

UNIT

# **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
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.	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.	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.

## Learning Technology

The following activities are available online to support the learning goals in this unit.

## Building Blocks Blocks

- Arrays in Area
- Clean the Plates
- Comic Book Shop
- Field Trip

### Digital Tools

- Arrays Tool
- Base 10 Blocks Tool
- Multiplication Table Tool

- Function Machine 2
- Snack Time
- Word Problems 5Word Problems 6
- Number Line Tool
- Sets Former Tool
- 100 Table Tool

## **Unit Overview**

Focus

Week

## Models for Multiplication

- Teacher Edition, pp. 276–289
- Activity Cards, 4A, 4B, 4C, 4D
- Student Workbook, pp. 5–16
- English Learner Support Guide, pp. 76–77
- Assessment, pp. 49–50

#### Number Lines and Arrays

- Teacher Edition, pp. 290-303
- Activity Cards, 4E, 4F, 4G, 4H
- Student Workbook, pp. 17–28
- English Learner Support Guide, pp. 78–79
- Assessment, pp. 51-52

#### **Building Multiplication Facts**

- Teacher Edition, pp. 304–317
- Activity Cards, 4I, 4J, 4K, 4L
- Student Workbook, pp. 29-40
- English Learner Support Guide, pp. 80-81
- Assessment, pp. 53-54

#### **Beyond the Basic Facts**

- Teacher Edition, pp. 318–331
- Activity Cards, 4M, 4N, 4O
- Student Workbook, pp. 41–52
- English Learner Support Guide, pp. 82–83
- Assessment, pp. 55–56

#### **Constructing Division**

- Teacher Edition, pp. 332-345
- Activity Cards, 4P, 4Q, 4R
- Student Workbook, pp. 53-64
- English Learner Support Guide, pp. 84-85
- Assessment, pp. 57–58

#### **Solving Word Problems**

- Teacher Edition, pp. 346-359
- Activity Cards, 4S, 4T, 4U
- Student Workbook, pp. 65-76
- English Learner Support Guide, pp. 86–87
- Assessment, pp. 59–60

## **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.

CCSS			
Learning Goals	CCSS Key Standards		
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. <b>Project:</b> Students can find products and write multiplication equations using the $\times$ symbol.	<b>Domain:</b> Operations and Algebraic Thinking <b>Cluster:</b> Represent and solve problems involving multiplication and division. <b>3.OA.1:</b> Interpret products of whole numbers (e.g., interpret $5 \times 7$ as the total number of objects in 5 groups of 7 objects each). <i>For example, describe a context in which a total number of objects can be expressed as</i> $5 \times 7$ .		
Students can extend their knowledge of models for multiplication to visualize multiplication problems as arrays and investigate the commutative and associative properties of multiplication. <b>Project:</b> Students model multiplication with arrays and use the commutative and associative properties.	<b>Domain:</b> Operations and Algebraic Thinking <b>Cluster:</b> Understand properties of multiplication and the relationship between multiplication and division. <b>3.OA.5:</b> Apply properties of operations as strategies to multiply and divide. <i>Examples:</i> If $6 \times 4 = 24$ <i>is known, then</i> $4 \times 6 = 24$ <i>is also known.</i> ( <i>Commutative property of multiplication.</i> ) $3 \times 5 \times 2$ <i>can be</i> <i>found by</i> $3 \times 5 = 15$ , <i>then</i> $15 \times 2 = 30$ , <i>or by</i> $5 \times 2 = 10$ , <i>then</i> $3 \times 10 = 30$ . ( <i>Associative property of</i> <i>multiplication.</i> ) Knowing that $8 \times 5 = 40$ and $8 \times 2 = 16$ , one can find $8 \times 7$ as $8 \times (5 + 2) = (8 \times 5) +$ $(8 \times 2) = 40 + 16 = 56$ . (Distributive property.)		
Students can extend their knowledge of repeated addition, skip counting, and arrays to do multiplication and begin to memorize multiplication fact through tens. <b>Project:</b> Students extend their knowledge of addition to multiplication.	<b>Domain:</b> Operations and Algebraic Thinking <b>Cluster:</b> Multiply and divide within 100. <b>3.OA.7:</b> Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division, (e.g., knowing that $8 \times 5 = 40$ , one knows $40 \div 5 = 8$ ) or properties of operations. By the end Grade 3, know from memory all products of two one-digit numbers.		
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. <b>Project:</b> Students extend their knowledge of multiplication facts to multiply with multi- digit numbers using the distributive property.	<b>Domain:</b> Operations and Algebraic Thinking <b>Cluster:</b> Understand properties of multiplication and division and the relationship between multiplication and division. <b>3.0A.5:</b> Apply properties of operations as strategies to multiply and divide. Examples: If $6 \times 4 = 24$ is known, then $4 \times 6 = 24$ is also known. (Commutative property of multiplication.) $3 \times 5 \times 2$ can be found by $3 \times 5 = 15$ , then $15 \times 2 = 30$ , or by $5 \times 2 = 10$ , then $3 \times 10 = 30$ . (Associative property of multiplication.) Knowing that $8 \times 5 = 40$ and $8 \times 2 = 16$ , one can find $8 \times 7$ as $8 \times (5 + 2) =$ $(8 \times 5) + (8 \times 2) = 40 + 16 = 56$ . (Distributive property.)		
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. <b>Project:</b> Students can use grouping to divide whole numbers and apply this knowledge to divide two-digit numbers by one-digit numbers with remainders.	<b>Domain:</b> Operations and Algebraic Thinking <b>Cluster:</b> Represent and solve problems involving multiplication and division. <b>3.OA.2:</b> Interpret whole-number quotients of whole numbers (e.g., interpret 56 $\div$ 8 as the number of objects in each share when 56 objects are partitioned equally into 8 shares, or as a number of shares when 56 objects are partitioned into equal shares of 8 objects each). <i>For example, describe a</i> <i>context in which a number of shares or a number of groups can be expressed as 56</i> $\div$ 8.		
Students can solve word problems (within 100) using multiplication or division. <b>Project:</b> Students can solve multiplication and division word problems with products of 99 or less.	<ul> <li>Domain: Operations and Algebraic Thinking</li> <li>Cluster: Represent and solve problems involving multiplication and division.</li> <li><b>3.OA.3:</b> Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities (e.g., by using drawings and equations with a symbol for the unknown number to represent the problem).</li> </ul>		

