

NUMBER WORLDS[®]



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Lesson Sampler

NUMBER WORLDS

With decades of proven results in the classroom, *Number Worlds* is the only **PreK–8 math intervention** program with built-in prevention for PreK–1, and English and Spanish equity for all students. *Number Worlds* accelerates mathematical understanding and effectively brings all students to grade-level proficiency and beyond.

Educators asked, and we listened—this revolutionary program:

- is supported by long-standing research and efficacy.
- helps school districts remediate declining math scores.
- provides multiple implementation models for abbreviated and extended instruction.
- complements any core math program.
- empowers students to build conceptual understanding, procedural skills, and fluency, and apply their knowledge in real-life scenarios.
- supports multiple learning modalities with digital components, interactive activities, hands-on learning, and adaptive practice powered by *Building Blocks*.
- offers a seamless, fully-digital user experience with hands-on manipulatives and optional print materials to support in-person, remote, or hybrid learning and instruction.
- equips teachers with effective Tier 2 and Tier 3 instructions, in-lesson differentiated support for ELL students, and Spanish equity for students.

District-wide, we had double-digit gains in our middle school math scores after using Number Worlds for one year.

**—Curriculum Coordinator,
Oklahoma City Public Schools**

Explore *Number Worlds* Online Today!

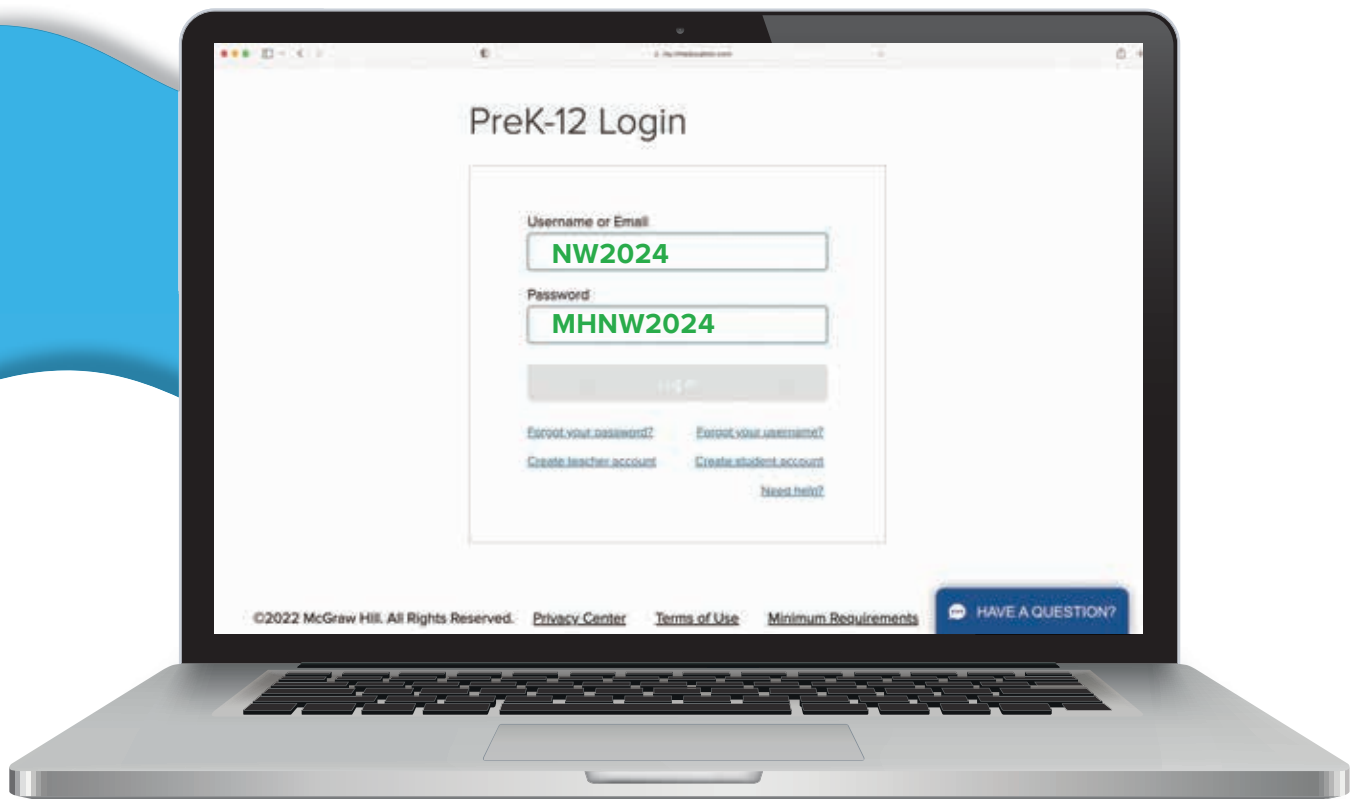


Welcome Educators!

To explore the digital experience of *Number Worlds*, please follow the below directions:

1. From your desktop computer, go to my.mheducation.com.
2. Enter the username and password displayed below.
3. Click **Log In**.

From the platform homepage, you will be able to explore a sample course of the *Number Worlds* PreK–8 program.



New to our learning platform?
Here's a short video to help you
navigate a course with ease.

NUMBER WORLDS®

Teacher Resources

Digital

Teacher Course

functions as the digital control center where teachers can plan, teach, assess student progress, and access digital instructional components.

Teacher eBook

now provides built-in, point-of-use resources such as Activity Cards, Warm-Up Cards, and Vocabulary Cards.

English Learner Support Guides

provide extra lessons, strategies, and resources to support English Language Learners.

eTool Kit

helps bring lessons alive with interactive manipulatives.

Professional Learning Environment

offers on-demand professional development resources, a Quick-Start Course, an Implementation Course, and a discussion community.

Print

Teacher Edition

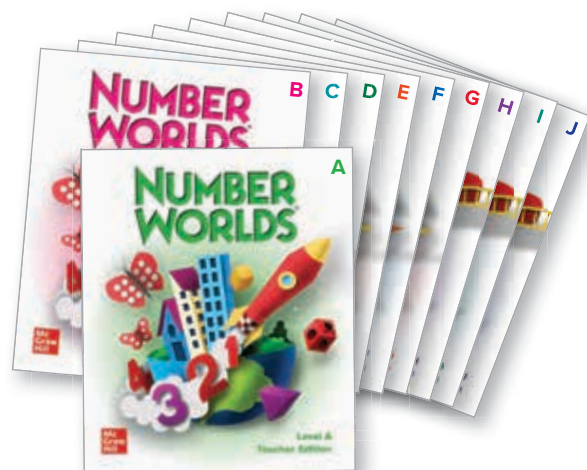
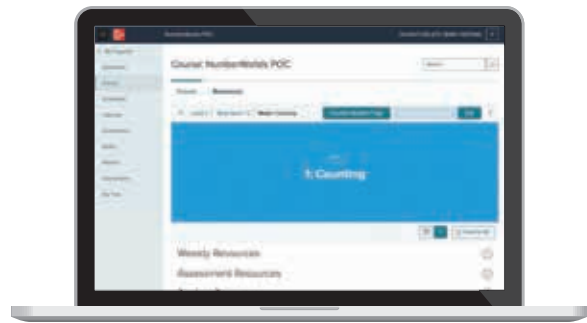
provides routine lesson plans, projects, and guidance for facilitating learning in the classroom.

Placement Test Guide

determines the appropriate level for students to start the program.

Manipulative Kit

includes math manipulatives for use in groups of five students.



Student Resources

Digital

Student Dashboard

functions as the digital access point for all student assignments, assessments, and activities.

Interactive Student Workbooks (English & Spanish)

include activities that help students develop and practice basic and higher-order thinking skills.

Practice Worksheets (English & Spanish)

provide ample opportunity to reinforce learning.

Online Assessments (English & Spanish)

enable students to access and complete in-program assessments.

eTool Kit

includes games and digital manipulatives that encourage student practice and modeling of math concepts.

Building Blocks Adaptive Learning

utilizes research-proven game-based activities designed to engage students and guide them through individualized learning trajectories.

Print

Student Workbooks (English & Spanish)

provide activities that help students develop and practice basic and higher-order thinking skills.

Manipulative Kit

includes physical manipulatives that engage students as they explore modeling math concepts and skills.

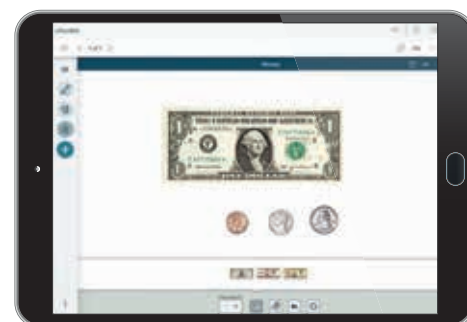
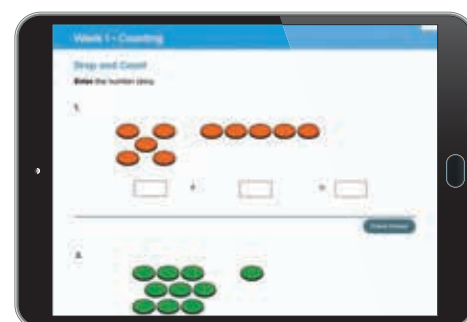


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Level C

Week 18 • Adding and Subtracting

Week at a Glance

This week students begin **Number Worlds**, Week 18 and continue to explore Object Land and Picture Land.

Background

In Picture Land, numbers are represented by numerals, which enable students to forge links between the world of real quantities (objects) and the world of formal symbols.

Teaching for Understanding

As students engage in these activities, they will associate subtraction with a decrease in quantity and will gradually become comfortable writing subtraction equations.

Observe closely while evaluating the Engage activities assigned for this week.

- Are students correctly adding and subtracting whole numbers?
- Do students use formal notation when writing addition and subtraction equations?
- Do students understand the concept of equality?

Skills Focus

- Compare and order numbers.
- Add whole numbers.
- Subtract whole numbers.


How Students Learn

As students begin this week's lesson, they should be able to write addition equations with two or more addends using formal notation.

At the end of this week, students should be able to write and solve both addition and subtraction problems using formal notation.

Key

Boldface Text = Online Resources















 = eTool

 = English Language Learners

 = Printable Resources

 = Printed Resources

Weekly Planner

Lesson	Learning Objectives	Program Materials
1	Students use spatial terms with the number sequence and use addition and subtraction in successive operations.	<ul style="list-style-type: none"> • Student Workbook  • Warm Up Card, What Number Am I? • Activity Card, Dragon Quest 2 • English Learner Support Guide Teacher eBook  • Neighborhood Number Line • Dragon Quest Game Board • Pawns, 1 per student • Spinner (1–4)
		<ul style="list-style-type: none"> • Dragon Quest Cards (+1 through +5, –1, and –2) • Picture Land Activity Sheet 10, p. A13, 1 per student  • Letters to Home   <p>Additional Materials paper and pencils</p>
2	Students continue to use spatial terms with the number sequence and to add and subtract whole numbers.	<ul style="list-style-type: none"> • Student Workbook  • Warm Up Card, What Number Am I? • Activity Card, Shopping Trip • Number Line Tool  • Neighborhood Number Line
		<ul style="list-style-type: none"> • Counters, 10 per student • Multi-Land Activity Sheet 1, p. A22, 1 per student 
3	Students gain additional practice using addition and subtraction in successive operations.	<ul style="list-style-type: none"> • Warm Up Card, What Number Am I? • Activity Card, Dragon Quest 2 • Number Line Tool  • Neighborhood Number Line • Dragon Quest Game Board • Pawns, 1 per student • Spinner (1–4)
		<ul style="list-style-type: none"> • Dragon Quest Cards (+1 through +5, –1, and –2) • Picture Land Activity Sheet 10, p. A13, 1 per student  <p>Additional Materials paper and pencils</p>
4	Students continue to use spatial terms with the number sequence and to add and subtract whole numbers.	<ul style="list-style-type: none"> • Warm Up Card, What Number Am I? • Activity Card, Shopping Trip • Neighborhood Number Line
		<ul style="list-style-type: none"> • Counters, 10 for each student • Multi-Land Activity Sheet 1, p. A22, 1 per student 
5	<p>Review and Assess</p> <p>Students will review and reinforce skills and concepts learned this week and in previous weeks.</p>	<ul style="list-style-type: none"> • Student Workbook  • Weekly Test, Assessment  • Neighborhood Number Line • Assessment Teacher eBook
Project	Students add, subtract, and compare whole numbers.	<ul style="list-style-type: none"> • Math-Link Cubes • Cats & Dogs, p. A28  <p>Additional Materials</p> <ul style="list-style-type: none"> • activity sheet • sheets of bulletin board paper • glue • copier paper • crayons or markers

Lesson 1

Objective

Students use spatial terms with the number sequence and use addition and subtraction in successive operations.

Vocabulary

- **quest:** A search or adventure
- **pawn:** Game piece

Creating Context ELL

Although it is important to ask beginning English Learners questions that have a lower language demand, this does not mean that questions should have a lower cognitive load. Ask English Learners to demonstrate their understanding with manipulatives, models, and illustrations.

Materials

Program Materials

Warm Up

Neighborhood Number Line

Additional Materials

Engage

paper and pencils

Engage

- Dragon Quest Game Board
- Pawns, 1 per student
- Spinner (1–4)
- Dragon Quest Cards +1 through +5, –1, and –2
- Picture Land Activity Sheet 10, p. A13, 1 per student

Prepare Ahead

Make sure the pile of Dragon Quest Cards contains only 1–5 Addition Cards and 1–2 Subtraction Cards. Make sure the top six cards in the facedown pile are addition cards so students will not have to subtract from 0 until they are ready to handle this challenge.

1 | Warm Up

What Number Am I?

Before beginning the small-group activity **Dragon Quest 2**, use the Warm Up Card **What Number Am I?** activity with the whole group.

Purpose

Students will use the spatial terms *before*, *after*, and *between* with the number sequence and add and subtract small quantities from one- and two-digit numbers.

Teacher's Note

Encourage students and families to play this game at home.

2 | Engage

Dragon Quest 2

"In today's game, you will collect buckets of water that you can use to put out a dragon's fire."

Follow the instructions on the Activity Card to play **Dragon Quest 2: The Dragon's Sister**. As students play, ask questions about what is happening in the activity.

Purpose

Students will use addition and subtraction in successive operations.

Supported Differentiation

For additional support with subtraction, students will work with a number line.

- Provide individuals or the group with a number line for reference.
- As appropriate for the group, show them subtraction problems, or have them write subtraction problems.
- Students take turns solving the problems by demonstrating the subtraction on a number line.

3 | Reflect

Extended Response

Ask questions such as the following:

- ▶ **What symbol do we use to show we are adding (or subtracting) something? Plus sign (minus sign).**
- ▶ **After each turn, how did you figure out how many more buckets of water you needed to put out the dragon's fire? Students may count on to determine the number of buckets still needed.**

Using Student Pages

Have students complete the *Student Workbook* or *Interactive Student Workbook*. Did students write the correct answer?

4 | Assess

Informal Assessment

Use the following table for informal observations.

Below the informal assessment questions are some tips on how you might teach these skills in future lessons.

What Number Am I?	Dragon Quest 2
Did the student <input type="checkbox"/> respond accurately? <input type="checkbox"/> respond quickly? <input type="checkbox"/> respond with confidence? <input type="checkbox"/> self-correct? <ul style="list-style-type: none"> • Improve accuracy by asking students to explain the meaning of the clue word <i>less</i> to each other. • Build self-confidence by having volunteers explain the game in terms of addition. • Build confidence by encouraging students to employ computing skills to explain the game in terms of subtraction. 	Did the student <input type="checkbox"/> make important observations? <input type="checkbox"/> extend or generalize learning? <input type="checkbox"/> provide insightful answers? <input type="checkbox"/> pose insightful questions? <ul style="list-style-type: none"> • Build observational skills by having students verify the correct movement of a classmate's game piece. • Build insightful answering by having students explain how they know their addition or subtraction is correct. • Extend learning by asking students for a variety of methods to work out negative answers.

Answer Key

* *Interactive Student Workbook* answers are available online.

Week 18 • Adding and Subtracting

Dragon Quest 2

Name _____ Date _____

Write the answer.

1.

$$3 - 2 = \underline{1}$$

2.

$$3 + 2 = \underline{5}$$

3.

$$4 + 5 = \underline{9}$$

4.

$$4 - 2 = \underline{2}$$



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Student Workbook, p. 56

Lesson 2

Objective

Students continue to use spatial terms with the number sequence and to add and subtract whole numbers.

Vocabulary

- **before:** In front of; coming first
- **after:** Behind; coming later

Creating Context

Prepositions are not in the beginning level of language proficiency. Help English Learners practice prepositions such as *before*, *after*, and *between* when they line up for recess. Have students identify who is before them in line, who is after them, and who is between two other students.

Materials

Program Materials

Warm Up

Neighborhood Number Line

Engage

- Counters, 10 per student
- Multi-Land Activity Sheet 1, p. A22, 1 per student

1 | Warm Up

What Number Am I?

Before beginning the small-group activity **Shopping Trip**, use the Warm Up Card **What Number Am I?** activity with the whole group.

Purpose

Students will use the spatial terms *before*, *after*, and *between* with the number sequence and will add and subtract small quantities from one- and two-digit numbers.

2 | Engage

Shopping Trip

“Today we are going to take a pretend shopping trip.”

Follow the instructions on the Activity Card to play **Shopping Trip**. As students play, ask questions about what is happening in the activity.

Purpose

Students will add together a series of numbers and then subtract that amount from a specified quantity.

Teacher's Note

This activity can be used again with different shopping “goals.” For example, you can ask students to spend all ten Counters, or to spend them as quickly (with the fewest purchases) or as slowly (with the most purchases) as possible. Note that you can and should adjust the amount of Counters each student starts with to meet the needs of your group.

Supported Differentiation

For additional support understanding number sequence, students will use the Number Line Tool.

- Students will give clues as in **What Number Am I?**
- One student will give a clue and another student will point out the correct number on the number line.
- Have students change roles.

3 | Reflect

Extended Response

Ask questions such as the following:

- ▶ How did you figure out which items to buy? *Answers will vary.*
- ▶ How did you keep track of how many Counters you had spent when you were deciding what to buy next? *Accept all reasonable answers.*

Using Student Pages

Have students complete the *Student Workbook* or *Interactive Student Workbook*. Did students write the correct number story?

4 | Assess

Informal Assessment

Use the following table for informal observations.

Below the informal assessment questions are some tips on how you might teach these skills in future lessons.

What Number Am I?	Shopping Trip
<p>Did the student</p> <ul style="list-style-type: none"> <input type="checkbox"/> respond accurately? <input type="checkbox"/> respond quickly? <input type="checkbox"/> respond with confidence? <input type="checkbox"/> self-correct? <ul style="list-style-type: none"> • Improve accuracy by asking students to explain the meaning of the clue word less to each other. • Build self-confidence by having volunteers explain the game in terms of addition. • Build confidence by encouraging students to employ computing skills to explain the game in terms of subtraction. 	<p>Did the student</p> <ul style="list-style-type: none"> <input type="checkbox"/> pay attention to the contributions of others? <input type="checkbox"/> contribute information and ideas? <input type="checkbox"/> improve on a strategy? <input type="checkbox"/> reflect on and check accuracy of work? <ul style="list-style-type: none"> • Improve attention to other by having students verify each other's totals. • Build contributions of ideas by having students suggest strategies for quickly adding or subtracting. • Encourage students to reflect on their work by asking them to explain how they planned their lists.

Answer Key


* *Interactive Student Workbook* answers are available online.

Week 18 • Adding and Subtracting


Shopping Trip

Name _____ Date _____

Write the number story.

1.  $10 - 6 = 4$

2.  $6 - 3 = 3$

3.  $7 - 6 = 1$

4.  $5 - 3 = 2$

Week 18 Adding and Subtracting 57

Student Workbook, p. 57

Lesson 3

Objective

Students gain additional practice using addition and subtraction in successive operations.

Vocabulary

- **add:** To put together
- **subtract:** To take away

Creating Context

English Learners often understand math concepts better when they can interact with other students who speak the same primary language. Allow students to work with partners or cross-age helpers who speak the same primary language so they can check understanding with one another in team situations.

Materials

Program Materials

Warm Up

Neighborhood Number Line

Additional Materials

Engage

paper and pencils

Engage

- Dragon Quest Game Board
- Pawns, 1 per student
- Spinner (1–4)
- Dragon Quest Cards +1 through +5, –1, and –2
- Picture Land Activity Sheet 10, p. A13, 1 per student

Prepare Ahead

Make sure the pile of Dragon Quest Cards contains only 1–5 Addition Cards and 1–2 Subtraction Cards. Make sure the top six cards in the facedown pile are addition cards so students will not have to subtract from 0 until they are ready to handle this challenge.

1 | Warm Up

What Number Am I?

Before beginning the small-group activity **Dragon Quest 2**, use the Warm Up Card **What Number Am I?** activity with the whole group.

Purpose

Students use the spatial terms *before*, *after*, and *between* with the number sequence and add and subtract small quantities from one- and two-digit numbers.

2 | Engage

Dragon Quest 2

“In today’s game, you will collect buckets of water you can use to put out a dragon’s fire.”

Follow the instructions on the Activity Card to play **Dragon Quest 2: The Dragon’s Sister**. As students play, ask questions about what is happening in the activity.

Purpose

Students will use addition and subtraction in successive operations.

Teacher’s Note

Encourage students to use this week’s vocabulary words as they engage in the activities, discuss math concepts, and make predictions.

Supported Differentiation

For additional support with the number sequence, students will work with the Number Line Tool.

- Tell students they will solve number riddles using the number line.
- Have a student ask a classmate a riddle, such as those in **What Number Am I?**
- The classmate will use the number line and point to the answer.
- The group will decide whether the answer is correct.

3 | Reflect

Extended Response

Ask questions such as the following:

- ▶ **How do you know if you've won the game? How can you prove you're the winner?** Students have won when they get at least fifteen buckets of water and land in the dragon's lair. They may check their answers by adding and subtracting their cards a second time or by reviewing the Activity Sheet.
- ▶ **Did anyone get a lot of big numbers? Did this help you get a lot of buckets or did it slow you down? Why?** Encourage students to refer to their completed Activity Sheets to explain their answers.

4 | Assess

Informal Assessment

Use the following table for informal observations.

Below the informal assessment questions are some tips on how you might teach these skills in future lessons.

What Number Am I?	Dragon Quest 2
<p>Did the student</p> <ul style="list-style-type: none"> <input type="checkbox"/> respond accurately? <input type="checkbox"/> respond quickly? <input type="checkbox"/> respond with confidence? <input type="checkbox"/> self-correct? <ul style="list-style-type: none"> • Improve accuracy by asking students to explain the meaning of the clue word less to each other. • Build self-confidence by having volunteers explain the game in terms of addition. • Build confidence by encouraging students to employ computing skills to explain the game in terms of subtraction. 	<p>Did the student</p> <ul style="list-style-type: none"> <input type="checkbox"/> provide a clear explanation? <input type="checkbox"/> communicate reasons and strategies? <input type="checkbox"/> choose appropriate strategies? <input type="checkbox"/> argue logically? <ul style="list-style-type: none"> • Improve logical arguing by having students discuss why some answers are negative numbers. • Build explanation skills by asking students to verify each other's running totals. • Improve communication of strategies by having students explain what they would like their next move to be.



Dragon Quest Game Board

Dragon Quest 2 and 3 Record Form

Name _____

<input type="text"/>	_____	=	<input type="text"/>
<input type="text"/>	_____	=	<input type="text"/>
<input type="text"/>	_____	=	<input type="text"/>
<input type="text"/>	_____	=	<input type="text"/>
<input type="text"/>	_____	=	<input type="text"/>
<input type="text"/>	_____	=	<input type="text"/>
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<input type="text"/>	_____	=	<input type="text"/>
<input type="text"/>	_____	=	<input type="text"/>
<input type="text"/>	_____	=	<input type="text"/>

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Picture Land • Activity Sheet 10 A13

Picture Land Activity Sheet 10, p. A13

Lesson 4

Objective

Students continue to use spatial terms with the number sequence and to add and subtract whole numbers.

Vocabulary

- **between:** In the middle of two things
- **plus sign:** Symbol that means “add”

Creating Context ELL

Some English Learners may have lived outside the United States and may have different shopping experiences, such as shopping in an open-air market. Ask students to describe a recent shopping trip. Did they have a list of items to buy? Have students create a shopping list by drawing pictures and by writing a numeral to indicate the quantity of each item they would buy.

Materials

Program Materials

Warm Up

Neighborhood Number Line

Engage

- Counters, 10 for each student
- Multi-Land Activity Sheet 1, p. A22, 1 per student

1 | Warm Up

What Number Am I?

Before beginning the small-group activity **Shopping Trip**, use the Warm Up Card **What Number Am I?** activity with the whole group.

Purpose

Students will use the spatial terms *before*, *after*, and *between* with the number sequence and will add and subtract small quantities from one- and two-digit numbers.

2 | Engage

Shopping Trip

“Today we are going to take a pretend shopping trip.”

Follow the instructions on the Activity Card to play **Shopping Trip**. As students play, ask questions about what is happening in the activity.

Purpose

Students add together a series of numbers and subtract that amount from a specified quantity.

Supported Differentiation

For additional support with subtracting, students will play a challenge version of **Shopping Trip**.

- Review the **Shopping Trip** activity.
- Have students start with 15 Counters.

3 | Reflect

Extended Response

Ask questions such as the following:

- ▶ **How did you solve this problem? Why did you choose this strategy?**
Accept all reasonable answers.
- ▶ **Can you think of other times at school or at home when you need to count money?** Accept all reasonable answers.

4 | Assess

Informal Assessment

Use the following table for informal observations.

Below the informal assessment questions are some tips on how you might teach these skills in future lessons.

