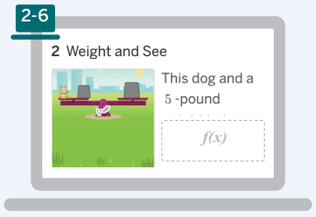
Students use the **Notice and Wonder** routine to explore how changing the weight of an object affects a seesaw. **MLR8: Discussion Supports**

Pacing: Screen 1

Activity 1

Pairs Sharing a Device | 10 min

Students use *equations* and tape diagrams to represent seesaw situations and to determine unknown animal weights. **(SMP.2)**

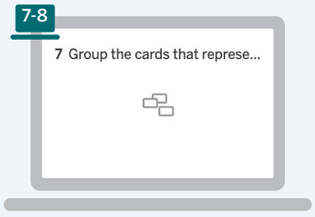


Pacing: Screens 2–3, Screens 4–6

Activity 2

Pairs Sharing a Device | 10 min

Students connect tape diagrams, equations, and seesaws and use them to determine unknown animal weights.



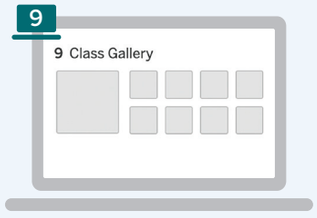
Pacing: Screens 7–8

Activity 3

Pairs | 10 min

Students use their creativity to make their own seesaw problem for other students to solve.

For students using print: Activity 3 Sheet

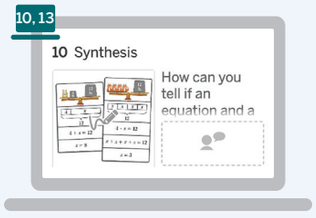


Pacing: Screen 9

Synthesis

Whole Class | 5 min

Students use the **Think-Pair-Share** routine to synthesize their understanding of how equations and tape diagrams can represent situations with unknowns.



Pacing: Screens 10, 13

Show What You Know

Independent | 5 min

Students demonstrate their understanding by matching equations to tape diagrams.

For students using print: Show What You Know Sheet

Pacing: Screens 11–12

Math Language Development

Multilingual / English Learners

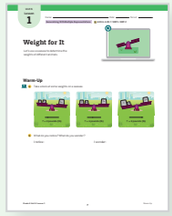
Consider using the scaffolds from the *Math Language Development Resources* with Activity 1 to support math language acquisition for your students.

Emerging	Expanding	Bridging
Students are provided with the Frayer model to connect situations, equations and tape diagrams and work together with you to complete the sentence frames. Guiding questions are provided for you to ask for students to share one-word responses.	Students are provided with the Frayer model to connect situations, equations and tape diagrams and work with a partner to complete the sentence frames. Guiding questions are provided for you to ask for students to share responses using simple phrases.	Students complete the Frayer model individually or with a partner. Guiding questions are provided to ask students to share responses using longer phrases or complete sentences.

Whole Class | 5 min | Pacing: Screen 1

Warm-Up

Purpose: Students use the Notice and Wonder routine to explore how changing the weight of an object affects a seesaw.



Students using print

1 Launch

1 **Demonstrate** how the seesaw changes as the weight is adjusted. Invite students to suggest a weight to try.

EL **Multilingual/English Learners** Invite students to share what they know about seesaws to increase access to the task. It may be helpful to show other images or videos of seesaws. **(Reading and Listening)**

To encourage playfulness, consider asking, "What is your favorite item on a playground?"

Use the Notice and Wonder routine to promote curiosity and help students make sense of balancing a seesaw. See the Routine Facilitation Guide for more information. **(SMP.1)**

2 Connect

MLR **MLR8: Discussion Supports** Use the sentence frames such as

- I notice when the weight is 4 pounds, _____.
- I notice when the weight is _____ pound(s), the seesaw is not balanced.
- I wonder what is special about the number _____ for this seesaw.

ELD.PI.6.1.Em, Ex, Br

Invite students to share their noticings and wonderings.

Math Identity and Community Consider celebrating variety and creativity in what students notice and wonder, including things that surprise you or things you think other students may not have noticed.

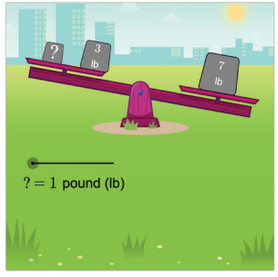
Consider asking:

- "What happens when the weight is less than 4 pounds? Greater than 4 pounds?"
- "What happens when the weight is exactly 4 pounds? Why might that make sense?"

Students using digital

1 ELD.PI.6.2.Em, Ex, Br

Warm-Up



Here are some weights on a seesaw.

a. Drag the movable point to adjust one of the weights.

b. What do you notice? What do you wonder?

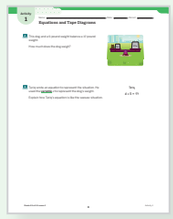
Responses vary.

- I notice when the weight is 4 pounds, the seesaw balances.
- I notice when the weight is 2 pounds or 9 pounds, the seesaw is not balanced.
- I wonder what is special about the number 4.
- I wonder how many pounds the seesaw can hold.
- I wonder whether I would fall off if a giant weight fell on the other end of the seesaw.

Pairs Sharing a Device | 10 min | Pacing: Screens 2–3, Screens 4–6

Activity 1 Equations and Tape Diagrams

Purpose: Students use *equations* and tape diagrams to represent seesaw situations and to determine unknown animal weights. **(SMP.2)**



Students using print

1 Launch

2 **To encourage connections**, consider asking, "How is this situation similar to the Warm-Up? How is it different?"

Encourage students to use the feedback on the screen to help them revise their responses.

2 Monitor

3 **Invite students using print** to discuss their strategy for determining the dog's weight with a partner.

A **Accessibility Conceptual Processing** Invite students to read the equation aloud with the variable's meaning instead of d (e.g., The weight of the dog plus 5 pounds is equal to 17 pounds.).

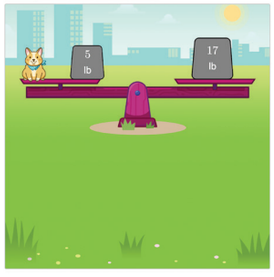
Pause to invite students to share their ideas about how the *equation* is like the seesaw.

EL **Multilingual/English Learners** Create or review an anchor chart that publicly displays vocabulary of the unit such as variable, equation, seesaw, balance, equality, tape diagram to aid students in explaining their reasoning. **(Writing, Speaking, and Listening)** ELD.PI.6.12.Em, Ex, Br

Activity 1 continued >

2 *Students using digital*

Weight and See



This dog and a 5-pound weight balance a 17-pound weight.

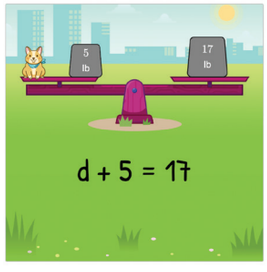
How much does the dog weigh?

12 pounds

ELD.PI.6.2.Em, Ex, Br

3

"d" Is for Dog



Tariq wrote an *equation* to represent the situation.

He used the ***variable*** d to represent the dog's weight.

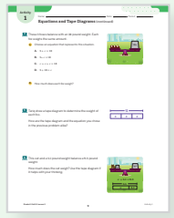
Explain how Tariq's equation is like the seesaw situation.

Responses vary. The left side of the equation is like the left side of the seesaw. It is the weight of the dog plus a 5-pound weight, so the left side of the equation is $d + 5$. The right side of the equation, 17, is like the 17-pound weight on the right side of the seesaw.

Pairs Sharing a Device | 10 min | Pacing: Screens 2–3, Screens 4–6

Activity 1 Equations and Tape Diagrams (continued)

Purpose: Students use *equations* and tape diagrams to represent seesaw situations and to determine unknown animal weights. (SMP.2)



Students using print

2 Monitor

4 D Differentiation

Look for students who:	Respond to Student Thinking
Select $3 + x = 18$.	**Support** Invite them to compare this seesaw to the situation on the previous screen.
Select $3 + 18 = x$.	**Support** Consider asking, "What does the x represent for this seesaw?"
Select one of the two correct equations.	**Strengthen** Consider asking, "Is this the only equation that represents the situation? How do you know?"
Make connections between $3 \cdot x = 18$ and $x + x + x = 18$.	**Strengthen** Invite students to share their thinking during the Connect.

5 EL Multilingual/English Learners Emerging, Expanding, and Bridging scaffolds and supports are available in the ***Math Language Development Resources.***

Capture a variety of descriptions of how the tape diagram and the equation(s) are alike to share during the Connect.

6 Look for a variety of strategies, such as creating a tape diagram, annotating the seesaw, or writing a subtraction expression, to highlight during the Connect.

D Differentiation: (Stretch) Invite students to draw a tape diagram to represent this situation and compare it to the tape diagram on the next screen.

3 Connect

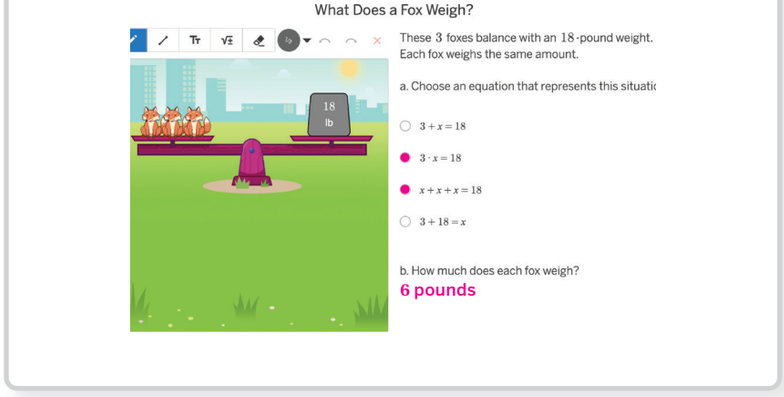
5 Create a class definition of **variable** using students' ideas from Screens 3–6. Consider asking, "Why might Tariq have used different variables in the first example and the second example?" *Responses vary.* To represent the weights of different animals.

To surface the Key Takeaway, consider:

- Inviting students to explain how they knew which equations matched the fox situation.
- Sharing captured descriptions and inviting students to make connections between them.

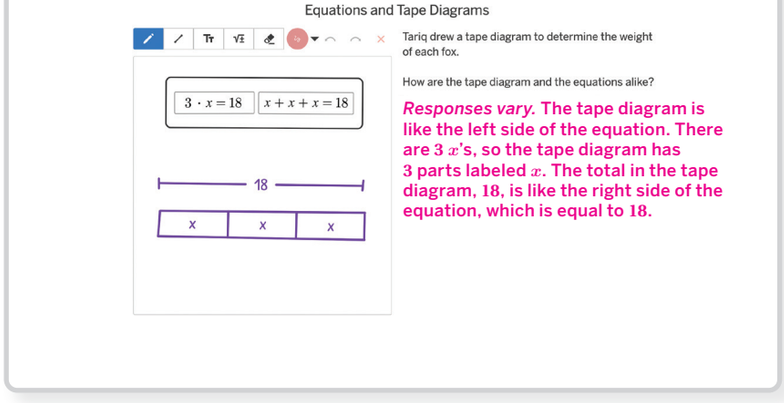
Students using digital

4



ELD.PI.6.10.Em, Ex, Br

5



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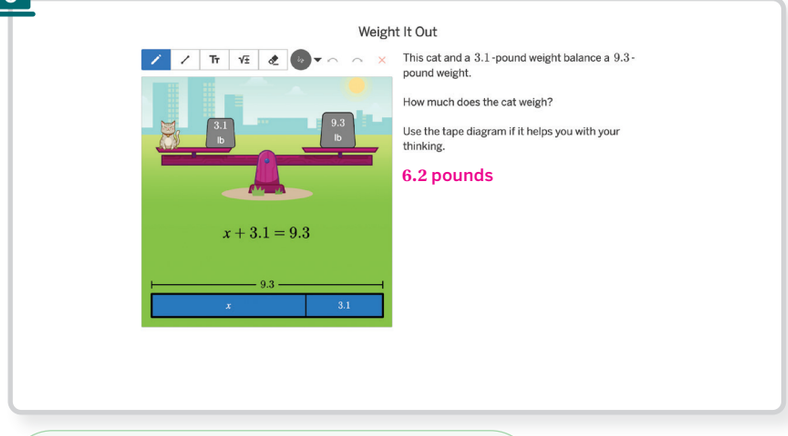
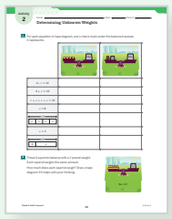


Key Takeaway: Seesaws, tape diagrams, and *equations* can be used to represent balanced relationships and determine unknown weights. These unknown weights are often represented by **variables** — letters or symbols that represent a number.

Pairs Sharing a Device | 10 min | Pacing: Screens 7–8

Activity 2 Determining Unknown Weights

Purpose: Students connect tape diagrams, equations, and seesaws and use them to determine unknown animal weights.



Students using print

1 Launch

7 **To support making connections**, consider asking, "What does x represent in each tape diagram?"

A **Accessibility: Executive Functioning** Consider chunking this activity by inviting students to work on one equation/tape diagram at a time.

2 Monitor

8 **Encourage students** to share their reasoning with their partner and work together to reach an agreement about which representations match.

Note: If time allows, invite pairs to compare their choices, justify their thinking, and make revisions based on their conversation.

D **Differentiation**

Look for students who:	Respond to Student Thinking
Draw a tape diagram that represents $5 + x = 7$.	**Support** Consider asking, "Using your tape diagram, how much would 1 squirrel weigh? Does this make sense with the picture of the seesaw?"
Use strategies to determine the unknown weight, such as: • Creating a tape diagram with 5 equal parts. • Writing the expression $7 \div 5$. • Writing the equation $5x = 7$.	**Strengthen** Invite students to compare their strategy with a classmate's. Select and sequence these to share during the Connect.

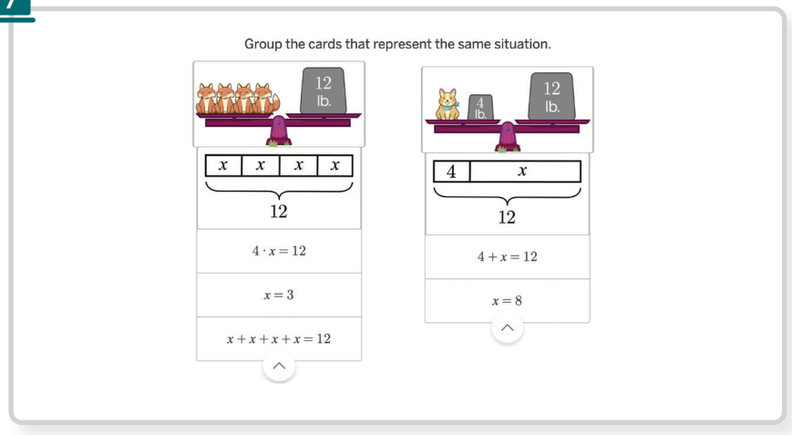
3 Connect

Invite students to share their strategies for determining the weight of each squirrel.

Consider asking, "How was determining the weight of the cat and the weight of the squirrels alike? How was it different?"

Key Takeaway: There is more than one strategy for determining the weight of the animal on a seesaw. These include drawing a tape diagram, using reasoning, and writing an equation.

7 *Students using digital*



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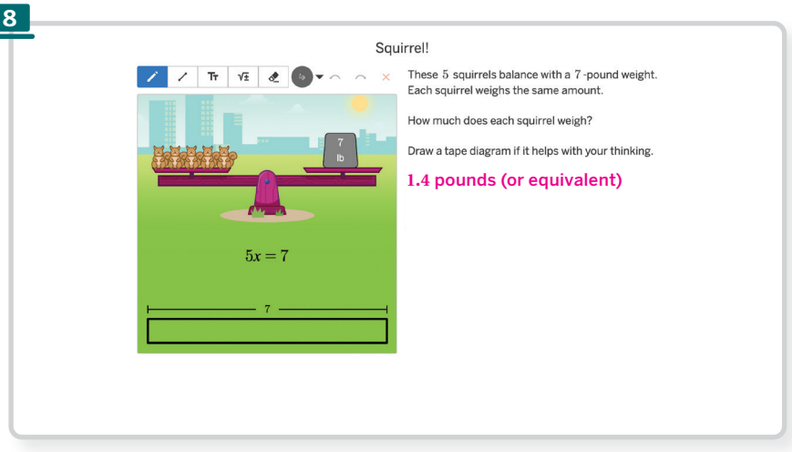
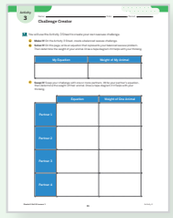


Pairs | 10 min | Pacing: Screen 9

Activity 3 Challenge Creator

Purpose: Students use their creativity to make their own seesaw problem for other students to solve.

Short on time? Consider having students only complete one challenge from a classmate.



Students using print

1 Launch

9

Consider sharing that students will create their own challenge similar to the problem on the previous screen.

Demonstrate how students using digital and students using print can create their seesaw.

Distribute the Activity 3 Sheet to students using print so they can create their seesaw challenge.

To encourage creativity, invite students to make a challenge they think will be different from ones their classmates create.

A **Accessibility: Executive Functioning** Invite students to work with a partner on a challenge before trying one independently.

2 Monitor

Listen to student strategies and discussions, offering help or encouragement as needed.

Invite students using print to check their answers with the person who created the seesaw they're solving. Encourage them to discuss and resolve any differences.

Capture several students' seesaws to share during the Connect.

3 Connect

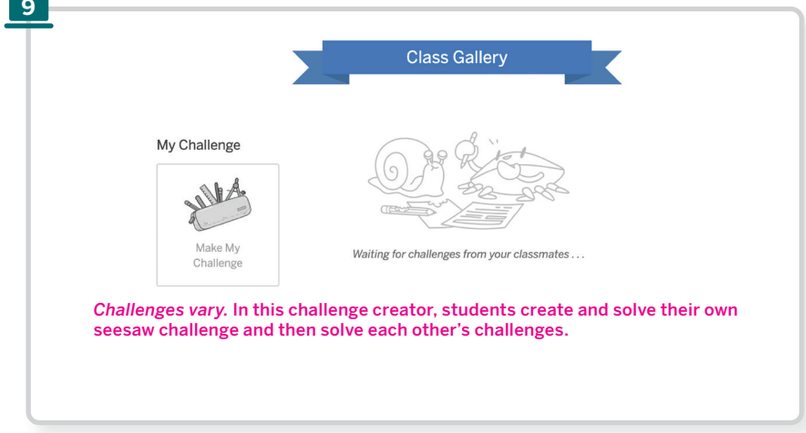
Share captured seesaws. Invite students to share how they decided how many animals and/or how much weight to put on each side of their seesaw.

Invite students to share a variety of strategies for determining the unknown weight in each seesaw problem.

Consider asking, "Did you hear a strategy that surprised you?"

Students using digital

9



Challenges vary. **In this challenge creator, students create and solve their own seesaw challenge and then solve each other's challenges.**

Whole Class | 5 min | Pacing: Screens 10, 13

Synthesis

Purpose: Students use the Think-Pair-Share routine to synthesize their understanding of how equations and tape diagrams can represent situations with unknowns.

Students using print

Synthesis

10 **Invite students** to discuss the Synthesis with a partner. Consider using the Think-Pair-Share routine.

Invite students share their responses to the Synthesis question. Select and sequence students who selected the advantages of each representation to share their thinking.

Math Identity and Community Invite students to share strategies they found helpful and give credit to the students who shared them.