CCSS

Daily lesson activities emphasize using communication, logic, reasoning, modeling, tools, precision, structure, and patterns to solve problems. All student activities, reflections, and assessments require application of the **Common Core Standards for Mathematical Practice.** 

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# **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.

### English Learners 💷

For language support, use the **English Learner Support Guide**, pages 76–77, to preview lesson concepts and teach academic vocabulary. **Number Worlds** Vocabulary Cards are listed as additional materials in many lessons and can be used to preteach and reinforce academic vocabulary.



## **Weekly Planner**

Lesson	Learning Objectives	
pages 278–279	Students can use pictures of equal groups to create models for multiplication.	
<b>2</b> pages 280–281	Students can use repeated addition to create models for multiplication.	
<b>3</b> pages 282–283	Students can use the $ imes$ symbol to write multiplication problems.	
pages 284–285	Students can describe groups that come in sets to build multiplication facts.	
<b>5</b> pages 286–287	<b>Review and Assess</b> Students review skills learned this week and complete the weekly assessment.	
Project pages 288–289	Students can find products and write multiplication equations using the $\times$ symbol.	

## **Key Standard for the Week**

Domain: Operations and Algebraic Thinking

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**Cluster:** Represent and solve problems involving multiplication and division.

**3.0A.1** Interpret products of whole numbers, e.g., interpret  $5 \times 7$  as the total number of objects in 5 groups of 7 objects each. For example, describe a context in which a total number of objects can be expressed as  $5 \times 7$ .