What Number Am I?	Shopping Trip
Did the student <input type="checkbox"/> respond accurately? <input type="checkbox"/> respond quickly? <input type="checkbox"/> respond with confidence? <input type="checkbox"/> self-correct? <ul style="list-style-type: none"> • Improve accuracy by asking students to explain the meaning of the clue word less to each other. • Build self-confidence by having volunteers explain the game in terms of addition. • Build confidence by encouraging students to employ computing skills to explain the game in terms of subtraction. 	Did the student <input type="checkbox"/> apply learning to new situations? <input type="checkbox"/> contribute concepts? <input type="checkbox"/> contribute answers? <input type="checkbox"/> connect mathematics to the real world? <ul style="list-style-type: none"> • Improve contributions of answers by asking for a variety of answers and explanations to the "Questions to Ask." • Build connections to the real world by discussing actual shopping and spending trips on which students have gone. • Help students apply learning by having the class create other shopping lists and trips.

Shopping Trip Name _____

pencil 2¢ ring 3¢ crayons 3¢ ball 4¢ apple 2¢
 balloon 3¢ game 4¢ goldfish 3¢ sunglasses 5¢
 ruler 2¢ paint 2¢ kite 2¢ whistle 5¢
 notebook 4¢ piggybank 1¢ hairbrush 5¢ flower 1¢
 hula hoop 3¢ magnifying glass 4¢ jump rope 1¢ jacks 1¢

A22 Multi-Land • Activity Sheet 1

Multi-Land Activity Sheet 1, p. A22

Lesson 5 • Review

Objective

Students will review and reinforce skills and concepts learned this week and in previous weeks.

Creating Context **ELL**

Playing games is an excellent way to give English Learners practice listening to and speaking English. Wait time is built into the process, and the low-stakes environment makes the use of games an enjoyable learning tool.

Materials

Program Materials

Warm Up

Neighborhood Number Line

Engage

See activity chosen for materials.

1 | Warm Up

What Number Am I?

Before beginning the **Free-Choice** activity, use the Warm Up Card **What Number Am I?** activity with the whole group.

Purpose

Students continue to use the spatial terms *before*, *after*, and *between* with the number sequence and to add and subtract small quantities from one- and two-digit numbers.

2 | Engage

Free-Choice Activity

For the last day of the week, allow students to choose an activity from this week or the previous weeks. Some activities they may choose include the following:

- Line Land: **Secret Shopping Game**
- Object Land: **Three Area Counter Drop**
- Picture Land: **Counter Dropping**

Make a note of the activities students select. Do they prefer easy or challenging activities? Continue to provide Challenge opportunities for students who have mastered the basic activities.

Progress Monitoring

If... students would benefit from extra practice on specific skills,

▶ Then... choose an activity for them.

Supported Differentiation

For additional support with adding and subtracting in successive operations, students will do Challenge 1 of **Drag Quest 2: The Dragon's Sister**.

- Review the **Dragon Quest 2: The Dragon's Sister** activity.
- Eliminate “stacking the deck” at the start of the game and shuffle the cards in the traditional fashion.
- Have students discuss options when students draw a subtraction card before an addition card and are faced with the challenge of subtracting from 0.
- Allow for conversations among themselves and with the teacher.

3 | Reflect

Extended Response

Ask questions such as the following:

- ▶ What did you like about playing Dragon Quest 2?
- ▶ Was there anything about playing this game you didn't like?
- ▶ Did this game help you do something you couldn't do before? What did it help you do?
- ▶ What was easy when you were playing Shopping Trip?
- ▶ What was hard when you were playing Shopping Trip?
- ▶ What do you remember most about this game?
- ▶ What was your favorite part?

Using Student Pages

Have students complete the *Student Workbook* or *Interactive Student Workbook*. Is the student correctly applying the skills learned in Week 18?

4 | Assess

Formal Assessment

Have students take the weekly assessment on the *Assessment* page.

Record formal assessment scores on the Student Assessment Record, found in *Assessment*. Alternatively, navigate to your course and select Assignments to input results of the weekly assessment and review progress. Use test results and observations to determine the next steps for each student.

Answer Key

* *Interactive Student Workbook* answers are available online.

Week 18 • Adding and Subtracting

Review

Name _____ Date _____

Write the answer.

1.

$$9 - 5 = \underline{4}$$

2.

$$7 - 4 = \underline{3}$$

3.

$$6 - 5 = \underline{1}$$

4.

$$2 - 2 = \underline{0}$$



58 Level C

Student Workbook, p. 58

Assessment

Name _____ Date _____

WEEK 18

Test

1. $5 - 1 = \underline{\quad}$

2.



3. $4 + 3 = \underline{\quad}$


4.



Level C Week 18 Test Adding and Subtracting 47

Assessment, p. 47

Test Instructions

-  Use the questions below with the following page to evaluate student performance this week. If students have difficulty with an individual item or items, review the associated Warm Ups and activities. If students show understanding of all the items on this assessment, they should move on to the next week of *Number Worlds*.

Lesson 1 -----

1. Write the answer. [4]

If a student has difficulty with this item, review

- *Warm Up Card 5*, What Number Am I?
- *Activity Card 32*, Dragon Quest 2: The Dragon's Sister

Lesson 2 -----

2. Write the number story. [9 – 6 = 3]

If a student has difficulty with this item, review

- *Warm Up Card 5*, What Number Am I?
- *Activity Card 33*, Shopping Trip

Lesson 3 -----

3. Write the answer. [7]

If a student has difficulty with this item, review

- *Warm Up Card 5*, What Number Am I?
- *Activity Card 32*, Dragon Quest 2: The Dragon's Sister

Lesson 4 -----

4. Write the number story. [5 – 4 = 1]

If a student has difficulty with this item, review

- *Warm Up Card 5*, What Number Am I?
- *Activity Card 33*, Shopping Trip

Name _____ Date _____

Test

1. $5 - 1 = \underline{\hspace{2cm}}$

2.



3. $4 + 3 = \underline{\hspace{2cm}}$

4.



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Project Preview

This week students will focus on adding and subtracting whole numbers. In Weeks 19 and 20, they will continue exploring whole numbers by composing subtraction equations and exploring equality. In Week 20, students will display their pet show posters.

Project-Based Learning

Standards-driven Project-Based Learning is effective in building deep content understanding. Project-Based Learning increases long-term retention of concepts and has been shown to be more effective than traditional instruction. By completing a project to answer an essential question, students are challenged to apply and demonstrate mastery of concepts and skills by expressing understanding through discussion, research, and presentation.

Essential Question

How can I add, subtract, and compare sets of numbers when preparing for a pet show?

Project Evaluation Criteria

Review project evaluation criteria with students prior to beginning the project.

Exceeds Expectations

- Advanced math vocabulary is used.
- Student shows a full knowledge and understanding of the math concepts.
- Student is able to answer all questions about the math concepts.
- Project is exceptionally prepared for sharing.
- Project is correctly organized, includes all required elements, and has additional information.

Meets Expectations

- Math vocabulary is used correctly.
- Student shows knowledge and understanding of the math concepts most of the time.
- Student is able to answer most questions about the math concepts.
- Project is prepared for sharing.
- Project is correctly organized, and all required elements are included.

Does Not Meet Expectations

- Math vocabulary is not used correctly.
- Student does not show knowledge and understanding of the math concepts.
- Student is unable to answer questions about the math concepts.
- Project is not prepared for sharing.
- Project is not correctly organized, and some elements are missing.

In the News

Objective

Students add, subtract, and compare whole numbers.

Materials

Program Materials

- Cats & Dogs p. A28
- Math-Link Cubes

Additional Materials

- activity sheet
- sheets of bulletin board paper
- glue
- copier paper
- crayons or markers

Prepare Ahead

Copy Cats & Dogs and cut out the animal squares for the students. Save the dog bones and the balls of yarn to use in Week 19. Cut bulletin board paper into a strip big enough to hold a sheet of copier paper from each group. Write *In the News* at the top of the paper.

Best Practices

- Pair oral directions with accessible pictures, icons, or written words for student needs.
- Attend to varying cognitive styles of individual students.
- Post the rules, routines, and procedures.



Introduce

Remind students that for the next few weeks they will create a pretend pet show and display the different animals on posters for the hallway.

- ▶ **Last week we created some special events for our pet show. How did we use math to explain these events?** We added the dogs and cats to show how many pets we had in all.

Write a plus symbol on the board (+).

- ▶ **What does this symbol in our number sentences tell us?** It is the addition symbol. It tells us to add the numbers.

Write an equal sign on the board (=).

- ▶ **What does this symbol in our number sentences tell us?** It is the equal sign. It tells us that the next number is the number in all.

Explore

- ▶ **In the next few weeks we will make posters for a pretend pet show. Today we will make some pretend news stories about our pet show.**
- ▶ **Watch as I tell a pretend story.**

Display two cats on the left side of a piece of white paper.

- ▶ **There were two cats in the fluffiest cat event.**

Display three cats on the right side of the paper.

- ▶ **Then three more cats joined. Then there were five cats in all.**

Write the number sentence to explain the story: $2 + 3 = 5$

Divide students into small groups.

- ▶ **Now you try it. Take turns making up an addition story using the cutouts you have of cats and dogs. Then choose your favorite pictures and your math sentence to put on the news poster.**

Write a sentence about the story. Provide a story prompt for students to copy and complete, such as: “_____ dogs and _____ cats are in a pet show.”

Have groups share their stories. Attach each story to the bulletin board paper.

- ▶ **I heard some great stories. What did you notice about all the stories?** They all had two parts put together to make a whole.

Reinforce the idea that addition is joining two sets together to make a larger set.

- ▶ **Watch as I tell another pretend story.**

Display six cats on the left side of a piece of white paper.

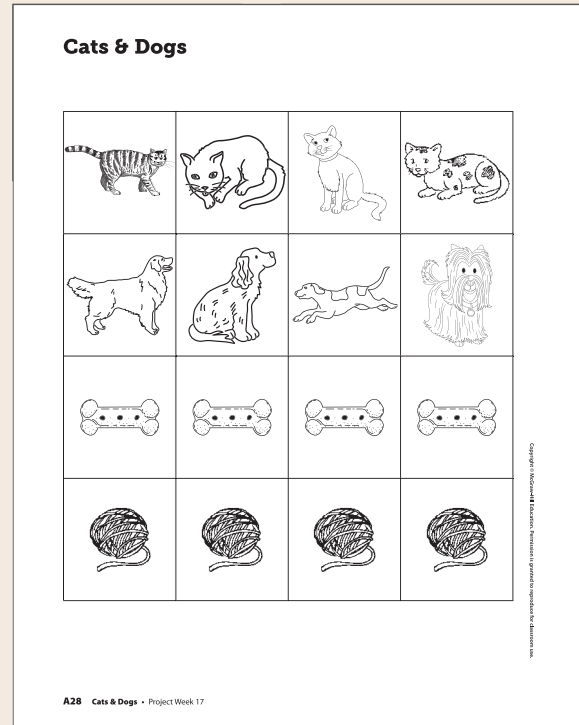
- ▶ **There were six cats in the loudest purr event.**

Cross out 2 cats.

- ▶ **Then a dog scared two cats away. Now there are only four cats left.**

Write the number sentence to explain the story at the top: $6 - 2 = 4$

- ▶ **How is this story different from my first story?** This is a subtraction story.



Cats & Dogs, p. A28

Explain that a subtraction story starts with a whole and takes part away.

Have students work again in their small groups.

- ▶ **Now you try it. Take turns making up a subtraction story using the cutouts. Then choose your favorite to put on the news poster. Use words and numbers to write about the story.**

Provide a writing prompt on the board, such as: “There were _____ cats. _____ ran away. There are _____ cats left.”

Allow groups to share their stories. Attach each story to the paper.

- ▶ **What did you notice about all of these stories?** They all started with a larger whole and a number was taken away.

Reinforce that subtraction is separating a whole into parts. If students need more support, tell stories using math link cubes. As you tell the story, remove a set. Show students the whole and its parts.

Wrap Up

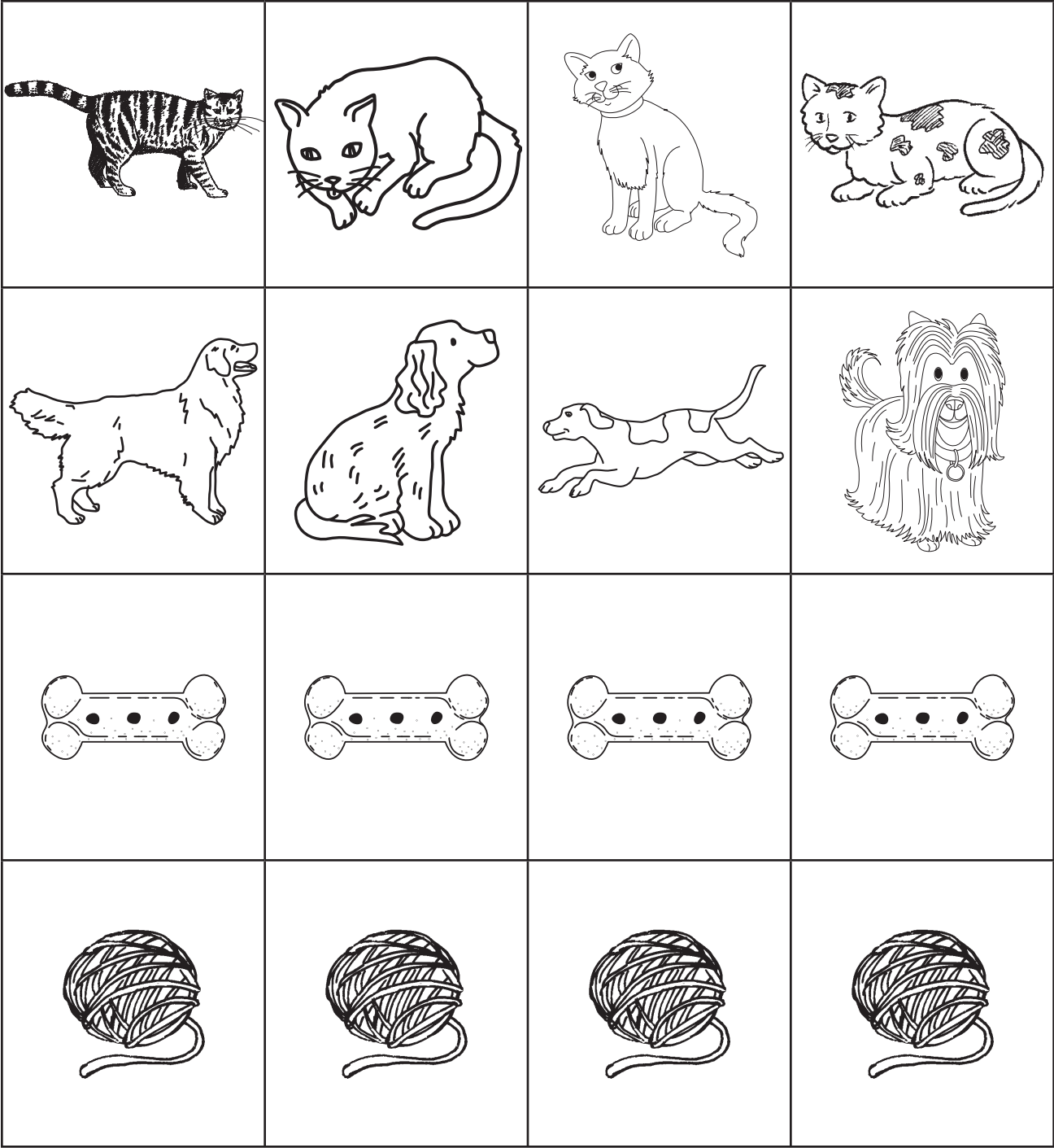
Have students turn to a partner and discuss the following question:

- ▶ **How were your two stories different?**

Listen for students’ understanding of the processes of addition and subtraction.

Roll the bulletin board paper up and save it to display on Week 20.

Cats & Dogs



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Warm Up 5

What Number Am I?

Objectives

- Use the spatial terms *before*, *after*, and *between* with the number sequence
- Predict which number will come before a specified number
- Add and subtract small quantities from single- and double-digit numbers

Materials

Program Materials

Neighborhood Number Line

Progress Monitoring

Week 9, Lesson 1

If... students have trouble remembering the clues,

▶ **Then...** give them a paper number line and some Counters or a pencil to mark off eliminated numbers.

Week 9, Lesson 2

If... students have trouble remembering the sequence of numbers,

▶ **Then...** model counting for them throughout the day.

Week 9, Lesson 3

If... students are ready for a challenge,

▶ **Then...** play the Challenge of **What Number Am I?**

Week 9, Lesson 4

If... students can consistently identify the correct number,

▶ **Then...** gradually use higher numbers.

Week 10, Lesson 1

If... students have trouble remembering the clues,

▶ **Then...** give them a paper number line and some Counters or a pencil to mark off eliminated numbers.

Week 10, Lesson 2

If... students have trouble remembering the sequence of numbers,

▶ **Then...** model counting for them throughout the day.

Week 10, Lesson 3

If... students are ready for a challenge,

▶ **Then...** play the Challenge of **What Number Am I?**

Week 10, Lesson 4

If... students can consistently identify the correct number,

▶ **Then...** gradually use higher numbers.

Week 17, Lesson 1

If... students have trouble remembering what clues have been given,

▶ **Then...** give them problems that can be solved with only one clue. For example, “When you’re counting by twos, what number comes after 12?”

Week 17, Lesson 2

If... students have trouble remembering the clues or solving the problem,

▶ **Then...** give them a paper number line and a pencil so they can mark off eliminated numbers.

Week 17, Lesson 3

If... students have a good understanding of the concepts *before* and *after*,

▶ **Then...** organize the class into groups, and have students take turns giving number clues to each other.

Progress Monitoring *Continued*

Week 17, Lesson 4

If... students have a good understanding of the concepts *before* and *after*,

▶ **Then...** organize the class into groups, and have students take turns giving number clues to each other.

Week 17, Lesson 5

If... students are comfortable playing the activity,

▶ **Then...** invite volunteers to make up number riddles for the class.

Week 18, Lesson 1

If... students have trouble remembering what clues have been given,

▶ **Then...** give them paper number lines and pencils that they can use to mark off eliminated numbers.

Week 18, Lesson 2

If... students have trouble remembering the clues,

▶ **Then...** give them problems with fewer clues. For example, “I come 2 numbers before 19.”

Week 18, Lesson 3

If... students have a good understanding of *before* and *after* concepts,

▶ **Then...** divide the class into groups and have students take turns giving number clues to each other.

Week 18, Lesson 4

If... students have a good understanding of *before* and *after* concepts,

▶ **Then...** organize the class into groups, and have students take turns giving number clues to each other.

Week 18, Lesson 5

If... students are comfortable playing the activity,

▶ **Then...** invite volunteers to make up number riddles for the class.

Week 24, Lesson 4

If... students can work fluently with numbers 1–10,

▶ **Then...** challenge them to work with bigger numbers.

Week 28, Lesson 2

If... students need help with basic skills,

▶ **Then...** practice counting skills with them throughout the day.

Week 29, Lesson 4

If... students can work fluently with numbers 1 through 10,

▶ **Then...** challenge them to work with bigger numbers.

Introduce the Activity

Tell students that today they are going to solve math mysteries.

Play

- Present students with “What Number Am I?” mystery problems as a math time warm up or closure or as part of your morning routine. Sample problems include the following:
 - ▶ **I come 2 numbers after 5. I come 1 number before 8. I am 1 more than 6. What number am I?**
 - ▶ **I am more than 10. I am less than 15. The number right before me is 11. The number right after me is 13. What number am I?**
 - ▶ **I am less than 20. I am more than 18. What number am I?**
 - ▶ **For a challenge: I am one group of 10 and 4 ones. I am more than 12 and I am more than 13. I am less than 16 and I am less than 15. What number am I?**
- Use the Neighborhood Number Line to give clues about your secret number.

Concluding Play

Allow volunteers to guess, and ask them to explain their reasoning.

Questions to Ask

- ▶ The number before me is n . What number am I?
- ▶ The number after me is n . What number am I?
- ▶ I am a group of n tens and n ones. What number am I?

Challenge

After students are familiar with the activity and have a good understanding of *before* and *after*, have volunteers give clues to you or to the rest of the class, or have students in a small group take turns giving clues to each other.

Activity 32

Dragon Quest 2: The Dragon's Sister

Objective

Use addition and subtraction in successive operations

Materials

Program Materials

- Dragon Quest Game Board
- Pawns, one for each student
- Spinner (1–4)
- Dragon Quest Cards +1 through +5, –1, and –2
- Picture Land Activity Sheet 10, 1 per student

Additional Materials

paper and pencils

Prepare Ahead

- Make sure the pile of Dragon Quest Cards contains only 1–5 Addition Cards and 1–2 Subtraction Cards. The other cards will be used in a later version of the activity.
- Make sure the top six cards in the facedown pile are addition cards so that students will not have to subtract from 0 until they are ready to handle this challenge.

Progress Monitoring

Week 18, Lesson 1

If... students have trouble doing the subtraction problems,

▶ **Then...** allow them to use a number line for reference.

Week 18, Lesson 3

If... students can fluently perform the addition and subtraction required for the activity,

▶ **Then...** have them play one of the Challenge variations.

Week 23, Lesson 2

If... students have trouble doing the subtraction problems,

▶ **Then...** allow them to use a number line for reference.

Week 23, Lesson 4

If... students can fluently perform the addition and subtraction required for the activity,

▶ **Then...** have them play one of the Challenge variations.

Introduce the Activity

- Explain to students that this game is played like Dragon Quest 1, but this time the dragon's sister has come. Her lair can only be reached by a difficult path.
- The students must get fifteen buckets of water to the dragon's hideout so that they can extinguish the fire.
- Explain that because this path is more difficult, the students may spill buckets of water along the way.
- Introduce the subtraction cards, and explain that the students can either draw an addition card and collect water at the well or draw a subtraction card and spill some water.
- Introduce Picture Land Activity Sheet 10, and tell students that each student will use this form to keep track of how many buckets of water they have at the end of each turn.
- Demonstrate how to use the form before you begin game play. Point out that there is a row of empty boxes for each turn. Show students that each row has a place to write how many buckets they have at the start of the turn, whether they are going to add or subtract buckets (+ or –), how many they are adding or subtracting, and how many they have at the end of that turn.
- Tell students that they have 0 buckets of water at the start of Turn 1, so a 0 should be entered in the first box of the Activity Sheet for Turn 1.
- Model picking an addition card and using the information on the card to fill in the remaining boxes for Turn 1.
- Tell students that the number of buckets they have at the end of a turn is the same number that they start with for the next turn, so they should bring that number down to the first box on the next line. Model this for the students.
- Model picking two additional cards (including a subtraction card) and using the information on the cards to fill in the boxes for Turns 2 and 3. Ask students to help you pick the cards or fill in the form.

Play

- Students will begin the game with their Pawns, inside the village walls, and will take turns using the Spinner to advance along the game board.
- When a student lands on a well (star square), he or she will pick a card and use the information on the card to complete the Activity Sheet for that turn. The other students should observe the process to make sure the recording is done correctly. When the recording is completed, the Spinner is passed to the next player.
- Encourage students to talk aloud as they complete their record sheet so other students can follow the process. Also encourage them to call on classmates for help if needed.

- Remind students that they have no buckets of water at the start of Turn 1, so they should write a 0 in the first box for that line. Also remind students to take their final sum for each turn in which they land on a well and to enter it in the first box of the following line.

Concluding Play

- If students reach the dragon’s lair with fewer than 15 buckets of water, they become the dragon’s prisoners and must wait for another player to rescue them. Have these students check their work to find out where they miscalculated.
- The first player to reach the dragon’s lair with at least 15 buckets of water will extinguish the dragon’s fire, free any imprisoned classmates, and win the game.
- Before a player can claim to have won the game, the others players must check that player’s record sheet to confirm that a total of at least 15 buckets of water has been collected. If an error is detected and the total is less than 15, that player also becomes the dragon’s prisoner and must wait for another player to rescue him or her.

Questions to Ask

Encourage students to focus on the process involved in adding and subtracting the buckets of water. Ask questions that require the students to identify signs and symbols, estimate answers, and make predictions about how many more buckets of water they need.

- ▶ **How many buckets did you have before you picked that card?**
- ▶ **What must you do now, add or subtract?**
- ▶ **What symbol do we use to show we are adding (or subtracting) something?**
- ▶ **How many buckets do you think you will have left after you take away those buckets?**
- ▶ **How many more buckets do you need to put out the dragon’s fire?**

Challenge 1

When students are ready for a challenge, eliminate “stacking the deck” at the start of the game and shuffle the cards in the traditional fashion. This will give students the possibility of drawing a subtraction card before an addition card and they will be faced with the challenge of subtracting from 0. Students often handle this challenge in interesting ways. Some students figure out how to solve and record this sort of problem by themselves, often by discussing it with their classmates. Others call on the teacher for help. Others use a learning tool such as a number line with negative numbers to help them solve the problem. Spending

time in “negative land” while playing this game can teach students a great deal about negative numbers.

Ask questions such as the following:

- ▶ **Did anyone get a lot of negative numbers?**
- ▶ **How did this affect the total number of buckets you collected during the game?**

Challenge 2

To provide practice with mental addition and subtraction, have students eliminate the written record and arrange the acquired cards in an elimination format, such as -4 cancels $+4$, and -2 and -1 cancel $+3$. Alternatively, have students figure out how many buckets they collected and spilled, then figure out the difference to determine how many buckets they have. Note that this version of the game provides mental math practice only if someone is available to repeatedly ask students to comment on how many buckets they have now, how many more they need, and how they figured out the answer. Other questions include the following:

- ▶ **Who has the most buckets?**
- ▶ **Who has the least?**
- ▶ **How do you know?**

Dragon Quest



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NUMBER WORLDS

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Dragon Quest 2 and 3 Record Form

Name _____

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Activity 33

Shopping Trip

Objective

Add together a series of numbers, and then subtract that amount from a specified quantity

Materials

Program Materials

- Counters, 10 for each student
- Multi-Land Activity Sheet 1, p. A22, 1 per student

Progress Monitoring

Week 18, Lesson 2

- | | |
|---|--|
| If... students have trouble remembering how many Counters they have spent, | ▶ Then... allow them to keep a running tally on a piece of paper. |
|---|--|

Week 18, Lesson 4

- | | |
|---|---|
| If... students can play the game fluently, | ▶ Then... challenge them to play with 15 Counters. |
|---|---|

Introduce the Activity

Tell the students that they are going on a pretend shopping trip.