13 **Formalize vocabulary:** A **variable** is a letter or symbol that represents a value or set of values. In the expression $10 - x$, the variable is x.

(optional) **Consider using the Frayer Model routine** with the word **variable**.

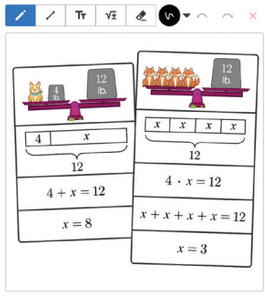
EL Refer to the *Math Language Development Resources* for more vocabulary support.

Invite students to refer to the **Summary** during Practice or anytime during the year.

Lesson Takeaway: Seesaws, tape diagrams, and equations can all be used to model relationships with an unknown amount. This unknown amount is represented by a **variable**.

10 *Students using digital* ELD.PI.6.1.Em, Ex, Br, ELD.PI.6.5.Em, Ex, Br

Synthesis



Discuss:

- How can you tell if an equation and a tape diagram match?
- What does the ***variable*** stand for in each representation?

Responses vary.

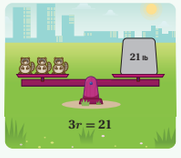
- I can tell if an equation and a tape diagram match if all of the pieces in the tape diagram are the same as one side of an equation and the total length of the tape diagram is the same as the other side of the equation.
- I can tell if an equation and a tape diagram match by seeing if I can draw the same picture for both of them, like a seesaw or another drawing.
- I can tell if an equation and a tape diagram match by replacing the variable in the equation and the tape diagram and seeing if they are both correct.
- Variables in all representations stand for the unknown weights of the animals.

13 **Summary** 6.01

You can use seesaws and tape diagrams to represent *equations* and help determine unknown values.

We often use a letter, such as x or a, as a placeholder for an unknown number in tape diagrams and equations. This letter is called a **variable**.

For example, if 3 equal-weight racoons weigh a total of 21 pounds, you can represent the weight of each raccoon with r and write the equation $3r = 21$.



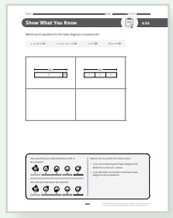
variable A letter or symbol that represents a value or set of values.

Grade 6 Unit 6 Lesson 1 12 Synthesis | Summary

Independent | 5 min | Pacing: Screens 11–12

Show What You Know

Purpose: Students demonstrate their understanding by matching equations to tape diagrams.

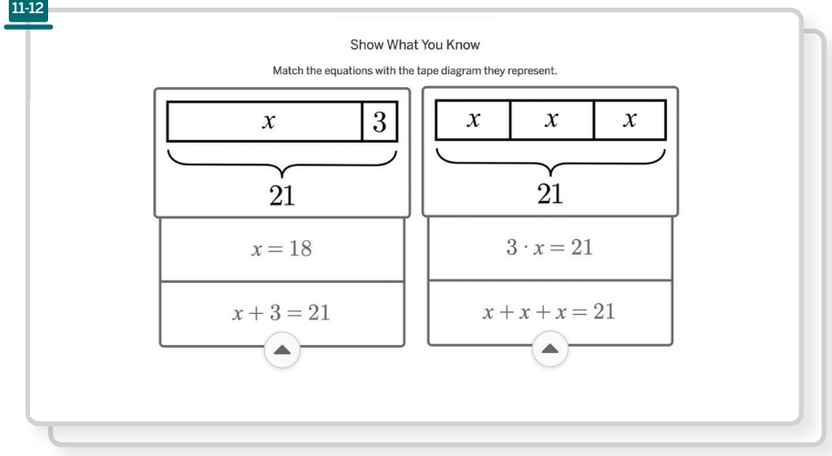


Students using print

11-12 Today's Goals

1. **Goal:** Use reasoning and tape diagrams to determine unknown values.
   - In the Show What You Know, students match the equations to determine the unknown values for each tape diagram.
2. **Language Goal:** Describe connections between diagrams that represent equations of the form $x + p = q$ or $px = q$. **(Speaking, Listening, and Writing)**

Students using digital



D Differentiation Use after Lesson 1

S Support

Provide targeted intervention.

If student work shows **partial understanding** of matching equations with tape diagrams . . .

Students will have more opportunities to develop their understanding of these concepts in Lesson 2. You may choose not to intervene now.

S Strengthen

Reinforce students' understanding.

If student work shows **conceptual understanding** of solving equations using tape diagrams, consider:

- Revisiting the **Challenge Creator** in **Activity 3** on Screen 9 and inviting students to solve additional problems.
- Assigning the **Lesson Practice**.

S Stretch

Challenge students and extend their learning.

If students would enjoy an **additional challenge,** consider:

- Assigning the **Sub-Unit 1 Extensions**.

Support, *Strengthen*, and *Stretch* learning by assigning these digital resources that adjust to each student's current level of skill and understanding.

- **Boost Personalized Learning**
- **Fluency Practice**
- **Math Adventures**

Math Language Development

Use the ***Math Language Development Resources*** for further language support with all your students, including those building English proficiency.

- English/Spanish cognates, e.g., variable/variable
- English/Spanish Glossary
- Frayer model templates
- Math Language Routine display structures, e.g., MLR8: Discussion Supports
- Vocabulary routines

Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.

Lesson 1
Practice

Students using digital

Students using print

Practice
6.01

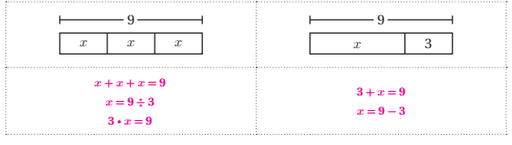
Name: _____ Date: _____ Period: _____

1. Determine the weight of 1 fox.
13 pounds

2. All 4 cats weigh the same amount. Determine the weight of 1 cat.
9 pounds

3. Match each equation to the tape diagram it represents.

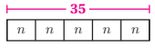
$3 + x = 9$ $x + x + x = 9$ $x = 9 \div 3$ $3 \cdot x = 9$ $x = 9 - 3$



$x + x + x = 9$
$x = 9 \div 3$
$3 \cdot x = 9$

$3 + x = 9$
$x = 9 - 3$

Problems 4–5: Kwabena is trying to determine the value of n in the equation $5 \cdot n = 35$. He begins drawing a tape diagram, but isn't sure how to complete it.



4. Complete Kwabena's tape diagram so it represents the equation $5 \cdot n = 35$.

5. Determine the value of n.
$n = 7$

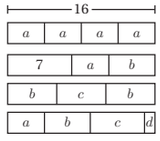
Grade 6 Unit 6 Lesson 1 13 Practice

Practice
6.01

Name: _____ Date: _____ Period: _____

6. Determine the value of a, b, c, and d.

$a =$ 4
$b =$ 5
$c =$ 6
$d =$ 1



Spiral Review

Problems 7–8: Calculate the price per pound for each item.

7. $2.52 for 4.5 pounds of potatoes.
$0.56 per pound of potatoes.

8. $7.75 for 2.5 pounds of broccoli.
$3.10 per pound of broccoli.

Problems 9–14: Determine the missing value to create a true equation.

9. $7 + \boxed{3} = 10$

10. $\boxed{9} \cdot 5 = 45$

11. $23 - \boxed{12} = 11$

12. $\boxed{32} \div 4 = 8$

13. $\boxed{20} \cdot \frac{1}{4} = 5$

14. $\boxed{125} \div 10 = 12.5$

Grade 6 Unit 6 Lesson 1 14 Practice

Practice for this lesson is available online.

Practice Problem Item Analysis

	Problem(s)	DOK	CA CCSSM
On-Lesson			
	1	1	6.EE.7
	2, 4	2	6.EE.7
	3, 5	2	6.EE.6 SMP.6
	6	3	6.EE.6, 6.EE.7
Spiral Review			
Test Practice	**7–8**	2	6.RP.2
Fluency	**9-14**	1	6.EE.5

Need more Practice?

Additional practice can be found in the **Practice Resources**, **Intervention and Extension Resources**, and online resources (item banks, Boost Personalized Learning, and Fluency Practice Practice).

Unit 6

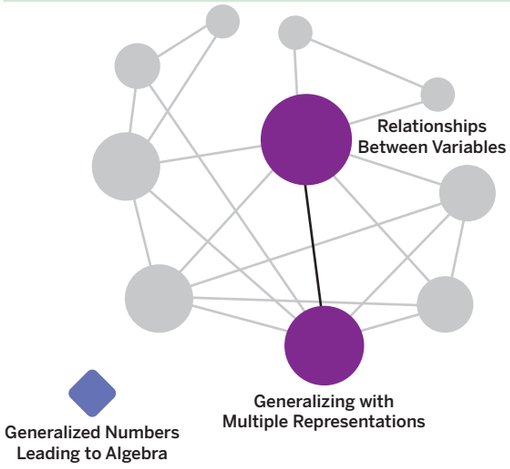
Lesson 2

Five Equations

Tape Diagrams, Equations, Situations

Let's represent situations with equations and tape diagrams.

Today's Big Ideas



Focus on the Big Ideas

Today's Goals

CC2 Generalizing With Multiple Representations

Relationships Between Variables

NS Generalized Numbers Leading to Algebra

1. **Goal:** Interpret tape diagrams that represent equations of the form $p + x = q$ or $px = q$.
2. **Goal:** Determine the value of the variable that makes an equation true.
3. **Language Goal:** Interpret the meaning of variables and *solutions to equations* in context. **(Writing, Speaking, and Listening)**

DI Why? In order to . . .	SMP How? Students will . . .	CC What? While . . .
Predict what could happen when a variable is part of an equation **(DI2)**	Reason abstractly and quantitatively about tape diagrams and other ways to represent equations **(SMP.2)**	Exploring changing quantities within equations **(CC2)**

Connections and Coherence

Students connect tape diagrams and equations to make sense of situations in context. They use these tools to determine **solutions to equations** and interpret the meanings of those solutions in context. **(SMP.1, SMP.2)**

Prior Learning

CC2 Generalizing With Multiple Representations

In Lesson 1, students explored equations and tape diagrams as ways to represent balancing weights on a seesaw.

Future Learning

CC2 Generalizing With Multiple Representations

In Lessons 3 and 4, students will explore other strategies for determining unknown values, like using balanced hangers and inverse operations.

Integrating Rigor in Student Thinking

Students build **conceptual understanding** for equations as they connect them to situations described in words and develop **strategies for problem solving** to help them determine a solution to an equation.

Vocabulary

New Vocabulary

solution to an equation

substitute

CA CCSSM

Addressing

6.EE.5

Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality **true? Use substitution to determine whether a given number in a specified set makes an equation** or inequality **true.**

Also Addressing: **6.EE.7**

Mathematical Practices: SMP.1, SMP.2

Building On	Building Toward
4.OA.3	**6.EE.6**

CA ELD Standards: ELD.PI.6.1, ELD.PI.6.6, ELD.PI.6.10

Lesson at a Glance

~ 45 min

CA CCSSM: 6.EE.5, 6.EE.7, SMP.1, SMP.2

Warm-Up

Whole Class | 10 min

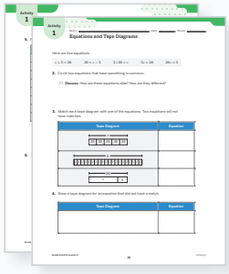
Students use MLR6: Three Reads to make sense of a situation in words. **(SMP.1)**

Presentation Screens 1–3

Activity 1

Pairs | 10 min

Students make connections between equations, tape diagrams, and a solution to an equation



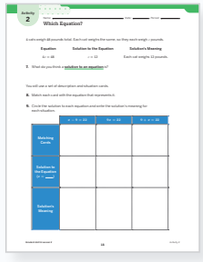
Presentation Screen 4

Activity 2

Pairs | 15 min

Students connect equations with descriptions and situations, then determine and interpret the meaning of each **solution to an equation**.
Routine: Think-Pair-Share **(SMP.2)**

Activity 2 Cards, one set per pair, pre-cut



Presentation Screens 5–6

Synthesis

Whole Class | 5 min

Students synthesize their understanding of the connections between equations, tape diagrams, and situations.

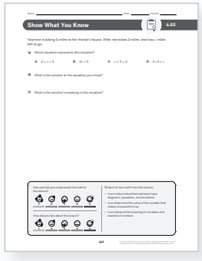
Presentation Screen 7

Show What You Know

Independent | 5 min

Students demonstrate their understanding by selecting an equation to match a situation, determining its solution, and interpreting the solution in the situation.

Show What You Know Sheet



Presentation Screen 8

Math Language Development

EL Multilingual / English Learners

Consider using the scaffolds from the *Math Language Development Resources* with Activity 2 to support math language acquisition for your students.

Emerging	Expanding	Bridging
Students are provided with sentence frames and support from you to write the meaning of the solution. Guiding questions are provided for you to ask students to support recognizing operations within a scenario.	Students are provided with sentence frames and work with a partner to write the meaning of the solution. Guiding questions are provided for you to ask students to support understanding the meaning of a solution in the context of a scenario.	Students are provided with sentence frames to write the meaning of the solution, individually first and then share with a partner. Guiding questions are provided for you to ask students to support understanding the meaning of a solution in the context of a scenario.

Whole Class | 10 min

Warm-Up

Purpose: Students use **MLR6: Three Reads** to make sense of a situation in words. **(SMP.1)**

Lesson 2
Warm-Up

Presentation Screens 1–3

1 Launch

1 MLR **MLR6: Three Reads** Invite students to read the text three times, each with a particular focus, to support students in making sense of the scenario. **(SMP.1)** **ELD.PI.6.6.Em, Ex, Br**

Display the situation with the hidden information and invite a student to read it aloud, then discuss the prompt.

To support making connections, invite students to share a story they have about cats.

2 **Display** the situation with the information given and invite a student to read it aloud, then discuss the prompt.

Invite students to share how they decided what the variable represents. **ELD.PI.6.1.Em, Ex, Br**

3 **Display** the situation again with a focus on the new information. After the third read, invite students to discuss the question with a partner, then as a class.

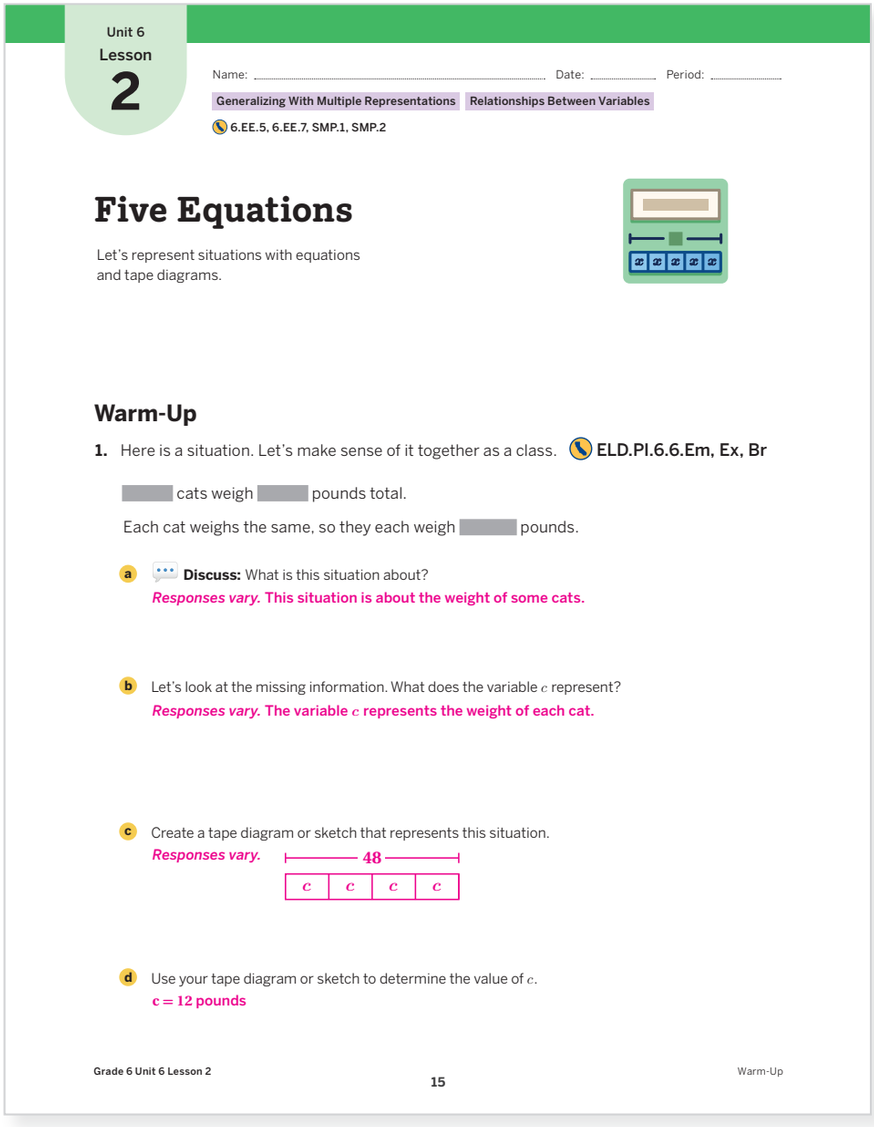
To encourage creativity, celebrate the variety of tape diagrams and sketches students create.

2 Connect

Invite students to share their values for c by polling the class. Encourage students to justify their choice and to share which representation they used to help them choose.

Consider asking, "How much does 1 cat weigh?"

Math Identity and Community Invite students to share why reading a question multiple times might help when solving a complex problem.



Unit 6
Lesson
2

Name: _____ Date: _____ Period: _____

Generalizing With Multiple Representations | Relationships Between Variables

6.EE.5, 6.EE.7, SMP.1, SMP.2

Five Equations

Let's represent situations with equations and tape diagrams.

Warm-Up

1. Here is a situation. Let's make sense of it together as a class. **ELD.PI.6.6.Em, Ex, Br**

   ____ cats weigh ____ pounds total.

   Each cat weighs the same, so they each weigh ____ pounds.

   a. **Discuss:** What is this situation about?
   Responses vary. **This situation is about the weight of some cats.**

   b. Let's look at the missing information. What does the variable c represent?
   Responses vary. **The variable c represents the weight of each cat.**

   c. Create a tape diagram or sketch that represents this situation.
   Responses vary.

   d. Use your tape diagram or sketch to determine the value of c.
   $c = 12$ pounds

Grade 6 Unit 6 Lesson 2 15 Warm-Up

Pairs | 10 min

Activity 1 Equations and Tape Diagrams

Purpose: Students make connections between equations, tape diagrams, and a solution to an equation.

Short on time? Consider omitting Problem 4.

Lesson 2
Activity 1

Presentation Screen
4

1 Launch

4 **Display** the five equations.

Consider asking, "What do you think it means when there is a number in front of a variable, like the 5 before the x in $5x = 20$?"

Note: This may be the first time students see a variable and a number next to each other (e.g., $5x$).

2 Monitor

A **Accessibility: Conceptual Processing** To support abstract thinking, consider labeling $5x$ in words like "5 times x."

Encourage students to justify each match with their partner before completing the next one.

D **Differentiation** *(Problems 3–4)*

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Invite them to describe what one equation means in words, like "an unknown number and 5 more is 20."
Use strategies like: • Testing values for x. • Looking at the number of equal groups. • Looking at the total.	**Strengthen** Invite students to share these strategies during the Connect.
Want to explore more.	**Stretch** Consider asking, "Can two different equations match the same tape diagram? Why or why not?"

Consider asking:

- "How are the tape diagrams alike and different?"
- "How are they the same as or different from their equations?"
- "How does each part of a tape diagram connect to each part of an equation?"
- "How can you use a tape diagram to help you determine which value of a variable makes an equation true?"