Materials		Technology
<ul> <li>Program Materials</li> <li>Student Workbook, pp. 5–7</li> <li>Practice, p. 76</li> <li>Activity Card 4A, Counting Clubs – 1</li> </ul>	Additional Materials <ul> <li>Vocabulary Card 1, add</li> <li>Vocabulary Card 27, multiply</li> </ul>	<b>Teacher Dashboard</b> Building Comic Book Shop Sets Former Tool
<ul> <li>Program Materials</li> <li>Student Workbook, pp. 8–9</li> <li>Practice, p. 77</li> <li>Activity Card 4B, Counting Clubs – 2</li> <li>Picture Cards</li> </ul>	Additional Materials <ul> <li>index cards</li> <li>paper clips</li> </ul>	<b>Teacher Dashboard</b> <ul> <li>Sets Former Tool</li> <li>100 Table Tool</li> </ul>
<ul> <li>Program Materials</li> <li>Student Workbook, pp. 10–11</li> <li>Practice, p. 78</li> <li>Activity Card 4C, Multiplication Groups</li> <li>Multiplication Groups Recording Chart</li> <li>Number Cards (2–7)</li> </ul>	<ul> <li>Additional Materials</li> <li>Vocabulary Card 16, <i>factors</i></li> <li>Vocabulary Card 27, <i>multiply</i></li> </ul>	<b>Teacher Dashboard</b> Bridering Field Trip Bridering Clean the Plates
<ul> <li>Program Materials</li> <li>Student Workbook, pp. 12–13</li> <li>Practice, p. 79</li> <li>Activity Card 4D, Multiplication Mixer</li> <li>Multiplication Groups Recording Chart</li> <li>Number Cards (2–7)</li> </ul>	Additional Materials Vocabulary Card 27, <i>multiply</i>	<b>Teacher Dashboard</b> <ul> <li>Base 10 Blocks Tool</li> <li>Sets Former Tool</li> </ul>
<ul> <li>Program Materials</li> <li>Student Workbook, pp. 14–15</li> <li>Weekly Test, Assessment, pp. 49–50</li> <li>Neighborhood Number Line</li> </ul>		Review previous activities.
<ul> <li>Program Materials</li> <li>Student Workbook, p. 16</li> <li>Counters</li> <li>Number Cube</li> </ul>	Additional Materials letter-sized blank paper, folded vertically into thirds	Review previous activities.



## 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, page 5.



#### Objective

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

#### Standard 🚥

**3.0A.1** Interpret products of whole numbers, e.g., interpret  $5 \times 7$  as the total number of objects in 5 groups of 7 objects each. For example, describe a context in which a total number of objects can be expressed as  $5 \times 7$ .

#### Vocabulary

#### **Creating Context**

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

Additional 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.



Student Workbook, p. 5

## 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.

4A	Counting Clubs - 1
Objective	Introduce the Activity
Students can use pictures of equal groups to create models for multiplication	<ul> <li>Tell students they are going to represent different numbers by reamanging themselves into different "Clubs"</li> </ul>
	<ul> <li>Have students stand so they can move into their groups.</li> </ul>
Materials Program Materials No materials needed.	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
Alternative Groupings Pair: Use pictures or drawings of people. Ask students to choose	or 10 for a total or 20. Ask students if they can determine what each of you has 10 of that would total 20 of the same thing. Possible arrawer, ingers
two people to form a Club of 4 (arms or legs). Repeat with different numbers and different club roumbers	<ul> <li>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</li> </ul>

#### Alternative Groupings

Activity Card 4A

**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.

#### **Progress Monitoring**

**If...** students struggle to create groups from pairs, such as eyes and knees,

Then... provide students with Counters that they can physically move into groups.

#### **Practice**

Have students complete *Student Workbook,* pages 6–7. Guide students through the Key Idea example and the Try This exercises.

add 
 multiply

#### Interactive Differentiation

Consult the *Teacher Dashboard* for grouping suggestions. You can also use performance on the Engage activity to guide students.

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Building

#### Independent Practice

For additional practice with identifying groups, students should complete Comic Book Shop.

#### Supported Practice

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 at the bottom of **Student Workbook**, page 7, 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 online or print Student Record, *Assessment*, page 128, to record informal observations.

#### **Counting Clubs**—1

- Did the student
- □ make important observations?
- $\Box$  extend or generalize learning?

#### **Additional Practice**

For additional practice, have students complete *Practice*, page 76.

□ provide insightful answers?

□ pose insightful questions?



Practice, p. 76



A. 2 B. 6	c_ 12
6. A. <u>3</u> B. <u>3</u>	c. <u>9</u>
Reflect Draw four groups of three pencils Write how many pencils there are Students should draw twelve	s each. e altogether? <u>12</u> e pencils shown in four groups of three.

## Lesson 2

#### Objective

Students can use repeated addition to create models for multiplication.

#### Standard CCSS

**3.0A.1** Interpret products of whole numbers e.g., interpret  $5 \times 7$  as the total number of objects in 5 groups of 7 objects each. For example, describe a context in which a total number of objects can be expressed as  $5 \times 7$ .