Play

- Distribute the Activity Sheets and tell students that they each have 10 Counters to spend. They should decide which items they can buy and still have at least 1 Counter left over.
- Give students time to figure out which items they can purchase.

Concluding Play

Have students take turns telling the group what they will buy, one purchase at a time, adding and subtracting when necessary.

Questions to Ask

Ask questions that lead students to explain the processes they applied to determine what they could purchase.

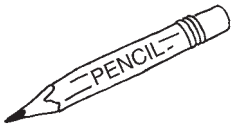
- ▶ **Did they add together prices until they were close to the 10-Counter limit and then subtract?**
- ▶ **Did they subtract each item from 10 as they chose it?**

Teacher's Note

This activity is a popular one with students and provides substantial practice in addition and subtraction. You may find it useful to create a poster-sized, color version of the shopping guide to display in front of the class and to use as a focal point for whole-class discussions.

Shopping Trip

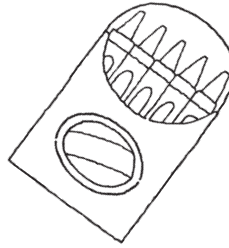
Name _____



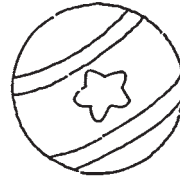
pencil 2¢



ring 3¢



crayons 3¢



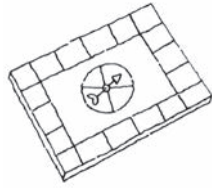
ball 4¢



apple 2¢



balloon 3¢



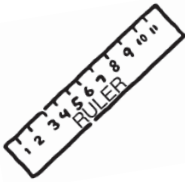
game 4¢



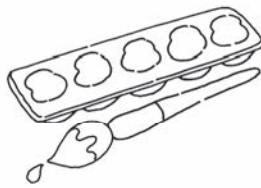
goldfish 3¢



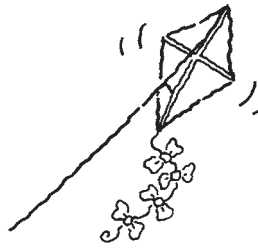
sunglasses 5¢



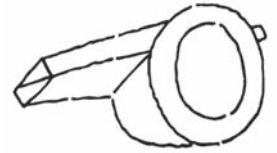
ruler 2¢



paint 2¢



kite 2¢



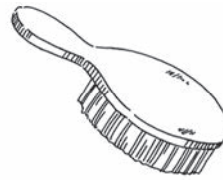
whistle 5¢



notebook 4¢



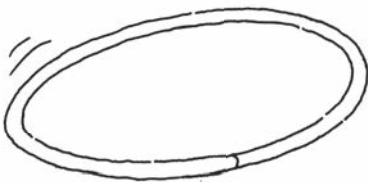
piggybank 1¢



hairbrush 5¢



flower 1¢



hula hoop 3¢



magnifying
glass 4¢



jump rope 1¢



jacks 1¢

Dragon Quest 2

Name _____ Date _____

Write the answer.

1.

$$3 - 2 = \underline{1}$$

2.

$$3 + 2 = \underline{5}$$

3.

$$4 + 5 = \underline{9}$$

4.

$$4 - 2 = \underline{2}$$



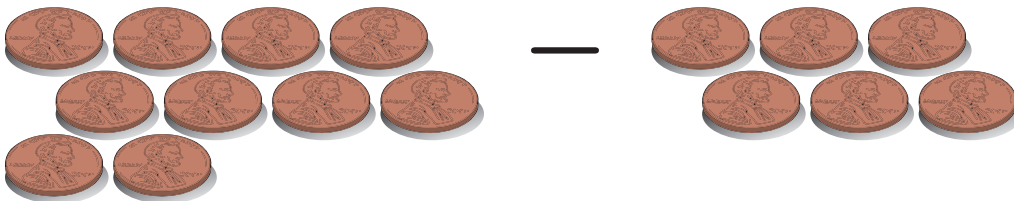
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Shopping Trip

Name _____ Date _____

Write the number story.

1.



$$10 - 6 = 4$$

2.



$$6 - 3 = 3$$

3.



$$7 - 6 = 1$$

4.



$$5 - 3 = 2$$

Review

Name _____ Date _____

Write the answer.

1.

$$9 - 5 = \underline{4}$$

2.

$$7 - 4 = \underline{3}$$

3.

$$6 - 5 = \underline{1}$$

4.

$$2 - 2 = \underline{0}$$



Letter to Home

Dear Family,

This week your child will use addition and subtraction in successive operations. Your child applied this concept by solving the equations below.

Discuss the activity with your child by asking questions such as the following:

- How did you figure out what numbers to write in the blanks?
- What do you notice about the first and last problems?

Assisting Your Child

If . . . your child has difficulty completing the equations,

Then . . . help your child draw a number line at the bottom of this paper. Have your child place his or her finger on the starting point and move right for addition and left for subtraction.

This week your child will continue using the *Number Worlds* program to master these concepts.

Estimada familia:

Esta semana su hijo(a) va a usar la suma y la resta en operaciones sucesivas. En el área de abajo, su hijo(a) aplicó este concepto resolviendo las siguientes ecuaciones.

Hable con su hijo(a) sobre esta actividad haciéndole las siguientes preguntas:

- ¿Cómo determinaste qué números debías escribir en los espacios en blanco?
- ¿Qué has notado acerca del primer y último problema?

Ayude a su hijo(a)

Si . . . su hijo(a) tiene problemas completando las ecuaciones,

Entonces . . . ayúdelo(a) a trazar una recta numérica en la parte inferior de esta hoja. Pídale que coloque su dedo en el punto de comienzo y lo mueva a la derecha para sumar y a la izquierda para restar. Esta semana su hijo(a) va a seguir usando el programa *El mundo de los números* para dominar estos conceptos.

Write the answer.

1. $1 + 5 + 1 + 3 =$ _____

2. $2 + 5 - 3 + 5 =$ _____

3. $4 + 8 - 3 + 2 =$ _____

4. $1 + 3 + 1 + 5 =$ _____

Level E

Unit 4 • Multiplication and Division

Unit at a Glance

This **Number Worlds** unit builds on prior knowledge of models of multiplication and basic multiplication facts. Students will apply this knowledge to extend their understanding of repeating addition and arrays as models for multiplication, as well as memorize the basic multiplication facts to tens. They will also develop skills for multiplying a multi-digit by a one-digit number, and learn basic division. Students will apply their understanding of the relationship of multiplication and division to solve simple word problems involving these operations.

Skills Trace

Before Level E	Level E	After Level E
<p>Level D Students can solve one and two-digit addition sentences within 100, including problem solving. They can also add and subtract within 1000 using concrete models and drawings.</p>	<p>By the end of this unit, students should be able to use repeated addition, skip counting, and arrays as models for multiplication. Students will also study and begin to memorize the multiplication table up to tens, and investigate the commutative, associative, and distributive properties of multiplication. They will also be introduced to division and use their relationship between multiplication and division to solve word problems involving these operations. The standard algorithm for long division and remainders will be introduced.</p>	<p>Moving on to Level F Students will understand the commutative, associative, and distributive properties, as well as the identity and zero properties. They will solve two-digit by two-digit multiplication sentences, as well as four-digit by one-digit multiplication sentences. They will relate multiplication to division, and will solve division problems to four-digit dividends with and without remainders.</p>

Essential Question

How can I use multiplication and division to plan for the future?

In this unit, students will explore how multiplication can be used to solve real-world problems. Each week, they will create one panel of a brochure that shows how they can help a local dog shelter. In week 6, they will publish their final six-panel brochure (digitally, if preferred) and present what they learned to the class.

Unit Overview

Week	Teacher Resources	Learning Goals
1	<p>Models for Multiplication</p> <ul style="list-style-type: none"> Teacher Edition Activity Cards 4A, 4B, 4C, 4D English Learner Support Guide Teacher eBook Assessment Teacher eBook 	<p>Students can use pictures of equal groups and repeated addition to create models for multiplication and describe sets, as well as use the \times symbol to write multiplication problems.</p> <p>Project: Students can find products and write multiplication equations using the \times symbol.</p>
2	<p>Number Lines and Arrays</p> <ul style="list-style-type: none"> Teacher Edition Activity Cards 4E, 4F, 4G, 4H English Learner Support Guide Teacher eBook Assessment Teacher eBook 	<p>Students can extend their knowledge of models for multiplication to visualize multiplication problems as arrays and investigate the commutative and associative properties of multiplication.</p> <p>Project: Students model multiplication with arrays and use the commutative and associative properties.</p>
3	<p>Building Multiplication Facts</p> <ul style="list-style-type: none"> Teacher Edition Activity Cards 4I, 4J, 4K, 4L English Learner Support Guide Teacher eBook Assessment Teacher eBook 	<p>Students can extend their knowledge of repeated addition, skip counting, and arrays to do multiplication and begin to memorize multiplication fact through tens.</p> <p>Project: Students extend their knowledge of addition to multiplication.</p>
4	<p>Beyond the Basic Facts</p> <ul style="list-style-type: none"> Teacher Edition Activity Cards 4M, 4N, 4O English Learner Support Guide Teacher eBook Assessment Teacher eBook 	<p>Students can use the distributive property to multiply multi-digit numbers and solve simple division problems with the understanding that division is the inverse of multiplication.</p> <p>Project: Students extend their knowledge of multiplication facts to multiply with multi-digit numbers using the distributive property.</p>
5	<p>Constructing Division</p> <ul style="list-style-type: none"> Teacher Edition Activity Cards 4P, 4Q, 4R English Learner Support Guide Teacher eBook Assessment Teacher eBook 	<p>Students can use grouping to develop an understanding of division. They will also solve problems involving remainders and two-digit numbers divided by one-digit numbers.</p> <p>Project: Students can use grouping to divide whole numbers and apply this knowledge to divide two-digit numbers by one-digit numbers with remainders.</p>
6	<p>Solving Word Problems</p> <ul style="list-style-type: none"> Teacher Edition Activity Cards 4S, 4T, 4U English Learner Support Guide Teacher eBook Assessment Teacher eBook 	<p>Students can solve word problems (within 100) using multiplication or division.</p> <p>Project: Students can solve multiplication and division word problems with products of 99 or less.</p>

Week 1 • Models for Multiplication

Week at a Glance

This week, students begin **Number Worlds**, Level E, Multiplication and Division. Students will explore grouping and repeated addition as models for multiplication.

Skills Focus


- Use objects and pictures to create equal groups and to identify a product.
- Relate repeated addition to pictures and groups to identify a product.
- Develop a conceptual knowledge of multiplication through the use of models.

How Students Learn

Being able to perform calculations accurately does not guarantee the students actually understand the operations they are performing. Conceptual knowledge is based on understanding the relationships represented by the numbers in the computations. Students can use pictures, charts, manipulatives, symbols, and words to interpret and define these relationships.

Key

Boldface Text = Online Resources

 = eTool

 = English Language Learners

 = Printable Resources

 = Printed Resources

Weekly Planner

Lesson	Learning Objectives	Program Materials	
1	Students can use pictures of equal groups to create models for multiplication.	<ul style="list-style-type: none"> • Student Workbook  • Activity Card, Counting Clubs – 1 • English Learner Support Guide Teacher eBook  • Vocabulary Card 1, add • Vocabulary Card 27, multiply • Sets Former Tool  • Practice Worksheet  • Letters to Home  	
2	Students can use repeated addition to create models for multiplication.	<ul style="list-style-type: none"> • Student Workbook  • Activity Card, Counting Clubs – 2 • 100 Table Tool  • Picture Cards  • Practice Worksheet  	<p>Additional Materials</p> <ul style="list-style-type: none"> • index cards • paper clips
3	Students can use the \times symbol to write multiplication problems.	<ul style="list-style-type: none"> • Student Workbook  • Activity Card, Multiplication Groups • Vocabulary Card 16, factors • Vocabulary Card 27, multiply • Multiplication Groups Recording Chart  • Number Cards (2–7) • Practice Worksheet  	
4	Students can describe groups that come in sets to build multiplication facts.	<ul style="list-style-type: none"> • Student Workbook  • Activity Card, Multiplication Mixer • Vocabulary Card 27, multiply • Sets Former Tool  • Multiplication Groups Recording Chart  • Number Cards (2–7) • Practice Worksheet  	
5	<p>Review and Assess</p> <p>Students review skills learned this week and complete the weekly assessment.</p>	<ul style="list-style-type: none"> • Student Workbook  • Weekly Test, Assessment  • Neighborhood Number Line 	
Project	Students can find products and write multiplication equations using the \times symbol.	<ul style="list-style-type: none"> • Student Workbook  • Counters • Number Cube (1–6) 	<p>Additional Materials</p> <p>letter-sized blank paper folded vertically into thirds</p>

Week 1

Models for Multiplication

Find the Math

In this week, encourage students to identify objects in groups.

Use the following to begin the discussion.

- If you own a pet, what are some additional items you need to purchase for it? Possible answers: food; treats; bedding; vitamins

Have students complete *Student Workbook* Find the Math before beginning the Warm Up.

Lesson 1

Objective

Students can use pictures of equal groups to create models for multiplication.

Vocabulary

- add
- multiply

Creating Context ELL

Help English Learners practice saying the names of things that come in groups. Create a large chart with counting numbers 1 to 20. Next to each number, have students write the name of something that comes in this grouping. Some spaces may remain blank.

Materials

Program Materials

- Vocabulary Card 1, *add*
- Vocabulary Card 27, *multiply*

1 | Warm Up

Prepare

Brainstorm with the entire class to name items that normally come in groups. Tell students that they may identify groups with only one individual item. Write the items named on the board. Do not allow students to judge or comment on others' contributions to the brainstorming list.

Lesson 1

Find the Math

Items are often sold in groups. What are some items for pets that are sold in groups? Possible answers: cat treats; dog biscuits; hamster chew sticks; crickets for reptiles



1. If you fed your cat daily treats, would you be more likely to buy ten separate packages of treats, or a box containing ten packages of treats? Why?

Possible answer: I would buy a box, so I wouldn't have to count individual packages of treats.

2. Would you rather count out 15 individual pieces from a giant box of treats, or open a package containing 15 treats?

Possible answer: I would rather open a package containing 15 treats, because it is faster than counting individual treats.

2 | Engage

Develop

Counting Clubs—1

“Today we are going to use objects of equal groups to model multiplication.” Follow the instructions on the Activity Card **Counting Clubs—1**. As students complete the activity, be sure to use the Questions to Ask.

Alternative Groupings

Pair: Use pictures or drawings of people. Ask students to choose two people to form a Club of 4 of (arms or legs). Repeat with different numbers of people and different Club numbers.

Practice

Have students complete the *Student Workbook* or *Interactive Student Workbook*. Guide students through the Key Idea example and the Try This exercises.

Supported Differentiation

For additional support, use the Sets Former Tool with students.

- Tell students that you're going to use marbles to create groups of objects.
- In the Format area of the palette, choose the Addition mat, marked with a plus sign (“+”).
- Use the Stamp tool to place marbles in the top and bottom halves of the mat.
- Use the cursor to drag marbles from one counting mat to the other.
- Model a multiplication fact, such as $4 \times 3 = 12$. Create four sets with 3 equal shares in the same color.
- The product (sum of the repeated addition sentence $3 + 3 + 3 + 3 = 12$) appears at the bottom of the mat.
- Have students identify the number of objects in each group.
- Students should use the Sets Former Tool until they can identify with confidence the number of objects in each group and the number of groups.

3 | Reflect

Think Critically

Review students' answers to the Reflect prompt in the *Student Workbook* and then review the Engage activity.

- Can twelve pencils be divided into a different number of equal groups? Yes; two groups of 6; three groups of 4; four groups of 3; six groups of 2.

4 | Assess

Informal Assessment

Use the following table for informal observations.

Counting Clubs—1

Did the student

- | | |
|---|--|
| <input type="checkbox"/> make important observations? | <input type="checkbox"/> provide insightful answers? |
| <input type="checkbox"/> extend or generalize learning? | <input type="checkbox"/> pose insightful questions? |

Additional Practice

For additional practice, have students complete the *Practice Worksheet*. Practice answers are available online.

Answer Key

* *Interactive Student Workbook* answers are available online.

Week 1 • Models for Multiplication

Lesson 1

Key Idea

Use pictures to represent groups.

Try This

Write how many are in each group.

1.  2

Draw circles to show the number of groups named.

2. Four groups of two



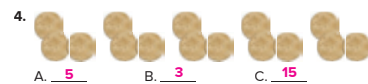
3. Three groups of four



Practice

Answer each of the questions for each drawing.

- A. How many groups?
B. How many are in each group?
C. How many altogether?



A. 5 B. 3 C. 15

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A. 2 B. 6 C. 12



A. 3 B. 3 C. 9

Reflect

Draw four groups of three pencils each. Write how many pencils there are altogether? 12

Students should draw twelve pencils shown in four groups of three.

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Student Workbook, pp. 6–7

3 | Reflect

Think Critically

Review students' answers to the Reflect prompt in the *Student Workbook* and then review the Engage activity.

Arrange students in pairs. Students should write and solve a problem similar to the one about Kelsey and Brandon. If time permits, invite students to share their stories and work.

- ▶ How would you explain this to someone who has never done this before?
- ▶ Can you think of other times outside school when you would use this skill?

Real-World Application

Suppose that your school had a fund-raiser by selling bumper stickers for \$3 each.

- ▶ Write a repeated addition sentence that shows how much money you made if you sold seven bumper stickers in one day.
 $\$3 + \$3 + \$3 + \$3 + \$3 + \$3 + \$3 = \21

4 | Assess

Informal Assessment

Use the following table for informal observations.

Counting Clubs—2	
Did the student	
<input type="checkbox"/> make important observations?	<input type="checkbox"/> provide insightful answers?
<input type="checkbox"/> extend or generalize learning?	<input type="checkbox"/> pose insightful questions?

Additional Practice

For additional practice, have students complete the *Practice Worksheet*. Practice answers are available online.

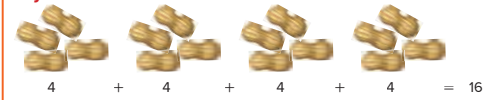
Answer Key

* Interactive Student Workbook answers are available online.

Week 1 • Models for Multiplication

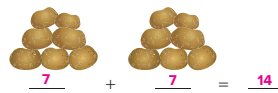
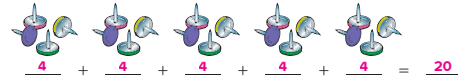


Lesson 2

Key Idea



Try This

Show a repeated addition sentence for each picture.

- 
 $7 + 7 = 14$
- 
 $4 + 4 + 4 + 4 + 4 = 20$
- 
 $2 + 2 + 2 + 2 + 2 = 10$
- 
 $7 + 7 + 7 = 21$

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Practice

Draw a picture for each repeated addition sentence.

5. $6 + 6 + 6 = 18$

Answers will vary but should include pictures of three groups of six each.

6. $9 + 9 = 18$

Answers will vary but should include pictures of two groups of nine each.

Reflect

Draw a picture that models the story below. Write repeated addition sentences to show who has more.

Kelsey and Brandon each bought a supersaver package of gum packs. Kelsey bought a package that has 5 packs of gum. Each pack has 6 pieces. Brandon bought a package that has 7 packs of gum. Each pack has 4 pieces.

Answers may vary. Kelsey's group should show five groups of six each with an addition sentence of $6 + 6 + 6 + 6 + 6 = 30$.

Brandon's group should show seven groups of four each with an addition sentence of $4 + 4 + 4 + 4 + 4 + 4 + 4 = 28$.

Kelsey has more gum.

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Student Workbook, pp. 8–9

Lesson 3

Objective

Students can use the \times symbol to write multiplication problems.

Vocabulary

- factors
- multiply

Creating Context ELL

An excellent strategy to use with English learners is to chart information visually. This gives English learners one more reference point for comprehension and assists in critically thinking.

Materials

Program Materials

- Multiplication Groups Recording Chart
- Number Cards (2–7)
- Vocabulary Card 16, *factors*
- Vocabulary Card 27, *multiply*

Prepare Ahead

- Make a copy of the Multiplication Groups Recording Chart for display.
- Make a copy of the Multiplication Groups Recording Chart for each pair of students.

1 | Warm Up

Prepare

Display a multiplication symbol.

- ▶ **Does anyone know what it means when this symbol appears between two numbers?**

Explain that this symbol is the multiplication symbol, and it tells us to multiply. Say, “It might be helpful to think of this symbol as meaning *groups of*.”

Just the Facts

Present students with $\times 1$ facts. Have them chorally call out the answer to each fact and then repeat it. Use facts such as the following:

- ▶ 1×3 equals 3. One times 3 equals 3.
- ▶ 1×4 equals 4. One times 4 equals 4.
- ▶ 1×8 equals 8. One times 8 equals 8.

2 | Engage

Develop

Multiplication Groups

“Today we are going to write multiplication problems using the multiplication symbol.” Follow the instructions on the Activity Card **Multiplication Groups**. As students complete the activity, be sure to use the Questions to Ask.

Alternative Groupings

Pair: Lay out a set of Number Cards face down, one with each amount (2–7) shown. Have each student pick one Number Card, and have both record the correct sentence on their Recording Chart. If students pick a pair of cards that has already been picked, have them pick again.

Practice

Have students complete the *Student Workbook* or *Interactive Student Workbook*. Guide students through the Key Idea example and the Try This exercises.

Supported Differentiation

For additional support, students will work in pairs to create multiplication problems using Number Cards (2–7), an index card with a multiplication symbol on it, and an index card with an equal sign on it.

- Student 1 draws two cards from the Number Cards (2–7) and creates a multiplication equation using the numbers, the multiplication symbol, and the equal sign.
- Student 2 reads the math equation. For example: $2 \times 4 =$ would be read “2 groups of 4 equals.” Once the equation has been read, students solve the equation and Student 2 reads with the product. For example: $2 \times 4 = 8$ would be read “2 groups of 4 equals 8.”
- Student 2 then rearranges the factors and Student 1 reads the new equation. For example: $4 \times 2 = 8$ would be read “4 groups of 2 equals 8.”
- Replace the Number Cards into the stack and have students switch roles with 2 new numbers.

3 | Reflect

Think Critically

Review students' answers to the Reflect prompt in the *Student Workbook* and then review the Engage activity.

- ▶ Was it easy or difficult to think of an item that comes in a group of two?
- ▶ What is the lowest number you can think of that is used to group items together?

Real-World Application

Provide an advertisement that includes pictures of items that can be bought in groups. Have students create an advertisement that shows how many dinner rolls a customer gets when he or she buys 3 packages of rolls with 6 rolls per package.

- ▶ How many groups of rolls are purchased? **3**
- ▶ How many rolls are in each group? **6**
- ▶ Write a repeated addition expression for the rolls purchased.
 $6 + 6 + 6$
- ▶ Write a multiplication sentence using the \times symbol. **$3 \times 6 = 18$**

4 | Assess

Informal Assessment

Use the following table for informal observations.

Multiplication Groups	
Did the student	
<input type="checkbox"/> make important observations?	<input type="checkbox"/> provide insightful answers?
<input type="checkbox"/> extend or generalize learning?	<input type="checkbox"/> pose insightful questions?

Additional Practice

For additional practice, have students complete the *Practice Worksheet*. Practice answers are available online.

Answer Key

* *Interactive Student Workbook* answers are available online.

Week 1 • Models for Multiplication

Lesson 3

Key Idea

Number of groups		Number in each group		
3	\times	4	=	12
3	groups of	4	equals	12

Try This

Write each as a multiplication sentence.

1.  $3 \times 4 = 12$

2.  $2 \times 4 = 8$


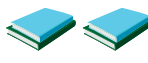
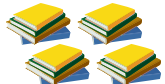

Practice

Write each as a multiplication sentence.

- | | |
|--|--|
| 3. $4 + 4 + 4 + 4 + 4 = 20$
$5 \times 4 = 20$ | 4. $2 + 2 + 2 = 6$
$3 \times 2 = 6$ |
| 5. $3 + 3 + 3 + 3 + 3 = 15$
$5 \times 3 = 15$ | 6. $7 + 7 + 7 + 7 = 28$
$4 \times 7 = 28$ |
| 7. Three groups of 8 equals 24.
$3 \times 8 = 24$ | 8. Eight groups of 2 equals 16.
$8 \times 2 = 16$ |

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Draw a line to match each repeated addition expression and multiplication sentence.

- | | | |
|---|-------------------------|-------------------|
| 9.  | $5 + 5 + 5$ | $2 \times 2 = 4$ |
| 10.  | $2 + 2$ | $6 \times 3 = 18$ |
| 11.  | $4 + 4 + 4 + 4$ | $4 \times 4 = 16$ |
| 12.  | $3 + 3 + 3 + 3 + 3 + 3$ | $3 \times 5 = 15$ |

Reflect

Think of an item that comes in groups of two. Draw a picture of this item, write a repeated addition sentence, and write a multiplication sentence that shows how many groups you would have if you had fourteen of the item.

Answers will vary but should be seven groups of two.
 $2 + 2 + 2 + 2 + 2 + 2 + 2 = 14$
 $7 \times 2 = 14$

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Student Workbook, pp. 10–11

Lesson 4

Objective

Students can describe groups that come in sets to build multiplication facts.

Vocabulary

multiply

Creating Context

Cooperative groups allow English Learners to gain more practice with English and learn math concepts more thoroughly. English Learners might be less worried about making language errors when working with small groups than when volunteering an answer in front of the whole class.

Materials

Program Materials

- Multiplication Groups Recording Chart
- Number Cards (2–7)
- Vocabulary Card 27, *multiply*

Prepare Ahead

- Combine Number Cards (2–7) to create a deck containing two of each number (12 cards).
- Make a copy of the Multiplication Groups Recording Chart for each pair of students.
- Make a copy of the Multiplication Groups Recording Chart for display.

1 | Warm Up

Prepare

- ▶ If you are counting items that come in pairs, by what do you skip count? **2**
- ▶ If you are counting items that come in a half dozen, by what do you skip count? **6**
- ▶ If you are counting 3, 6, 9, 12, and so on, what number are you using to skip count? **3**

Just the Facts

Present students with $\times 2$ facts. Use questions such as the following.

- ▶ What is 1×2 ? 2×2 ? 3×2 ? 4×2 ? 5×2 ? 6×2 ? 7×2 ? 8×2 ? 9×2 ?