Activity 1 continued >

Activity 1

Name: Date: Period:

Equations and Tape Diagrams

Here are five equations.

$x + 5 = 20$ $\quad 20 = x - 5$ $\quad 5 \cdot 20 = x$ $\quad 5x = 20$ $\quad 20x = 5$

2. Circle two equations that have something in common.
Responses vary.

Discuss: How are these equations alike? How are they different?
Responses vary. $x + 5 = 20$ and $20x = 5$ both have 5, 20, and x.
$x + 5 = 20$ involves addition and $20x = 5$ involves multiplication.

3. Match each tape diagram with one of the equations. Two equations will not have matches.

Tape Diagram	Equation
x: 20 | 20 | 20 | 20 | 20	$5 \cdot 20 = x$
5: x x x x x x x x x x x x x x x x x x x x	$20x = 5$
20: x | 5	$x + 5 = 20$

4. Draw a tape diagram for an equation that did not have a match.
Responses vary.

Tape Diagram	Equation
20: x x x x x or 20: 5 / x	$5x = 20$ or $20 = x - 5$

Grade 6 Unit 6 Lesson 2 16 Activity 1

Pairs | 10 min

Activity 1 Equations and Tape Diagrams (continued)

Purpose: Students make connections between equations, tape diagrams, and a solution to an equation.

Short on time? Consider omitting Problem 4.

Lesson 2
Activity 1

Presentation Screen
4

2 Monitor

Encourage students to justify the solutions they circled with their partner.

Listen for students who substitute the values for the variable to determine the correct answer.

D **Differentiation: (Stretch)** Invite students to share why they did not select the other values in the set for each equation.

3 Connect

Invite students to share their solutions and their strategies for determining the solution to a few equations.

Consider asking:

- "What strategies did you use to know that the solution you circled was true?"
- "Is there a strategy that works every time?"
- "Is there a strategy that only works with certain types of equations?"

Create a class definition for the term **substitute** using students' language and the glossary.

To support making connections, consider asking, "Did anyone's strategy involve substitution?"

Math Identity and Community Consider naming strategies after the students who use them and using those names throughout the lesson and unit.

Activity **1**

Name: ..... Date: ..... Period: .....

Equations and Tape Diagrams (continued)

5. For each equation, circle the value of x that makes the equation true.

Equation	Values
$x + 5 = 20$	4, 10, (15), 25
$20 = x - 5$	5, 15, (25), 30
$5 \cdot 20 = x$	4, 15, (100), 200
$5x = 20$	(4), 5, 10, 15
$20x = 5$	($\frac{1}{4}$), $\frac{1}{2}$, 4, 100
$\frac{x}{5} = 20$	$\frac{1}{2}$, 10, 20, (100)
$4x = 20$	$\frac{1}{2}$, 4, (5), 80
$\frac{x}{4} = 20$	5, 20, 40, (80)

6. **Discuss:** How did you determine which value makes each equation true?

ELD.PI.6.1.Em, Ex, Br

Responses vary.

Grade 6 Unit 6 Lesson 2 17 Activity 1

Pairs | 15 min

Activity 2 Which Equation?

Purpose: Students connect equations with descriptions and situations, then determine and interpret the meaning of each **solution to an equation**. (SMP.2)

Short on time? Consider working on the first problem as a whole class.

Lesson 2
Activity 2

Presentation Screens 5–6

1 Launch

Display the situation from the Warm-Up, including the equation, solution, and solution's meaning.

Use the **Think-Pair-Share** routine to support student-to-student discourse. Invite students to think independently and then take turns sharing with a partner.

Create a class definition of a **solution to an equation** using students' ideas and language.

Distribute a set of the Activity 2 Cards to each pair.

2 Monitor

Multilingual/English Learners: Emerging, Expanding, and Bridging scaffolds and supports are available in the ***Math Language Development Resources.***

Differentiation *(Problems 8–9)*

Look for students who:	Respond to Student Thinking
Need support making sense of the situations.	**Support** Encourage them to read each situation three times and answer questions similar to the Warm-Up.
Match "22 is 9 more than x" with $x - 9 = 22$, or a similar mismatch.	**Support** Consider asking, "22 is 9 more than what number?" Invite them to test that value in the equation they chose.
Use imprecise language for a solution's meaning, like "13 stops."	**Support** Consider asking, "How could you describe what the 13 means more precisely?"
Use strategies like: • Making a tape diagram. • Using reasoning. • Drawing on their personal experience.	**Strengthen** Invite students to share these during the Connect.
Would like to explore this concept more.	**Stretch** Invite them to write their own situation, then trade it with a classmate who will write an equation and determine its solution.

3 Connect

Display the equations, situations, and descriptions. As a class, match each equation to its situation and description.

To surface the Key Takeaway, consider asking:
- "What was your strategy for determining the solution to the equation $x - 9 = 22$?"
- "What does the solution mean in Mohamed's situation?"

Activity 2

Name: _____ Date: _____ Period: _____

Which Equation?

4 cats weigh 48 pounds total. Each cat weighs the same, so they each weigh c pounds.

Equation	Solution to the Equation	Solution's Meaning
$4c = 48$	$c = 12$	Each cat weighs 12 pounds.

7. What do you think a **solution to an equation** is?

Responses vary. The solution to an equation is the number that can replace the variable to make the equation true. 4 times 12 equals 48, so the solution to $4c = 48$ is 12.

You will use a set of description and situation cards.

8. Match each card with the equation that represents it.

9. Circle the solution to each equation and write the solution's meaning for each situation. ELD.PI.6.6.Em, Ex, Br, ELD.PI.6.10.Em, Ex, Br

	$x - 9 = 22$	$9x = 22$	$9 + x = 22$
Matching Cards	Card 3 Card 5	Card 4 Card 6	Card 1 Card 2
Solution to the Equation ($x =$ ____)	$\frac{22}{9}$, 13, (31)	($\frac{22}{9}$), 13, 31	$\frac{22}{9}$, (13), 31
Solution's Meaning	Card 3: Mohamed made \$31. Card 5: 9 less than 31 is 22.	Card 4: The product of 9 and $\frac{22}{9}$ is 22. Card 6: Rebecca can afford to buy 2 day passes because she cannot buy part of a pass.	Card 1: Kwasi has 13 stops left on the bus. Card 2: 22 is 9 more than 13.

Grade 6 Unit 6 Lesson 2 18 Activity 2

Key Takeaway: A **solution to an equation** is a value that makes the equation true. A solution's meaning is what that value represents in context. For example, the solution to $x - 9 = 22$ is $x = 31$. In this activity, 31 represents the \$31 Mohamed earned from mowing lawns. **(SMP.2)**

Whole Class | 5 min

Synthesis

Purpose: Students synthesize their understanding of the connections between equations, tape diagrams, and situations.

Presentation Screen 7

Synthesis

7 **Invite students** to discuss the Synthesis with a partner.

Have students share their responses to the Synthesis question. Select and sequence students who determine the solution to the equation and interpret its meaning.

Math Identity and Community Invite students to share strategies they found helpful and give credit to the students who shared them.

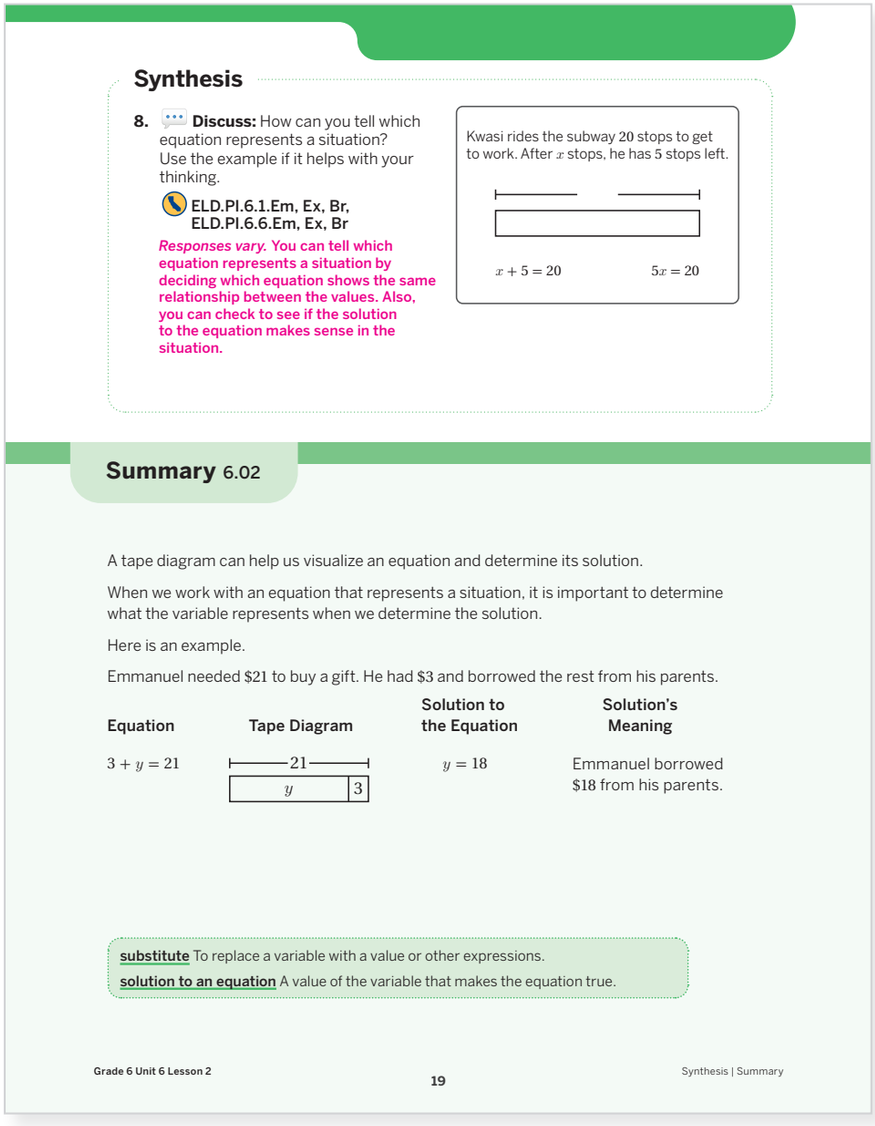
Formalize vocabulary: solution to an equation, substitute

(optional) **Consider using the Frayer Model routine** with one or more of the new vocabulary words.

EL Refer to the *Math Language Development Resources* for more vocabulary support.

Invite students to refer to the **Summary** during Practice or anytime during the year.

Lesson Takeaway: Tape diagrams and equations can represent situations and descriptions in words. The **solution to an equation** is the value of the variable that makes the equation true. Its meaning is what that value represents in the situation.



Synthesis

8. **Discuss:** How can you tell which equation represents a situation? Use the example if it helps with your thinking.

ELD.PI.6.1.Em, Ex, Br, ELD.PI.6.6.Em, Ex, Br

Responses vary. You can tell which equation represents a situation by deciding which equation shows the same relationship between the values. Also, you can check to see if the solution to the equation makes sense in the situation.

Kwasi rides the subway 20 stops to get to work. After x stops, he has 5 stops left.

$x + 5 = 20$ $5x = 20$

Summary 6.02

A tape diagram can help us visualize an equation and determine its solution.

When we work with an equation that represents a situation, it is important to determine what the variable represents when we determine the solution.

Here is an example.

Emmanuel needed $21 to buy a gift. He had $3 and borrowed the rest from his parents.

Equation	Tape Diagram	Solution to the Equation	Solution's Meaning
$3 + y = 21$		$y = 18$	Emmanuel borrowed $18 from his parents.

substitute To replace a variable with a value or other expressions.

solution to an equation A value of the variable that makes the equation true.

Independent | 5 min

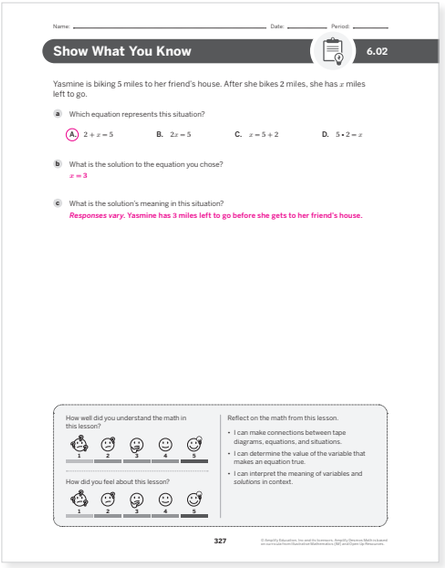
Show What You Know

Purpose: Students demonstrate their understanding by selecting an equation to match a situation, determining its solution, and interpreting the solution in the situation.

Presentation Screen 8

8 Today's Goals

1. **Goal:** Interpret tape diagrams that represent equations of the form $p + x = q$ or $px = q$.
2. **Goal:** Determine the value of the variable that makes an equation true.
   - In the Show What You Know, students determine the solution to the equation they selected in part a.
3. **Language Goal:** Interpret the meaning of variables and *solutions to equations* in context. **(Writing, Speaking, and Listening)**
   - In the Show What You Know, students explain the meaning of their solution.



Name: _____ Date: _____ Period: _____

Show What You Know 6.02

Yasmine is biking 5 miles to her friend's house. After she bikes 2 miles, she has x miles left to go.

a. Which equation represents this situation?

A. $2 + x = 5$ B. $2x = 5$ C. $x = 5 + 2$ D. $5 \cdot 2 = x$

b. What is the solution to the equation you chose?

$x = 3$

c. What is the solution's meaning in this situation?

Responses vary. Yasmine has 3 miles left to go before she gets to her friend's house.

How well did you understand the math in this lesson? 1 2 3 4 5

How did you feel about this lesson? 1 2 3 4 5

Reflect on the math from this lesson.
- I can make connections between tape diagrams, equations, and situations.
- I can determine the value of the variable that makes an equation true.
- I can interpret the meaning of variables and solutions in context.

327

D Differentiation Use after Lesson 2

S Support

Provide targeted intervention.

If student work shows **partial understanding** of using tape diagrams, consider:

- Revisiting Unit **4, Lesson 2, Activity 2** (*Division Meanings*) **and Unit 5, Lesson 4, Warm-Up** (*Missing Digits*). Invite students to describe how tape diagrams represent the expressions.

S Strengthen

Reinforce students' understanding.

If student work shows **conceptual understanding** with minor errors, consider:

- Assigning the **Lesson Practice**.

S Stretch

Challenge students and extend their learning.

If student would enjoy an **additional challenge**, consider:

- Inviting students to **create situations** that match the tape diagrams in Activity 1.
- Assigning the **Sub-Unit 1 Extensions**.

Support, *Strengthen*, and *Stretch* learning by assigning these digital resources that adjust to each student's current level of skill and understanding.

- **Boost Personalized Learning**
- **Fluency Practice**
- **Math Adventures**

Math Language Development

Use the ***Math Language Development Resources*** for further language support with all your students, including those building English proficiency.

- English/Spanish cognates, e.g., **substitute / sustituir**
- English/Spanish Glossary, e.g., **solution to an equation / solución a una ecuación**
- Frayer model templates
- Math Language Routine display structures, e.g., **MLR6: Three Reads**
- Vocabulary routines

Practice

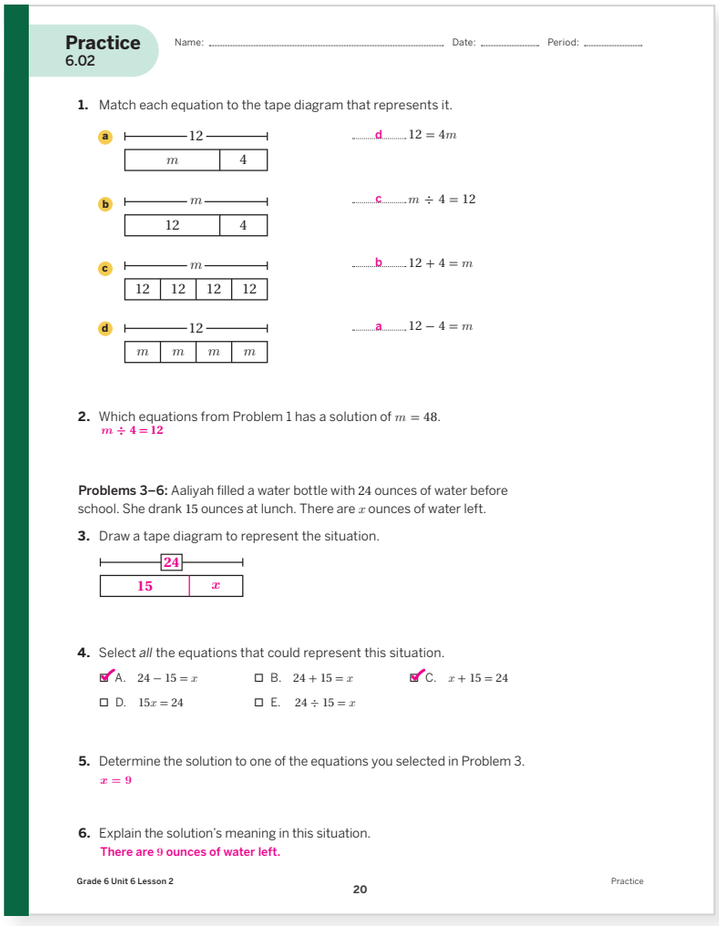
Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.

Lesson 2
Practice

Students using digital

Students using print



Practice
6.02

Name: Date: Period:

1. Match each equation to the tape diagram that represents it.

a.

d. $12 = 4m$

b.

c. $m \div 4 = 12$

c.

b. $12 + 4 = m$

d.

a. $12 - 4 = m$

2. Which equations from Problem 1 has a solution of $m = 48$.
$m \div 4 = 12$

Problems 3–6: Aaliyah filled a water bottle with 24 ounces of water before school. She drank 15 ounces at lunch. There are x ounces of water left.

3. Draw a tape diagram to represent the situation.

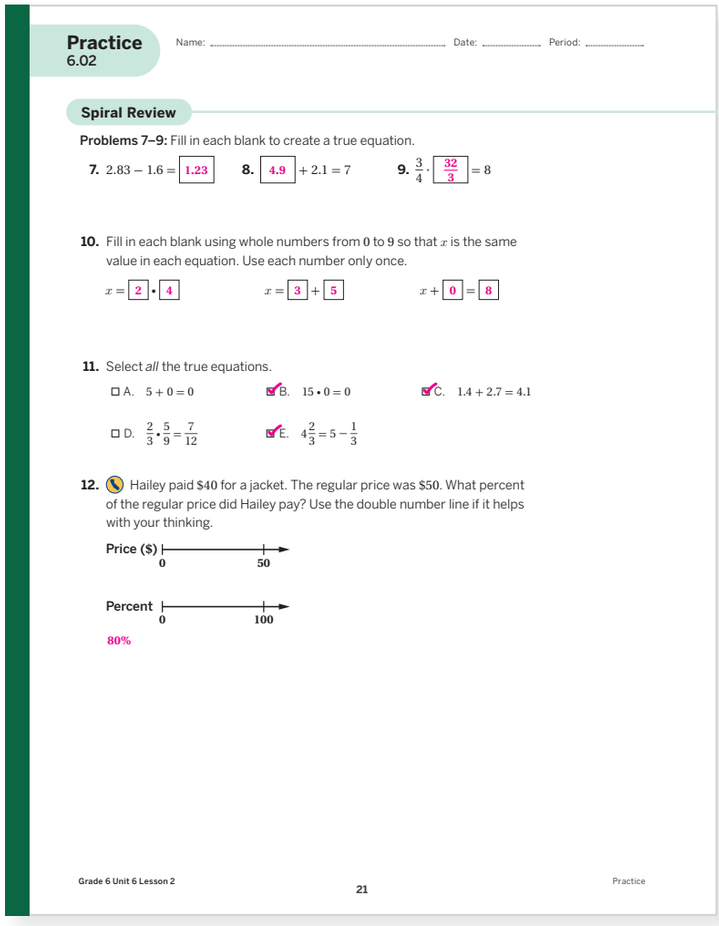
4. Select *all* the equations that could represent this situation.