#### Vocabulary

add
 multiply

#### **Creating Context**

Math activities are an excellent way to give English Learners practice listening to and speaking English. The natural repetition of procedural and counting language replaces tedious drill with authentic, active experience. Build wait time into the process, and provide a low-stakes environment that makes the activities enjoyable.

#### Materials

Program Materials

Additional Materials

index cards

• paper clips

#### **Prepare Ahead**

Make multiple copies of Picture Cards and cut them apart so that each student has at least one card.

## 1 WARM UP

#### **Prepare**

An addition strategy that students usually learn and practice is adding doubles. Provide doubles addition facts on index cards. Randomly distribute two or three different cards to the students. Demonstrate the task with a card that has 3 + 3 on it by placing three paper clips on each edge. Allow students time to complete and share their cards.

#### **Just the Facts**

Play a variation of "Simon Says" using doubles facts. Use questions such as the following:

- ▶ If 1 + 1 is 2, touch your nose. touch nose
- ▶ If 4 + 4 is 9, clap your hands. do not clap hands

State the correct answer immediately after presenting a fact with an incorrect answer, for example, "4 + 4 is 8."

## ENGAGE

#### **Develop:** Counting Clubs—2

"Today we are going to continue to practice multiplication as repeated addition through the use of groups of equal numbers." Follow the instructions on the Activity Card **Counting Clubs—2.** As students complete the activity, be sure to use the Questions to Ask.



#### Alternative Groupings

**Pair:** Lay out Picture Cards for students; four 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.

#### **Progress Monitoring**

**If...** students have difficulty remembering the repeated addition sentence in **Counting Clubs—2**,

Then... distribute paper clips to students so that they can model the amount on their cards along the edges.

#### Practice

Have students complete **Student Workbook**, pages 8–9. Guide students through the Key Idea example and the Try This exercises.

#### Interactive Differentiation



Consult the *Teacher Dashboard* for grouping suggestions. You can also use performance on the Engage activity to guide students.

#### Independent Practice



For additional practice with repeated addition use the Sets Former Tool. Have students use the Stamp tool to place groups on the mat.

#### **Supported Practice**

For additional support, use the 100 Table Tool with students.

- Tell students that you will use the 100 Table Tool to show repeated addition.
- Under Grid Type, select 0–100. Fill in Skip Count A with 0 as Start, 100 as End, and a number between 1–12 for Count By. Click Start and a pattern will highlight on the table in yellow.
- Repeat until students can relate addition sentences, such as 9 + 9 + 9 + 9 + 9 + 9 + 9 + 9 + 9 = 81, along with their corresponding multiplication facts, such as 9 × 9.



Review students' answers to the Reflect prompt at the bottom of **Student Workbook**, page 9, 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 = \$21



#### **Informal Assessment**

Use the online or print Student Record, *Assessment*, page 128, to record informal observations.

#### **Counting Clubs—2**

Did the student

□ make important observations?

provide insightful answers?pose insightful questions?

□ extend or generalize learning?

**Additional Practice** 

For additional practice, have students complete *Practice*, page 77.

M	odels for Multiplication: Lesson 2
Dr	aw a picture for each repeated-addition sentence.
1.	3+3+3+3=12
	Answers will vary, but should include pictures of four groups three each.
	10 + 10 + 10 = 30





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 = 30. Brandon's group should show seven groups of four each with an addition sentence of 4 + 4 + 4 + 4 + 4 + 4 = 28. Kelsey has more gum.

Week 1 Models for Multiplication • Lesson 2 9

Student Workbook, pp. 8–9

• multiply

## Lesson 3

#### Objective

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

#### Standard 📴

**3.0A.1** Interpret products of whole numbers, e.g., interpret  $5 \times 7$  as the total number of objects in 5 groups of 7 objects each. For example, describe a context in which a total number of objects can be expressed as  $5 \times 7$ .

#### Vocabulary

factors

#### **Creating Context**

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** 

**Recording Chart** 

Number Cards (2–7)

Multiplication Groups

- Additional Materials
- 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:

 $1 \times 3$  equals 3. One times 3 equals 3.

- $1 \times 4$  equals 4. One times 4 equals 4.
- $1 \times 8$  equals 8. One times 8 equals 8.

