Amplify Desmos Math
CALIFORNIA

Grade 3

UNIT 1 | SUB-UNIT 2

Arrays

About Amplify

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

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

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Amplify Desmos Math
CALIFORNIA

Grade 3

Unit 1: Introducing Multiplication

Sub-Unit 2: Arrays

Teacher Edition

Unit 1 Introducing Multiplication

Students are formally introduce to multiplication and represent and solve problems involving multiplication, including missing factors. Students represent and interpret data using scaled graphs to extend their multiplication work

UNIT 1

Introducing Multiplication

Questions for Investigation

- How does multiplication represent equal groups?
- How do visual models represent multiplication?
- How do different scales affect picture graphs and bar graphs?

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

Unit Story: My Name Is Harper
In this story, young Harper found her interests and friends at the library. Now she's a grown-up, running that same library.

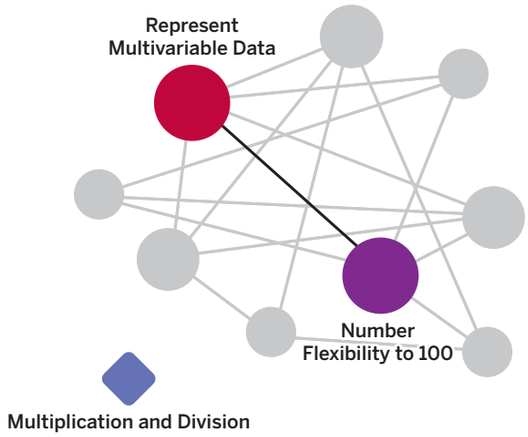
Focus on the Big Ideas

CA CCSSM

Addressing

3.MD.3, 3.OA.1, 3.OA.3, 3.OA.4, 3.OA.5, 3.OA.7

Standards for Mathematical Practice:
SMP.1, SMP.2, SMP.3, SMP.4, SMP.6, SMP.7, SMP.8



Unit Story

Every unit has a Unit Story to engage students and help them make connections between math and authentic contexts.

About the Story

Harper reminisces about her experience as a child, feeling out of place, and then discovering the library for the first time. The library presents itself as a massive, intimidating place with its huge shelves and stacks. But over time, and with the help of her local librarian, Harper becomes more comfortable, even finding friends in other readers she meets there. Now the circle continues as she herself is a librarian, welcoming new readers to her library.

Unit Story Read-Aloud

For the **Warm-Up of Lesson 1**, read aloud the Unit Story. Use the **Presentation Screens** for Lesson 1 to display the story images to introduce students to the characters.

The Math in the Story

Working With Data as an Introduction to Multiplication

As Harper recalls her time in the library, the illustrations provide opportunities for students to see how a group of students with different interests come together as a community and how arrays, as a representation of multiplication, are all around us.

Throughout the unit . . .

- Students are introduced to multiplication as an operation to compute equal groups of objects related to the library.
- Students create and look at data representations related to their interests to ask and answer questions.

Math Connections

Students will connect the math of the unit to the Unit Story in these activities:

- **Lesson 1**
- **Lesson 4, Activities 1 and 2**
- **Lesson 5, Activity 2**
- **Lesson 8, Activity 1**
- **Lesson 9, Activities 1 and 2**
- **Lesson 11, Activity 1**
- **Lesson 12, Activity 1**
- **Lesson 14, Activity 1**
- **Lesson 16, Activities 1 and 2**
- **Lesson 17, Activities 1 and 2**

Math Identity and Community

The Unit Story provides an opportunity for students to reflect on their math identity and share their experiences of being a part of a math community. Throughout the unit, you may wish to support students in their mathematical journey by asking them to reflect on the Math Identity and Community questions provided at the start of each lesson.

We are a math community.

In the story, Harper realizes it is important to be curious. What are you curious about in math class? **(Lesson 5)**

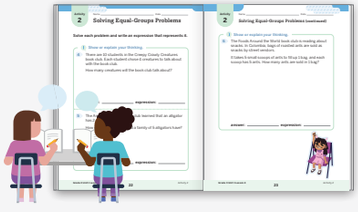
Harper feels comfortable being herself at the library. What makes you feel comfortable being yourself in math class? **(Lesson 12)**

Story Moments

Lesson 1

Math Connection

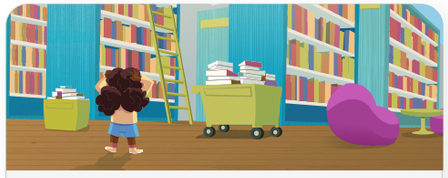
Students take a walk around their school to notice equal groups all around them, just like Harper when she went on a walk to find bugs.

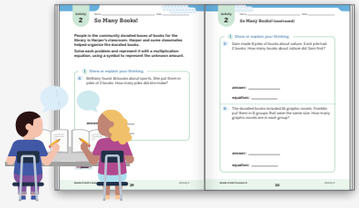


Lesson 4 Activity 2

Math Connection

Students write expressions and solve multiplication problems involving book clubs in Harper's class.