Remind students that multiplication is a shortcut for adding the same number over and over again. Have students chorally recite the sentences for $\times 2$ facts in sequential order.

2 | Engage

Develop

Multiplication Mixer

“Today we are going to describe groups that come in sets.” Follow the instructions on the Activity Card **Multiplication Mixer**. As students complete the activity, be sure to use the Questions to Ask.

Alternative Groupings

Pair: Lay out a set of Number Cards (2–7) face down. Have each student, in turn, pick and replace one Number Card. Have both record the correct sentence on their Recording Chart. If students pick a pair of cards that has already been picked, have them pick again.

Practice

Have students complete the *Student Workbook* or *Interactive Student Workbook*. Guide students through the Key Idea example and the Try This exercises.

Supported Differentiation

For additional support, use the Sets Former Tool with students.

- Tell students that you are going to use marbles to create groups of objects.
- In the Format area of the palette, choose the Addition mat, marked with a plus sign (“+”).
- Use the Stamp tool to place marbles in the top and bottom halves of the mat.
- Use the Cursor tool to drag marbles from one counting mat to the other.
- Model a multiplication fact, such as $4 \times 3 = 12$. Create four sets with 3 equal shares in the same color.
- The product (sum of the repeated addition sentence $3 + 3 + 3 + 3 = 12$) appears at the bottom of the mat.
- Have students identify the number of objects in each group.
- Students should use the Sets Former Tool until they can identify with confidence the number of objects in each group and the number of groups.

3 | Reflect

Think Critically

Review students' answers to the Reflect prompt in the *Student Workbook* and then review the Engage activity.

Discuss whether this chart fits other types of bugs. If any student has extensive knowledge about a particular type of insect, invite him or her to play the role of teacher and guide the class to create a chart showing the number of legs, eyes, or antennae.

- ▶ What was easy about this activity?
- ▶ What was difficult about this activity?

Real-World Application

People who work at concession stands often have charts similar to those used in this lesson to help them quote prices quickly.

- ▶ Make a chart for selling 1 to 10 hot dogs. Each hot dog costs \$2.
- ▶ Often, people order the same number of drinks and hot dogs. Make a chart for selling 1 drink and 1 hot dog to 10 drinks and 10 hot dogs. Each hot dog and drink together cost \$3.

4 | Assess

Informal Assessment

Use the following table for informal observations.

Multiplication Mixer			
Did the student			
<input type="checkbox"/>	make important observations?	<input type="checkbox"/>	provide insightful answers?
<input type="checkbox"/>	extend or generalize learning?	<input type="checkbox"/>	pose insightful questions?

Additional Practice

For additional practice, have students complete the *Practice Worksheet*. Practice answers are available online.

Answer Key

* *Interactive Student Workbook* answers are available online.

Week 1 • Models for Multiplication

Lesson 4

Key Idea

Groups can be described in specific ways. Below are some examples.



Try This

Complete the charts. Write a repeated addition sentence for each problem if you need a model to figure out the answer.





Number of Students	Number of Mittens per Student	Multiplication Sentence
1	2	$1 \times 2 = 2$
2	2	$2 \times 2 = 4$
3	2	$3 \times 2 = 6$
4	2	$4 \times 2 = 8$
5	2	$5 \times 2 = 10$

Number of Cars	Number of Tires on a Car	Multiplication Sentence
1	4	$1 \times 4 = 4$
2	4	$2 \times 4 = 8$
3	4	$3 \times 4 = 12$
4	4	$4 \times 4 = 16$
5	4	$5 \times 4 = 20$

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Practice

Write a multiplication sentence for each situation. Write a repeated addition sentence if you need a model to figure out the answer.

- The number of wheels on four skates.  $4 \times 4 = 16$
- The number of toes on five feet.  $5 \times 5 = 25$
- The number of pieces of bread on three sandwiches.  $3 \times 2 = 6$
- The number of legs on two cats.  $2 \times 4 = 8$

Reflect

Create a chart that shows the number of legs on one, two, three, and four spiders.



Number of Spiders	Number of Legs on a Spider	Multiplication Sentence
1	8	$1 \times 8 = 8$
2	8	$2 \times 8 = 16$
3	8	$3 \times 8 = 24$
4	8	$4 \times 8 = 32$

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Student Workbook, pp. 12–13

Lesson 5 • Review

Objective

Students review skills learned this week and complete the weekly assessment and project.

Vocabulary

Review vocabulary introduced during the week.

Creating Context ELL

English Learners may benefit from clarification of some common phrases and words that proficient English speakers probably know. Occasionally words have more than one meaning or are used in potentially puzzling idiomatic expressions. Before or during the lesson, be sure to clarify the words and phrases that may be confusing. For example, *times* means “repeated addition” and not the measure of clock time.

1 | Warm Up

Prepare

- ▶ **Name the ways we looked at multiplication this week.**
grouping; repeated addition; using the \times symbol
- ▶ **How can you find out how many are there altogether in four groups of three apples each?** Possible answers: 3 plus 3 plus 3 plus 3 equals 12
- ▶ **Can you say four groups of three apples each another way?**
Possible answers: 4 times 3 equals 12; 3 times 4 equals 12

2 | Engage

Practice



Have students complete the *Student Workbook*. *Interactive Student Workbook* answers are available online.

Week 1 • Models for Multiplication

Lesson 5 • Review


This week you looked at multiplication sentences. You learned the multiplication is repeated addition. You also learned that the \times symbol means “times” or “groups of.”

Lesson 1 Draw circles to show the number of groups named.

- Three groups of five

- Four groups of two



Answer the questions below for the drawing shown.


- How many groups are shown?
- How many are in each group?
- How many altogether?

- 

A. 3 B. 5 C. 15

Lesson 2 Write a repeated addition sentence for each picture.

- 


$2 + 2 + 2 + 2 + 2 + 2 = 12$
- 

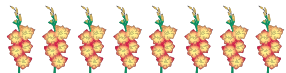
$4 + 4 + 4 + 4 + 4 = 20$

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Lesson 3

Write each as a multiplication sentence.

- 


$3 \times 3 = 9$
- 

$8 \times 5 = 40$
- $7 + 7 + 7 + 7 = 28$
 $4 \times 7 = 28$
- $10 + 10 + 10 + 10 + 10 = 50$
 $5 \times 10 = 50$

Lesson 4 Complete the chart.

10. The store has five cartons of eggs on the shelf. Create a chart that shows the number of eggs anytime there are two to five cartons on the shelf.

Number of Cartons	Number of Eggs in a Carton	Multiplication Sentence
2	12	$2 \times 12 = 24$
3	12	$3 \times 12 = 36$
4	12	$4 \times 12 = 48$
5	12	$5 \times 12 = 60$



Reflect

List as many items as you can that come in groups of two.
Answers will vary.

List as many items as you can that come in groups of three.
Answers will vary.

Explain which list was easier to complete.
Possible answer: More items come in groups of two than in groups of three.

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Student Workbook, pp. 14–15

3 | Reflect

Think Critically

Review students' answers to the Reflect prompt in the **Student Workbook**.

Discuss the answer with the group to reinforce Week 1 concepts.

4 | Assess

Formal Assessment

Students may take the weekly assessment online or on **Assessment** pages.

Record formal assessment scores on the Student Assessment Record, found in **Assessment**. Alternatively, navigate to your course and select Assignments to input results of the weekly assessment and review progress. Use test results and observations to determine the next steps for each student.

Going Forward

Navigate to your course and select Assignments to view results and answers for the online assessments, to input the results of print student assessments, and to review progress. Use the weekly test results and observations to determine the next steps for each student.

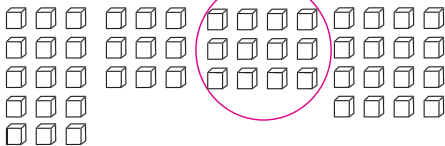
Retention	
Student displays good grasp of this week's concepts and skills.	Have students create flash cards for multiplication facts to 5×5 , with the factors on one side and the product on the other. Students should work in pairs to quiz each other, working toward fluency.
Remediation	
Student is still struggling with the week's concepts and skills.	Use the Neighborhood Number Line to model multiplication. Present a multiplication fact such as 4×2 , and have students first skip count by 2s to the house with the 8 door, and then solve the multiplication problem. When the solution is found, students should create a flash card to use to quiz each other as for those in the Retention group.

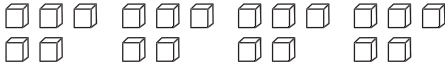
Suggestions for Re-Evaluation: If a student has struggled without success for several weeks, use observations and test results to place the student at a level in which they can find success and build confidence to move forward.

Assessment Answer Key

Name _____ Date _____ **WEEK 1**

Models for Multiplication

- Circle the answer that shows 3 groups of 4 cubes.
 
- In the space below, draw 2 groups of 5 circles.

Answers will vary but should reflect two distinct groups of five circles.
- Write a repeated addition sentence for the figure below.
 

$5 + 5 + 5 + 5 = 20$
- Write a repeated addition sentence for the story below.


Julia bought 5 packages of juice for a class party. Each package had 6 boxes of juice.

$6 + 6 + 6 + 6 + 6 = 30$

Level E Assessment • Unit 4 Week 1 49

WEEK 1 Name _____ Date _____

Models for Multiplication

- Write a multiplication sentence for the figure below.
 

$3 \times 4 = 12$
- Write a multiplication sentence that matches this addition sentence.

$3 + 3 + 3 + 3 + 3 = 15$

$5 \times 3 = 15$
- Write a multiplication sentence that is the same as 7 groups of 8 equals 56.

$7 \times 8 = 56$
- Write a multiplication sentence that matches this story. Solve the multiplication sentence.

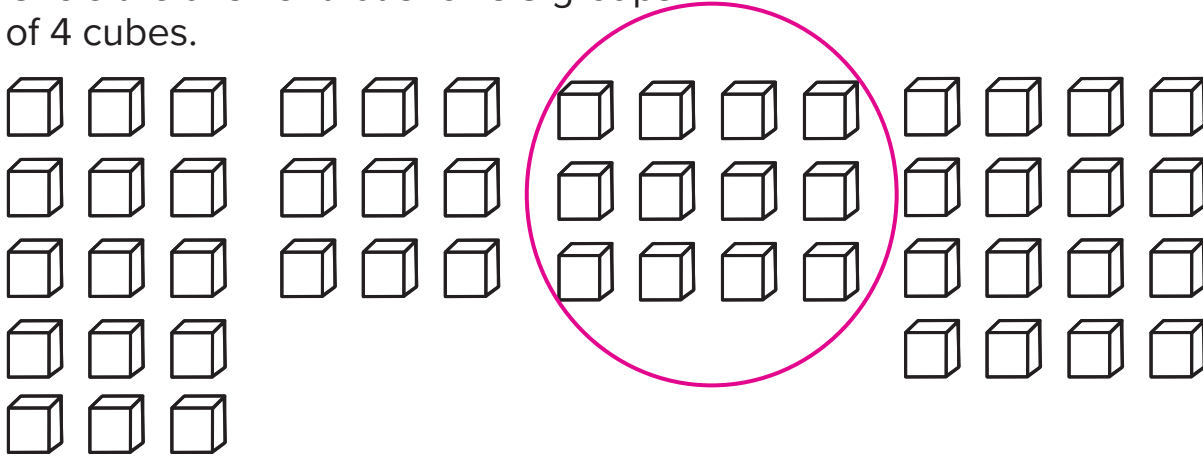
There are 5 seats in each row on a plane. How many people can fit in 6 rows?

$5 \times 6 = 30$

50 Level E Assessment • Unit 4 Week 1

Models for Multiplication

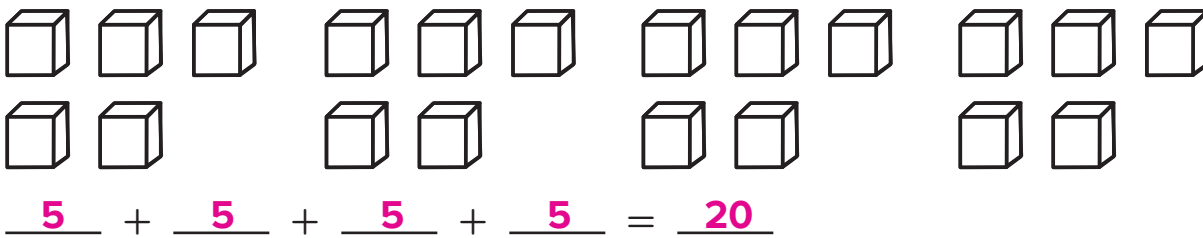
1. Circle the answer that shows 3 groups of 4 cubes.



2. In the space below, draw 2 groups of 5 circles.

Answers will vary but should reflect two distinct groups of five circles.

3. Write a repeated addition sentence for the figure below.



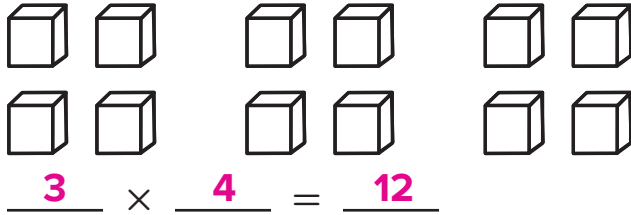
4. Write a repeated addition sentence for the story below.

Julia bought 5 packages of juice for a class party. Each package had 6 boxes of juice.

6 + 6 + 6 + 6 + 6 = 30

Models for Multiplication

5. Write a multiplication sentence for the figure below.



6. Write a multiplication sentence that matches this addition sentence.

$$3 + 3 + 3 + 3 + 3 = 15$$

$$\underline{5} \times \underline{3} = \underline{15}$$

7. Write a multiplication sentence that is the same as 7 groups of 8 equals 56.

$$\underline{7} \times \underline{8} = \underline{56}$$

8. Write a multiplication sentence that matches this story. Solve the multiplication sentence.

There are 5 seats in each row on a plane. How many people can fit in 6 rows?

$$\underline{5} \times \underline{6} = \underline{30}$$

Project Preview

This week, students learned models for multiplication. The project for this unit requires students to apply the models they learned to help them determine the number of items they will need to help dogs at a dog shelter.

Note: Students using the *Interactive Student Workbook* will complete projects on a sheet of paper.

Project-Based Learning

Standards-driven Project-Based Learning is effective in building deep content understanding. Project-Based Learning increases long-term retention of concepts and has been shown to be more effective than traditional instruction. Completing a project to answer an essential question challenges students to apply and demonstrate mastery of concepts and skills by expressing understanding through discussion, research, and presentation.

Essential Question

How can I use multiplication and division to plan for the future?

Project Evaluation Criteria

Review project evaluation criteria with students prior to beginning the project.

Exceeds Expectations

- Project result is explained and can be extended.
- Project result is explained in context and can be applied to other situations.
- Project result is explained using advanced mathematical vocabulary.
- Project result is explained and extended, and shows advanced knowledge of mathematical concepts and skills.

Meets Expectations

- Project result is explained.
- Project result is explained in context.
- Project result is explained using mathematical vocabulary.
- Project result is described, and mathematics are used correctly.
- Project result is explained, and shows satisfactory knowledge of mathematical concepts and skills.

Does Not Meet Expectations

- Project result is not explained.
- Project result is explained, but out of context.
- Project result is explained, but mathematical vocabulary is oversimplified.
- Project result is described, but mathematics are not used correctly.
- Project result is not explained and or extended, or shows less than satisfactory knowledge of mathematical concepts and skills.

Support the Dog Shelter

Objective

Students can find products and write multiplication equations using the \times symbol.

Materials

Program Materials

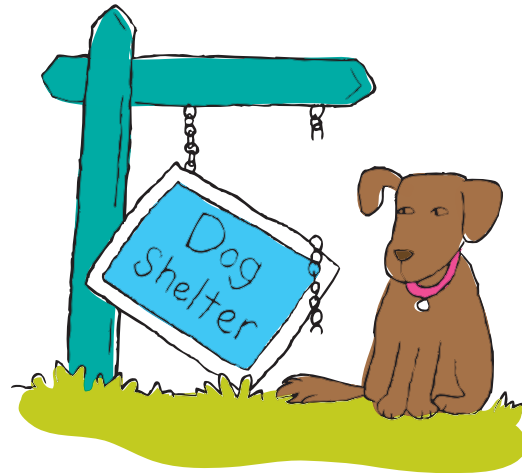
- Counters
- Number Cube (1–6)

Additional Materials

letter-sized blank paper folded vertically into thirds

Best Practices

- Organize the materials before the lesson.
- Allow students to think industriously.
- Provide project directions that are clear and brief.



Introduce

Imagine that a hurricane has caused the dog population at a local shelter to increase. How many items could you collect to help the shelter take care of its new residents?

- ▶ **Shelters welcome donations of items and volunteer time to help their animals.**
- ▶ **What are the basic needs of these shelters?**
- ▶ **Let's brainstorm a list of items that we could collect for a dog shelter.**

Explore

- ▶ **Today you will begin to create a brochure to show how you are helping the shelter.**

Have each student respond to question 1 by listing an item to collect for the shelter.

- ▶ **Use your age to decide how many dogs you will help. For example if you are 8 years old, you will help 8 dogs. This number is your first factor.**
- ▶ **Roll the Number Cube. Add 3 to the number on the Number Cube to determine how many of the item you will give each dog. For example, if you roll a 2, you will donate 5 of the item to each dog. This number is your second factor.**
- ▶ **Complete the *Student Workbook* to find the total number of this item you will donate to the local shelter. This is the product.**

Wrap Up

- Allow students time to tell which item they decided to collect.
- Make sure each student can explain how they determined the total number of items to collect.
- If students struggle to find the product, have them first find the answer using repeated addition or have them use Counters to create an array to find the product.
- Discuss students' answers to the Reflect prompts in the ***Student Workbook***.

Distribute to each student one piece of letter-size blank paper, folded vertically into thirds. Show students the first panel on the left.

- ▶ **On this panel of the brochure, you will tell what you are donating.**
- ▶ **Writer "I will collect [number] [item]."** Possible answer: I will collect twenty-four boxes of dog treats.

If time permits, allow each student to add an illustration to the brochure panel. Be sure to save this brochure, as they will continue to add to it over the next 6 weeks.

Week 1 • Models for Multiplication

Project

Support Your Local Dog Shelter

Write the answer to each question on the line.

1. Which item will you collect for the shelter? _____
2. Use your age to find the number of dogs you are going to help.
I will help _____ dogs.
3. Roll a Number Cube. Add 3 to the number on the Number Cube to find how many of the item you will collect for each dog.
I will collect _____ items.
4. Write a number sentence to show the total number of this item you will collect.
_____ × _____ = _____

number of items for each dog	number of dogs	total number of items
------------------------------------	-------------------	--------------------------

I will collect _____ items for _____ dogs.

Reflect

What do you need to know before you begin to collect items for the shelter?

You need to know how many of the item to get for each dog and how many dogs you will be helping.

How does using multiplication compare to using addition to find the total number of items?

Possible answer: You can usually write the equation faster with multiplication than with repeated addition. $6 \times 4 = 24$ vs. $4 + 4 + 4 + 4 + 4 + 4 = 24$

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Student Workbook, p. 16

Teacher Reflect

- Did I explain the directions before the students began their projects?
- Were students able to answer my questions about their solutions?
- Did I adequately explain and discuss the Reflect questions with the students?

Project

Support Your Local Dog Shelter

Write the answer to each question on the line.

- Which item will you collect for the shelter? _____
- Use your age to find the number of dogs you are going to help.
I will help _____ dogs.
- Roll a Number Cube. Add 3 to the number on the Number Cube to find how many of the item you will collect for each dog.
I will collect _____ items.
- Write a number sentence to show the total number of this item you will collect.

$$\underline{\hspace{2cm}} \times \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$$

number of items for each dog	number of dogs	total number of items
------------------------------------	-------------------	--------------------------

I will collect _____ items for _____ dogs.

Reflect

What do you need to know before you begin to collect items for the shelter?

You need to know how many of the item to get for each dog and how many dogs you will be helping.

How does using multiplication compare to using addition to find the total number of items?

Possible answer: You can usually write the equation faster with multiplication than with repeated addition. $6 \times 4 = 24$ vs. $4 + 4 + 4 + 4 + 4 + 4 = 24$

Activity 4A

Counting Clubs - 1

Objective

Students can use pictures of equal groups to create models for multiplication.

Materials

Program Materials

No materials needed.

Alternative Groupings

Pair: Use pictures or drawings of people. Ask students to choose two people to form a Club of 4 (arms or legs). Repeat with different numbers and different club numbers.

Introduce the Activity

- Tell students they are going to represent different numbers by rearranging themselves into different “Clubs.”
- Have students stand so they can move into their groups.

Begin the Activity

- Begin play by choosing one student to come stand with you. Announce to students that you and the other student represent a “Club” of 2 groups of 10 for a total of 20.
- Ask students if they can determine what each of you has 10 of that would total 20 of the same thing.
Possible answer: fingers
- Model this once more by choosing another two students to stand with you and announcing that you now are a Club of 3 groups of 2 for a total of 6.
Possible answer: arms or legs
- Continue play by telling the students the following:
 1. Stand with one other person to form a Club with a total of 4. Possible answer: ears or eyes
 2. Stand with one other person to form a Club with a total of 2. Possible answer: noses or necks
 3. Stand with two other people to form a Club with a total of 3. Possible answer: mouths or heads
 4. Stand with two other people to form a Club with a total of 6. Possible answer: arms or legs
 5. Stand with three other people to form a Club with a total of 8. Possible answer: hands or knees
 6. Stand with three other people to form a Club with a total of 4. Possible answer: mouths or noses

Conclude the Activity

When students complete the six regroupings for the specified totals, ask them to stand together and determine the club total they would represent if just big toes were counted.

Questions to Ask

- ▶ **If there are three people in your group, how many of something do you each need to make a total of 6?**
- ▶ **Did you skip count when you were totaling your Club amounts?**
- ▶ **What is the multiplication sentence for a Club of 5 people who each wearing 3 adhesive bandages?**

Activity 4B

Counting Clubs - 2

Objective

Students can use repeated addition to create models for multiplication.

Materials

Program Materials

Picture Cards

Additional Materials

- index cards
- paper clips

Alternative Groupings

Pair: Lay out Picture Cards for students; 4 for each number. Ask students to use two Picture Cards with the same number to form a Club with 4. Then ask them to use three cards with the same number to form a Club with 15. Repeat with different numbers of cards and different Clubs.

Prepare Ahead

Make multiple copies of Picture Cards. Cut apart the cards so that each student has at least one card.

Introduce the Activity

Tell students that they are each going to represent a different amount and that, as before, they will rearrange themselves into Clubs totaling different numbers.

Begin the Activity

- Allow each student to select a Picture Card without looking at the picture. This will be the initial amount that he or she represents (2, 3, 5, or 6).
- Begin play by choosing one card and standing next to one student who has the identical amount on his or her card.
- Ask students if they can determine what total your two-person club represents.
- Choose a different card, and stand with two students whose cards are identical to your new one.
- Ask students if they can state the repeated addition sentence for the total your three-person club represents.
- Continue playing the game. Students may not be part of some rounds, depending on the cards they

hold. Tell students they must be prepared to say their clubs' repeated addition sentences: 1. Stand with one other person to form a Club with a total of 4. 2. Stand with two other people to form a Club with a total of 18. 3. Stand with three other people to form a Club with a total of 12.

- Have two, three, or four students with the same number form more clubs with different totals.

Conclude the Activity

Ask students to choose any group size they have not been a part of. Students will state and defend their Club totals by stating the repeated addition sentences that they represent.

Questions to Ask

- ▶ **If there are four people in your group, how many of something do you need to make a total of 20?**
- ▶ **Was it helpful to skip count?**
- ▶ **What do you notice about ones places for Club totals using the Picture Cards with 5 stars?**

Activity 4C

Multiplication Groups

Objective

Students can use the \times symbol to write multiplication problems.

Materials

Program Materials

- Multiplication Groups Recording Chart
- Number Cards (2–7)

Alternative Groupings

Pair: Lay out a set of Number Cards (2–7) face down. Have each student pick one Number Card. Have both students record the correct sentence on their Multiplication Groups Recording Charts. If students pick a pair of cards that has already been picked, have them pick again.

Prepare Ahead

- Make a copy of the Multiplication Groups Recording Chart for display.
- Make a copy of the Multiplication Groups Recording Chart for each student.

Introduce the Activity

- Explain to students that they are each going to represent a different fixed amount for the entire activity and that they will change pairings many times.
- Explain that they must be able to regroup with other student partners, to collaborate, and then to record information on individual charts.

Begin the Activity

- Shuffle the Number Cards (2–7) and place the pile face down. Allow student to take the top card in turn. Give each student a Multiplication Groups Recording Chart.
- Model their task by using a 2 Number Card and a 3 Number Card. Show student the cards and say the one or more multiplication sentences. “Two multiplied by three equals six.” or “Two groups of three equals six.”
- Then model writing this information in the corresponding column on the chart.
- Ask students to begin their charts. Explain that they may choose any student partner in any order but that each solution must be different.
- Be certain students understand that they may collaborate with their partners to arrive at the solutions but that each must fill in his or her own chart.

- If students have difficulty finding the answer to the multiplication, encourage them to use a drawing or repeated addition to find the answer.
- Continue changing partners until all possible pairs have been made.

Conclude the Activity

When students complete their last solutions, ask them to choose which pairings were the most difficult to solve. Discuss why they chose these problems by exploring the strategies they used or might have used. Guide other students to suggest methods they used to solve the problems.

Questions to Ask

- ▶ **Did you partner with someone for all the numbers and fill each of the six lines on the chart?**
- ▶ **What was your highest solution amount?**
- ▶ **What was the multiplication problem with the highest solution?**
- ▶ **Which strategies did you use to find the various solutions?**

Activity 4D

Multiplication Mixer

Objective

Students can describe groups that come in sets to build multiplication facts.

Materials

Program Materials

- Multiplication Groups Recording Chart
- Number Cards (2–7)

Alternative Groupings

Pair: Lay out a set of Number Cards face down. Have each student pick one Number Card. Have both record the correct sentence on their Recording Chart. If students pick a pair of cards that has already been picked, have them pick again.