## 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.

4C	Multiplication Groups
Objective	Introduce the Activity
Students can use the X symbol to write multiplication problems.	<ul> <li>Explain to students that they are each going to represent a different fixed arrount for the entire activity and that they will change pairings many times.</li> </ul>
Materials Program Materials	<ul> <li>Explain that they must be able to regroup with other student partners, to collaborate, and then to record information on individual charts.</li> </ul>
Recording Chart	Begin the Activity
Alternative Groupings	<ul> <li>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.</li> </ul>
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	<ul> <li>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"</li> </ul>
sentence on their Multiplication	in the consume

Activity Card 4C

#### **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.

#### **Progress Monitoring**

**If...** students have difficulty recording information on their charts,

Then... partner with them to model recording the first sentence.

#### Practice

Have students complete *Student Workbook,* pages 10–11. Guide students through the Key Idea example and the Try This exercises.

#### **Interactive Differentiation**



Consult the **Teacher Dashboard** for grouping suggestions. You can also use performance on the Engage activity to guide students.

#### Independent Practice



Students should use Field Trip to build competence with using multiplication to describe objects in groups.

#### **Supported Practice**



For additional support, use Clean the Plates.

- Tell students that they will solve multiplication problems.
- Have students complete the Clean the Plates Activity.
- After students complete the activity, ask students to give the product of a multiplication problem by using a 2, 3, 5, or 10 fact.
- Repeat until students can confidently state the product of three multiplication by 2, 3, 5, or 10 facts.



Review students' answers to the Reflect prompt at the bottom of **Student Workbook**, page11, 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 online or print Student Record, *Assessment*, page 128, to record informal observations.

#### Multiplication Groups

Did the student
make important observations?
extend or generalize learning?

- provide insightful answers?
- eneralize learning? Depose insightful questions?

#### Additional Practice

For additional practice, have students complete *Practice*, page 78.





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Week 1 • Models for Multiplication Lesson 3 **Key Idea** 12 4 3 × 3 groups 4 12 \_ \_ \_ **Try This** Write each as a multiplication sentence. 1. × 4 = 12 4 = 8 **Practice** Write each as a multiplication sentence. **3.** 4 + 4 + 4 + 4 + 4 = 20 **4.** 2 + 2 + 2 = 6 <u>5</u> × <u>4</u> = <u>20</u> <u>3</u> × <u>2</u> = <u>6</u> **5.** 3 + 3 + 3 + 3 + 3 = 15 **6.** 7 + 7 + 7 + 7 = 28 <u>5</u> × <u>3</u> = <u>15</u> 7. Three groups of 8 equals 24. 8. Eight groups of 2 equals 16. <u>3</u> × <u>8</u> = <u>24</u> <u>8</u> × <u>2</u> = <u>16</u>

10 Level E Unit 4 Multiplication and Division



Student Workbook, pp. 10–11

## Lesson 4

#### Objective

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

#### Standard (CSS

**3.0A.1** Interpret products of whole numbers, e.g., interpret  $5 \times 7$  as the total number of objects in 5 groups of 7 objects each. For example, describe a context in which a total number of objects can be expressed as  $5 \times 7$ .

#### 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** 

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

#### **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.

## 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.

4D	Multiplication Mixer
Objective Students can describe groups that come in with to hold	Introduce the Activity     Tell students they are each going to represent several different amounts
multiplication facts.	<ul> <li>Students must be able to sit with their student partners, to collaborate, and then to record information on a joint chart.</li> </ul>
Program Materials • Multiplication Groups Recording Chart • Number Cards (2-7)	Begin the Activity  • Begin play by shuffing the Number Cards (2-7) and placing the pile face down. Give each student a copy of the Multiplication Recording Chart.
Alternative Groupings Pair: Layout a set of Namber Cards face down, Have each studient pick one Number Card, Meashable record the correct	<ul> <li>Model the task by steering the top card and choosing a student to select the exet card. Digether, record the information on a Multiplication Compa Recording Chart, follow the multiplication problem by saying any can of the following multiplication percentained and are carample, if you have down a 3 and the student drew a 5; you could say "The multiplied by these equals (filters) Or "The groups of three equation (filters)" Or Theme</li> </ul>

Activity Card 4D

**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.

#### **Progress Monitoring**

**Alternative Groupings** 

**If...** students do not know the meaning of the words used to describe sets,

Then... model the appropriate vocabulary as you use group manipulative objects into sets.