☑ A. $24 - 15 = x$ ☐ B. $24 + 15 = x$ ☑ C. $x + 15 = 24$
☐ D. $15x = 24$ ☐ E. $24 \div 15 = x$

5. Determine the solution to one of the equations you selected in Problem 3.
$x = 9$

6. Explain the solution's meaning in this situation.
There are 9 ounces of water left.

Grade 6 Unit 6 Lesson 2 20 Practice



Practice
6.02

Name: Date: Period:

Spiral Review

Problems 7–9: Fill in each blank to create a true equation.

7. $2.83 - 1.6 = \boxed{1.23}$ **8.** $\boxed{4.9} + 2.1 = 7$ **9.** $\frac{3}{4} \cdot \boxed{\frac{32}{3}} = 8$

10. Fill in each blank using whole numbers from 0 to 9 so that x is the same value in each equation. Use each number only once.

$x = \boxed{2} \cdot \boxed{4}$ $x = \boxed{3} + \boxed{5}$ $x + \boxed{0} = \boxed{8}$

11. Select *all* the true equations.

☐ A. $5 + 0 = 0$ ☑ B. $15 \cdot 0 = 0$ ☑ C. $1.4 + 2.7 = 4.1$
☐ D. $\frac{2}{3} \cdot \frac{5}{9} = \frac{7}{12}$ ☑ E. $4\frac{2}{3} = 5 - \frac{1}{3}$

12. Hailey paid $40 for a jacket. The regular price was $50. What percent of the regular price did Hailey pay? Use the double number line if it helps with your thinking.

80%

Grade 6 Unit 6 Lesson 2 21 Practice

Practice for this lesson is available online.

Practice Problem Item Analysis

	Problem(s)	DOK	CA CCSSM
On-Lesson			
	1–6	2	6.EE.5
Spiral Review			
Fluency	7–9	2	6.EE.5
	10	3	6.EE.5, 6.EE.6
	11	1	6.EE.5
Test Practice	12	2	6.RP.3.c, SMP.2

Need more Practice?

Additional practice can be found in the **Practice Resources**, **Intervention and Extension Resources**, and online resources (item banks, Boost Personalized Learning, and Fluency Practice Practice).

Unit 6

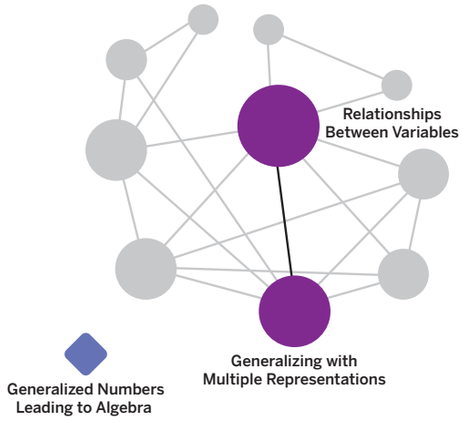
Lesson 3

Hanging Around

Introduction to Balanced Hangers

Let's use balanced hangers to solve equations.

Today's Big Ideas



Focus on the Big Ideas

Today's Goals CC2 Generalizing With Multiple Representations

Relationships Between Variables NS Generalized Numbers Leading to Algebra

1. **Goal:** Make connections between balanced hangers and true equations.
2. **Language Goal:** Interpret hanger diagrams that represent equations of the form $x + p = q$ and $px = q$. **(Writing, Speaking, and Listening)**

DI Why? In order to . . .	SMP How? Students will . . .	CC What? While . . .
Make sense of balancing equations **(DI1)**	Solve equations with precision **(SMP.6)**	Using hanger diagrams **(CC2)**

Connections and Coherence

Students make connections between the structures of hanger diagrams and equations. They use hangers to represent equations and to determine unknown values. **(SMP.6, SMP.7)**

Prior Learning CC2 Generalizing With Multiple Representations

In Lesson 2, students connected tape diagrams and equations with situations. They determined the solution and the meaning of the solution in the context of the situation.

Future Learning CC2 Generalizing With Multiple Representations

In Lesson 4, students will solve equations using reasoning and inverse operations.

Integrating Rigor in Student Thinking

Students develop **conceptual understanding** by connecting balanced hanger diagrams to equations and then use **strategies for problem-solving and computation** as they use hanger diagrams to solve equations.

CA CCSSM

Addressing

6.EE.5

Understand solving an equation or inequality **as a process of answering a question: which values** from a specified set, if any, **make the equation** or inequality **true?** Use substitution to determine whether a given number in a specified set makes an equation or inequality true.

Also Addressing: **6.EE.6, 6.EE.7**

Mathematical Practices: SMP.6, SMP.7

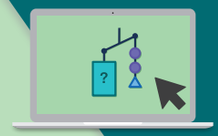
Building On	Building Toward
4.OA.3	**7.EE.4.a**

CA ELD Standards: ELD.PI.6.3, ELD.PI.6.10, ELD.PI.6.11, ELD.PII.6.3

Lesson at a Glance

~ 45 min

CA CCSSM: 6.EE.5, 6.EE.6, 6.EE.7, SMP.6, SMP.7



Why digital?

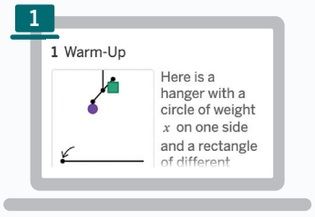
Challenge Creator supports students in creating and sharing challenges with classmates.

Warm-Up

Whole Class | 5 min

Students make sense of how a hanger works and make connections to the balancing work of Lesson 1.

Materials: clothes on hangers (as needed)

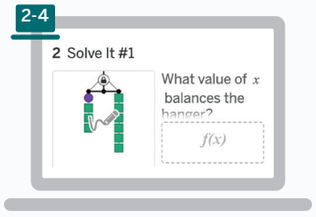


Pacing: Screen 1

Activity 1

Pairs Sharing a Device | 10 min

Students make connections between equations and the hangers that represent them.

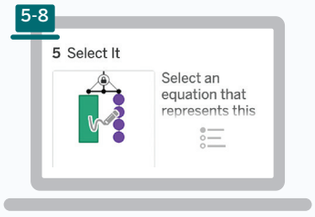


Pacing: Screens 2–4

Activity 2

Pairs Sharing a Device | 10 min

Students create hangers to represent and solve equations.



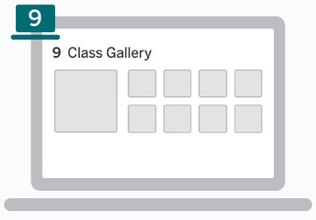
Pacing: Screens 5–8

Activity 3

Pairs Sharing a Device | 10 min

Students use their creativity to make their own hanger challenge for other students to solve.

For students using print: Activity 3 Sheet, one per person

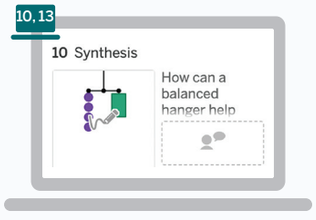


Pacing: Screen 9

Synthesis

Whole Class | 5 min

Students synthesize their understanding of using hanger diagrams to represent and solve equations.



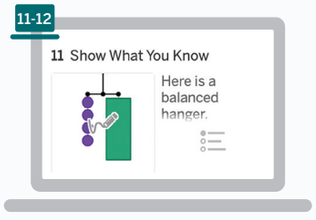
Pacing: Screen 10, 13

Show What You Know

Independent | 5 min

Students demonstrate their understanding by selecting the equation that represents the hanger and then determining the value of x that balances the hanger.

For students using print: Show What You Know Sheet



Pacing: Screens 11–12

Math Language Development

EL Multilingual / English Learners

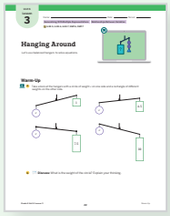
Consider using the scaffolds from the *Math Language Development Resources* with Activity 2 to support math language acquisition for your students.

Emerging	Expanding	Bridging
Students build their hanger diagram digitally and work with you to select the correct equation. A guiding question is provided for you to help students make the connection between the hanger diagram and the equation.	Students work with a partner to match the hanger diagram to the equation and then check their solutions using the digital hanger diagram. A guiding question is provided for you to help students make the connection between the hanger diagram and the equation.	Students work independently or with a partner to match the hanger diagram to the equation and then check their solutions using the digital hanger diagram. A guiding question is provided for you to help students make the connection between the hanger diagram and the equation.

Whole Class | 5 min | Pacing: Screen 1

Warm-Up

Purpose: Students make sense of how a hanger works and make connections to the balancing work of Lesson 1.



Students using print

1 Launch

1 **Demonstrate** how to change the value of the weight on the hanger.

A **Accessibility: Conceptual Processing** Use objects like clothes on hangers to demonstrate how a hanger works in real life.

To support making connections, consider asking, "Where have you seen something like this in real life?"

2 Connect

Invite students to share how they approximated the weight of the circle.

Discuss what it means when the hanger is tilted in one direction or the other.

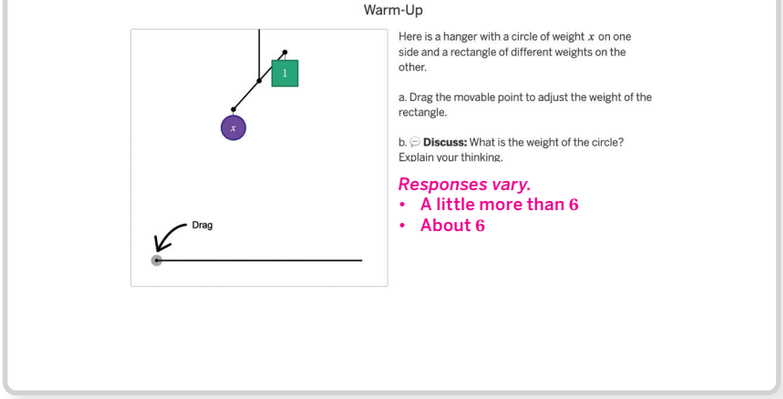
EL **Multilingual/English Learners** Encourage students to use gestures or hand motions to help them describe what it means for a hanger to be "balanced." **(Reading and Listening)**

ELD.PII.6.3.Em, Ex, Br

Students using digital

1

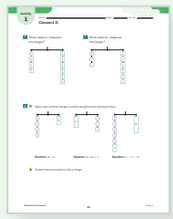
ELD.PI.6.3.Em, Ex, Br



Pairs Sharing a Device | 10 min | Pacing: Screens 2–4

Activity 1 Connect It

Purpose: Students make connections between equations and the hangers that represent them.



Students using print

1 Launch

2 **Invite students** to share a value of x that they know *does not* balance the hanger and justify their thinking.

2 Monitor

2-3 **D Differentiation**

Look for students who:	Respond to Student Thinking
Use the interactive feedback to determine the value of x.	**Support** Consider asking, "How could you determine the value of x if you did not have access to feedback?"
Draw a tape diagram to represent each hanger.	**Support** Consider asking, "How did you use the tape diagram? What would that strategy look like on the hanger?"
Use a variety of strategies, like: • Removing the same weight from both sides or dividing the hanger into equal groups. • Writing expressions or equations.	**Strengthen** Invite these students to share their strategies during the Connect.

4 **Invite students using print** to share their thinking with a partner in place of responsive feedback.

Capture a variety of hangers and equations using the Snapshot tool to share during the Connect.

3 Connect

2-3 **Invite students** to share a variety of strategies for determining the value of x on each hanger.

Consider asking, "How were your strategies for each problem alike? How were they different?"

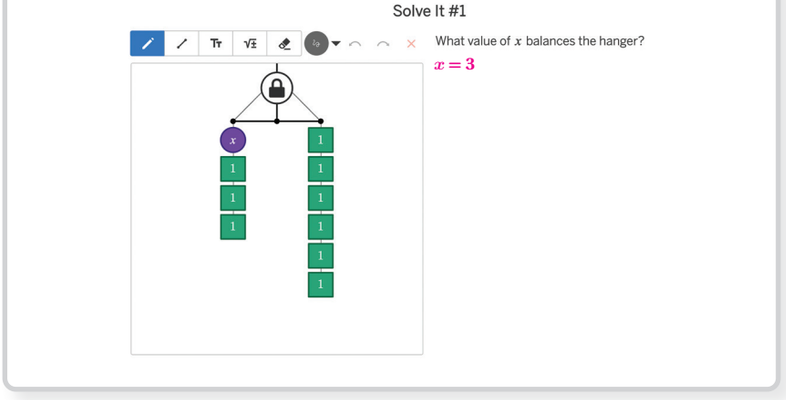
4 **Share** captured hanger diagrams and equations, and discuss how students see the same information in each matching representation. **(SMP.7)**

Math Identity and Community Consider celebrating students' creativity in both their hangers and their explanations.

Key Takeaway: Equations can be used to represent hanger diagrams. Both hanger diagrams and their matching equations can be used to determine the unknown value of x.

Students using digital

2



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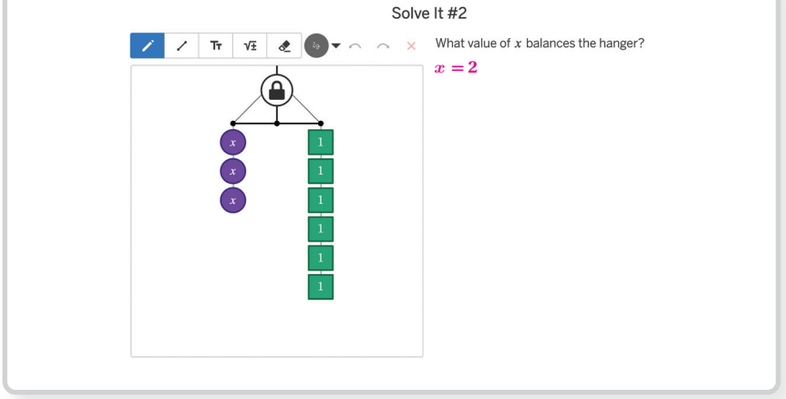
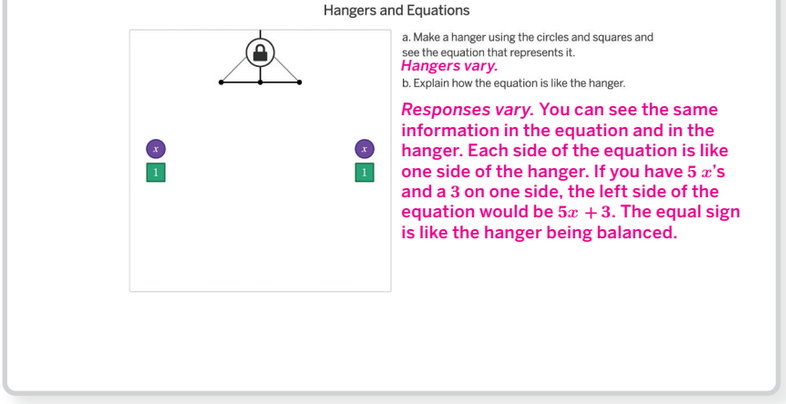


ELD.PI.6.10.Em, Ex, Br

4

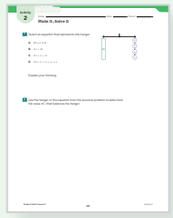


Pairs Sharing a Device | 10 min | Pacing: Screens 5–8

Activity 2 Make It, Solve It

Purpose: Students create hangers to represent and solve equations.

Short on time? Consider completing Screens 5–6 as a class.



Students using print

1 Launch

5 **To support making connections**, consider asking, "How are hanger diagrams and tape diagrams alike? How are they different?"

2 Monitor

EL **Multilingual/English Learners:** Emerging, Expanding, and Bridging scaffolds and supports are available in the ***Math Language Development Resources.***

Look for students who select each of the correct responses and for students who debate between $11 = 4x$ and $11 = x + x + x + x$.

A **Accessibility: Visual-Spatial Processing** Invite students to compare and contrast each equation before responding to support recognizing the differences between each equation.

6 **Look for** students who apply or build on their strategies from the previous activity.

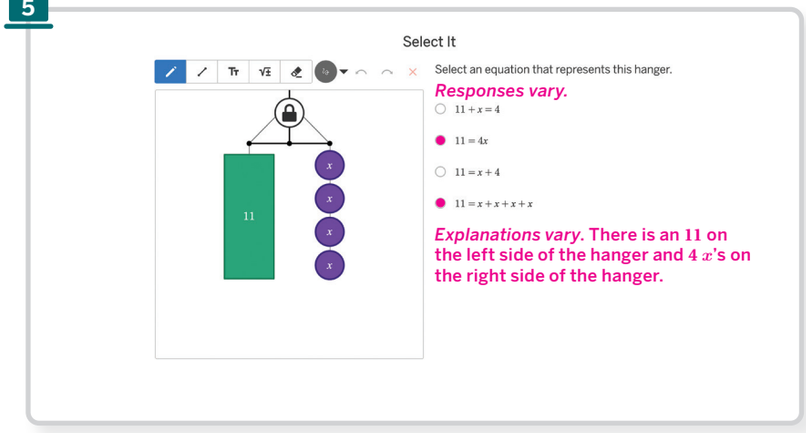
D **Differentiation: (Support)** Look for students who use number sense to reason that the value of x is slightly less than 3. Consider asking, "How would you determine the unknown weight if you used a seesaw?"

Activity 2 continued >

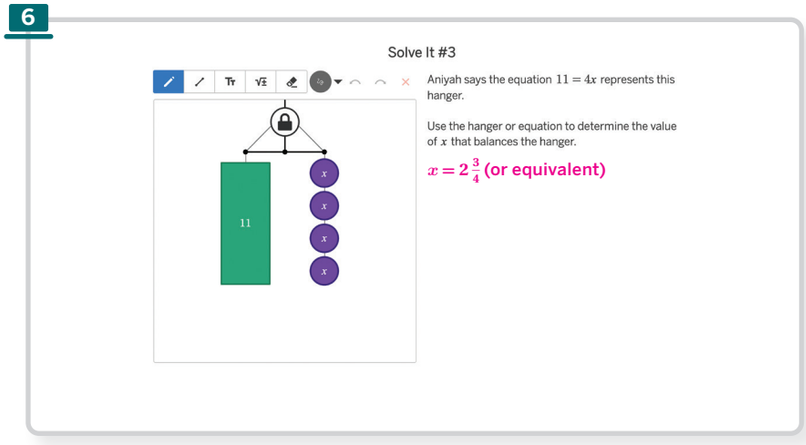
Students using digital

ELD.PI.6.11.Em, Ex, Br

5



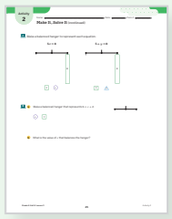
6



Pairs Sharing a Device | 10 min | Pacing: Screens 5–8

Activity 2 Make It, Solve It (continued)

Purpose: Students create hangers to represent and solve equations.



Students using print

2 Monitor

7 **Capture** both correct and incorrect hangers using the Snapshot tool to share during the Connect.