Prepare Ahead

- Combine Number Cards (2–7) to create a deck containing two of each number (12 cards).
- Make a copy of the Multiplication Groups Recording Chart for each pair of students.
- Make a copy of the Multiplication Groups Recording Chart for display.

Introduce the Activity

- Tell students they are each going to represent several different amounts for the activity and that they each will have one partner.
- Students must be able to sit with their student partners, to collaborate, and then to record information on a shared chart.

Begin the Activity

- Begin play by shuffling the Number Cards (2–7) and placing the pile face down. Give each student a copy of the Multiplication Recording Chart.
- Model the task by selecting the top card and choosing a student to select the next card. Together, record the information on a Multiplication Groups Recording Chart. Solve the multiplication problem by saying any one of the following multiplication sentences aloud. For example, if you have drawn a 3 and the student drew a 5; you could say “Five multiplied by three equals fifteen.” Or “Five groups of three equals fifteen.” Or “Three groups of five equals fifteen.” Or “Five times three equals fifteen.”

- Continue modeling. Replace the cards in the pile and reshuffle. Then both you and the student select the top card in turn. Record the information on the chart. Say a multiplication sentence aloud, collaborating on the solution.
- Replace the cards and reshuffle.
- Allow students to take the top card from the pile in turn. Have students form into pairs and complete the task as demonstrated. After all pairs have completed their charts, have them return the cards to the pile. Reshuffle the cards and have students repeat the task with new cards.

Conclude the Activity

Have each pair choose the problem that was the most difficult for them. Discuss methods they used to solve the problem, and prompt other students to suggest other methods.

Questions to Ask

- ▶ **Did you and your partner have problems in which the solutions were the same as one or more of your other problems? How can this happen?**
- ▶ **What was your highest solution amount?**
- ▶ **Which strategies did you use to find your solutions?**

Lesson 1

Find the Math

Items are often sold in groups. What are some items for pets that are sold in groups? **Possible answers: cat treats; dog biscuits; hamster chew sticks; crickets for reptiles**



1. If you fed your cat daily treats, would you be more likely to buy ten separate packages of treats, or a box containing ten packages of treats? Why?

Possible answer: I would buy a box, so I wouldn't have to count individual packages of treats.

2. Would you rather count out 15 individual pieces from a giant box of treats, or open a package containing 15 treats?

Possible answer: I would rather open a package containing 15 treats, because it is faster than counting individual treats.

Lesson 1

Key Idea

Use pictures to represent groups.

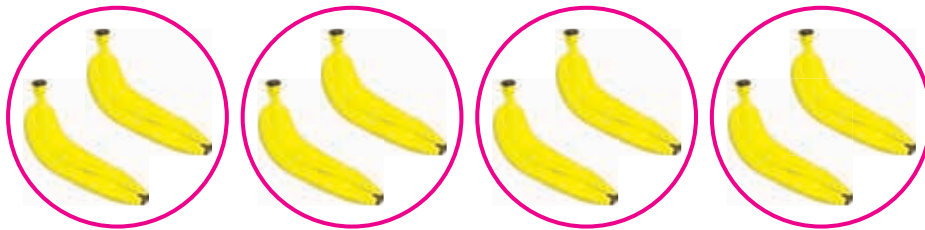
Try This

Write how many are in each group.

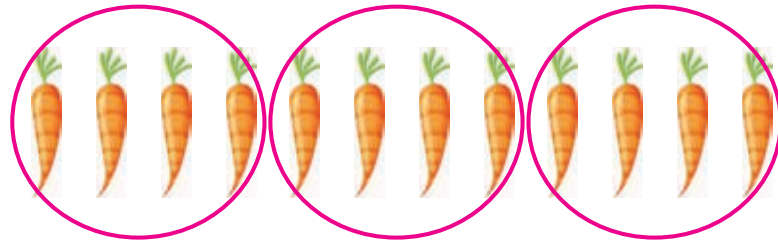
1.  2

Draw circles to show the number of groups named.

2. Four groups of two



3. Three groups of four



Practice

Answer each of the questions for each drawing.

- A. How many groups?
- B. How many are in each group?
- C. How many altogether?

4. 
A. 5 B. 3 C. 15

5.



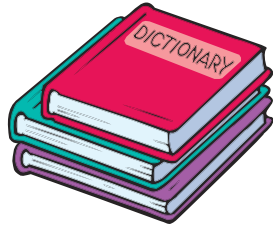
A. 2

B. 6

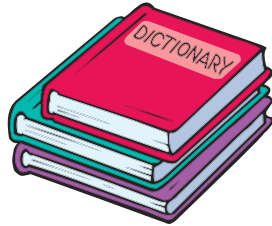


C. 12

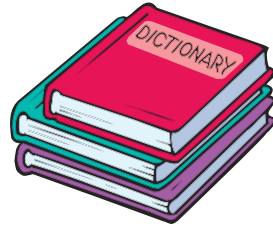
6.



A. 3



B. 3



C. 9

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Reflect

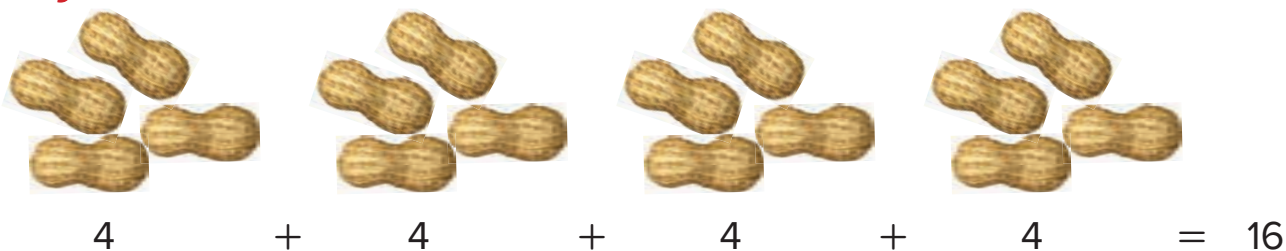
Draw four groups of three pencils each.

Write how many pencils there are altogether? 12

Students should draw twelve pencils shown in four groups of three.

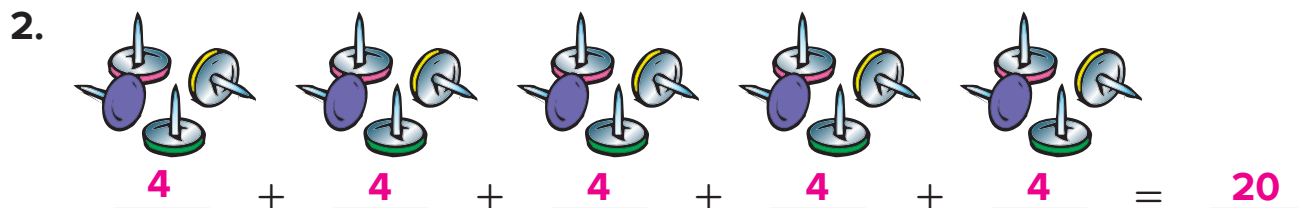
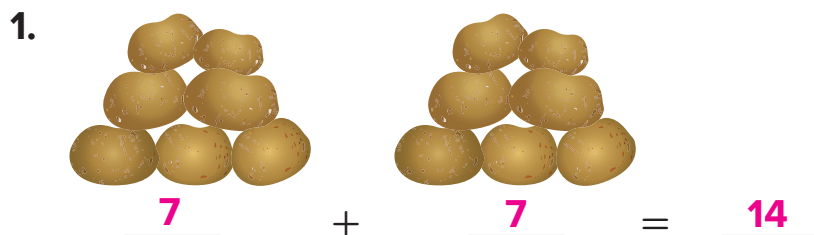
Lesson 2

Key Idea



Try This

Show a repeated addition sentence for each picture.



Practice

Draw a picture for each repeated addition sentence.

5. $6 + 6 + 6 = 18$

Answers will vary but should include pictures of three groups of six each.

6. $9 + 9 = 18$

Answers will vary but should include pictures of two groups of nine each.

Reflect

Draw a picture that models the story below. Write repeated addition sentences to show who has more.

Kelsey and Brandon each bought a supersaver package of gum packs. Kelsey bought a package that has 5 packs of gum. Each pack has 6 pieces. Brandon bought a package that has 7 packs of gum. Each pack has 4 pieces.

Answers may vary. Kelsey's group should show five groups of six each with an addition sentence of $6 + 6 + 6 + 6 + 6 = 30$.

Brandon's group should show seven groups of four each with an addition sentence of $4 + 4 + 4 + 4 + 4 + 4 + 4 = 28$.

Kelsey has more gum.

Lesson 3

Key Idea

Number of groups		Number in each group		
3	×	4	=	12
3	groups of	4	equals	12

Try This

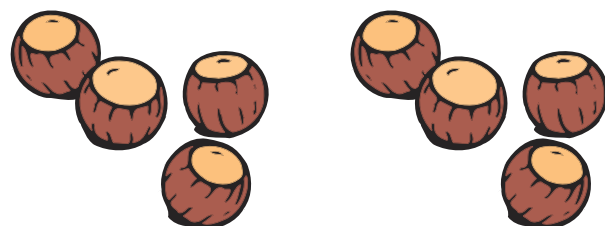
Write each as a multiplication sentence.

1.



$$\underline{3} \times \underline{4} = \underline{12}$$

2.



$$\underline{2} \times \underline{4} = \underline{8}$$

Practice

Write each as a multiplication sentence.

3. $4 + 4 + 4 + 4 + 4 = 20$

$$\underline{5} \times \underline{4} = \underline{20}$$

4. $2 + 2 + 2 = 6$

$$\underline{3} \times \underline{2} = \underline{6}$$

5. $3 + 3 + 3 + 3 + 3 = 15$

$$\underline{5} \times \underline{3} = \underline{15}$$

6. $7 + 7 + 7 + 7 = 28$

$$\underline{4} \times \underline{7} = \underline{28}$$

7. Three groups of 8 equals 24.

$$\underline{3} \times \underline{8} = \underline{24}$$

8. Eight groups of 2 equals 16.

$$\underline{8} \times \underline{2} = \underline{16}$$

Draw a line to match each repeated addition expression and multiplication sentence.

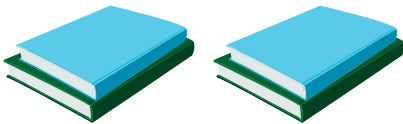
9.



$5 + 5 + 5$

$2 \times 2 = 4$

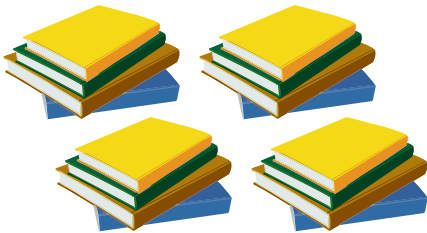
10.



$2 + 2$

$6 \times 3 = 18$

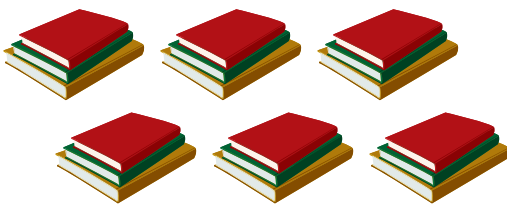
11.



$4 + 4 + 4 + 4$

$4 \times 4 = 16$

12.



$3 + 3 + 3 + 3 + 3 + 3$

$3 \times 5 = 15$

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Reflect

Think of an item that comes in groups of two. Draw a picture of this item, write a repeated addition sentence, and write a multiplication sentence that shows how many groups you would have if you had fourteen of the item.

Answers will vary but should be seven groups of two.

$2 + 2 + 2 + 2 + 2 + 2 + 2 = 14$

$7 \times 2 = 14$

Lesson 4

Key Idea

Groups can be described in specific ways. Below are some examples.



Pair of mittens
Group of 2



Set of tires
Group of 4



Dozen eggs
Group of 12

Try This

Complete the charts. Write a repeated addition sentence for each problem if you need a model to figure out the answer.

1.

Number of Students	Number of Mittens per Student	Multiplication Sentence
1	2	$1 \times 2 = 2$
2	2	$2 \times 2 = 4$
3	2	$3 \times 2 = 6$
4	2	$4 \times 2 = 8$
5	2	$5 \times 2 = 10$

2.

Number of Cars	Number of Tires on a Car	Multiplication Sentence
1	4	$1 \times 4 = 4$
2	4	$2 \times 4 = 8$
3	4	$3 \times 4 = 12$
4	4	$4 \times 4 = 16$
5	4	$5 \times 4 = 20$

Practice

Write a multiplication sentence for each situation. Write a repeated addition sentence if you need a model to figure out the answer.

3. The number of wheels on four skates



$$4 \times 4 = 16$$

4. The number of toes on five feet



$$5 \times 5 = 25$$

5. The number of pieces of bread on three sandwiches



$$3 \times 2 = 6$$

6. The number of legs on two cats



$$2 \times 4 = 8$$

Reflect

Create a chart that shows the number of legs on one, two, three, and four spiders.



Number of Spiders	Number of Legs on a Spider	Multiplication Sentence
1	8	$1 \times 8 = 8$
2	8	$2 \times 8 = 16$
3	8	$3 \times 8 = 24$
4	8	$4 \times 8 = 32$

Lesson 5 • Review

This week you looked at multiplication sentences. You learned the multiplication is repeated addition. You also learned that the \times symbol means “times” or “groups of.”

Lesson 1 Draw circles to show the number of groups named.

1. Three groups of five



2. Four groups of two



Answer the questions below for the drawing shown.

- A. How many groups are shown?
- B. How many are in each group?
- C. How many altogether?

3.



A. 3



B. 5



C. 15

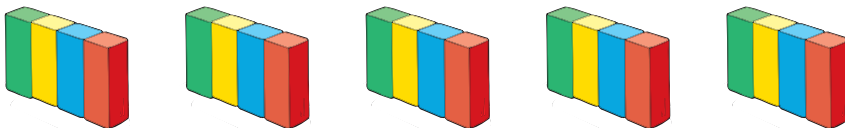
Lesson 2 Write a repeated addition sentence for each picture.

4.



$$2 + 2 + 2 + 2 + 2 + 2 = 12$$

5.



$$4 + 4 + 4 + 4 + 4 = 20$$

Lesson 3 Write each as a multiplication sentence.

6.  $3 \times 3 = 9$

7.  $8 \times 5 = 40$

8. $7 + 7 + 7 + 7 = 28$
 $4 \times 7 = 28$

9. $10 + 10 + 10 + 10 + 10 = 50$
 $5 \times 10 = 50$

Lesson 4 Complete the chart.

10. The store has five cartons of eggs on the shelf. Create a chart that shows the number of eggs anytime there are two to five cartons on the shelf.



Number of Cartons	Number of Eggs in a Carton	Multiplication Sentence
2	12	$2 \times 12 = 24$
3	12	$3 \times 12 = 36$
4	12	$4 \times 12 = 48$
5	12	$5 \times 12 = 60$

Reflect

List as many items as you can that come in groups of two.

Answers will vary.

List as many items as you can that come in groups of three.

Answers will vary.

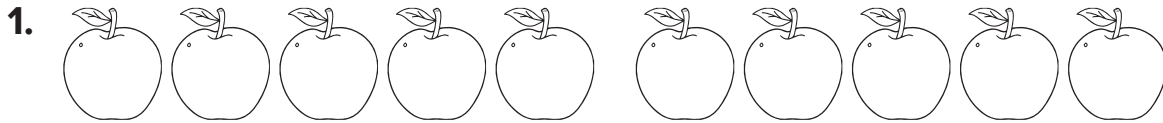
Explain which list was easier to complete.

Possible answer: More items come in groups of two than in groups of three.

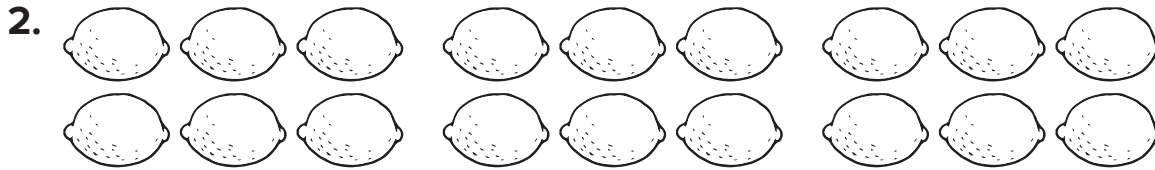
Models for Multiplication: Lesson 1

Answer the following questions for each drawing.

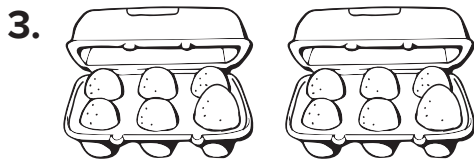
- A. How many groups are there?
- B. How many items are in each group?
- C. How many items are there altogether?



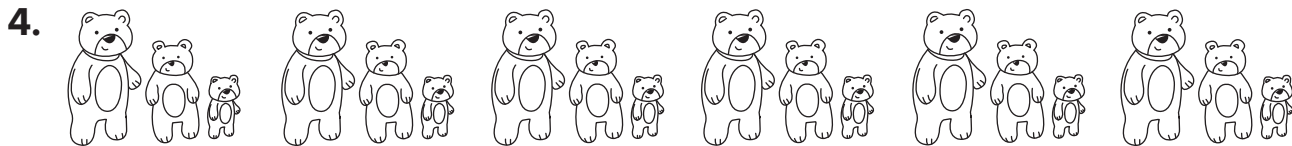
- A. 2 B. 5 C. 10



- A. 3 B. 6 C. 18



- A. 2 B. 6 C. 12



- A. 6 B. 3 C. 18

Models for Multiplication: **Lesson 2**

Draw a picture for each repeated-addition sentence.

1. $3 + 3 + 3 + 3 = 12$

Answers will vary, but should include pictures of four groups of three each.

2. $10 + 10 + 10 = 30$

Answers will vary, but should include pictures of three groups of ten each.

3. $8 + 8 = 16$

Answers will vary, but should include pictures of two groups of eight each.

Models for Multiplication: Lesson 3

Write each sentence as a multiplication sentence.

1. $6 + 6 + 6 + 6 = 24$
4 \times 6 = 24

2. $5 + 5 + 5 + 5 + 5 + 5 + 5 = 35$
7 \times 5 = 35

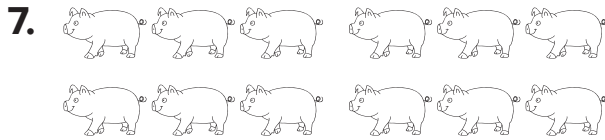
3. $7 + 7 + 7 = 21$
3 \times 7 = 21

4. $8 + 8 + 8 + 8 + 8 = 40$
5 \times 8 = 40

5. Two groups of 10 equals 20.
2 \times 10 = 20

6. Nine groups of 2 equals 18.
9 \times 2 = 18

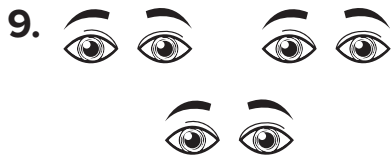
Write a repeated-addition sentence and a multiplication sentence for each group of pictures.



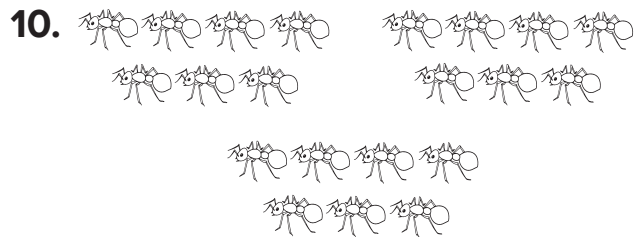
3 + 3 + 3 + 3 = 12
4 \times 3 = 12



4 + 4 + 4 + 4 = 16
4 \times 4 = 16



2 + 2 + 2 = 6
3 \times 2 = 6



7 + 7 + 7 = 21
3 \times 7 = 21

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Name _____

Date _____

Models for Multiplication: Lesson 4

Write a multiplication sentence for each group. Write a repeated-addition sentence if you need a model to help you determine the answer.

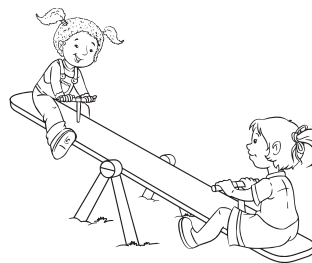
1.



The number of points on four stars

$$\underline{4 \times 5 = 20}$$

2.



The number of children playing on six seesaws

$$\underline{6 \times 2 = 12}$$

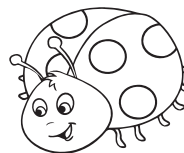
3.



The number of lenses in three pairs of sunglasses

$$\underline{3 \times 2 = 6}$$

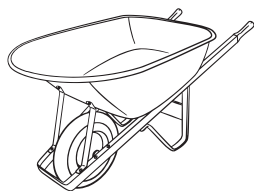
4.



The number of spots on the backs of six bugs

$$\underline{6 \times 5 = 30}$$

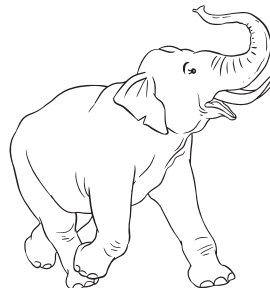
5.



The number of wheels on five wheelbarrows

$$\underline{5 \times 1 = 5}$$

6.



The number of feet on eight elephants

$$\underline{8 \times 4 = 32}$$

Letter to Home

Dear Family,

In our math class, we try to relate things we learn in the classroom to the real world. In *Number Worlds*, students will explore models for multiplication. This week, students will explore the concept of multiplication through pictures, arrays, repeated addition, and counting by multiples. They will also use the “x” symbol to write multiplication problems.

Below is an activity you can do together that is related to what we will do this week.

Sincerely,

Querida familia:

En nuestra clase de matemáticas, tratamos de relacionar cosas que aprendemos en el salón de clases con cosas de la vida real. En *El mundo de los números*, los estudiantes practicarán con modelos de multiplicación. Esta semana, los estudiantes explorarán los conceptos de la multiplicación por medio de fotografías, matrices, suma repetida y conteo de múltiplos. También escribirán el símbolo “x” en los problemas de multiplicación.

Abajo encontrará una actividad que se relaciona con los temas de la semana y pueden hacer juntos.

Sinceramente,

Look around the house, and make a list of items that belong in groups. Enter the items and their group number into the chart. Decide if the group number is usually the same or if the item commonly appears in other groups as well.

Item	Number in Group	Name of Group	Is This Number Consistent?
eggs	12	carton/dozen	yes
sneakers	2	pair	yes
cans of soda	6	six-pack	no; 12, 24, 2-liter, etc.

Level I

Unit 1 • Number Sense

Unit at a Glance

This **Number Worlds** unit builds on prior knowledge of rational numbers and ratios. Students will apply this knowledge of rational numbers to solve problems involving integers, absolute value, fractions, terminating and repeating decimals, and percents. They will also use ratios, rates, and unit rates to convert between units of length in the customary system and between monetary units.

Skills Trace

Before Level I	Level I	After Level I
Level H Students can convert between fractions and decimals. Students understand the concept of ratios. They use ratios, ratio tables, and rates to solve real-world problems, including problems involving constant speed and unit pricing. They understand the meaning of integers. Students use their understanding of fractions, decimals, and integers to compare and order rational numbers.	By the end of this unit, students should be able to graph rational numbers on number lines, and use number lines to determine absolute value. Students will convert between fractions, decimals, and percents. Students will use ratios, rates, and unit rates to solve real-world problems, including converting monetary units and customary units of length. Students will also use percents to solve real-world problems, including problems involving markups, discounts, fees, taxes, simple interest, and commissions.	Moving on to Level J Students will graph rational numbers, including integers, on number lines and use rational numbers to represent real-world situations. They will use exponents and scientific notation to write rational numbers. Students will be introduced to irrational numbers and will understand there is a one-to-one correspondence between numbers and points on a number line.

Essential Question

How will my knowledge of percentages and ratios help me outside the classroom?

In this unit, students will use ratios as they formulate lemonade recipes. They will also use rates and percents to calculate production costs, selling prices, and commission rates for a lemonade-selling business.

Unit Overview

Week	Teacher Resources	Learning Goals
1	Rational Numbers <ul style="list-style-type: none"> Teacher Edition Activity Cards 1A, 1B, 1C, 1D English Learner Support Guide Teacher eBook Assessment Teacher eBook 	<p>Students can represent real-world situations using rational numbers, including integers. They can plot rational numbers on number lines and determine absolute value. Students can also use rational numbers to represent real-world situations.</p> <p>Project: Students can plot integers on a vertical number line.</p>
2	Fractions, Decimals, and Percents <ul style="list-style-type: none"> Teacher Edition Activity Cards 1E, 1F, 1G, 1H English Learner Support Guide Teacher eBook Assessment Teacher eBook 	<p>Students can write rational numbers as fractions, decimals, and percents. They use their understanding of rational numbers to compare fractions and decimals.</p> <p>Project: Students can use fractions, decimals, and percents to represent part of a whole.</p>
3	Ratios and Rates <ul style="list-style-type: none"> Teacher Edition Activity Cards 1I, 1J, 1K, 1L English Learner Support Guide Teacher eBook Assessment Teacher eBook 	<p>Students can write and interpret ratios and understand the relationship between ratios and rates. They use ratio tables and proportions as they explore proportional reasoning.</p> <p>Project: Students can use a ratio table to determine equivalent ratios.</p>
4	Unit Rates <ul style="list-style-type: none"> Teacher Edition Activity Cards 1M, 1N, 1O, 1P English Learner Support Guide Teacher eBook Assessment Teacher eBook 	<p>Students can use unit rates to convert between units of length in the customary system and between monetary systems. They use ratios and rates to solve problems involving fractions.</p> <p>Project: Students can use unit rates to calculate unit costs.</p>
5	Percents, Discounts, and Commissions <ul style="list-style-type: none"> Teacher Edition Activity Cards 1Q, 1R, 1S, 1T English Learner Support Guide Teacher eBook Assessment Teacher eBook 	<p>Students can calculate percent increase and decrease. Students solve problems involving discount and commissions. They use percents to calculate gratuities and sales tax.</p> <p>Project: Students can use percents to calculate commissions.</p>
6	Markups, Markdowns, and Simple Interest <ul style="list-style-type: none"> Teacher Edition Activity Cards 1U, 1V, 1W, 1X English Learner Support Guide Teacher eBook Assessment Teacher eBook 	<p>Students can use percents to calculate markups, markdowns, and simple interest. They use percents to solve problems involving tax rates.</p> <p>Project: Students can use percents to determine markups.</p>

Week 1 • Rational Numbers

Week at a Glance

This week, students begin **Number Worlds**, Level I, Number Sense. Students will explore rational numbers including integers. They will represent rational numbers and absolute value on number lines, and use rational numbers to represent real-world situations.