#### **Practice**

Have students complete *Student Workbook,* pages 12–13. Guide students through the Key Idea example and the Try This exercises.

#### **Interactive Differentiation**



Consult the **Teacher Dashboard** for grouping suggestions. You can also use performance on the Engage activity to guide students.

#### Independent Practice



#### Supported Practice

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.





Review students' answers to the Reflect prompt at the bottom of **Student Workbook**, page 13, 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 online or print Student Record, *Assessment*, page 128, to record informal observations.

#### **Multiplication Mixer**

Did the student

- □ make important observations?
- provide insightful answers?
- □ extend or generalize learning?
- □ pose insightful questions?

#### **Additional Practice**

For additional practice, have students complete *Practice*, page 79.



Practice, p. 79



Student Workbook, pp. 12–13

## Lesson 5 Review

#### Objective

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

#### Standard 💴

**3.0A.1** Interpret products of whole numbers, e.g., interpret  $5 \times 7$  as the total number of objects in 5 groups of 7 objects each. For example, describe a context in which a total number of objects can be expressed as  $5 \times 7$ .

#### Vocabulary

Review vocabulary introduced during the week.

#### **Creating Context**

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 × 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 Student Workbook, pages 14–15.



Student Workbook, pp. 14–15



Review students' answers to the Reflect prompt at the bottom of **Student Workbook**, page 15.

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

## **4** ASSESS

#### Formal Assessment 🥑

Students may take the weekly assessment online.

As an alternative, students may complete the weekly test on **Assessment**, pages 49–50. Record progress using the Student Assessment Record, **Assessment**, page 128.

## Going Forward

Use the **Teacher Dashboard** to view results of the online assessments, to input the results of print student assessments, and to review progress before making decisions about next steps. 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 $5 \times 5$ , 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 $4 \times 2$ , 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 <b>Retention</b> 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 he or she can find success and build confidence to move forward.

Name Date Models for Multiplication	WEEK
1. Circle the answer that shows 3 groups of 4 cubes.	
<b>2.</b> 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. 5 + 5 + 5 + 5 + 5 = 20	
<ul> <li>4. Write a repeated addition sentence for the story below.</li> <li>Julia bought 5 packages of juice for a class party. Each package had 6 boxes of juice.</li> <li><u>6</u> + <u>6</u> + <u>6</u> + <u>6</u> + <u>6</u> = <u>30</u></li> </ul>	40
Level E UNIX 4 We	9ek 1 49
Name Date Models for Multiplication	_
$3 \times 4 = 12$	
<ul> <li>6. Write a multiplication sentence that matches this addition sentence.</li> <li>3 + 3 + 3 + 3 = 15</li> <li>5 × 3 = 15</li> </ul>	
7. Write a multiplication sentence that is the same as 7 groups of 8 equals 56. 7 $\times 8 = 56$	
<ul> <li>Write a multiplication sentence that matches this story. Solve the multiplication sentence.</li> <li>There are 5 seats in each row on a plane. How many page are fix a fix and a sentence.</li> </ul>	Copyright O McGraw Hill Education. Pr
people can fit in 6 rows?	Permi
<u>5</u> × <u>6</u> = <u>30</u>	ssion 1: granted to reproduce for classroom use.

Assessment, pp. 49–50

## **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.

#### **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 Shelfer

#### Objective

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

#### Standard CCS

**3.0A.1** Interpret products of whole numbers, e.g., interpret  $5 \times 7$  as the total number of objects in 5 groups of 7 objects each. For example, describe a context in which a total number of objects can be expressed as  $5 \times 7$ .

#### 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 Student Workbook, page 16, 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 at the bottom of Student Workbook, p. 16.

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.

Project Support Your Local Dog Shelter
Write the answer to each question on the line.
1. Which item will you collect for the shelter?
<ul> <li>Use your age to find the number of dogs you are going to help.</li> <li>I will help dogs.</li> </ul>
<ul> <li>8. 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.</li> <li>I will collect items.</li> </ul>
<ul> <li>Write a number sentence to show the total number of this item you will collect.</li> <li>× =</li> </ul>
number of number total number items for of dogs of items each dog
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. $4 + 4 + 4 + 4 + 4 + 4 = 24$
16 Level E Unit 4 Multiplication and Division

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	h
the students?	





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