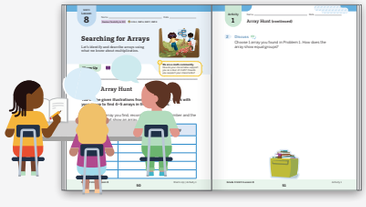




Lesson 5 Activity 2

Math Connection

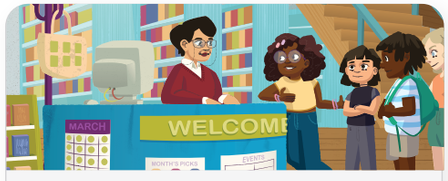
Students solve equal-groups problems about the boxes of books the community donated to Harper's classroom.

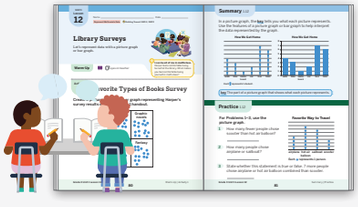


Lesson 8 Activity 1

Math Connection

Students look for arrays in illustrations from the Unit Story and describe how the structure of an array shows equal groups.

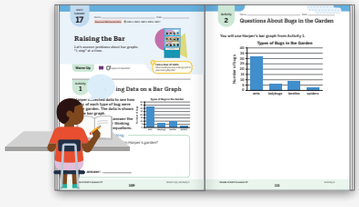




Lesson 12 Activity 1

Math Connection

Students create a picture graph or a bar graph to represent data Harper collected about her classmates' favorite types of books.



Lesson 17 Activities 1 and 2

Math Identity Connection

Students observe data Harper collected to see how many of each type of bug were in her garden and reflect on how they could use a bar graph in everyday life.

Read this aloud during the **Warm-Up of Lesson 1**, using the lesson's **Presentation Screens.**

Read-Aloud My Name Is Harper

2

My name is Harper and for as long as I can remember, I've felt different.

My classmates were always playing the same games, watching the same shows, laughing at the same kind of jokes...

But me? I was happiest by myself.

3

During recess, I'd stand alone in the yard, watching ants or beetles crawling along the ground.

I loved bugs—things with six eyes, or eight legs, or little wiggly antennas. I loved thinking about their little worlds.

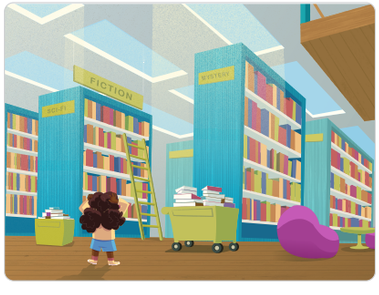
But any time I tried to explain that to my classmates, they'd say my interests were weird.

4

For a long time, I felt like I was the only person in the whole world that loved these "weird" things. But one day, my mom took me to my local library.

When we walked in, I was amazed.

5



There were so many books—laid out in piles, stacked in bins, and rolled around in carts. There were dozens of bookcases, going as far as the eye could see. And on each of the bookcases were shelves, each arranged with their own neat rows of books.

I wandered around for so long, I ended up getting lost! I couldn't tell one part of the library from the next. And just when I was about to cry, I looked up. That's when I met Mrs. Park.

Ask: *"What do you notice? What do you wonder?"*

6

Mrs. Park was the head librarian. She asked me my name and about the kinds of things I was interested in.

When I told her about the bugs, she didn't laugh. Instead she took me around and showed me how the sections were arranged. Non-fiction. Science. Biology. Insects and Arachnids.

I couldn't believe it! There were shelves upon shelves dedicated to books about different bugs. I had no idea there were so many people interested in the same things I was.

7

After that, the library became a second home to me.

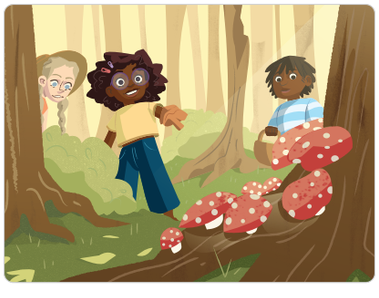
The more time I spent there, the more I realized there were other people just like me. I don't mean people who love spiders and termites. I mean people who were passionate about what they were interested in. Some of them were even from my class!

Ask: *"What do you notice? What do you wonder?"*

8

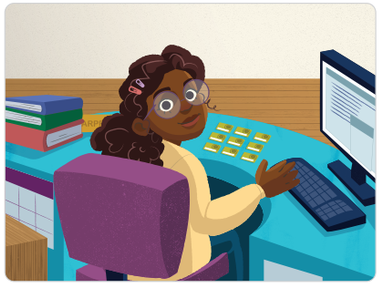
Like Sam who loved books on dancing.
Or Bethany who loved to read about airplanes.
Or Franklin who couldn't get enough stories about mushrooms.
Sometimes, we'd get together and talk about what we were reading.