Skills Focus


- Write rational numbers.
- Locate rational numbers on horizontal and vertical number lines, and understand that the absolute value of a rational number is its distance from zero on a number line.
- Use rational numbers to represent real-world situations.

How Students Learn

One common misconception among students is that when negative numbers “get bigger,” their values also increase. The real-world context of accounting can help correct this misconception. During discussions, associate the meaning of *owning* when a quantity is positive and *owing* when a quantity is negative. Provide various real-world contexts in which students can apply these concepts and make sense of negative integers.

Key

Boldface Text = Online Resources




















 = eTool

 = English Language Learners

 = Printable Resources

 = Printed Resources

Weekly Planner

Lesson	Learning Objectives	Program Materials
1	Students can understand that rational numbers include positive and negative integers, positive and negative fractions, and positive and negative decimals.	<ul style="list-style-type: none"> • Student Workbook  • Activity Card, Be Rational • English Learner Support Guide Teacher eBook  • Vocabulary Card 23, fraction • Vocabulary Card 27, integer • Vocabulary Card 36, negative number • Vocabulary Card 50, positive number • Probability Tool  • Number 1–6 Cubes
		<ul style="list-style-type: none"> • Number Cards (0–100) • Plus-Minus Cube • Practice Worksheet  • Letters to Home   <p>Additional Materials</p> <ul style="list-style-type: none"> • paper and pencils • stopwatch or two-minute timer
2	Students can locate rational numbers on a number line, and understand that the absolute value of a number is its distance from zero.	<ul style="list-style-type: none"> • Student Workbook  • Activity Card, How Far From Zero? • Vocabulary Card 1, absolute value • Vocabulary Card 36, negative number • Vocabulary Card 50, positive number • Number Line Tool  • GalaX,Y Game Board • Number Cards (0–100)
		<ul style="list-style-type: none"> • Magnetic Chips • Magnetic Number Line • Plus-Minus Cube • Practice Worksheet  <p>Additional Materials</p> <ul style="list-style-type: none"> • index cards • rulers
3	Students can apply knowledge of rational numbers on a horizontal number line to a vertical scale such as a thermometer.	<ul style="list-style-type: none"> • Student Workbook  • Activity Card, Hot or Cold? • Vocabulary Card 36, negative number • Vocabulary Card 50, positive number • Coordinate Grid Tool  • World Temperatures 
		<ul style="list-style-type: none"> • Practice Worksheet  <p>Additional Materials</p> <ul style="list-style-type: none"> • outdoor, vertical thermometers (Celsius scale) • world map or globe
4	Students can apply a knowledge of rational numbers to real-world problems.	<ul style="list-style-type: none"> • Student Workbook  • Activity Card, Creating a World • Vocabulary Card 1, absolute value • Vocabulary Card 36, negative number • Vocabulary Card 50, positive number • Number Line Tool  • Practice Worksheet 
		<p>Additional Materials</p> <ul style="list-style-type: none"> • colored pencils • index cards • long sheets or rolls of paper • rulers or meter sticks
5	<p>Review and Assess</p> <p>Students review skills learned this week and complete the weekly assessment and project.</p>	<ul style="list-style-type: none"> • Student Workbook  • Weekly Test, Assessment 
		<p>Additional Materials</p> <p>Data from textbooks, almanacs, or the Internet.</p>
Project	Students can plot integers on a vertical number line.	<ul style="list-style-type: none"> • Student Workbook  • Number 7–12 Cubes
		<p>Additional Materials</p> <ul style="list-style-type: none"> • paper and pens/pencils • rulers • digital slide presentation software

Week 1 Rational Numbers

Find the Math

This week, introduce students to rational numbers.

Use the following to begin a guided discussion.

- **What do we mean when we say a mountain is 10,000 feet high? Possible answers: The top of the mountain is 10,000 feet above sea level.**

Have students complete **Student Workbook** Find the Math before beginning the Warm Up.

Lesson 1

Objective

Students can understand that rational numbers include positive and negative integers, positive and negative fractions, and positive and negative decimals.

Vocabulary

- fraction
- integer
- negative number
- positive number

Creating Context ELL

Review the pronunciation of *half*, *third*, *fourth*, *tenth*, and *hundredth*. Also, review the formal way to read fractions and decimals; for example, $\frac{1}{2}$ is *one-half*, not *one over two*, and 4.37 is *four and thirty-seven hundredths*, not *four point three seven*.

Materials

Program Materials

- Number 1–6 Cubes, 2 per team
- Number Cards (0–100), 1 set per pair
- Plus-Minus Cube, 1 per team
- Vocabulary Card 23, *fraction*
- Vocabulary Card 27, *integer*
- Vocabulary Card 36, *negative number*
- Vocabulary Card 50, *positive number*

Additional Materials

- paper and pencils
- stopwatch or two-minute timer

1 | Warm Up

Prepare

- **What does the fraction $\frac{3}{4}$ mean? three parts out of four equal parts, or three equal objects out of a set of four objects**
- **Write 7, 0.9, $2\frac{1}{3}$, 5, and 1.75 as fractions. $\frac{7}{1}$, $\frac{9}{10}$, $\frac{7}{3}$, $\frac{5}{1}$, $\frac{175}{100}$**

Lesson 1

Find the Math

Death Valley National Park is located in the eastern part of California. Its lowest point is named Badwater Basin, which is 282 feet below sea level. The surrounding mountains, however, rise as high as 11,049 feet above sea level.



1. What number can you use to show that something is at sea level?
0
2. How would you indicate that a mountain's elevation is 11,049 feet above sea level?
11,049 ft
3. How would you write the depth of the Badwater Basin using symbols?
-282 ft

Student Workbook, p. 5

- Have students draw circles or grids to show numbers as fractions.

- **Rational numbers also include negative numbers. What do we usually call numbers, such as 7 and -5? integers**

- Have students write -7 , -0.9 , $-2\frac{1}{3}$, -5 , and -1.75 as fractions.
 $-\frac{7}{1}$, $-\frac{9}{10}$, $-\frac{7}{3}$, $-\frac{5}{1}$, $-\frac{175}{100}$

2 | Engage

Develop

Be Rational

"Today, we are going to generate rational numbers. A rational number is any number that can be written as a fraction of two integers." Follow the instructions on the Activity Card **Be Rational**. As students complete the activity, be sure to use the Questions to Ask

Alternative Groupings

Individual: Complete as written, with individuals competing against each other.

Whole Class: Complete as written, comparing numbers created as a class.

Practice

Have students complete the **Student Workbook** or **Interactive Student Workbook**. Guide students through the Key Idea example and the Try This exercises.

Supported Differentiation

For additional support, use the Probability Tool to create a random roll of two Number 1–6 Cubes. [Sample answers come from rolling a 4 and a 2.]

- ▶ **What two-digit integers can you write with the results as they are ordered?** 24, 42
- Write both integers on the board. Below each number, have students change the integers to new decimal numbers by adding 0 ones and a decimal point.
- ▶ **What decimal numbers did you write?** 0.24, 0.42
- Repeat, using a fraction bar to separate the two digits in each integer. $\frac{2}{4}$, $\frac{4}{2}$
- ▶ **What is true about all of the numbers you wrote?**
All are rational numbers.
- ▶ **Suppose you place a negative sign in front of those numbers. Would the numbers still be rational? Explain.** Yes; all of the numbers are rational because they can be written as fractions.

3 | Reflect

Think Critically

Review students' answers to the Reflect prompt in the **Student Workbook** and then review the Engage activity.

- ▶ **Why is an integer a rational number?** It can be written as a fraction; for example, 3 can be written as $\frac{3}{1}$ and -3 can be written as $\frac{-3}{1}$.

4 | Assess

Informal Assessment

Use the following table for informal observations.

Be Rational

Did the student

- | | |
|---|--|
| <input type="checkbox"/> make important observations? | <input type="checkbox"/> provide insightful answers? |
| <input type="checkbox"/> extend or generalize learning? | <input type="checkbox"/> pose insightful questions? |

Additional Practice

For additional practice, have students complete the **Practice Worksheet**. Practice answers are available online.

Answer Key

* Interactive Student Workbook answers are available online.

Week 1 • Rational Numbers

Lesson 1

Key Idea

An integer is any whole number or its opposite. A rational number is any number that can be written as a fraction in which both the numerator and the denominator are integers. Rational numbers can be positive or negative. Rational numbers can be whole numbers, integers, fractions, or decimals. Here are some examples:

$$3 \quad 0.42 \quad \frac{7}{4} \qquad -3 \quad -0.42 \quad \frac{-7}{4}$$

Try This

Change each positive rational number by rewriting it as a negative rational number.

1. 5 -5 2. 1.2 -1.2

3. $\frac{3}{4}$ $-\frac{3}{4}$ 4. $\frac{8}{5}$ $-\frac{8}{5}$

Change each negative rational number by rewriting it as a positive rational number.

5. -10 10 6. $-\frac{2}{7}$ $\frac{2}{7}$

7. -41 41 8. $-\frac{13}{9}$ $\frac{13}{9}$

6 Level 1 Unit 1 Number Sense

Practice

Write an integer, fraction, and decimal using each set of numbers and symbols provided. Use the negative sign as part of the number, not as an operation. Use a zero placeholder in the ones place for decimal numbers less than 1.

9. 4, 3, + $34, 43; \frac{3}{4}, \frac{4}{3}; 0.34, 0.43, 3.4, 4.3$
10. 6, 1, - $-16, -61; \frac{-1}{6}, \frac{-6}{1}; -1.6, -6.1, -0.16, -0.61$
11. 3, 8, - $-38, -83; \frac{-3}{8}, \frac{-8}{3}; -3.8, -8.3, -0.38, -0.83$
12. 1, 4, 9, - $-149, -194, -491, -419, -914, -941, \frac{-1}{49}, \frac{-1}{94}, \frac{-14}{9}, \frac{-19}{4}, \frac{-4}{19}, \frac{-4}{91}, \frac{-41}{9}, \frac{-49}{1}, \frac{-14}{41}, \frac{-41}{4}, \frac{-1}{1}, -1.49, -1.94, -4.91, -4.19, -9.14, -9.41, -14.9, -19.4, -49.1, -41.9, -91.4, -94.1, -0.149, -0.194, -0.491, -0.419, -0.914, -0.941$

Identify each rational number as negative or positive. Then identify each number as an integer, a fraction, or a decimal.

13. 5 **positive, integer**
14. $-\frac{3}{2}$ **negative, fraction**
15. -7.8 **negative, decimal**

Reflect

What is true about all of the numbers you listed in Problems 7–10? Explain.

Possible answer: They are all rational numbers; they can be written as fractions with integers in the numerators and denominators.

Week 1 Rational Numbers • Lesson 1 7

Student Workbook, pp. 6–7

Lesson 2

Objective

Students can locate rational numbers on a number line, and understand that the absolute value of a number is its distance from zero.

Vocabulary

- absolute value
- negative number
- positive number

Creating Context

Provide concrete examples of the meanings of the words *equal* and *distance*.

- Show students a map of your school building or your state.
 - Identify a central point of reference, such as the main office or a well-known city. Then identify a second location on the map.
 - Find a third location that is the same distance from the central point of reference as the second location.
- **How could you determine if these two distances are the same or equal?** Possible answers: *measure with a ruler; use the map's key.*

Materials

Program Materials

- GalaX,Y Game Board
- Magnetic Chips
- Magnetic Number Line
- Number Cards (0–100)
- Plus-Minus Cube
- Vocabulary Card, 1 *absolute value*
- Vocabulary Card 36, *negative number*
- Vocabulary Card 50, *positive number*

Additional Materials

- index cards
- rulers

Prepare Ahead

Gather Number Cards (1–10). Also, label the marks on the blank side of the Magnetic Number Line with integers -10 to 10 .

1 | Warm Up

Prepare

Draw a long, horizontal number line on the board, labeled -5 to 5 .

- Have a student stand at -3 and move slowly to the right while the class counts each step.
- **How many steps is it from -3 to 0 ?** 3
- **The distance from -3 to 0 is 3, just as it is from 0 to 3 .**

- Repeat with another volunteer to find the distance from 3 to 0 .
- Then have two students stand at numbers such as -4 and 4 . Tell them to walk to zero and count each step, simultaneously.

Just the Facts

Tell students you will call out a number from the number line. If the number is to the left of zero, students should raise their left hands. If the number is to the right of zero, students should raise their right hands. If the number is neither to the left nor right of zero, students should point their thumbs straight up.

Use numbers such as the following: -3 *left hand*; 4 *right hand*; 0 *thumbs up*

2 | Engage

Develop

How Far From Zero?

“Today we are going to mark where numbers are located on a number line. We will study *absolute value*, the distance a number is from zero.” Follow the instructions on the Activity Card **How Far From Zero?** As students complete the activity, be sure to use the Questions to Ask.

Alternative Groupings

Small Group: Each group forms a team, and two teams complete the activity together. Teams should take turns naming numbers -10 to 10 . The other team marks the number on the number line and tells its absolute value.

Pair: Complete as written, with one student naming numbers -10 to 10 . The other student marks the number on the number line and tells its absolute value.

Practice

Have students complete the *Student Workbook* or *Interactive Student Workbook*. Guide students through the Key Idea example and the Try This exercises.

Supported Differentiation

For additional support, use the Number Line Tool with students.

- Select the following settings: From: -5 ; To: 5 ; By: 1 . Use the Hop Tool and make red hop arrows from 0 to 5 by 1 , and from 0 to -5 by 1 .
- Guide students to count from 0 to 5 and from 0 to -5 . Point out that the red hop arrows show counting by 1 . Each hop equals a distance of 1 unit.
- Point to various numbers. For each number, have students identify the number of red hop arrows and state the absolute value. Then ask students to identify another number that has the same absolute value.
- You may wish to cover up parts of the screen to help students focus on specific portions of the number line.
- Students may also repeat the process with Number Format changed to decimals and then to fractions. This type of practice helps demonstrate that the concept applies to all rational numbers.

3 | Reflect

Think Critically

Review students' answers to the Reflect prompt in the *Student Workbook* and then review the Engage activity.

- ▶ **How can you determine the absolute value of a number if you do not have a number line?** Possible answer: If a number is negative, such as -5 , then its absolute value is the opposite of the number. If the number is positive, the absolute value is the same as the number.

Real-World Application

When you have a bank account, you receive a monthly statement from the bank. The statement shows how much money you have, how much money you withdrew, and how much money you deposited. Withdrawals are shown as negative numbers because they subtract money from your account. Deposits are shown as positive numbers because they add money to your account.

- ▶ **What does $-\$100$ mean on your bank statement?** Possible answers: I withdrew $\$100$; I took out $\$100$; I subtracted $\$100$ from the account.
- ▶ **What does $\$100$ mean?** Possible answer: I deposited $\$100$; I added $\$100$ to the account.
- ▶ **What is true about $-\$100$ and $\$100$?** Possible answers: They have the same absolute value; they are the same amount of money used in opposite ways; they both tell by how much the account changed.

4 | Assess

Informal Assessment

Use the following table for informal observations.

How Far From Zero?	
Did the student	
<input type="checkbox"/> respond accurately?	<input type="checkbox"/> respond with confidence?
<input type="checkbox"/> respond quickly?	<input type="checkbox"/> self-correct?

Additional Practice

For additional practice, have students complete the *Practice Worksheet*. Practice answers are available online.

Answer Key

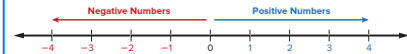
* *Interactive Student Workbook* answers are available online.

Week 1 • Rational Numbers

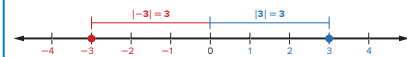
Lesson 2

Key Idea

Positive numbers are greater than zero. Negative numbers are less than zero. Always use a negative sign ($-$) to write a negative number.



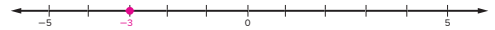
The absolute value of a number is its distance from zero. For example, the number 3 is three units away from zero. That means the absolute value of 3 is 3. Since -3 is also three units away from zero, its absolute value is also 3. We can write these facts using mathematical symbols: $|3| = 3$ and $|-3| = 3$.



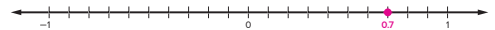
Try This

Draw a point to show the location of each rational number on the number line.

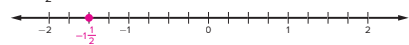
1. -3



2. 0.7



3. $-\frac{1}{2}$

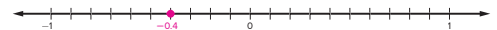


8 Level 1 Unit 1 Number Sense

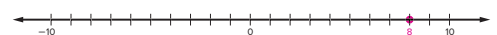
Practice

Draw a point to show the location of each rational number on the number line.

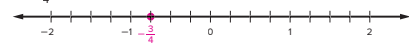
4. -0.4



5. 8



6. $-\frac{3}{4}$



Write the absolute value of each number.

7. $|-2| = 2$

8. $|5.3| = 5.3$

9. $|-7\frac{3}{5}| = 7\frac{3}{5}$

10. $|-0.1| = 0.1$

Reflect

Explain how to determine the absolute value of a number.

Possible answer: Figure out how far the number is from zero on a number line. The absolute value of a number is always positive.

Week 1 Rational Numbers • Lesson 2 9

Student Workbook, pp. 8–9

Lesson 3

Objective

Students can apply knowledge of rational numbers on a horizontal number line to a vertical scale such as a thermometer.

Vocabulary

- negative number
- positive number

Creating Context

Remind students that *horizontal* means side to side, and *vertical* means up and down. Use a pencil or ruler to illustrate the difference. Have students lay flat on the floor to illustrate a horizontal position. Then have them stand straight to illustrate a vertical position. You may wish to reinforce the concepts with real-world connections, such as the sun setting over the horizon or the verticality of a basketball player.

Materials

Program Materials

- World Temperatures
- Vocabulary Card 36, *negative number*
- Vocabulary Card 50, *positive number*

Additional Materials

- outdoor vertical thermometers (Celsius scale), 1 per group
- world map or globe

Prepare Ahead

Prepare World Temperatures for display to the class.

1 | Warm Up

Prepare

- Have students describe what it feels like outside on very hot and very cold days.
- Display a vertical, outdoor thermometer. Point out the Celsius scale on the thermometer.
- State that 0 degrees Celsius is the freezing point—the temperature at which water turns to ice. Explain that all temperatures greater than 0 degrees Celsius are above freezing, and all temperatures less than 0 degrees Celsius are below freezing.
- Explain that reading temperatures on a vertical thermometer is just like locating points on a vertical number line.

Just the Facts

Explain that you will be calling out temperatures in degrees Celsius. If the temperature is above 0 degrees, students should point their thumbs up. If the temperature is below 0 degrees, students should point their thumbs down. Use temperatures such as the following:

- ▶ 12 degrees *thumb up*
- ▶ -3 degrees *thumb down*
- ▶ -25 degrees *thumb down*

2 | Engage

Develop

Hot or Cold?

“Today, we are going to use a thermometer to record different temperatures. This is just like locating numbers on a vertical number line.” Follow the instructions on the Activity Card **Hot or Cold?** As students complete the activity, be sure to use the Questions to Ask.

Alternative Groupings

Whole Class: Have volunteers take turns marking each city’s temperature on the thermometer.

Pair: Partners can take turns marking the cities’ temperatures on a thermometer, or one student can mark positive temperatures and the other can mark negative temperatures.

Practice

Have students complete the **Student Workbook** or **Interactive Student Workbook**. Guide students through the Key Idea example and the Try This exercises.

Supported Differentiation

For additional support, use the Coordinate Grid Tool with students.

- Select the -10 to 10 grid. Point out that the *x*-axis is a horizontal number line, and the *y*-axis is a vertical number line.
- Place a point on the horizontal number line (the *x*-axis). Have students identify the number marked by the point. Then drag the point to its corresponding location on the *y*-axis, and identify its absolute value.
- Continue this process with different positive and negative numbers until students demonstrate a clear understanding of how to locate rational numbers on a vertical number line.

3 | Reflect

Think Critically

Review students' answers to the Reflect prompt in the *Student Workbook* and then review the Engage activity.

- ▶ **What is the difference between a vertical number line and a horizontal number line?** Possible answer: The only difference is the way it stands; one has a scale that goes up and down, and the other has a scale that goes left to right.

Real-World Application

Remind students that a thermometer is an example of a real-world, vertical number line. Also mention that knowing how to use a thermometer helps people make valuable decisions.

- ▶ **If the temperature outside gets too cold, you may need to bring certain plants inside. Here's an example: You have plants that cannot live if the temperature drops below freezing. The current reading on the thermometer is 1 degree Celsius, and the temperature is supposed to drop 5 degrees overnight. In this situation, would you bring your plants into your home? Explain.** Yes; the temperature is predicted to fall to -4 , degrees Celsius, which is colder than 0 degrees.
- Discuss the difference between the Celsius and Fahrenheit scales. Be sure to mention the temperature on both scales at which water freezes.
- ▶ **It is -5 degrees Fahrenheit outside today. What kinds of clothes should you wear?** Answers will vary, but should mention clothing appropriate for very cold weather.

4 | Assess

Informal Assessment

Use the following table for informal observations.

Hot or Cold?	
Did the student	
<input type="checkbox"/> apply learning to a new situation?	<input type="checkbox"/> contribute answers?
<input type="checkbox"/> contribute concepts?	<input type="checkbox"/> connect mathematics to the real world?

Additional Practice

For additional practice, have students complete the *Practice Worksheet*. Practice answers are available online.

Answer Key

* Interactive Student Workbook answers are available online.

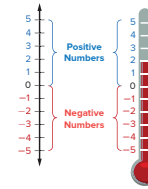
Week 1 • Rational Numbers

Lesson 3

Key Idea

Vertical number lines are similar to horizontal number lines. On a vertical number line, the numbers are labeled up and down from zero, instead of right and left of zero. For vertical number lines, **positive numbers** lie above 0, and **negative numbers** lie below zero.

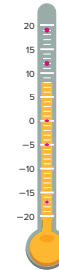
A thermometer is a real-world example of a vertical number line.



Try This

Draw and label the following points on the thermometer.

- 12 degrees
- -5 degrees
- 0 degrees
- -17 degrees
- 19 degrees



10 Level 1 Unit 1 Number Sense

Practice

Draw and label the following points on the thermometer. Then write the absolute value of each number.

- -15
 $|-15| = 15$
- -1
 $|-1| = 1$
- 18
 $|18| = 18$
- -8
 $|-8| = 8$
- 8
 $|8| = 8$
- 3
 $3 = 3$
- -11
 $|-11| = 11$



Reflect

Is -10 degrees below or above -5 degrees on a thermometer? Why?

The temperature -10 degrees is below -5 degrees on a thermometer.

The numbers on a vertical number line decrease from top to bottom, and

-10 is less than -5 .

Week 1 Rational Numbers • Lesson 3 11

Student Workbook, pp. 10–11

Lesson 4

Objective

Students can apply a knowledge of rational numbers to real-world problems.

Vocabulary

- absolute value
- negative number
- positive number

Creating Context

Discuss with students the terms *above sea level* and *below sea level*. Emphasize that we use negative numbers to describe distances below sea level, but the actual distances are always positive. Demonstrate this concept by having students walk three steps forward to model $+3$ and the 3 steps backward to model -3 . Point out that in each case, the students travel the same distance (three steps).

Materials

Program Materials

- Vocabulary Card 1, *absolute value*
- Vocabulary Card 36, *negative number*
- Vocabulary Card 50, *positive number*

Additional Materials

- colored pencils
- index cards, 10 per group
- long sheets or rolls of paper
- rulers or meter sticks

Prepare Ahead

Prepare a copy of the Lowest Point on Land table (see Real-World Application section on the following page) for display to the class.

1 | Warm Up

Prepare

- Remind students that they already know how to use positive and negative numbers to describe temperatures.
- ▶ **What kinds of numbers do you use to describe temperatures above zero degrees? Below zero degrees?** *positive numbers; negative numbers*
- Explain that we can use positive and negative numbers to describe many other phenomena in the real world.

Just the Facts

Say different integers between -10 and 10 . Tell students to take that number of steps forward for positive numbers or backward for negative numbers. Then students should use their fingers to show the absolute value of the number. Use numbers, such as the following:

- ▶ -2 *two steps backward; two fingers*
- ▶ 6 *six steps forward; six fingers*
- ▶ -5 *five steps backward; five fingers*

2 | Engage

Develop

Creating a World

“Today, we will use number lines and create new worlds. We will use rational numbers—both positive and negative—to locate places in that world, and we will use absolute values to compare distances.” Follow the instructions on the Activity Card **Creating a World**. As students complete the activity, be sure to use the Questions to Ask.

Alternative Groupings

Pair: Partners should work together to create number lines. They should also label and illustrate at least ten locations.

Whole Class: Display a long sheet of paper on the board, wall, or floor. Work together as a class to develop a concept for a new world map. Then each student can label and illustrate one location on the map, and describe its distance from sea level.

Practice

Have students complete the *Student Workbook* or *Interactive Student Workbook*. Guide students through the Key Idea example and the Try This exercises.

Supported Differentiation

For additional support, use the Number Line Tool with students.

- Select the following settings: From: -10 ; To: 10 ; By: 1 . Use the Hop Tool and make red hop arrows from 0 to 10 by 1 , and from 0 to -10 by 1 .
- Name two locations above or below sea level between -10 feet and 10 feet.
- To determine each number’s absolute value, students should identify locations on the number line, and count red hop arrows to zero.
- Finally, guide students to identify which location is farther from sea level by comparing the absolute values of the numbers.
- Repeat the process until students can confidently apply their knowledge of rational numbers to real-world problems.

3 | Reflect

Think Critically

Review students' answers to the Reflect prompt in the *Student Workbook* and then review the Engage activity.