A **Accessibility: Memory and Attention** Invite students with working memory challenges to look for similarities and differences between their task here and the hanger on the previous screen.

8 **D** **Differentiation**

Look for students who:	Respond to Student Thinking
Represent $6 = x + 2$ with two x's on one side and a weight of 6 on the other side.	**Support** Consider asking, "How would you represent the equation $6 = 2x$?"
Use a variety of strategies, like: • Using reasoning and number sense. • Crossing off equal weights from the hanger. **(SMP.6)** • Using inverse operations in their equation.	**Strengthen** Invite them to share their strategy during the Connect.

3 Connect

7 **Share** captured hanger diagrams and equations. Invite students to decide which equation each hanger matches, or to write a new equation if it matches neither.

Math Identity and Community Normalize learning from mistakes by encouraging students to add to a list of common errors made while creating hanger diagrams.

Consider asking, "How is 5 represented in each hanger diagram?"

8 **Invite students** to share strategies for creating a hanger and for determining the solution to the equation $6 = x + 2$.

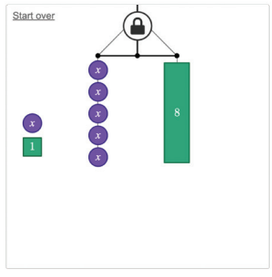
Note: If it does not come up naturally, consider asking, "Is solving $6 = x + 2$ different from solving $x + 2 = 6$? Why or why not?" No. They are equivalent because they are both represented by a weight of 6 on one side of the hanger and weights of 2 and x on the other side.

Students using digital

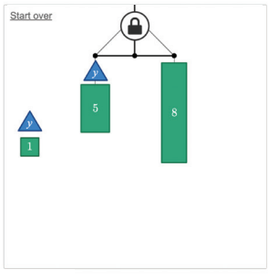
7

Same and Different

Make a balanced hanger to represent $5x = 8$.



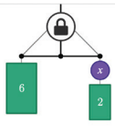
Make a balanced hanger to represent $5 + y = 8$.



Responses vary. Sample response shown.

8

Make It



$6 = x + 2$

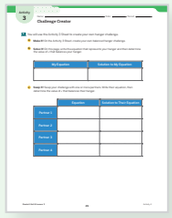
a. Make a hanger that represents $6 = x + 2$.
Sample response shown.

b. What is the value of x that balances the hanger?
$x = 4$

Pairs Sharing a Device | 10 min | Pacing: Screen 9

Activity 3 Challenge Creator

Purpose: Students use their creativity to make their own hanger challenge for other students to solve.



Students using print

1 Launch

9 **Consider sharing** that students will create their own challenge similar to the problem on the previous screen. Demonstrate how students using digital and students using print can create their hanger challenge.

Distribute the Activity 3 Sheet to students using print so they can create their hanger challenge.

Note: Students using print will not receive immediate feedback.

To encourage creativity, invite students to make a challenge they think will be different from ones their classmates create.

A **Accessibility: Executive Functioning** Invite students to work with a partner on a challenge before trying one independently.

2 Monitor

Listen to student strategies and discussions, and offer help or encouragement as needed.

D **Differentiation: (Support)** Look for students who think an equation does not have a solution because the value is not a whole number. Consider asking, "Have we seen solutions that were not whole numbers in this lesson?"

Invite students using print to check their answer with the person who created the hanger they are solving. Encourage them to discuss and resolve any differences.

Capture several students' hanger diagrams to share during the Connect.

3 Connect

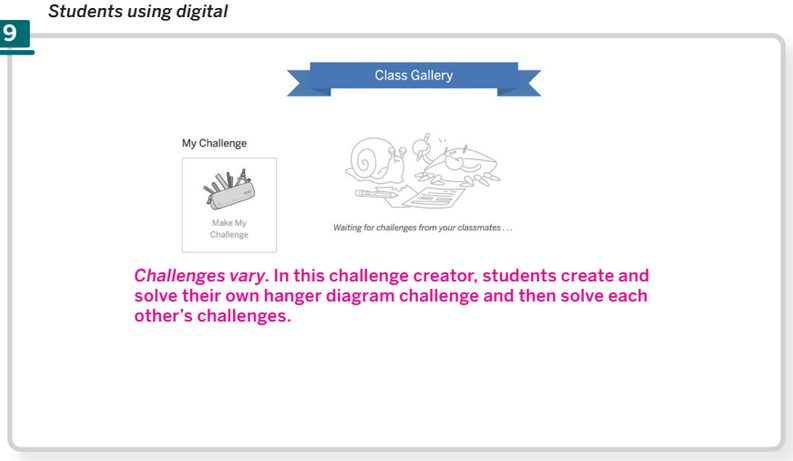
Share captured hanger diagrams. Invite students to share their strategies for writing and solving equations to determine the unknown weight.

Consider asking:

- "How did you pick the challenges you wanted to solve?"
- "Was there a strategy you heard that surprised you?"

Math Identity and Community Remind students that confusion is a part of learning and thank students who ask questions for supporting the class's collective learning.

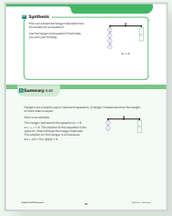
Students using digital



Whole Class | 5 min | Pacing: Screens 10, 13

Synthesis

Purpose: Students synthesize their understanding of using hanger diagrams to represent and solve equations.



Students using print

Synthesis

10 **Invite students** to respond independently then share their thinking with a partner. Consider using the **Think-Pair-Share** routine.

Capture and share a variety of ideas, such as:

- Annotating diagrams.
- Using inverse operations.
- Describing the relationship between hanger diagrams and equations.

Math Community If time allows, invite students to shout out students whose strategies they found most helpful.

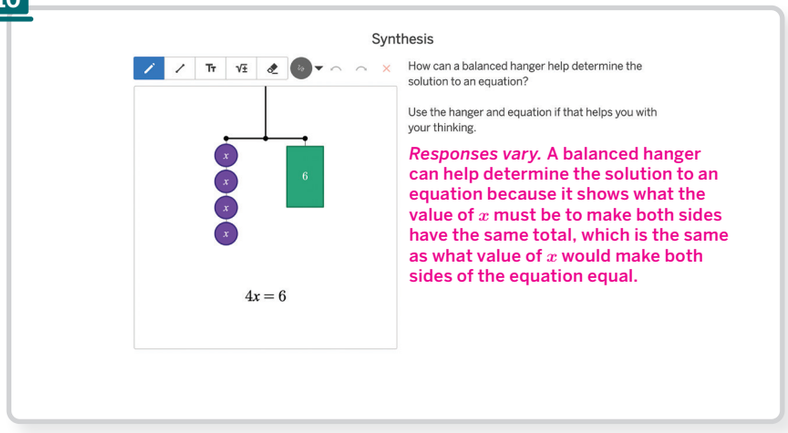
Note: If time allows, invite students to revise their previous thinking based on the discussion.

13 **Invite** students to refer to the **Summary** during Practice or anytime during the year.

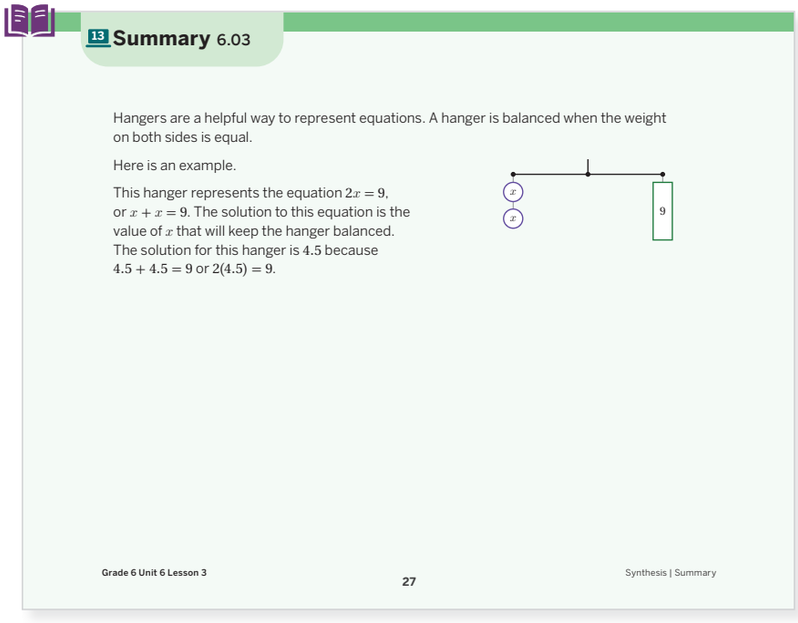
Lesson Takeaway: There are different strategies for determining an unknown weight on a hanger diagram. In each strategy, you must remove an equal amount of weight from each side to keep the hanger balanced.

Students using digital

10



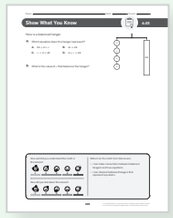
13 **Summary** 6.03



Independent | 5 min | Pacing: Screens 11–12

Show What You Know

Purpose: Students demonstrate their understanding by selecting the equation that represents the hanger and then determining the value of x that balances the hanger.

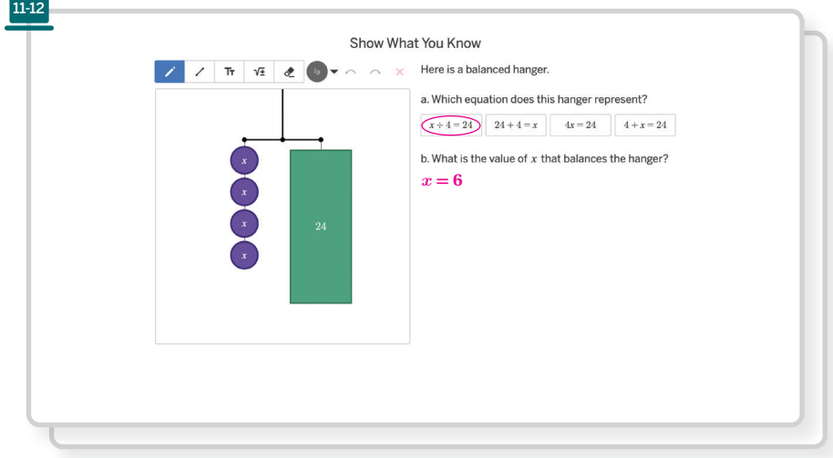


Students using print

11-12 Today's Goals

1. **Goal:** Make connections between balanced hangers and true equations.
   - In the Show What You Know, students select the correct equation that connects to the balanced hanger.
2. **Language Goal:** Interpret hanger diagrams that represent equations of the form $x + p = q$ and $px = q$. **(Writing, Speaking, and Listening)**

Students using digital



D Differentiation Use after Lesson 3

Support

Provide targeted intervention.

If student work shows **partial understanding** of solving equations involving hangers . . .

Students will have more opportunities to solve equations using hangers in Lesson 4. You may choose not to intervene now.

Strengthen

Reinforce students' understanding.

If student work shows **conceptual understanding** with minor errors, consider:

- Revisiting the **Challenge Creator** in **Activity 3** and inviting students to solve additional problems.
- Assigning the **Lesson Practice**.

Stretch

Challenge students and extend their learning.

If students would enjoy an **additional challenge**, consider:

- Inviting students to **create hanger problems** on paper with different numbers of unknown weights on both sides. Encourage them to create a strategy for solving them.
- Assigning the **Sub-Unit 1 Extensions**.

Support, *Strengthen*, and *Stretch* learning by assigning these digital resources that adjust to each student's current level of skill and understanding.

- **Boost Personalized Learning**
- **Fluency Practice**
- **Math Adventures**

Math Language Development

Use the **Math Language Development Resources** for further language support with all your students, including those building English proficiency.

- English/Spanish cognates
- English/Spanish Glossary
- Frayer model templates
- Math Language Routine display structures
- Vocabulary routines

Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.

Lesson 3
Practice

Students using digital

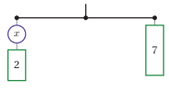
Students using print

Practice
6.03

Name: _____ Date: _____ Period: _____

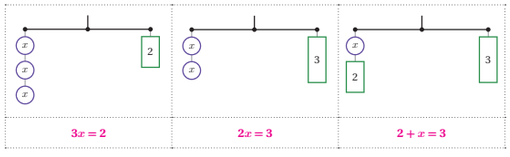
1. Anushka says that to balance this hanger the value of x must be 7. Is she correct? Explain your thinking.

No. *Explanations vary.* The hanger would not be balanced if the value of x was 7 because the left side of the hanger would equal 9, and the right side of the hanger equals 7.



2. Match each equation to the hanger it represents. One equation will have no match.

$2x = 3$ $\quad 2 + x = 3$ $\quad 3 + x = 2$ $\quad 3x = 2$



$3x = 2$ $\quad 2x = 3$ $\quad 2 + x = 3$

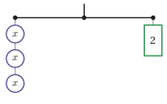
Equation with no match: $3 + x = 2$

Problems 3–4: Determine the value of x that balances the hanger.

3.

$x = \frac{3}{2}$ (or equivalent)

4.



$x = \frac{2}{3}$ (or equivalent)

Spiral Review

Problems 5–8: Determine the value of each expression.

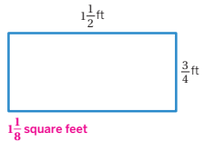
5. $12 + 2.4 = 14.4$ **6.** $12 \cdot 2.4 = 28.8$ **7.** $12 - 2.4 = 9.6$ **8.** $12 \div 2.4 = 5$

Grade 6 Unit 6 Lesson 3 650 Practice

Practice
6.03

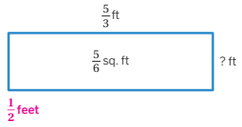
Name: _____ Date: _____ Period: _____

9. Calculate the area of this rectangle.



$1\frac{1}{8}$ square feet

10. Calculate the length of this rectangle.



$\frac{1}{2}$ feet

11. Precious set a goal to save $20 for a new game. Complete the table to show how much money Precious saved at different percentages of her goal.

Percentage of Goal (%)	Money Saved ($)
25	5
75	15
125	25

12. Select *all* of the equations that have a solution of $m = 7$.

- ☐ A. $2m = 21$
- ☑ B. $m + 9 = 16$
- ☑ C. $3m = 21$
- ☐ D. $40 - m = 23$
- ☑ E. $m - 6 = 1$

Grade 6 Unit 6 Lesson 3 651 Practice

Practice for this lesson is available online.

Practice Problem Item Analysis

	Problem(s)	DOK	CA CCSSM
On-Lesson			
	1	2	6.EE.5
	2–4	2	6.EE.5, 6.EE.7
Spiral Review			
Fluency	**5–8**	1	6.NS.3
	9	1	5.NF.4.b
Test Practice	**10**	2	6.NS.1
	11	2	6.RP.3.c
	12	2	6.EE.5

Need more Practice?

Additional practice can be found in the **Practice Resources**, **Intervention and Extension Resources**, and online resources (item banks, Boost Personalized Learning, and Fluency Practice Practice).

Unit 6

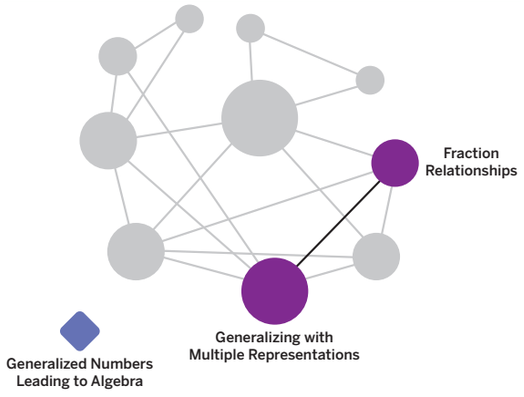
Lesson 4

Hanging It Up

Solving Equations

Let's use a variety of strategies to solve equations.

Today's Big Ideas



Focus on the Big Ideas

Today's Goals

CC2 Fraction Relationships | Generalizing With Multiple Representations | NS Generalized Numbers Leading to Algebra

1. **Goal:** Solve an equation of the form $x + p = q$ and $px = q$ that include whole numbers, decimals, or fractions with and without diagrams.
2. **Language Goal:** Compare and contrast strategies for solving equations without using visual models. **(Writing, Speaking, and Listening)**

DI Why? In order to . . .	SMP How? Students will . . .	CC What? While . . .
Make sense of solving equations **(DI1)**	Look for and make use of different strategies **(SMP.5, SMP.7)**	Connecting mathematical representations **(CC2)**

Connections and Coherence

Students develop fluency with solving equations that include decimals and fractions. They revisit connections between equations, balanced hangers, and tape diagrams, then consider strategies like reasoning about what number makes an equation true and using inverse operations to solve equations.

Prior Learning

CC2 Fraction Relationships | Generalizing With Multiple Representations

In Lesson 3, students represented equations with hangers to help them determine the solutions to those equations.

Future Learning

CC2 Generalizing With Multiple Representations | Unit Rates in the World

In Lesson 5, students will use a variety of tools to solve equations representing real-life situations. In Grade 7, students will solve more complex equations of the form $px + q = r$ and $p(x + q) = r$.

Integrating Rigor in Student Thinking

Students develop **strategies for problem solving and computation** by applying the same operation on both sides of the equation and determining the solution to equations involving fractions and decimals.

Vocabulary

Additional Vocabulary

inverse operations

CA CCSSM

Addressing

6.EE.7

Solve real-world and **mathematical problems by writing and solving equations of the form $x + p = q$ and $px = q$ for cases in which p, q and x are all nonnegative rational numbers.**

Also Addressing: **6.EE.5, 6.EE.6, 6.NS.1**

Mathematical Practices: SMP.5, SMP.7

Building Toward

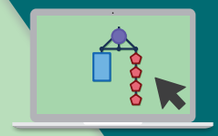
7.EE.4.A

CA ELD Standards: ELD.PI.6.1, ELD.PI.6.3, ELD.PI.6.10, ELD.PI.6.11

Lesson at a Glance

~ 45 min

CA CCSSM: 6.EE.7, 6.EE.5, 6.EE.6, 6.NS.1 SMP.5, SMP.7



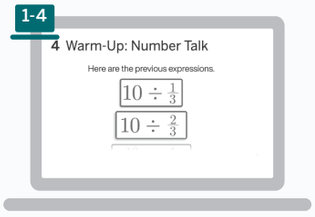
Why digital?

Challenge Creator supports students in creating and sharing challenges with classmates.

Warm-Up Fluency

Whole Class | 5 min

Students engage in the **Number Talk** routine as they revisit strategies from Unit 4 for dividing fractions.



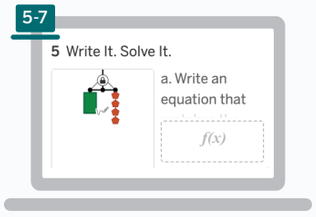
Pacing: Screens 1–4

Activity 1

Pairs Sharing a Device | 10 min

Students revisit balanced hangers and tape diagrams, then consider strategies for solving equations with non-whole number solutions.

Materials: chips and coins (as needed)

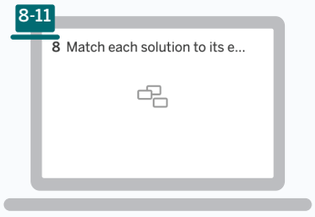


Pacing: Screens 5–7

Activity 2

Pairs Sharing a Device | 10 min

Students match solutions to equations and use **MLR7: Compare and Connect** to analyze two strategies for solving equations without diagrams.