- ▶ Which type of number line do you prefer using, horizontal or vertical? *Answers may vary.*

Real-World Application

Display the table, below. Have students use absolute values to compare the elevations.

- ▶ Which lake's shore is farther from sea level, Lake Assal or Lake Eyre? *Lake Assal*
- ▶ Which is farther from sea level, the bottom of Death Valley or the bottom of Bentley Trench? *the bottom of Bentley Trench*
- ▶ Which two continents have the two lowest points of land in the world? *Antarctica and Asia*

Continent	Lowest Point of Land
Africa	Lake Assal shore, -156 m
Antarctica	Bentley Trench, -2,538 m
Asia	Dead Sea shore, -409 m
Australia	Lake Eyre, -12 m
Europe	Caspian Sea shore -28 m
North America	Death Valley, -86 m
South America	Laguna del Carbon, -105 m

4 | Assess

Informal Assessment

Use the following table for informal observations.

Creating a World	
Did the student	
<input type="checkbox"/> provide a clear explanation?	<input type="checkbox"/> choose appropriate strategies?
<input type="checkbox"/> communicate reasons and strategies?	<input type="checkbox"/> argue logically?

Additional Practice

For additional practice, have students complete the *Practice Worksheet*. Practice answers are available online.

Answer Key

* *Interactive Student Workbook* answers are available online.

Week 1 • Rational Numbers

Lesson 4

Key Idea

You can use **positive** and **negative** rational numbers to describe real-world situations, such as elevations above and below sea level. You can also use these numbers to describe temperatures, sports statistics, as well as bank deposits and withdrawals.

Try This

Write a positive or negative rational number for each real-world situation.

- a depth of 252 feet below sea level -252
- a height of 50.9 meters above sea level 50.9
- a temperature of 6 degrees below zero -6
- a temperature of 70.5 degrees above zero 70.5
- a loss of 10 yards in a football game -10
- a gain of $5\frac{1}{2}$ yards in a football game $5\frac{1}{2}$
- a bank deposit of \$1,000 1,000
- a bank withdrawal of \$100 -100

Determine the absolute value of each distance. Then tell which distance is farther from sea level. Explain your reasoning.

- a fish swimming at -3 meters, or a mosquito flying at 7 meters
 $|-3| = 3$; $|7| = 7$; 7 meters; 7 > 3
- a submarine at -6,539 meters, or a helicopter at 4,250 meters
 $|-6,539| = 6,539$; $|4,250| = 4,250$; -6,539 meters; 6,539 > 4,250

12 Level 1 Unit 1 Number Sense

Practice

Determine the absolute value of each distance. Then tell which distance is farther from sea level. Explain your reasoning.

- a scuba diver at -60.5 meters, or a bird at 160 meters
 $|-60.5| = 60.5$; $|160| = 160$; 160 meters; 160 > 60.5
- the deepest point in Earth's oceans at -10,994 meters, or the highest point on Earth at 8,848 meters
 $|-10,994| = 10,994$; $|8,848| = 8,848$; -10,994 meters; 10,994 > 8,848
- Death Valley, California, at -282 feet, or Mount McKinley, Alaska, at 20,320 feet
 $|-282| = 282$; $|20,320| = 20,320$; 20,320 feet; 20,320 > 282
- a sea plant at -274 meters, or the top of a hill at 105 meters
 $|-274| = 274$; $|105| = 105$; -274 meters; 274 > 105

Solve each real-world problem.

- Monday's coldest temperature was -5 degrees Fahrenheit. Tuesday's coldest temperature was -3 degrees Fahrenheit. On which day was the temperature colder?
Monday
- Deion and Anita went scuba diving. Deion dove to a depth of -8,100 feet. Anita dove to a depth of -9,400 feet. Who dove to a greater depth?
Anita
- Jamal's score in a game of miniature golf is -8. Susan's score is -6. The winner of the game will be the golfer with the lower score. Who is winning the game so far?
Jamal

Reflect

How can we compare distances above and below sea level?

Possible answer: Determine each absolute value. Then compare the absolute values to see which is greater.

Week 1 Rational Numbers • Lesson 4 13

Student Workbook, pp. 12–13

Lesson 5 • Review

Objective

Students review skills learned this week, and complete the weekly assessment and project.

Vocabulary

Review vocabulary introduced during the week.

Creating Context **ELL**

Have students create vocabulary flash cards to practice their new vocabulary words. Students often benefit from cards that have vocabulary terms on one side and definitions, illustrations, and examples on the other side. To keep vocabulary cards together, punch holes in their upper-left corners and place them on book rings. Throughout the year, add new vocabulary cards to the book rings.

1 | Warm Up

Prepare

- ▶ **How do you know whether a number is a rational number?**
Possible answer: A rational number can be written as a fraction.
- ▶ **How are positive and negative numbers alike? How are they different?** Possible answer: Both are rational numbers that can be represented on a number line. Positive numbers are greater than zero; negative numbers are less than zero.
- ▶ **Where are negative numbers located on a horizontal number line? Where are they located on a vertical number line?** to the left of zero; below zero
- ▶ **Where are positive numbers located on a horizontal number line? Where are they located on a vertical number line?** to the right of zero; above zero
- ▶ **What is the absolute value of a number? How is absolute value used?** Absolute value means the distance of the number from zero; we use absolute value to compare changes and distance, regardless of direction.

2 | Engage

Practice

Have students complete the *Student Workbook*. *Interactive Student Workbook* answers are available online.

Week 1 • Rational Numbers

Lesson 5 • Review

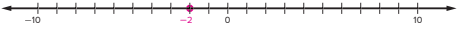
This week you learned that rational numbers are any numbers that can be written as fractions. You learned how to locate positive and negative rational numbers on both vertical and horizontal number lines. You also learned how to figure out a rational number's distance from zero by determining its absolute value.

Lesson 1 Identify each rational number as negative or positive. Then identify each as an integer, a fraction, or a decimal.

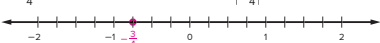
- 8 **positive, integer**
- 5 **negative, integer**
- $-\frac{4}{5}$ **negative, fraction**
- 6.2 **positive, decimal**
- 5.7 **negative, decimal**
- $-\frac{8}{3}$ **negative fraction**

Lesson 2 Draw and label the following points on the number line. Then write the absolute value of the numbers.

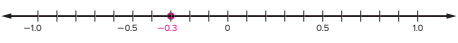
7. -2 $|-2| = 2$



8. $-\frac{3}{4}$ $|\frac{3}{4}| = \frac{3}{4}$



9. -0.3 $|-0.3| = 0.3$

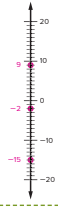


14 Level I Unit 1 Number Sense

Lesson 3

Draw and label the following points on the number line. Then write the absolute value of each number.

- 15 $|-15| = 15$
- 9 $|9| = 9$
- 2 $|-2| = 2$



Lesson 4 Solve each problem.

- Megan is at the bottom of a valley. The valley is at -50 feet. Carlos is at the top of a hill at an elevation of 75 feet. Who is farther from sea level?
Carlos
- On Friday, the temperature was -13 degrees Fahrenheit. On Saturday, the temperature was -9 degrees Fahrenheit. On which day was the temperature warmer?
Saturday
- At the end of a board game, Anita's score was -10 points, and Kwan's score was -2 points. The winner of the game was the player with the higher score. Who won the game?
Kwan

Reflect
How are negative numbers used in the real world?
Possible answers: to describe temperatures above and below 0 degrees, elevations above and below sea level, bank deposits and withdrawals, game scores, and sports-related statistics.

Week 1 Rational Numbers • Lesson 5 15

Student Workbook, pp. 14–15

3 | Reflect

Think Critically

Review students' answers to the Reflect prompt in the *Student Workbook*.

Discuss the answer with the group to reinforce Week 1 concepts.

4 | Assess

Formal Assessment

Students may take the weekly assessment online or on *Assessment* pages.

Record formal assessment scores on the Students Assessment Record, found in *Assessment*. Alternatively, navigate to your course and select Assignments to input results of the weekly assessment and review progress. Use test results and observations to determine the next steps for each student.

Going Forward

Navigate to your course and select Assignments to view results and answers for the online assessments, to input the results of print student assessments, and to review progress. Use the weekly test results and observations to determine the next steps for each student.

Retention	
Student displays good grasp of this week's concepts and skills.	Have students graph a set of data, and use absolute value to describe the meaning of each number in the set. Students should use textbooks, almanacs, or the Internet to find real-world data that include positive and negative numbers.
Remediation	
Student is still struggling with the week's concepts and skills.	Identify the skill with which the student struggles, such as locating a rational number on a number line or determining absolute value. Pair students with those who have mastered the targeted skill, and reteach the skill with the Supported Practice lesson suggestions.

Suggestions for Re-Evaluation: If a student has struggled without success for several weeks, use observations and test results to place the student at a level in which he or she can find success and build confidence to move forward.

Assessment Answer Key

Name _____ Date _____ **WEEK 1**

Rational Numbers

1. Arrange these numbers in order from least to greatest.
 $14, -14, \frac{1}{5}, -\frac{1}{5}, 0.9, -0.9, 2.6, -2.6$

-14 -2.6 -0.9
 $-\frac{1}{5}$ $\frac{1}{5}$ 0.9
 2.6 14

2. Write the absolute value for each number on the line beside it.

-6 6 4.7 4.7
 $-3\frac{2}{9}$ $3\frac{2}{9}$ 12 12
 -0.03 0.03

3. Write each number on the line below the number line it can be found on. Then, put a dot on the number line where the number is located.

-7.3 42.2 $11\frac{3}{8}$ 18 -0.6

Level 1 Assessment • Unit 1 Week 1 13

WEEK 1 Name _____ Date _____

Rational Numbers

4. Put a dot on the number line where each of these numbers would be located. Write the number beside each dot.

-4.9 0.75 -53 62 33 -27

5. Write a positive or negative number to represent each situation.

$1,578$ A hiker climbs a vertical cliff of 1,578 feet.
 -429 A hot air balloon descends 429 feet.
 3.5 A tree grows an average of 3.5 inches a year.
 -4.8 The water level drops 4.8 feet from high to low tide.
 11 The price of gasoline rose by 11 cents.

14 Level 1 Assessment • Unit 1 Week 1

Rational Numbers

1. Arrange these numbers in order from least to greatest.

14, -14, $\frac{1}{5}$, $-\frac{1}{5}$, 0.9, -0.9, 2.6, -2.6

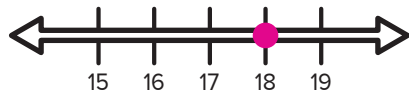
-14, -2.6, -0.9,
 $-\frac{1}{5}$, $\frac{1}{5}$, 0.9,
2.6, 14

2. Write the absolute value for each number on the line beside it.

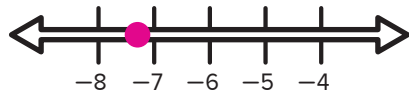
-6 6 4.7 4.7
 -3 $\frac{2}{9}$ $3\frac{2}{9}$ 12 12
 -0.03 0.03

3. Write each number on the line below the number line it can be found on. Then, put a dot on the number line where the number is located.

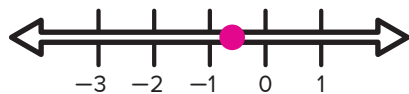
-7.3 42.2 $11\frac{3}{8}$ 18 -0.6



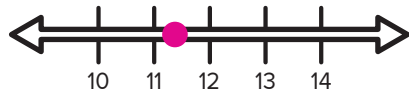
18



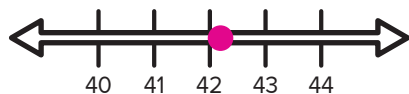
-7.3



-0.6



$11\frac{3}{8}$



42.2

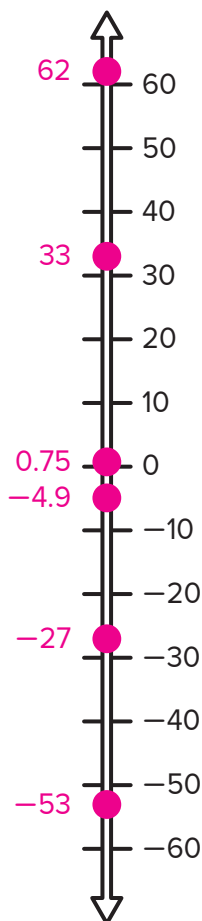
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Rational Numbers

4. Put a dot on the number line where each of these numbers would be located. Write the number beside each dot.

−4.9 0.75 −53 62 33 −27



5. Write a positive or negative number to represent each situation.

1,578 A hiker climbs a vertical cliff of 1,578 feet.

−429 A hot air balloon descends 429 feet.

3.5 A tree grows an average of 3.5 inches a year.

−4.8 The water level drops 4.8 feet from high to low tide.

11 The price of gasoline rose by 11 cents.

Project Preview

This week, students learned to identify rational numbers and convert them to different forms. They will use their understanding of rational numbers to plot integers on a vertical number line and compare the numbers.

Note: Students using the *Interactive Student Workbook* will complete projects on a sheet of paper.

Project-Based Learning

Standards-driven Project-Based Learning is effective in building deep content understanding. Project-Based Learning increases long-term retention of concepts and has been shown to be more effective than traditional instruction. Completing a project to answer an essential question challenges students to apply and demonstrate mastery of concepts and skills by expressing understanding through discussion, research, and presentation.

Essential Question

How will my knowledge of percentages and ratios help me outside the classroom?

Project Evaluation Criteria

Review project evaluation criteria with students prior to beginning the project.

Exceeds Expectations

- Project result is explained and can be extended.
- Project result is explained in context and can be applied to other situations.
- Project result is explained using advanced mathematical vocabulary.
- Project result is explained and extended, and shows advanced knowledge of mathematical concepts and skills.

Meets Expectations

- Project result is explained.
- Project result is explained in context.
- Project result is explained using mathematical vocabulary.
- Project result is described, and mathematics are used correctly.
- Project result is explained, and shows satisfactory knowledge of mathematical concepts and skills.

Does Not Meet Expectations

- Project result is not explained.
- Project result is explained, but out of context.
- Project result is explained, but mathematical vocabulary is oversimplified.
- Project result is described, but mathematics are not used correctly.
- Project result is not explained and/or extended, or shows less than satisfactory knowledge of mathematical concepts and skills.

Lemonade Empire

Objective

Students can plot integers on a vertical number line.

Materials

Program Materials

Number 7–12 Cubes

Additional Materials

- paper and pens/pencils
- rulers
- digital slide presentation software

Best Practices

- Provide meaning and organization to the lessons and concepts.
- Permit flexible classroom arrangements.
- Allow students to self-monitor.



Introduce

Even a simple business, such as a lemonade stand, needs a business plan. In this project, you will develop a business plan to start a successful lemonade business, and summarize the plan in a digital slide presentation.

Explore

- Explain that a business plan describes the details related to starting a business. For example, before banks will lend money to people hoping to start new businesses, banks require organized business plans. If the plans are complete and make sense, the banks are more likely to lend money.
- ▶ **Today, you begin making your business plan.**
- ▶ **First, you will need to name your lemonade stand. Take a few minutes to choose a name that will interest people and tell them (or suggest to them) what your product is.**
- ▶ **Next, you will start thinking about the supplies you will need to make and to serve the lemonade. In Question 2 of the Student Workbook, you will list all of the supplies you expect to need. Don't forget the materials you will need to make the lemonade, serve the lemonade, and clean up everything.**
- ▶ **Next, you will select the temperatures, in Celsius, for your lemonade and the ice. Roll a Number 7–12 Cube to determine the temperatures.**
- ▶ **Finally, follow the directions on the Student Workbook to sketch a thermometer and plot the temperatures you will use.**

Wrap Up

- Allow students time to plan their businesses by answering the questions on *Student Workbook*.
- Make sure each student can differentiate between the positive and negative temperature.
- Discuss students' answers to the Reflect prompts in the *Student Workbook*.

Tell students to make the first two slides of their presentation.

- ▶ **On the first slide, write the name of the business and title of the document as your business plan.**
- ▶ **On the next slide, summarize the decisions you made about the temperatures. You can include the drawing of your thermometer and plotted points.**

If time permits, allow each student to add art to the first two slides of the business plan. Save student work for Week 2.

Week 1 • Rational Numbers

Project

Lemonade Empire

Complete each task. **Check students' work.**

1. Decide on a name for your lemonade business. The name should interest people and help them understand what your product is.

2. Start thinking about supplies you will need, both to make the lemonade and to run the business. List all of the supplies you think you will need.

3. Roll the number cube to determine the Celsius temperature at which you will serve your lemonade. Record the temperature.

4. Ice needs to be stored at a temperature below zero degrees Celsius. Roll the number cube again. The number you roll is the opposite of the temperature at which the ice should be stored. Record the temperature.

5. On paper, sketch a simple thermometer using a ruler. The scale should show the following temperatures in degrees Celsius: 50, 40, 30, 20, 10, 0, -10, -20, -30, -40, and -50. Be sure these temperature markings are evenly spaced, such as one-fourth or one-half inch between them. Then, on the thermometer, plot the temperatures at which you will store the ice and serve the lemonade.

Reflect

How might the temperatures on the thermometer change if the difference between them increased?

Possible answer: The positive temperature (of the lemonade) could rise and/or the negative temperature (of the ice) could drop.

16 Level 1 Unit 1 Number Sense

Student Workbook, p. 16

Teacher Reflect

- Did I explain what students had to find, make, or do before they began their projects?
- Did students use their time wisely and effectively?
- Did students finish all of the steps required by the project?

Project

Lemonade Empire

Complete each task. **Check students' work.**

1. Decide on a name for your lemonade business. The name should interest people and help them understand what your product is.

2. Start thinking about supplies you will need, both to make the lemonade and to run the business. List all of the supplies you think you will need.

3. Roll the number cube to determine the Celsius temperature at which you will serve your lemonade. Record the temperature.

4. Ice needs to be stored at a temperature below zero degrees Celsius. Roll the number cube again. The number you roll is the opposite of the temperature at which the ice should be stored. Record the temperature.

5. On paper, sketch a simple thermometer using a ruler. The scale should show the following temperatures in degrees Celsius: 50, 40, 30, 20, 10, 0, -10 , -20 , -30 , -40 , and -50 . Be sure these temperature markings are evenly spaced, such as one-fourth or one-half inch between them. Then, on the thermometer, plot the temperatures at which you will store the ice and serve the lemonade.

Reflect

How might the temperatures on the thermometer change if the difference between them increased?

Possible answer: The positive temperature (of the lemonade) could rise and/or the negative temperature (of the ice) could drop.

Activity 1A

Be Rational

Objective

Students can understand that rational numbers include positive and negative integers, positive and negative fractions, and positive and negative decimals.

Materials

Program Materials

- Number 1–6 Cubes, two per team
- Plus-Minus Cube, one per team

Additional Materials

- paper and pencils
- stopwatch or two-minute timer

Alternative Groupings

Individual: Complete as written, with individuals competing against each other.

Whole Class: Complete as written, comparing numbers created as a class.

Progress Monitoring

If... students have difficulty generating rational numbers,

▶ **Then...** suggest that students create integers first, then decimals, and then fractions. Also review rational numbers with students.

Introduce the Activity

- Place students into teams of two (or three) students to ensure an even number of teams.
- Each team should have pencil and paper to record the numbers created.
- A round consists of rolling all three cubes. Teams then have two minutes to arrange the two digits and the sign into as many rational numbers (integers, fractions, and decimals) as they can, and to record their results. The goal is to create as many numbers as possible.
- The fraction bar and decimal point are available for use. Students must roll the + sign to write positive numbers. When writing a decimal number less than zero, students should use a zero place holder in the ones place. (Students should write 0.35, not .35.) So, for a roll of $-$, 3, and 5, students should generate -35 , -53 , -3.5 , -5.3 , -0.35 , -0.53 , -3.5 , and -5.3 .

Begin the Activity

- Demonstrate a shortened round for the class.
- Monitor teams, and make suggestions if students are having difficulty generating numbers.
- At the end of each round, the teams compare their results. Members of one team can challenge any numbers generated by an opposing team, but challengers must have a valid reason for each challenge.
- After each round, change the pairings of teams, so that students can compete against a different set of classmates.

Conclude the Activity

- If desired, keep track of the numbers generated in each round, and recognize the team that generated the most numbers.
- Discuss any frequent errors made in generating the numbers.
- Have students practice saying the numbers aloud.

Questions to Ask

- ▶ **Which type of number appears most often in your results?** Answers may vary.
- ▶ **What strategies did you use in order to write numbers as quickly and accurately as possible?** Accept all reasonable answers.
- ▶ **What term describes all of the numbers you wrote?** rational numbers
- ▶ **Is 0 a rational number? Why?** yes; possible answer: Zero can be written as 0 1.

Challenge

Use three Number 1–6 Cubes. This will allow for mixed numbers to be generated.

Activity 1B

How Far From Zero?

Objective

Students can locate rational numbers on a number line, and understand that the absolute value of a number is its distance from zero.

Materials

Program Materials

- GalaX,Y Game Board
- Magnetic Chips
- Magnetic Number Line
- Number Cards (1–10)
- Plus-Minus Cube

Additional Materials

index cards

Alternative Groupings

Small Group: Each group forms a team, and two teams complete the activity together. Teams should take turns naming numbers -10 to 10 . The other team marks the number on the number line and tells its absolute value.

Pair: Complete as written, with one student naming numbers -10 to 10 . The other student marks the number on the number line and tells its absolute value.

Prepare Ahead

- Gather Number Cards (1–10).
- Label the marks on the blank side of the Magnetic Number Line with integers -10 to 10 .

Progress Monitoring

If... students have trouble marking the correct places on the number line,

► **Then...** lead students to count the units of the number line, starting at zero and moving to negative ten, pointing at each number as they count. Repeat for zero to positive ten.

Introduce the Activity

- Explain that students will use a number line to determine the absolute value of different numbers.
- Show the Magnetic Number Line. Place a chip at 0.

- **What number does this chip mark? 0**
- Explain that zero separates rational numbers into two categories—positive numbers and negative numbers. State that the numbers to the left of zero are negative; they are less than zero.
- Then state that numbers to the right of zero are positive; they are greater than zero. Zero is neither positive nor negative.
- Place a chip at -5 .
- **What number does this chip mark? -5**
- Write $|-5|$ on the board. Explain that the two vertical line segments are the symbol for absolute value.
- **The absolute value of a number is its distance from 0 on a number line. The expression on the board says, “The absolute value of negative five.”**
- While counting the units aloud, move the chip from -5 to 0 on the number line.
- **What is the distance from -5 to zero on a number line? 5 (or, 5 units)**
- **This means that the absolute value of -5 is 5.**
- Write $-5 = 5$.
- **Is there another number that is 5 units from zero? What is that number? yes; 5**

Begin the Activity

- Organize students into two teams.
- Have a volunteer from each team select a number card to decide which team goes first.
- The first team should roll the Plus-Minus Cube and select a number card.
- Have a student from that team say the number represented. Then have him or her use a chip to mark the number’s location on the Magnetic Number Line.
- Ask the next student from the team for the absolute value of that number.
- A correct answer gains the team a point.
- Repeat the sequence, alternating teams.
- Each round consists of each team completing a turn. Continue the activity so that each team has at least five turns.

Conclude the Activity

To conclude the activity and ensure understanding, say different numbers to the class, and have students determine the absolute value of each. Then have students identify a second number that has the same absolute value.

Questions to Ask

- ▶ How do you know if a number lies to the left or right of zero?
- ▶ How can you determine the absolute value of a number?
- ▶ Can a positive number and a negative number have the same absolute value? Explain.

Variation

Each round, have teams compare the absolute value of their numbers. The team with the greatest absolute

value wins the round and gains a point. If the numbers have the same absolute value, both teams earn a point

Alternatively, have students use the GalaX, Y Game Board to plot points on a number line, letting the pink dot in the center of the Game Board represent 0. Students can locate positive and negative integers on the horizontal line that passes through the pink dot. Students can also locate positive and negative integers on the vertical line that passes through the pink dot.

Activity 1C

Hot or Cold?

Objective

Students can apply knowledge of rational numbers on a horizontal number line to a vertical scale, such as a thermometer.

Materials

Program Materials

World Temperatures

Additional Materials

- outdoor, vertical thermometers (Celsius scale), 1 per group
- world map or globe

Alternative Groupings

Whole Class: Have volunteers take turns marking each city's temperature on the thermometer.

Pair: Partners can take turns marking the cities' temperatures on a thermometer, or one student can mark positive temperatures and the other can mark negative temperatures.

Prepare Ahead

Prepare World Temperatures for display to the class.

Progress Monitoring

If... students have difficulty locating negative temperatures on the thermometer,	► Then... lay the thermometer on its side, so that it looks like a familiar, horizontal number line.
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Introduce the Activity

Explain that in this activity, students will locate and mark temperatures for various world cities on a vertical number line.

- Show students a thermometer, and draw a vertical number line on the board.
- **How is a thermometer similar to a vertical number line?** Possible answer: It has a point for zero, positive numbers that go above zero, and negative numbers that go below zero.

- **For a vertical number line, in which direction from 0 are the positive numbers?** Positive numbers are above the zero on a vertical number line.
- **In which direction from 0 are the negative numbers?** Negative numbers are below the zero on a vertical number line.
- State that locating and marking points on a vertical number line is like locating and marking points on a horizontal number line.

Begin the Activity

- Organize students into small groups of two or three.
- Give each group a copy of World Temperatures.
- Have group members work together to locate, mark, and label city temperatures on the thermometer. For each city, students should draw the appropriate point on the number line and write the city name next to that point.

Conclude the Activity

- Have groups compare the labels on their thermometers.
- Have students identify pairs of cities with temperatures that have the same absolute values. Easter Island, Troll; Los Angeles, Yakutsk; San Diego, Fairbanks; Baltimore, Longyearbyen; Minneapolis, Anchorage; Madison, Whitehorse
- If time allows, help students locate each city on a map or a globe.

Questions to Ask

- **How do you know whether to place the point above or below zero?**
- **Which city has the warmest temperature? Which city has the coldest temperature?** Easter Island; Troll

Activity 1D

Creating a World

Objectives

Students can apply a knowledge of rational numbers to real-world problems.