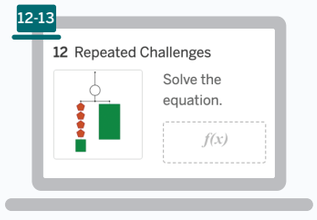
Pacing: Screens 8–11

Activity 3

Independent | 10 min

Students complete a variety of challenges to develop fluency in solving equations.

Materials: chips and coins (as needed)

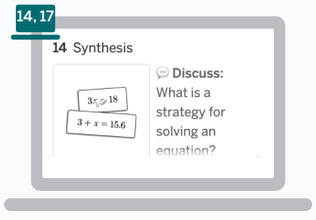


Pacing: Screens 12–13

Synthesis

Whole Class | 5 min

Students synthesize their understanding of strategies for solving an equation.



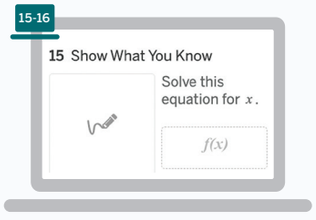
Pacing: Screens 14, 17

Show What You Know

Independent | 5 min

Students demonstrate their understanding by solving an equation with a decimal solution.

For students using print: Show What You Know Sheet



Pacing: Screens 15–16

Math Language Development

EL Multilingual / English Learners

Consider using the scaffolds from the *Math Language Development Resources* with Activity 2 to support math language acquisition for your students.

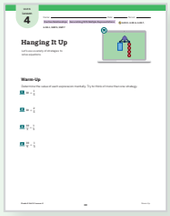
Emerging	Expanding	Bridging
Students use the language of each strategy to make sense of solving equations. They work together with you to complete the sentence frames using the word bank to compare and connect the strategies. Guiding questions are provided for you to ask for students to share one-word responses.	Students work with a partner to complete the sentence frames using the word bank to compare and connect the strategies for solving equations. Guiding questions are provided for you to ask for students to share responses using simple phrases.	Students work individually or with a partner to complete the sentence frames to compare and connect the strategies for solving equations Guiding questions are provided to ask students to share responses using longer phrases or complete sentences.

Whole Class | 5 min | Pacing: Screens 1–4

Warm-Up

Fluency

Purpose: Students engage in the Number Talk routine as they revisit strategies from Unit 4 for dividing fractions.



Students using print

1 Launch

1-4

Use the Number Talk routine to support students' ability to think flexibly about fraction division.

Invite students to evaluate the expression independently and then share their strategies aloud.

Create a record of each strategy that students share, along with the name of the student who shared it.

Consider asking:

- "Who thought about it in a different way?"
- "Can someone explain ___'s strategy in their own words?"

Note: Repeat this structure for each expression in the Number Talk.

A **Accessibility: Memory and Attention** Invite students to refer back to notes they took earlier on fraction division to draw out prior knowledge.

2 Connect

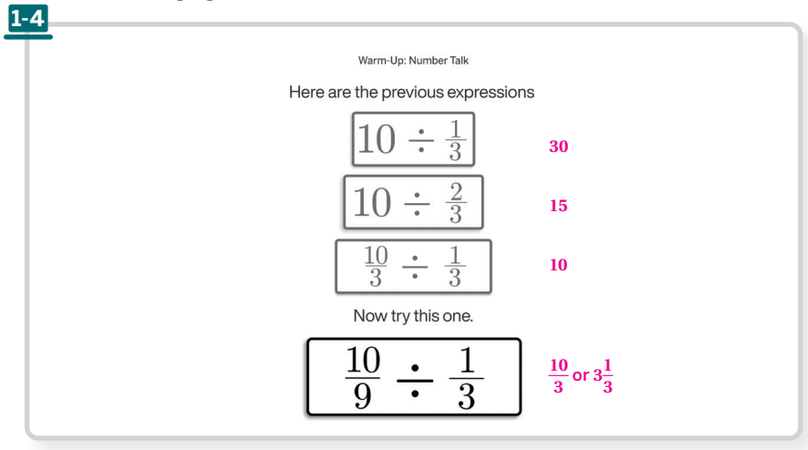
Invite students to compare and contrast the different expressions.

Consider asking:

- "What connections do you notice among the strategies we've discussed?"
- "What connections do you notice among the different expressions?"

Students using digital

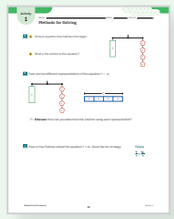
1-4



Pairs Sharing a Device | 10 min | Pacing: Screens 5–7

Activity 1 Methods for Solving

Purpose: Students revisit balanced hangers and tape diagrams, then consider strategies for solving equations with non-whole number solutions.



Students using print

1 Launch

5 **To draw out prior knowledge**, consider asking, "What do you think will be helpful to remember when determining an unknown value in the hanger?"

2 Monitor

A **Accessibility: Conceptual Processing** Invite students to use objects like chips or coins to support them in making sense of the hanger.

Look for students who use a variety of strategies.

D **Differentiation**

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Encourage them to write each side of the hanger as one side of an equation.
Say the solution is $\frac{4}{7}$.	**Support** Invite them to substitute their solution into the equation to check if that value makes the equation true.
Use strategies like: • Dividing the hanger into equal parts. • Estimating first, then refining their thinking. • Reasoning using the equation.	**Strengthen** Invite these students to share their strategies when opportunities arise throughout the lesson.

6 **Listen for** a variety of student ideas to highlight during the Connect.

7 D **Differentiation: (Stretch)** Look for students who recognize that Fabiana kept the equation balanced by dividing both sides of the equation by 4. Consider asking, "Would you expect to use the same strategy every time you are solving for an unknown variable?"

3 Connect

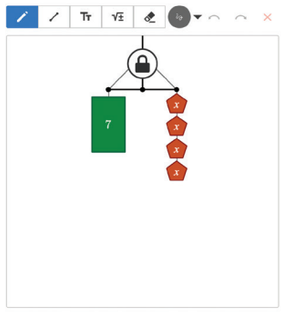
6 **Display** the hanger and tape diagram. Consider asking, "What are the advantages of using the hanger to solve equations? What about the tape diagram?"

7 **To surface the Key Takeaway**, consider asking students to connect Fabiana's strategy to solving an equation using a hanger or a tape diagram. **(SMP.7)**

Students using digital

5

Write It. Solve It.



a. Write an equation that matches the hanger.

$7 = 4x$

b. What is the solution to this equation?

$x = 1.75$ (or equivalent)

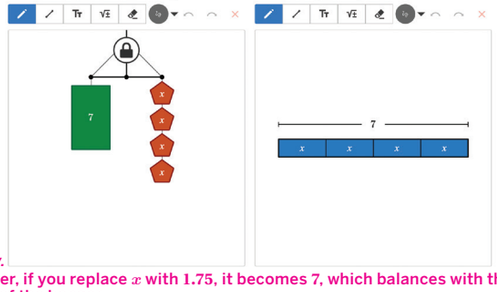
ELD.PI.6.1.Em, Ex, Br

6

Two Representations

Here are two different representations of the equation $7 = 4x$.

Discuss: How can you determine the solution using each representation?



Responses vary.

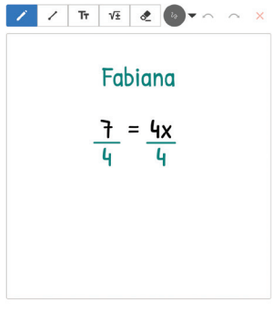
- For the hanger, if you replace x with 1.75, it becomes 7, which balances with the 7 on the left side of the hanger.
- In the tape diagram, there are 4 sections that total to 7, so each section is $\frac{7}{4}$.

ELD.PI.6.10.Em, Ex, Br

7

Solving Strategy

Here is how Fabiana solved the equation $7 = 4x$. Describe her strategy.



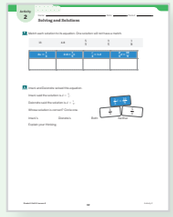
Responses vary. Fabiana divided both sides of the equation by 4.

Key Takeaway: There are many methods for solving equations with variables, including using hanger diagrams, tape diagrams, and inverse operations.

Pairs Sharing a Device | 10 min | Pacing: Screens 8–11

Activity 2 Solving and Solutions

Purpose: Students match solutions to equations and use **MLR7: Compare and Connect** to analyze two strategies for solving equations without diagrams.



Students using print

1 Launch

8 **To draw out prior knowledge**, consider asking, "What does $\frac{c}{4}$ mean? How can we represent $\frac{c}{4}$ using division? multiplication?"

2 Monitor

Encourage students to share their reasoning with a partner and work together to reach an agreement about how to sort the equations.

Note: If time allows, invite pairs to compare their matches, justify their thinking, and make revisions based on their conversation.

Look for student progress using the dashboard's Teacher View. Lead a discussion if students need support.

A **Accessibility: Executive Functioning** Invite students to focus on one equation at a time to support students in carrying out multiple steps.

9 D **Differentiation**

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Consider asking, "How can you check if $\frac{3}{5}$ is a solution? $\frac{5}{3}$?"
Select "Both."	**Support** Encourage them to substitute both solutions into the equation to see which one makes it true.

Math Community Consider inviting students to think about what a student who responded differently might have been thinking.

Note: If time allows, pause to invite students to justify their choice and listen to their classmates' reasoning.

Activity 2 continued >

Students using digital

8

Match each solution to its equation. One solution will not have a match.

$\frac{c}{4} = 1.2$ — 4.8

$2a = \frac{1}{4}$ — $\frac{1}{8}$

$\frac{3}{5}$

$2.6 = \frac{1}{5}b$ — 13

$\frac{2}{3}d = \frac{10}{9}$ — $\frac{5}{3}$

ELD.PI.6.11.Em, Ex, Br

9

Different Answers

$\frac{2}{3}d = \frac{10}{9}$

$\frac{3}{5}$ $\frac{5}{3}$

Imani and Deiondre solved this equation.

Imani said the solution is $d = \frac{3}{5}$.

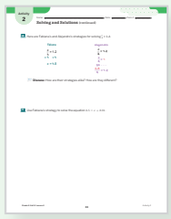
Deiondre said the solution is $d = \frac{5}{3}$.

Whose solution is correct?

Imani's | Deiondre's | Both | Neither

Explanations vary. I am trying to determine what number times $\frac{2}{3}$ equals $\frac{10}{9}$, and $\frac{2}{3} \cdot \frac{5}{3} = \frac{10}{9}$. I know it can't be $d = \frac{3}{5}$ because the denominator would be 15 instead of 9.

Pairs Sharing a Device | 10 min | Pacing: Screens 8–11



Students using print

Activity 2 Solving and Solutions (continued)

Purpose: Students match solutions to equations and use **MLR7: Compare and Connect** to analyze two strategies for solving equations without diagrams.

2 Monitor

10 EL **Multilingual/English Learners:** Emerging, Expanding, and Bridging scaffolds and supports are available in the ***Math Language Development Resources.***

D Differentiation

Look for students who:	Respond to Student Thinking
Recognize that both strategies lead to the same solution.	**Strengthen** Invite them to share their thinking during the Connect.
Describe Fabiana's strategy as using the inverse operation on both sides of the equation.	

11 **Look for** students' understanding of Fabiana's strategy to support the conversation in the Connect.

3 Connect

10 MLR **MLR7: Compare and Connect** Invite students to analyze and compare each strategy, and then connect to their strategy.

Consider asking:
- "What did each student do?"
- "Where do you see the same information in Fabiana's and Alejandro's strategies?"
- "How does each strategy compare to your own?"
- "When might we use each strategy?"

ELD.PI.6.3.Em, Ex, Br

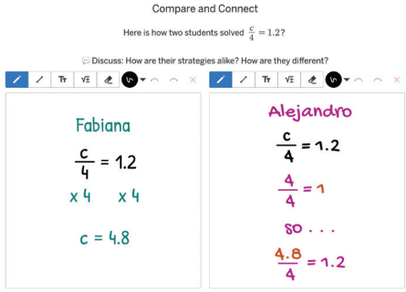
11 **Invite students** to share their work. Consider creating a record of strategies for students to refer to throughout the lesson and unit.

To surface the Key Takeaway, consider asking:
- "What would Fabiana's strategy look like if the equation included addition? What if it was subtraction?"
- "When might Fabiana's strategy be useful? When might Alejandro's?"

Key Takeaway: Using inverse operations and reasoning are two strategies for solving equations that do not use diagrams. No matter the strategy, the solution will be the same every time because the same number makes the equation true.

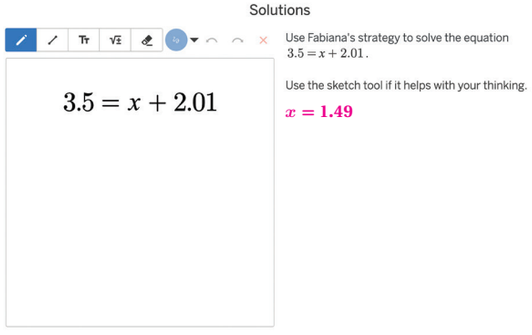
Students using digital ELD.PI.6.3.Em, Ex, Br

10



Responses vary. The strategies are alike because both students found the value of c that makes the equation true. Fabiana found the value of c by using inverse operations and multiplying both sides of the equation by 4. Alejandro found the value of c by using number sense.

11

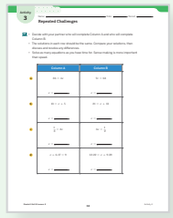


Independent | 10 min | Pacing: Screens 12–13

Activity 3 Repeated Challenges

Purpose: Students complete a variety of challenges to develop fluency in solving equations.

Short on time? Consider having students only complete four to six problems.



Students using print

1 Launch

12

Invite students to set their own goal for how many problems they would like to complete, sharing that sense-making is more important than speed.

Students using print will need a partner for this activity. They will solve and compare their solutions to pairs of problems instead of receiving interactive feedback.

Encourage students to use the feedback from the hanger to help them revise their thinking.

2 Monitor

Invite students using print to solve problems in any order or to choose any four problems to solve.

A **Accessibility: Conceptual Processing** Invite students to solve a similar question with friendlier numbers to support thinking abstractly.

Listen for student strategies and partner discussions, offering help or encouragement as needed.

D **Differentiation**

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Consider asking, "How might drawing a tape diagram or seesaw help you?"
Subtract the coefficient in equations of the form $px = q$.	**Support** Consider asking, "What operation is being applied to the variable? What is the inverse operation?"
Use a variety of strategies like: • Creating a tape diagram. • Using number sense. • Using inverse operations. **(SMP.5)**	**Strengthen** Invite students to share during the Connect.

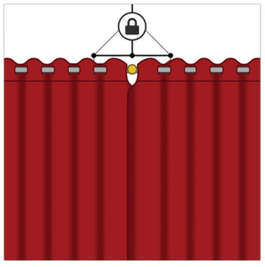
Note: Use the dashboard's Teacher View to see how many problems each student has completed correctly.

Activity 3 continued >

Students using digital

12

Repeated Challenges



Solve the equation for x.

$36 = 4x$

This screen contains an unlimited number of challenges. The first few challenges are the same for each student on print and digital; additional digital challenges are randomized.

The first few responses are:

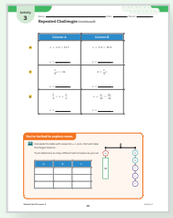
- 9
- 8
- $\frac{1}{6}$
- 2.83

Independent | 10 min | Pacing: Screens 12–13

Activity 3 Repeated Challenges (continued)

Purpose: Students complete a variety of challenges to develop fluency in solving equations.

Short on time? Consider having students only complete four to six problems.



Students using print

2 Monitor

12 **Note:** Refer to the guidance on the previous page to support students as they work on these repeated challenges on Screen 12.

Look for students with a variety of strategies and invite them to share during the Connect.

13 D **Differentiation: You're invited to explore more.** (Stretch) Invite students who would like to explore solving equations further to complete this optional task. Encourage them to discuss their thinking with a partner.

3 Connect

12 **Invite students** to share strategies that they found helpful or what they learned from the mistakes they made while solving these challenges.

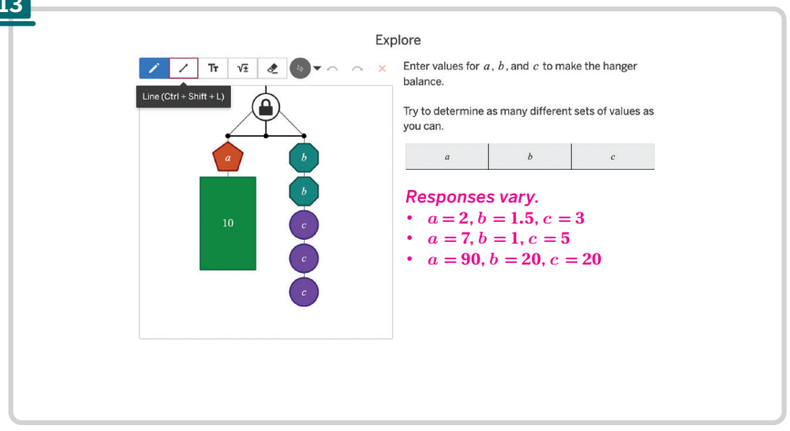
EL **Multilingual/English Learners** Invite students to share strategies in their primary languages. Encourage all students to use gestures and/or visuals as they share. **(Speaking and Listening)**

Consider asking:

- "Did your strategy change when the problem included fractions? Decimals?"
- "What is your favorite strategy to use when solving these types of math problems?"

Students using digital

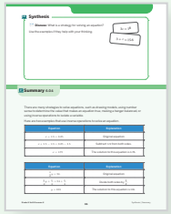
13



Whole Class | 5 min | Pacing: Screens 14, 17

Synthesis

Purpose: Students synthesize their understanding of strategies for solving an equation.



Students using print

Synthesis

14 **Invite students** to discuss the Synthesis with a partner.

Have students share their responses to the Synthesis question. Select and sequence strategies for solving equations, such as:

- Using a tape diagram or seesaw.
- Using inverse operations on both sides of the equation.
- Using number sense to reason about values that could make the equation true.

Note: If time allows, invite students to share with a partner what makes sense about each strategy and what questions they still have.

Math Community If time allows, invite students to shout out students whose strategies they found most helpful.

17 **Invite students** to refer to the **Summary** during Practice or anytime during the year.

Lesson Takeaway: Multiple strategies can be used to solve equations including drawing diagrams, using number sense and applying inverse operations.

Students using digital

ELD.PI.6.1.Em, Ex, Br

14

Synthesis

Discuss: What is a strategy for solving an equation?

Use the examples if they help with your thinking.

$3x = 18$

$3 + x = 15.6$

Responses vary.

- I can solve an equation by getting the variable alone on one side of the equation. For the equation $3 + x = 15.6$, I can subtract 3 from both sides. In the equation $3x = 18$, I can divide both sides by 3.
- I can solve an equation by thinking about a tape diagram. For $3x = 18$, I can draw a tape diagram with a total length of 18 and divide my diagram into three equal sections.
- I can solve an equation by thinking about which number makes an equation true. For $3 + x = 15.6$, I can think $3 + 12 = 15$, so $3 + 12.6 = 15.6$.

17 **Summary** 6.04

There are many strategies to solve equations, such as drawing models, using number sense to determine the value that makes an equation true, making a hanger balanced, or using inverse operations to isolate a variable.

Here are two examples that use inverse operations to solve an equation.

Equation	Explanation
$x + 1.5 = 3.25$	Original equation
$x + 1.5 - 1.5 = 3.25 - 1.5$	Subtract 1.5 from both sides.
$x = 1.75$	The solution to this equation is 1.75.

Equation	Explanation
$\frac{1}{2}y = 54.$	Original equation
$\frac{1}{2}y \div \frac{1}{2} = 54 \div \frac{1}{2}$	Divide both sides by $\frac{1}{2}$.
$y = 108$	The solution to this equation is 108.

Grade 6 Unit 6 Lesson 4 36 Synthesis | Summary

Independent | 5 min | Pacing: Screens 15–16

Show What You Know

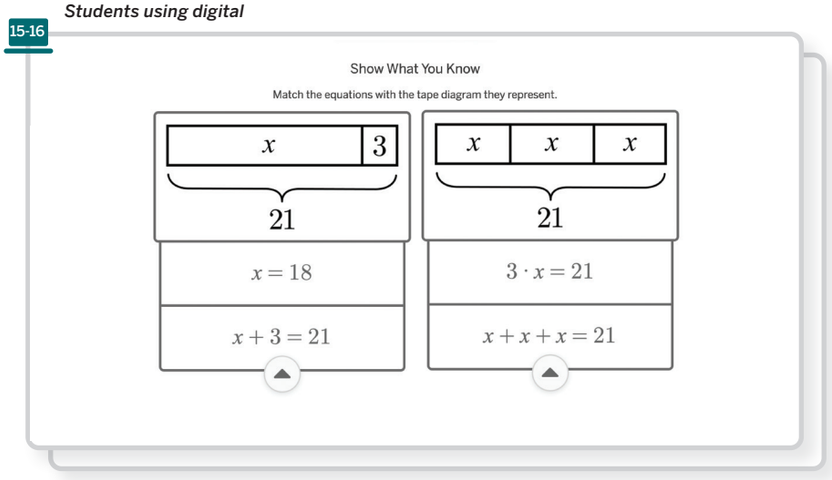
Purpose: Students demonstrate their understanding by solving an equation with a decimal solution.

Students using print

15-16 Today's Goals

1. **Goal:** Solve equations of the form $x + p = q$ and $px = q$ that include whole numbers, decimals, or fractions with and without diagrams.
   - In the Show What You Know, students solve the equation in the form of $x + p = q$.
2. **Language Goal:** Compare and contrast strategies for solving equations without using visual models. **(Writing, Speaking, and Listening)**

Students using digital



D Differentiation Use after Lesson 4

S Support

Provide targeted intervention.

If student work shows **partial understanding** of using algebraic strategies, consider:

- Revisiting **Activities 1–2** (particularly Fabiana's work) with students before providing individualized feedback on the relevant **Practice Problems**.

S Strengthen

Reinforce students' understanding.

If student work shows **conceptual understanding** of solving equations with minor errors, consider:

- Revisiting the **Repeated Challenges** in Activity 3.
- Assigning the **Lesson Practice**.
- Emphasizing the Pentagon and Hexagon sheets during **Practice Day 1**.

S Stretch

Challenge students and extend their learning.

If students would enjoy an **additional challenge,** consider:

- Inviting students to complete the **Explore More** task and discuss their thinking with a partner.
- Assigning the **Sub-Unit 1 Extensions**.

Support, *Strengthen*, and *Stretch* learning by assigning these digital resources that adjust to each student's current level of skill and understanding.

- **Boost Personalized Learning**
- **Fluency Practice**
- **Math Adventures**

Math Language Development

Use the **Math Language Development Resources** for further language support with all your students, including those building English proficiency.

- English/Spanish cognates
- English/Spanish Glossary, e.g., *inverse operations / operaciones inversas*
- Frayer model templates
- Math Language Routine display structures, e.g., **MLR7: Compare and Connect**
- Vocabulary routines

Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.

Lesson 4
Practice

Students using digital

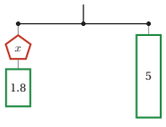
Students using print

Practice 6.04 Name: Date: Period:

1. Select *all* the equations that have a solution of $n = 11$.

- A. $2n = 22$
- B. $23 - n = 12$
- C. $4n = 411$
- D. $n \div 1 = 11$
- E. $n - 7 = 4$

Problems 2–3: Use the hanger diagram if it helps with your thinking.



2. Determine the value of x in the equation $x + 1.8 = 5$.
$x = 3.2$

3. Vihaan says the solution to $x + 1.8 = 5$ is $x = 6.8$. Explain how you know this is incorrect.
Responses vary. This is incorrect because $6.8 + 1.8$ would equal 8.6 instead of 5.

Problems 4–9: Solve each equation. Draw a hanger or tape diagram if it helps with your thinking.

4. $4m = 8$
$m = 2$

5. $\frac{1}{2}a = \frac{5}{8}$
$a = 1\frac{1}{4}$ (or equivalent)

6. $10d = 32$
$d = 3.2$

7. $w + 5.2 = 17$
$w = 11.8$

8. $1.5x = 0.9$
$x = 0.6$

9. $24.6 = 6.1 + c$
$c = 18.5$

Practice 6.04 Name: Date: Period:

10. Fill in each blank using the numbers 0 to 9 so that x has the same value in each pair of equations. Each number can only be used once.
Responses vary.

$x = \boxed{1}$ $\quad x = \boxed{4}$

$x + \boxed{2} = \boxed{3}$ $\quad x + \boxed{5} = \boxed{9}$

Spiral Review

11. Calculate each product.

Expression	Product
$212 \cdot 2$	424
$21.2 \cdot 0.2$	4.24
$21.2 \cdot 0.02$	0.424

12. Kweku and Javier each used a different strategy to determine 25% of 60. Whose strategy is correct? Circle one.

Kweku: 60 × 25 Javier: 60 ÷ 4

Kweku's (Javier's) Both Neither

Explain your thinking.
Explanations vary. Javier's strategy is correct because 25% is $\frac{1}{4}$ of a whole. To find 25% of 60, divide it by 4.

Problems 13–14: A rectangle has an area of 14 square units. It has side lengths x and y. Determine the value of y based on the value of x.

13. $x = 2\frac{1}{3}$
$y = 6$ units (or equivalent)

14. $x = 4\frac{1}{5}$
$y = 3\frac{1}{3}$ units (or equivalent)

Practice for this lesson is available online.

Practice Problem Item Analysis

	Problems	DOK	CA CCSSM
On-Lesson			
Test Practice	1	1	6.EE.5, 6.EE.7
Fluency	2, 4–9	1	6.EE.7
	3	2	6.EE.5, 6.EE.7, SMP.3
	10	3	6.EE.5 6.EE.7
	11	1	6.NS.3
	12	2	6.RP.3.c, SMP.3
	14–15	2	6.NS.1

Need more Practice?

Additional practice can be found in the **Practice Resources**, **Intervention and Extension Resources**, and online resources (item banks, Boost Personalized Learning, and Fluency Practice Practice).

Unit 6

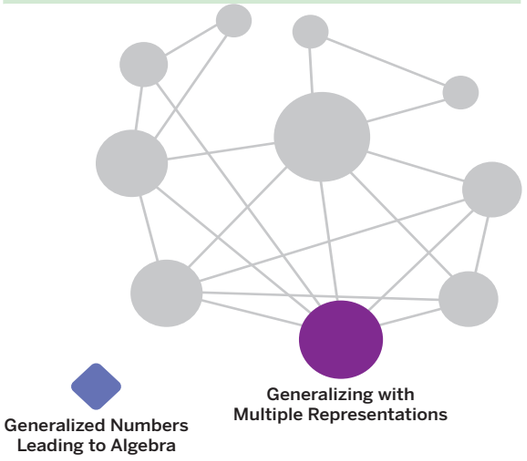
Lesson 5

Swap and Solve

Solving Equations in Context

Let's write and solve equations.

Today's Big Ideas



Focus on the Big Ideas

Today's Goals

CC2 Generalizing With Multiple Representations

NS Generalized Numbers Leading to Algebra

1. **Goal:** Use inverse operations and properties of equality to solve one-step equations.
2. **Goal:** Use one-step equations to solve problems in context and interpret the meaning of the solution.
3. **Language Goal:** Describe a situation that can be represented by a one-step equation. **(Reading, Writing, Speaking, and Listening)**

DI Why? In order to . . .	SMP How? Students will . . .	CC What? While . . .
Make sense of connecting situations and equations **(DI1)**	Reason abstractly and quantitatively **(SMP.2)**	Reasoning about the meaning of the solution **(CC4)**

Connections and Coherence

tudents use inverse operations and properties of equality to solve one-step equations.They write their own situations to match equations, and solve their classmates' equations, check the accuracy of their solutions, and interpret the solutions in the context of the situations. **(SMP.2)**

Prior Learning

CC2 Fraction Relationships

NS Generalizing With Multiple Representations

In Lesson 2, students matched equations with situations and determined their solutions. In Lessons 3 and 4, students learned a variety of strategies for solving an equation out of context.

Future Learning

CC2 Unit Rates in the World

In Grade 7, students will write and solve equations for more complex situations of the form $px + q = r$ and $p(x + q) = r$.

Integrating Rigor in Student Thinking

Students apply **strategies for problem solving** as they write and solve equations to answer questions about situations.

Vocabulary

New Vocabulary

properties of equality

CA CCSSM

Addressing

6.EE.6

Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.

6.EE.7

Solve real-world and mathematical problems by writing and solving equations of the form $x + p = q$ and $px = q$ for cases in which p, q and x are all nonnegative rational numbers.

Mathematical Practices: SMP.1, SMP.2, SMP.6

Building On	Building Toward
5.OA.2	7.EE.4.A
6.NS.3	
6.EE.5	

CA ELD Standards: ELD.PI.6.5. ELD.PI.6.6, ELD.PI.6.10

Lesson at a Glance

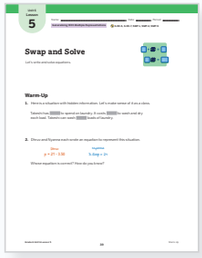
~ 45 min

CA CCSSM: 6.EE.6, 6.EE.7, SMP.1, SMP.2, SMP.6

Warm-Up

Independent | 10 min

Students use **MLR6: Three Reads** to make sense of a situation described in words. **(SMP.1)**



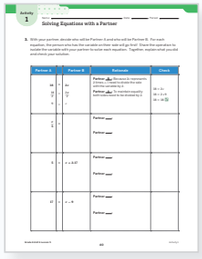
Lesson 5 Warm-Up

Presentation Screens 1–3

Activity 1

Pairs | 10 min

Students use properties of equality to solve equations by performing the same operation on each side of the equal sign.



Lesson 5 Activity 1

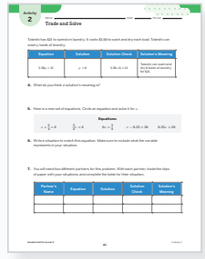
Presentation Screen 4

Activity 2

Pairs | 15 min

Students write situations that match equations, and trade them with several classmates to write an equation for each classmate's situation and solve it. **MLR1: Stronger and Clearer Each Time**

Materials: index cards or slips of paper



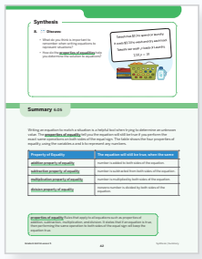
Lesson 5 Activity 2

Presentation Screens 5–7

Synthesis

Whole Class | 5 min

Students synthesize their understanding of writing equations to represent situations.



Lesson 5 Synthesis

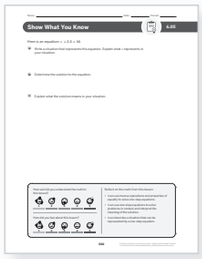
Presentation Screen 8

Show What You Know

Independent | 5 min

Students demonstrate their understanding by writing a situation for an equation, and then determining its solution and the meaning of the solution.

Show What You Know Sheet



Lesson 5 Show What You Know

Presentation Screen 9

Math Language Development

Multilingual / English Learners

Consider using the scaffolds from the *Math Language Development Resources* with Activity 2 to support math language acquisition for your students.

Emerging	Expanding	Bridging
Students are provided with two example situations to help them write their own situation. They work together with you to connect the equations with the situations. Guiding questions are provided for you to ask for students to share one-word responses.	Students provided with two example situations to help them write their own situation and work with a partner to connect the equations with the situations. Guiding questions are provided for you to ask for students to share responses using simple phrases.	Students connect the equations with the situations individually or with a partner before writing their own situation. Guiding questions are provided to ask students to share responses using longer phrases or complete sentences.

Independent | 10 min

Warm-Up

Purpose: Students use **MLR6: Three Reads** to make sense of a situation described in words. **(SMP.1)**

Lesson 5
Warm-Up

Presentation Screens 1–3

1 Launch

MLR **MLR6: Three Reads** Invite students to read the text three times, each with a particular focus, to support students in making sense of the scenario. **(SMP.1)**

1. **Display** the situation with the hidden information and invite a student to read it aloud, then discuss the prompt.

   To support making connections, invite students to share a time they've helped with laundry.

2. **Display** the situation with the information given and invite a student to read it aloud, then discuss the prompt.

   Invite students to share how they decided what the variable represents.

3. **Display** the situation again with a focus on the two equations. After the third read, invite students to discuss the question with a partner, then as a class.

A **Accessibility: Memory and Attention** Invite students to record their work in their Student Edition or on paper to support students with keeping track of information.

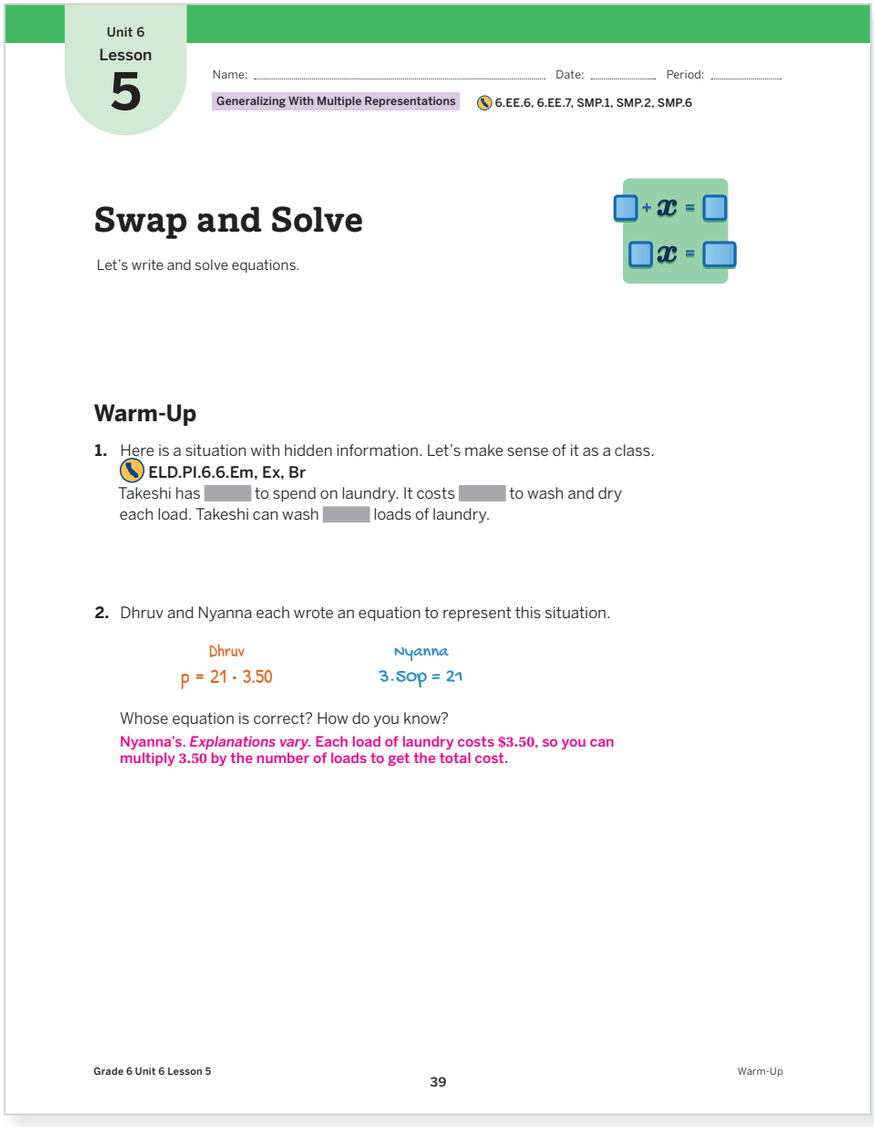
2 Connect

Invite students to share which equation is correct by polling the class. Encourage students to justify their choices.

Consider asking, "What question could you ask Dhruv to help him understand his mistake?"

Math Identity and Community Invite students to share why reading a question multiple times might help when solving a complex problem.

Note: If time allows, invite students to solve Nyanna's equation and interpret the solution in Takeshi's situation.



Unit 6
Lesson
5

Name: _____ Date: _____ Period: _____

Generalizing With Multiple Representations | 6.EE.6, 6.EE.7, SMP.1, SMP.2, SMP.6

Swap and Solve

Let's write and solve equations.

$\square + x = \square$

$\square x = \square$

Warm-Up

1. Here is a situation with hidden information. Let's make sense of it as a class.
   ELD.PI.6.6.Em, Ex, Br
   Takeshi has ____ to spend on laundry. It costs ____ to wash and dry each load. Takeshi can wash ____ loads of laundry.

2. Dhruv and Nyanna each wrote an equation to represent this situation.

   Dhruv: $p = 21 \cdot 3.50$

   Nyanna: $3.50p = 21$

   Whose equation is correct? How do you know?

   Nyanna's. *Explanations vary.* Each load of laundry costs $3.50, so you can multiply 3.50 by the number of loads to get the total cost.

Grade 6 Unit 6 Lesson 5 39 Warm-Up

Pairs | 10 min

Activity 1 Solving Equations with a Partner

Purpose: Students use properties of equality to solve equations by performing the same operation on each side of the equal sign.

Lesson 5
Activity 1

Presentation Screen
4

Launch

Display the directions for the activity. Have each pair of students identify who will be Partner A and who will be Partner B.

Demonstrate using the completed example in the Student Edition, noting how Partner B would start because the variable is on the right side of the equation.

Monitor

Listen for students who share their reasoning about the inverse operations and properties of equalities.

Differentiation

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Ask, "What can you do to isolate the x? Think back to the hanger diagrams. What did you do to balance them?"
Use the same operation instead of the inverse operation to solve for the variable.	**Support** Invite them to substitute their solution for the variable and check whether the equation is true.
Evaluating the last equation as the product of $\frac{1}{5}$ and x, and solving the equation by dividing both sides by $\frac{1}{5}$.	**Strengthen** Invite them to share their strategy during Connect. Consider asking, "What other strategy can be used to solve the equation?"
Evaluating the last equation as the quotient of x and 5, and solving the equation by multiplying both sides by 5.	**Strengthen** Invite them to share their strategy during Connect.Consider asking,, "What other strategy can be used to solve the equation?"

Connect

Invite students to share how working with a partner helped them solve the equations along with their strategies and solutions for each equation.

Display the last equation $\frac{x}{5} = 4.1$ and invite students to share their strategy for solving. If it does not come up naturally, discuss the possible strategies for solving: multiply each side by 5, or divide both sides by $\frac{1}{5}$.

Consider asking, "How does checking the solution show the relationships between multiplication and division, and addition and subtraction?"

Activity 1

Name: ..... Date: ..... Period: .....

Solving Equations with a Partner

3. With your partner, decide who will be Partner A and who will be Partner B. For each equation, the person who has the variable on their side will go first! Share the operation to isolate the variable with your partner to solve each equation. Together, explain what you did and check your solution.