Materials

Additional Materials

- colored pencils
- index cards, 10 per group
- long sheets or rolls of paper
- rulers or meter sticks

Alternative Groupings

Pair: Partners should work together to create number lines. They should also label and illustrate at least ten locations.

Whole Class: Display a long sheet of paper on the board, wall, or floor. Work together as a class to develop a concept for a new world map. Then each student can label and illustrate one location on the map, and describe its distance from sea level.

Progress Monitoring

If... students have difficulty understanding how positive and negative numbers describe locations in their worlds,	Then... tell students to think of 0 as the surface of the ocean. Locations with negative heights (or negative elevations) will be underwater or underground.
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Introduce the Activity

- Organize students into small groups. Give each group a long sheet of paper and ten index cards.
- Tell students to write a number between $-5,000$ and $5,000$ on each index card. Tell them that half of the numbers should be positive and half of them should be negative. Numbers can be whole numbers, fractions, or decimals.
- **Today, you will be working with a group to create your own, new world. Your world can be a fantasy world, or it can be based on the real world. The numbers you just wrote on your cards are the heights, or elevations, of ten places in your world.**
- **Be sure to label elevations in feet or meters.**

Begin the Activity

- Have groups use rulers or meter sticks to draw a horizontal or vertical number line on their papers. Number lines should include values from -5000 to 5000 , with intervals of 500 .
- Tell students that *sea level* is at the ocean's surface, and they should label 0 degrees as sea level. Places above or to the right of 0 are above sea level; places below or to the left of 0 are below sea level.
- Groups should select ten locations, real or imaginary. If needed, suggest that negative values should be used for underwater or underground places, and positive values should be used for different land elevations or for the tops of man-made structures.
- Students should locate and label each location on their number lines.
- If time permits, students may decorate their number lines to show features of their ten locations.

Conclude the Activity

- Have each group identify the places in their world that are closest to, and furthest from, sea level.
- Discuss how making such comparisons involves comparing the absolute values of numbers.
- Have students share their work with the class

Questions to Ask

- ▶ **What are other real-world situations that can be described using positive and negative numbers?**
Possible answers: temperatures, deposits and withdrawals of money, profits and debts, yards gained and lost in football games, golf scores, time before and after the launching of space rockets, etc.
- ▶ **How do positive and negative numbers help us talk about the distances above and below sea level?**
- ▶ **What is the difference between using a horizontal and a vertical number line?**

Lesson 1

Find the Math

Death Valley National Park is located in the eastern part of California. Its lowest point is named Badwater Basin, which is 282 feet below sea level. The surrounding mountains, however, rise as high as 11,049 feet above sea level.



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1. What number can you use to show that something is at sea level?

0

2. How would you indicate that a mountain's elevation is 11,049 feet above sea level?

11,049 ft

3. How would you write the depth of the Badwater Basin using symbols?

-282 ft

Lesson 1

Key Idea

An **integer** is any whole number or its opposite. A **rational number** is any number that can be written as a **fraction** in which both the numerator and the denominator are integers. Rational numbers can be **positive** or **negative**. Rational numbers can be whole numbers, integers, **fractions**, or **decimals**. Here are some examples:

$3 \quad 0.42 \quad \frac{7}{4}$

$-3 \quad -0.42 \quad \frac{-7}{4}$

Try This

Change each positive rational number by rewriting it as a negative rational number.

1. 5 -5

2. 1.2 -1.2

3. $\frac{3}{4}$ $\frac{-3}{4}$

4. $\frac{8}{5}$ $\frac{-8}{5}$

Change each negative rational number by rewriting it as a positive rational number.

5. -10 10

6. $\frac{-2}{7}$ $\frac{2}{7}$

7. -4.1 4.1

8. $\frac{-13}{9}$ $\frac{13}{9}$

Practice

Write an integer, fraction, and decimal using each set of numbers and symbols provided. Use the negative sign as part of the number, not as an operation. Use a zero placeholder in the ones place for decimal numbers less than 1.

9. 4, 3, + 34, 43; $\frac{3}{4}$, $\frac{4}{3}$; 0.34, 0.43, 3.4, 4.3
10. 6, 1, - -16, -61; $\frac{-1}{6}$, $\frac{-6}{1}$; -1.6, -6.1, -0.16, -0.61
11. 3, 8, - -38, -83; $\frac{-3}{8}$, $\frac{-8}{3}$; -3.8, -8.3, -0.38, -0.83
12. 1, 4, 9, - -149, -194, -491, -419, -914, -941, $\frac{-1}{49}$, $\frac{-1}{94}$, $\frac{-14}{9}$, $\frac{-19}{4}$, $\frac{-4}{19}$, $\frac{-4}{91}$, $\frac{-41}{9}$, $\frac{-49}{1}$, $\frac{-9}{14}$, $\frac{-9}{41}$, $\frac{-91}{4}$, $\frac{-94}{1}$; -1.49, -1.94, -4.91, -4.19, -9.14, -9.41, -14.9, -19.4, -49.1, -41.9, -91.4, -94.1, -0.149, -0.194, -0.491, -0.419, -0.914, -0.941

Identify each rational number as negative or positive. Then identify each number as an integer, a fraction, or a decimal.

13. 5 positive, integer
14. $\frac{-3}{2}$ negative, fraction
15. -7.8 negative, decimal

Reflect

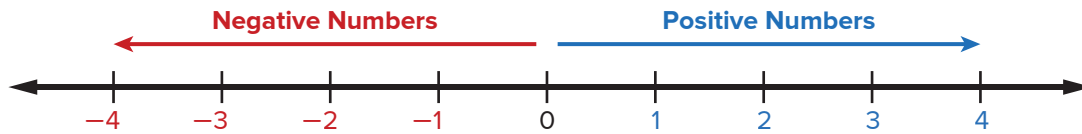
What is true about all of the numbers you listed in Problems 7–10? Explain.

Possible answer: They are all rational numbers; they can be written as fractions with integers in the numerators and denominators.

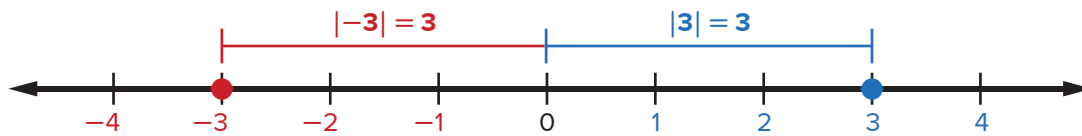
Lesson 2

Key Idea

Positive numbers are greater than zero. **Negative numbers** are less than zero. Always use a negative sign (–) to write a negative number.



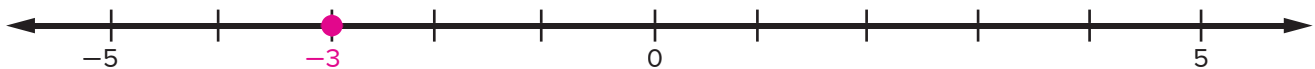
The **absolute value** of a number is its distance from zero. For example, the number 3 is three units away from zero. That means the absolute value of 3 is 3. Since -3 is also three units away from zero, its absolute value is also 3. We can write these facts using mathematical symbols: $|3| = 3$ and $|-3| = 3$



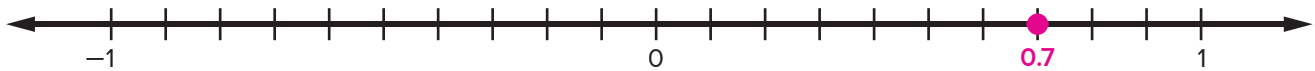
Try This

Draw a point to show the location of each rational number on the number line.

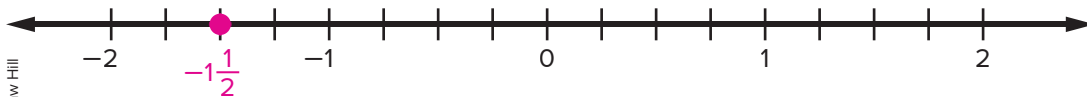
1. -3



2. 0.7



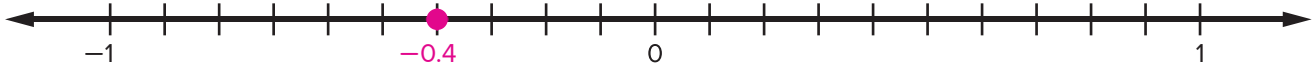
3. $-1\frac{1}{2}$



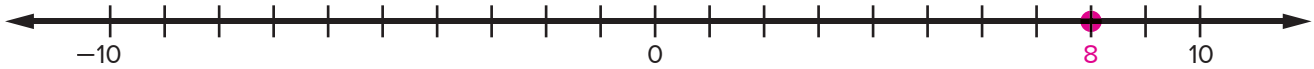
Practice

Draw a point to show the location of each rational number on the number line.

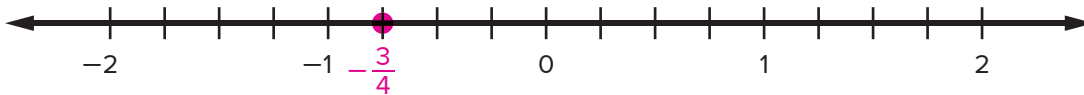
4. -0.4



5. 8



6. $-\frac{3}{4}$



Write the absolute value of each number.

7. $|-2| = \underline{2}$

8. $|5.3| = \underline{5.3}$

9. $|-7\frac{3}{5}| = \underline{7\frac{3}{5}}$

10. $|-0.1| = \underline{0.1}$

Reflect

Explain how to determine the absolute value of a number.

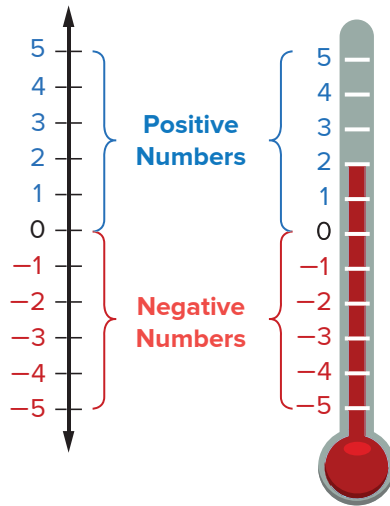
Possible answer: Figure out how far the number is from zero on a number line. The absolute value of a number is always positive.

Lesson 3

Key Idea

Vertical number lines are similar to horizontal number lines. On a vertical number line, the numbers are labeled up and down from zero, instead of right and left of zero. For vertical number lines, **positive numbers** lie above 0, and **negative numbers** lie below zero.

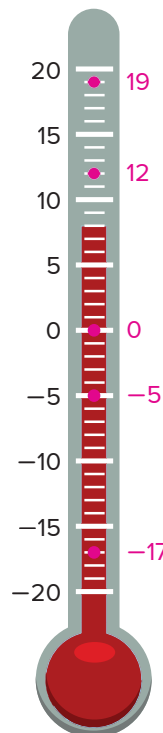
A thermometer is a real-world example of a vertical number line.



Try This

Draw and label the following points on the thermometer.

- 12 degrees
- 5 degrees
- 0 degrees
- 17 degrees
- 19 degrees



Practice

Draw and label the following points on the thermometer. Then write the absolute value of each number.

6. -15
 $|-15| = \underline{15}$

7. -1
 $|-1| = \underline{1}$

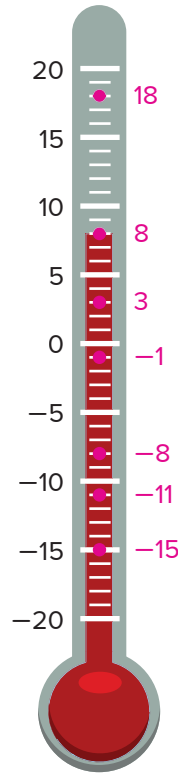
8. 18
 $|18| = \underline{18}$

9. -8
 $|-8| = \underline{8}$

10. 8
 $|8| = \underline{8}$

11. 3
 $3 = \underline{3}$

12. -11
 $|-11| = \underline{11}$



Reflect

Is -10 degrees below or above -5 degrees on a thermometer? Why?

The temperature -10 degrees is below -5 degrees on a thermometer.

The numbers on a vertical number line decrease from top to bottom, and -10 is less than -5 .

Lesson 4

Key Idea

You can use **positive** and **negative** rational numbers to describe real-world situations, such as elevations above and below sea level. You can also use these numbers to describe temperatures, sports statistics, as well as bank deposits and withdrawals.

Try This

Write a positive or negative rational number for each real-world situation.

1. a depth of 252 feet below sea level -252
2. a height of 50.9 meters above sea level 50.9
3. a temperature of 6 degrees below zero -6
4. a temperature of 70.5 degrees above zero 70.5
5. a loss of 10 yards in a football game -10
6. a gain of $5\frac{1}{2}$ yards in a football game $5\frac{1}{2}$
7. a bank deposit of \$1,000 $1,000$
8. a bank withdrawal of \$100 -100

Determine the **absolute value** of each distance. Then tell which distance is farther from sea level. Explain your reasoning.

9. a fish swimming at -3 meters, or a mosquito flying at 7 meters
 $|-3| = 3; |7| = 7; 7 \text{ meters}; 7 > 3$
10. a submarine at $-6,539$ meters, or a helicopter at 4,250 meters
 $|-6,539| = 6,539; |4,250| = 4,250; -6,539 \text{ meters}; 6,539 > 4,250$

Practice

Determine the absolute value of each distance. Then tell which distance is farther from sea level. Explain your reasoning.

11. a scuba diver at -60.5 meters, or a bird at 160 meters

$$|-60.5| = 60.5; |160| = 160; 160 \text{ meters}; 160 > 60.5$$

12. the deepest point in Earth's oceans at $-10,994$ meters, or the highest point on Earth at 8,848 meters

$$|-10,994| = 10,994; |8,848| = 8,848; -10,994 \text{ meters}; 10,994 > 8,848$$

13. Death Valley, California, at -282 feet, or Mount McKinley, Alaska, at 20,320 feet

$$|-282| = 282; |20,320| = 20,320; 20,320 \text{ feet}; 20,320 > 282$$

14. a sea plant at -274 meters, or the top of a hill at 105 meters

$$|-274| = 274; |105| = 105; -274 \text{ meters}; 274 > 105$$

Solve each real-world problem.

15. Monday's coldest temperature was -5 degrees Fahrenheit. Tuesday's coldest temperature was -3 degrees Fahrenheit. On which day was the temperature colder?

Monday

16. Deion and Anita went scuba diving. Deion dove to a depth of $-8,100$ feet. Anita dove to a depth of $-9,400$ feet. Who dove to a greater depth?

Anita

17. Jamal's score in a game of miniature golf is -8 . Susan's score is -6 . The winner of the game will be the golfer with the lower score. Who is winning the game so far?

Jamal

Reflect

How can we compare distances above and below sea level?

Possible answer: Determine each absolute value. Then compare the absolute values to see which is greater.

Lesson 5 • Review

This week you learned that rational numbers are any numbers that can be written as fractions. You learned how to locate positive and negative rational numbers on both vertical and horizontal number lines. You also learned how to figure out a rational number's distance from zero by determining its absolute value.

Lesson 1 Identify each rational number as negative or positive. Then identify each as an integer, a fraction, or a decimal.

1. 8 **positive, integer**

2. -5 **negative, integer**

3. $-\frac{4}{5}$ **negative, fraction**

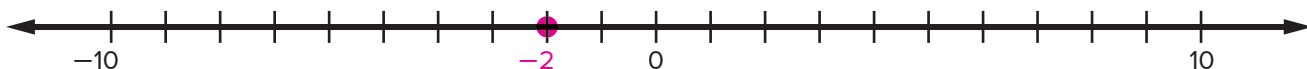
4. 6.2 **positive, decimal**

5. -5.7 **negative, decimal**

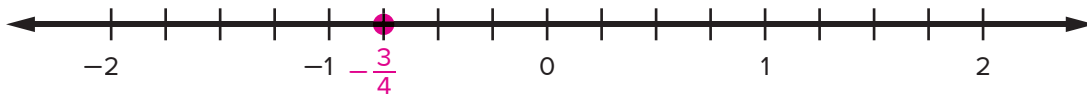
6. $-\frac{8}{3}$ **negative fraction**

Lesson 2 Draw and label the following points on the number line. Then write the absolute value of the numbers

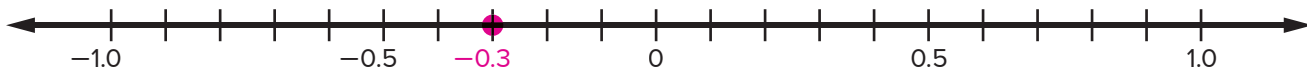
7. -2 $|-2| = \underline{2}$



8. $-\frac{3}{4}$ $|\frac{-3}{4}| = \underline{\frac{3}{4}}$



9. -0.3 $|-0.3| = \underline{0.3}$



Lesson 3 Draw and label the following points on the number line. Then write the absolute value of each number.

10. -15

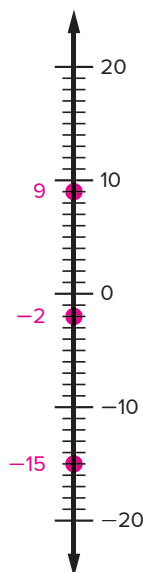
$|-15| = \underline{15}$

11. 9

$|9| = \underline{9}$

12. -2

$|-2| = \underline{2}$



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Lesson 4 Solve each problem.

13. Megan is at the bottom of a valley. The valley is at -50 feet. Carlos is at the top of a hill at an elevation of 75 feet. Who is farther from sea level?

Carlos

14. On Friday, the temperature was -13 degrees Fahrenheit. On Saturday, the temperature was -9 degrees Fahrenheit. On which day was the temperature warmer?

Saturday

15. At the end of a board game, Anita's score was -10 points, and Kwan's score was -2 points. The winner of the game was the player with the higher score. Who won the game?

Kwan

Reflect

How are negative numbers used in the real world?

Possible answers: to describe temperatures above and below 0 degrees, elevations above and below sea level, bank deposits and withdrawals, game scores, and sports-related statistics.

Name _____

Date _____

Rational Numbers: Lesson 1

Write an integer, fraction, and decimal for each set of numbers and symbols provided. Use the negative sign as part of the number, not as an operation. For decimal numbers less than 1, use a zero placeholder in the ones place.

1. 5, 7, + 57, 75; $\frac{5}{7}$, $\frac{7}{5}$; 0.57, 0.75, 5.7, 7.5

2. 2, 9, - -29, -92; $\frac{-2}{9}$, $\frac{-9}{2}$; -0.29, -0.92, -2.9, -9.2

3. 1, 5, - -15, -51; $\frac{-1}{5}$, $\frac{-5}{1}$; -0.15, -0.51, -1.5, -5.1

4. 8, 3, + 83, 38; $\frac{8}{3}$, $\frac{3}{8}$; 0.83, 0.38, 8.3, 3.8

Identify each number as negative or positive. Then identify each number as an integer, a fraction, or a decimal.

5. -7 negative, integer

6. $\frac{1}{3}$ positive, fraction

7. 8.2 positive, decimal

8. $\frac{-2}{5}$ negative, fraction

9. -0.9 negative, decimal

10. 1,000,000 positive, integer

11. $\frac{6}{5}$ positive, fraction

12. 15 positive, integer

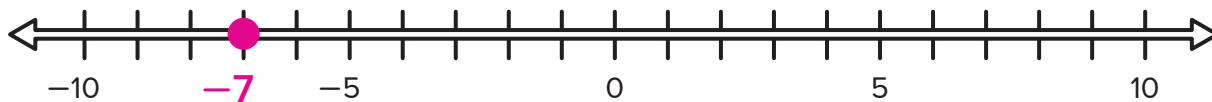
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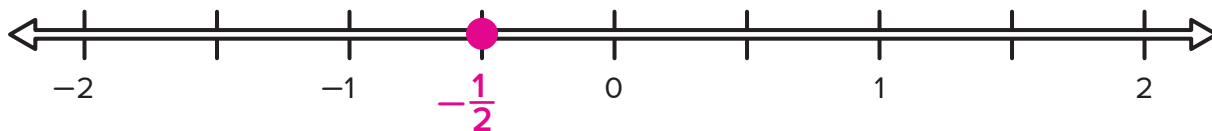
Rational Numbers: Lesson 2

Mark and label the following points on the number lines.

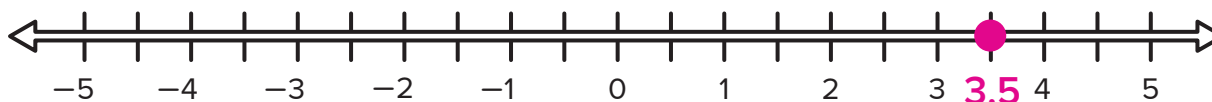
1. -7



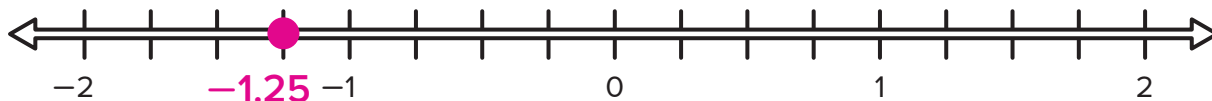
2. $-\frac{1}{2}$



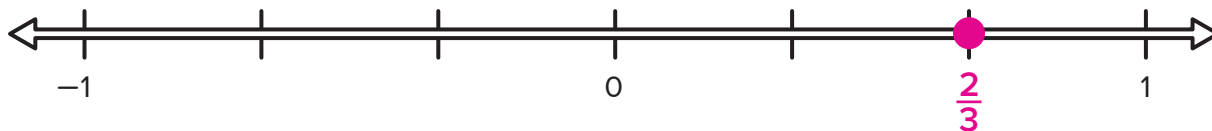
3. 3.5



4. -1.25



5. $\frac{2}{3}$



Write the absolute value of each number.

6. $|-6| = \underline{6}$

7. $|9| = \underline{9}$

8. $\left| -4\frac{5}{8} \right| = \underline{4\frac{5}{8}}$

9. $\left| -\frac{1}{4} \right| = \underline{\frac{1}{4}}$

10. $|8.2| = \underline{8.2}$

11. $|-3.75| = \underline{3.75}$

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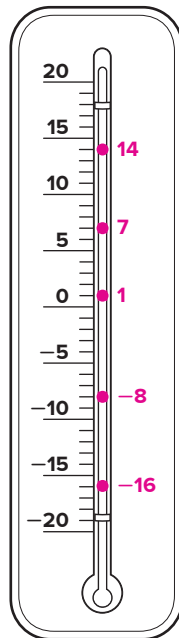
Name _____

Date _____

Rational Numbers: Lesson 3

Draw and label each of the following points on the thermometer.

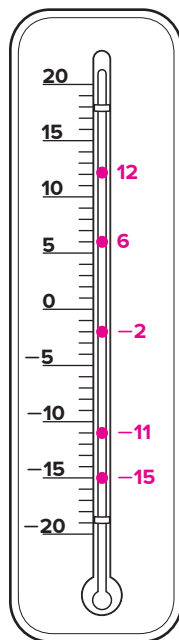
1. -8 degrees
2. 14 degrees
3. 1 degrees
4. -16 degrees
5. 7 degrees



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Draw and label the following points on the thermometer. Then write the absolute value of each number.

6. -11
 $|-11| = \underline{\hspace{2cm} 11 \hspace{2cm}}$
7. -2
 $|-2| = \underline{\hspace{2cm} 2 \hspace{2cm}}$
8. 12
 $|12| = \underline{\hspace{2cm} 12 \hspace{2cm}}$
9. -15
 $|-15| = \underline{\hspace{2cm} 15 \hspace{2cm}}$
10. 6
 $|6| = \underline{\hspace{2cm} 6 \hspace{2cm}}$



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Rational Numbers: Lesson 4

Write a positive or negative rational number for each real-world situation.

1. a temperature of 13 degrees below zero −13
2. an elevation of 200.5 meters above sea level 200.5
3. a debt of \$50 −50
4. a loss of $3\frac{1}{2}$ points in a game $-3\frac{1}{2}$
5. a temperature of 60.8 degrees above zero 60.8

Solve each problem.

6. The bottom of a well is at -60 feet, and the top of a flagpole is at 35 feet. Which distance is farther from sea level?
−60 feet
7. While scuba diving, Tyler dove to a depth of $-3,500$ feet. Marta dove to a depth of $-4,200$ feet. Who dove to a greater depth?
Marta
8. In Antarctica, the average January temperature is -27.1 degrees Celsius. The average February temperature is -38.6 degrees Celsius. In which month is the average temperature warmer?
January
9. In a computer game, the player with the fewest points wins. Max has -258 points, and Rhianna has -250 points. Who is winning the game?
Max
10. A scuba diver swims at -150 meters. A hiker stands at 1,500 meters. Which person is closer to sea level?
the scuba diver

Letter to Home

Dear Family,

In our math class, we try to relate things we learn in the classroom to the real world. In **Number Worlds**, students will study the number system. This week, students will locate rational numbers, including integers, on a number line and understand that the absolute value of a number is its distance from zero.

Below is an activity you can do together that is related to what we will do this week.

Sincerely,

Querida familia:

En nuestra clase de matemáticas, tratamos de relacionar cosas que aprendemos en el salón de clases con cosas de la vida real. En **El mundo de los números**, los estudiantes estudiarán el sistema numérico. Esta semana, los estudiantes ubicarán números racionales (incluyendo los números enteros) en una recta numérica, y comprenderán el valor absoluto de un número y la distancia que lo separa del cero.

Abajo encontrará una actividad que se relaciona con los temas de la semana y pueden hacer juntos.

Sinceramente,

Stand up and find three items in your home that are above waist level and three items that are below waist level. Let the floor be Position -10 , your waist be Position 0 , the top of your head be Position $+10$, and the ceiling be Position $+20$. Write the name of each item and its position in the tables below. Then plot each item's location on the number line.

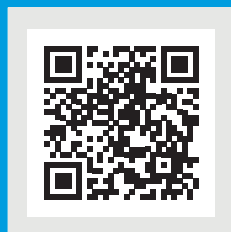
Positive Items	Position
item 1: _____	+ _____
item 2: _____	+ _____
item 3: _____	+ _____

Negative Items	Position
item 1: _____	- _____
item 2: _____	- _____
item 3: _____	- _____



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