ELD.PI.6.5.Em, Ex, Br, ELD.PI.6.10.Em, Ex, Br

Partner A		Partner B	Rationale	Check
18 $\frac{18}{2}$ 9	= = =	$2x$ $\frac{2x}{2}$ x	Partner B: Because $2x$ represents 2 times x, I need to divide the side with the variable by 2. Partner A: To maintain equality both sides need to be divided by 2.	$18 = 2x$ $18 = 2 \cdot 9$ $18 = 18$ ✅
$\frac{x}{5}$ $5 \cdot \frac{x}{5}$ x	= = =	4.1 $4.1 \cdot 5$ 20.5	Partner A: Because $\frac{x}{5}$ represents x divided by 5, I need to multiply the side with the variable by 5. Partner B: To maintain equality both sides need to be multiplied by 5.	$\frac{x}{5} = 4.1$ $\frac{20.5}{5} = 4.1$ $4.1 = 4.1$
5 $5 - 2.17$ 2.83	= = =	$x + 2.17$ $x + 2.17 - 2.17$ x	Partner B: Because $x + 2.17$ represents the sum of x and 2.17, I need to subtract 2.17 from the side with the variable. Partner A: To maintain equality 2.17 needs to be subtracted from both sides.	$5 = x + 2.17$ $5 = 2.17 + 2.83$ $5 = 5$
17 $17 + 9$ 26	= = =	$x - 9$ $x - 9 + 9$ x	Partner B: Because $x - 9$ represents the difference of x and 9, I need to add 9 to the side with the variable. Partner A: To maintain equality 9 needs to be added to both sides.	$17 = x - 9$ $17 = 26 - 9$ $17 = 17$

Grade 6 Unit 6 Lesson 5 40 Activity 1

Key Takeaway: The solution to an equation can be found by isolating the variable using the inverse operations. This can be done by performing the same action or operation on each side of the equation – like each partner did – using the **properties of equality**. Using the variables a, b, and c, to represent any numbers if $a = b$,

- **addition property of equality states** $a + c = b + c$.
- **subtraction property of equality states** $a - c = b - c$.
- **multiplication property of equality states** $a \cdot c = b \cdot c$.
- **division property of equality states** $a \div c = b \div c$. $(c \neq 0)$

Pairs | 15 min

Activity 2 Trade and Solve

Purpose: Students write situations that match equations, and trade them with several classmates to write an equation for each classmate's situation and solve it.

Short on time? Consider having students only trade situations with 1 or 2 classmates.

Lesson 5
Activity 2

Presentation Screens 5–7

Launch

5 **Display** the situation, equation, solution, solution check from the Warm-Up to discuss the solution's meaning as a whole class.

6 **Display** the equations and the directions for the activity.

Monitor

EL **Multilingual/English Learners** Emerging, Expanding, and Bridging scaffolds and supports are available in the ***Math Language Development Resources.***

D **Differentiation** *(Problem 5)*

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Invite students to return to their work from Activity 1. Consider asking, "What operation is used on the variable side? What operation would isolate the variable?"
Use imprecise language for a solution's meaning, like "13 stops."	**Support** Consider asking, "How could you describe what 13 means more precisely?" **(SMP.6)**
Use precise language to describe the properties of equality they used to solve the equation.	**Strengthen** Invite them to share their strategy during Connect.

MLR **MLR1: Stronger and Clearer Each Time** If time allows, use this routine to support students in developing precise language. Invite students to meet with 1–2 different partners, give feedback on each other's situations, then use the feedback to write a second clearer draft. See the Routine Facilitation Guide for more information. **(SMP.6)** **ELD.PI.6.10 Em, Ex, Br**

7 **Display** the directions and review them as a class. Distribute one index card or slip of paper to each student. Invite them to write the second draft of their situation on it.

Connect

Display the list of equations and invite students to share their strategies for writing equations that represent their classmates' situations.

To surface the Key Takeaway, consider inviting students to share their equations, solutions, and meanings with different situations that match the same equation.

Activity 2

Name: _____ Date: _____ Period: _____

Trade and Solve

Takeshi has $21 to spend on laundry. It costs $3.50 to wash and dry each load. Takeshi can wash p loads of laundry.

Equation	Solution	Solution Check	Solution's Meaning
$3.50p = 21$	$p = 6$	$3.50 \cdot 6 = 21$	Takeshi can wash and dry 6 loads of laundry for $21.

4. What do you think a solution's meaning is?

Responses vary. A solution's meaning is what that number represents in the situation. Here, the solution is 6 and its meaning is how many loads of laundry Takeshi can do.

5. Here is a new set of equations. Circle an equation and solve it for x.

Equations:

$x + \frac{3}{4} = 6$ $\quad \frac{3}{4}x = 6$ $\quad 6x = \frac{3}{4}$ $\quad x - 0.25 = 20$ $\quad 0.25x = 20$

6. Write a situation to match this equation. Make sure to include what the variable represents in your situation. **ELD.PI.6.10 Em, Ex, Br**

Responses vary.

7. You will need two different partners for this problem. With each partner, trade the slips of paper with your situations and complete the table for their situation.

Responses vary.

Partner's Name	Equation	Solution	Solution Check	Solution's Meaning

Grade 6 Unit 6 Lesson 5 41 Activity 2

Key Takeaway: One equation can represent multiple situations. The solution to the equation will be the same but its meaning will depend on the situation.

Whole Class | 5 min

Synthesis

Purpose: Students synthesize their understanding of writing equations to represent situations.

Lesson 5
Synthesis

Presentation Screen
8

Synthesis

8 **Invite students** to discuss the Synthesis with a partner.

Have students share their responses to the Synthesis question. Select and sequence a variety of ideas such as paying close attention to the relationship between the numbers and the variables.

Math Identity and Community Invite students to share strategies they found helpful and give credit to the students who shared them.

Formalize vocabulary: Properties of equality are the rules that apply to all equations such as addition, subtraction, multiplication, and division, which state that if an equation is true, then performing the same operation to both sides will result in an equivalent equation.

(optional) **Consider using the** Frayer Model routine with the word **properties of equality**

EL Refer to the *Math Language Development Resources* for more vocabulary support

Invite students to refer to the **Summary** during Practice or anytime during the year.

Lesson Takeaway: The properties of equality enable us to keep an equation true by performing the same action or operation on each side. This allows us to find the solution to an equation by isolating the variable using the inverse operations.

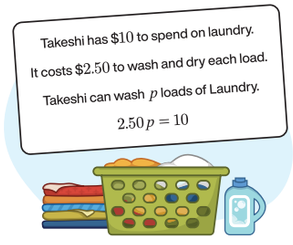
One equation can represent multiple situations. The solution to the equation will be the same but its meaning will depend on the situation. **(SMP.2)**

Synthesis

8. Discuss:

- What do you think is important to remember when writing equations to represent situations?
- How do the properties of equalities help you determine the solution to equations?

Responses vary. When writing equations, it's important to understand the relationship between the numbers and the variable. The properties of equality help us keep an equation true by doing the same operation on both sides. This way, we can find the solution by isolating the variable.



Summary 6.05

Writing an equation to match a situation is a helpful tool when trying to determine an unknown value. The properties of equality tell you the equation will still be true if you perform the exact same operations on both sides of the equal sign. The table shows the four properties of equality, using the variables a and b to represent any numbers.

Property of Equality	The equation will still be true, when the same
addition property of equality	number is added to both sides of the equation.
subtraction property of equality	number is subtracted from both sides of the equation.
multiplication property of equality	number is multiplied by both sides of the equation.
division property of equality	nonzero number is divided by both sides of the equation.

properties of equality Rules that apply to all equations such as properties of addition, subtraction, multiplication, and division. It states that if an equation is true, then performing the same operation to both sides of the equal sign will keep the equation true.

Grade 6 Unit 6 Lesson 5 42 Synthesis | Summary

Independent | 5 min

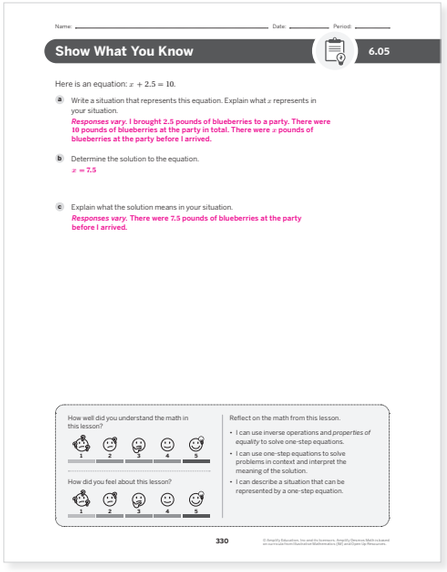
Show What You Know

Purpose: Students demonstrate their understanding by writing a situation for an equation, and then determining its solution and the meaning of the solution.

Presentation Screen 9

Today's Goals

1. **Goal:** Use inverse operations and properties of equality to solve one-step equations.
   - In the Show What You Know, students solve the equation.
2. **Goal:** Use one-step equations to solve problems in context and interpret the meaning of the solution.
   - In the Show What You Know, students interpret the meaning of the solution based on the situation they wrote.
3. **Language Goal:** Describe a situation that can be represented by a one-step equation. (Reading, Writing, Speaking, and Listening)
   - In the Show What You Know, students write a situation that can be represented by the given equation.


Name: _____ Date: _____ Period: _____

Show What You Know 6.05

Here is an equation: $x + 2.5 = 10$.

a. Write a situation that represents this equation. Explain what x represents in your situation.
Responses vary. I brought 2.5 pounds of blueberries to a party. There were 10 pounds of blueberries at the party in total. There were x pounds of blueberries at the party before I arrived.

b. Determine the solution to the equation.
$x = 7.5$

c. Explain what the solution means in your situation.
Responses vary. There were 7.5 pounds of blueberries at the party before I arrived.

How well did you understand the math in this lesson? 1 2 3 4 5

How did you feel about this lesson? 1 2 3 4 5

Reflect on the math from this lesson.
- I can use inverse operations and properties of equality to solve one-step equations.
- I can use one-step equations to solve problems in context and interpret the meaning of the solution.
- I can describe a situation that can be represented by a one-step equation.

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Differentiation Use after Lesson 5

Support

Provide targeted intervention.

If student work shows **partial understanding** of writing a situation to represent an equation, consider:

- Using the ***Writing and Solving Equations*** **Mini-Lesson**.
- Reviewing the **Lesson 4 Summary**.

Strengthen

Reinforce students' understanding.

If student work shows **conceptual understanding** with minor errors, consider:

- Revisiting **Activity 1.** Invite students to choose other equations, solve them, and create situations for the ones they haven't yet completed.
- Assigning the **Lesson Practice**.

Stretch

Challenge students and extend their learning.

If students would enjoy an **additional challenge**, consider:

- Inviting students to **create their own situations and equations** that model them. Encourage them to solve each other's problems.
- Assigning the **Sub-Unit 1 Extensions**.

Support, *Strengthen*, and *Stretch* learning by assigning these digital resources that adjust to each student's current level of skill and understanding.

- **Boost Personalized Learning**
- **Fluency Practice**
- **Math Adventures**

Math Language Development

Use the **Math Language Development Resources** for further language support with all your students, including those building English proficiency.

- English/Spanish cognates
- English/Spanish Glossary, e.g., **properties of equality/propiedades de la igualdad**
- Frayer model templates
- Math Language Routine display structures, e.g., **MLR1: Stronger and Clearer Each Time, MLR6: Three Reads**
- Vocabulary routines

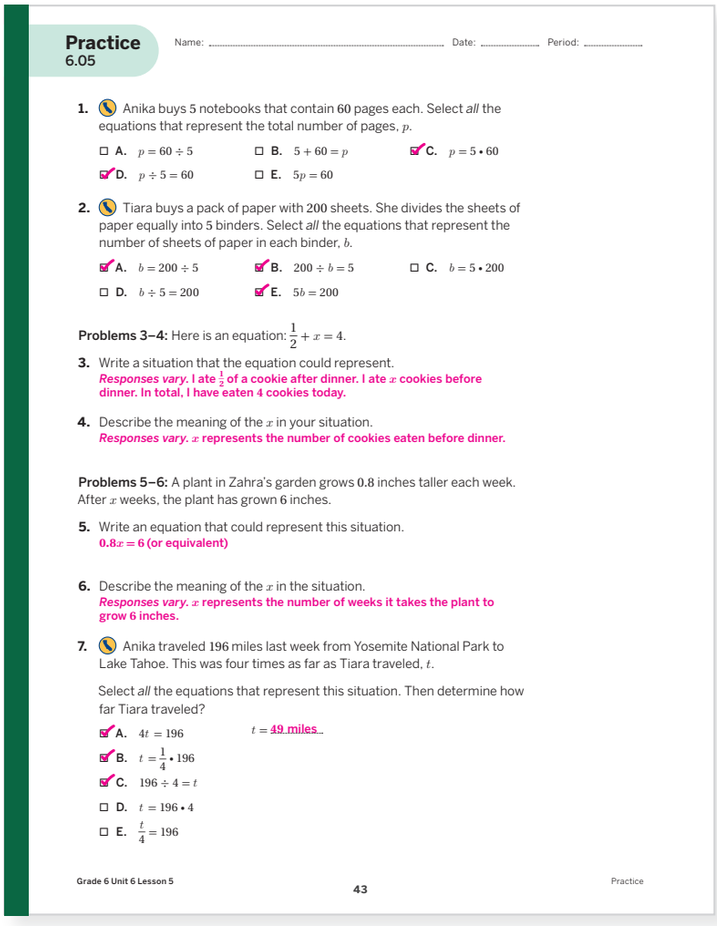
Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.

Students using digital

Students using print



Practice 6.05

Name: Date: Period:

1. Anika buys 5 notebooks that contain 60 pages each. Select *all* the equations that represent the total number of pages, p.

- ☐ A. $p = 60 \div 5$
- ☐ B. $5 + 60 = p$
- ☑ C. $p = 5 \cdot 60$
- ☑ D. $p \div 5 = 60$
- ☐ E. $5p = 60$

2. Tiara buys a pack of paper with 200 sheets. She divides the sheets of paper equally into 5 binders. Select *all* the equations that represent the number of sheets of paper in each binder, b.

- ☑ A. $b = 200 \div 5$
- ☑ B. $200 \div b = 5$
- ☐ C. $b = 5 \cdot 200$
- ☐ D. $b \div 5 = 200$
- ☑ E. $5b = 200$

Problems 3–4: Here is an equation: $\frac{1}{2} + x = 4$.

3. Write a situation that the equation could represent.
Responses vary. I ate $\frac{1}{2}$ of a cookie after dinner. I ate x cookies before dinner. In total, I have eaten 4 cookies today.

4. Describe the meaning of the x in your situation.
Responses vary. x represents the number of cookies eaten before dinner.

Problems 5–6: A plant in Zahra's garden grows 0.8 inches taller each week. After x weeks, the plant has grown 6 inches.

5. Write an equation that could represent this situation.
$0.8x = 6$ (or equivalent)

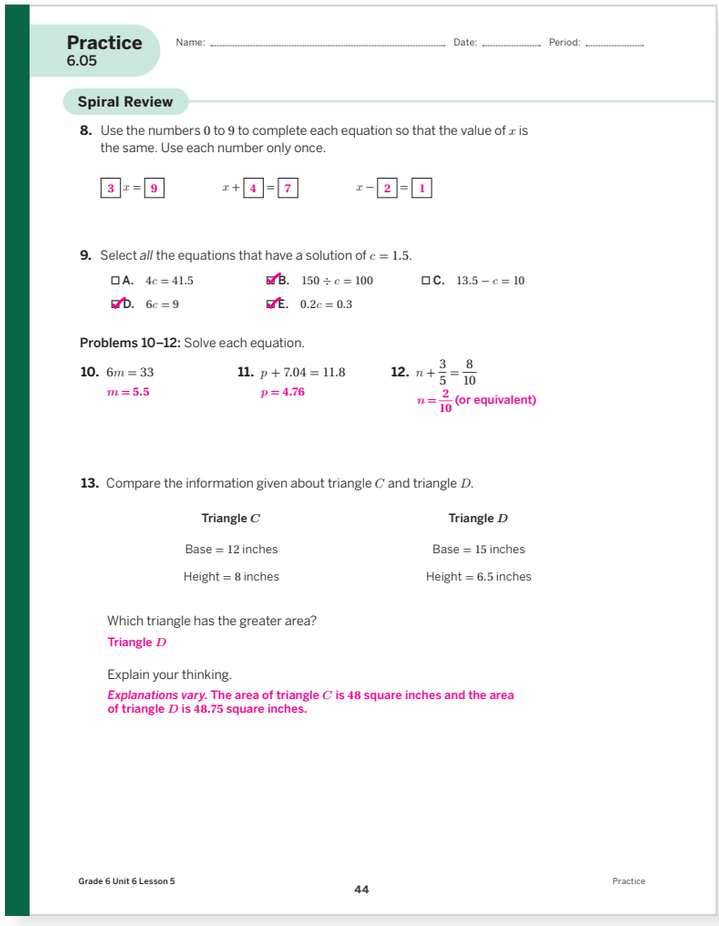
6. Describe the meaning of the x in the situation.
Responses vary. x represents the number of weeks it takes the plant to grow 6 inches.

7. Anika traveled 196 miles last week from Yosemite National Park to Lake Tahoe. This was four times as far as Tiara traveled, t.

Select *all* the equations that represent this situation. Then determine how far Tiara traveled?

- ☑ A. $4t = 196$ $t = 49$ miles
- ☑ B. $t = \frac{1}{4} \cdot 196$
- ☑ C. $196 \div 4 = t$
- ☐ D. $t = 196 \cdot 4$
- ☐ E. $\frac{t}{4} = 196$

Grade 6 Unit 6 Lesson 5 43 Practice



Practice 6.05

Name: Date: Period:

Spiral Review

8. Use the numbers 0 to 9 to complete each equation so that the value of x is the same. Use each number only once.

$\boxed{3}x = \boxed{9}$ $x + \boxed{4} = \boxed{7}$ $x - \boxed{2} = \boxed{1}$

9. Select *all* the equations that have a solution of $c = 1.5$.

- ☐ A. $4c = 41.5$
- ☑ B. $150 \div c = 100$
- ☐ C. $13.5 - c = 10$
- ☑ D. $6c = 9$
- ☑ E. $0.2c = 0.3$

Problems 10–12: Solve each equation.

10. $6m = 33$
$m = 5.5$

11. $p + 7.04 = 11.8$
$p = 4.76$

12. $n + \frac{3}{5} = \frac{8}{10}$
$n = \frac{2}{10}$ (or equivalent)

13. Compare the information given about triangle C and triangle D.

Triangle C	Triangle D
Base = 12 inches	Base = 15 inches
Height = 8 inches	Height = 6.5 inches

Which triangle has the greater area?
Triangle D

Explain your thinking.
Explanations vary. The area of triangle C is 48 square inches and the area of triangle D is 48.75 square inches.

Grade 6 Unit 6 Lesson 5 44 Practice

Practice for this lesson is available online.

Practice Problem Item Analysis

	Problem	DOK	CA CCSSM
On-Lesson			
Test Practice	1–2, 7	2	6.EE.6, 6.EE.7, SMP.2
	3–4	3	6.EE.6, 6.EE.7, SMP.2
	5–6	2	6.EE.6, 6.EE.7, SMP.2
	8	3	6.EE.6, 6.EE.7
Spiral Review			
	9	1	6.EE.5, 6.EE.7
Fluency	10–12	1	6.EE.B.7
	13	1	6.G.1

Need more Practice?

Additional practice can be found in the **Practice Resources**, **Intervention and Extension Resources**, and online resources (item banks, Boost Personalized Learning, and Fluency Practice Practice).

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