9



That's when I began to realize it didn't matter what people thought of the things I cared about. What's important is to always be curious. After all, the world is full of exciting people, places, and things. It would be a shame if we didn't try to explore and understand it.

10



That was many years ago. These days, I'm the head librarian at my town's library, just like Mrs. Park was.

11

My favorite part of the job is helping all the different people who come in. I get to hear them talk about their passions and their interests.

If I can, I help them find what they're looking for. It's a powerful thing.

With just the right book, you can change someone's life forever.

Ask: *"What do you notice? What do you wonder?"*

Sub-Unit 2

Arrays

Sub-Unit 2 Goal

- Represent and solve multiplication problems involving arrays.

Progression of Big Ideas in Sub-Unit 2

- **Lessons 8–11:** Students connect **Number Flexibility to 100** and **Multiplication and Division**. They interpret and construct arrays to write multiplication equations and justify their answers.

Sub-Unit 2 Progression	Lesson 8	Lesson 9	Lesson 10	Lesson 11
CC2 Number Flexibility to 100	●	●	●	●
NS Multiplication and Division	◆	◆	◆	◆

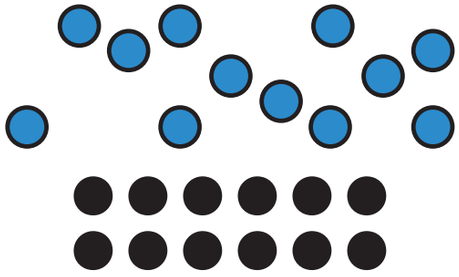
Coming up Next

- **Sub-Unit 3, Lessons 12–18:** **Represent Multivariate Data** **Number Flexibility to 100.**

Big Idea Development

CC2 Flexibility to 100 As students progress through Sub-Unit 2, look for these strategies as they develop an understanding of multiplication within 100 by justifying answers using an array.

Progression of Strategies, Skills, or Language

Progression	For example . . .
Representing a total number of objects with an array.	Show how this set of dots could be arranged into an array. 
Representing an array with a multiplication expression or equation.	**2 × 6** **2 rows with 6 in each row**
Determining an unknown total in a multiplication problem involving an array.	The library invites guest readers each month. Their photos are arranged in 3 rows. Each row has 4 photos. How many photos are there? **3 × 4 = ?** **There are 12 photos.**
Determining an unknown number of rows or number of objects in each row in a multiplication problem involving an array.	There are 8 rows of crayons in a box. The box has 40 crayons in it. If each row has the same number of crayons, how many crayons are in each row? **8 × ? = 40** **There are 5 crayons in each row.** A tray of watercolor paints has 14 colors arranged in an array. Each row has 7 colors. How many rows of colors does the tray have? **? × 7 = 14** **There are 2 rows of colors in the tray.**

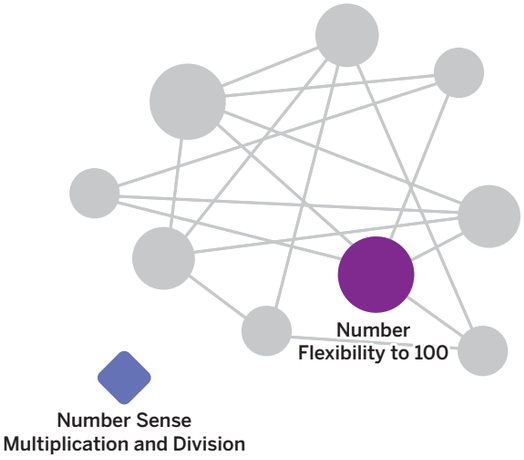
Unit 1
Lesson
8

Searching for Arrays

Finding, Drawing, and Describing Arrays

Let's identify and describe arrays using what we know about multiplication.

Today's Big Ideas



Focus on the Big Ideas

Today's Goal

CC2 Number Flexibility to 100 · NS Multiplication and Division

1. **Language Goal:** Describe the relationship between arrays, equal groups, and multiplication. **(Speaking and Listening)**

DI Why? In order to . . .	SMP How? Students will . . .	CC What? While . . .
Make sense of and visualize equal groups in relation to multiplication **(DI1)**	Use precise language when describing arrays **(SMP.6)**	Using their understanding of factors and products to answer questions. **(CC2)**

Connections and Coherence

Students review array structures, identifying them in Unit Story illustrations and describing equal groups. They relate arrays to equal groups, seeing them as rows and columns with equal numbers of objects. Then students create arrays by rearranging dots into 1 or more arrays and describe them using multiplication structures. **(SMP.6, SMP.8)**

Prior Learning

CC4 Squares in an Array

In Grade 2, students learned that a rectangular array contains objects arranged into rows and columns, with the same number of objects in each row and the same number of objects in each column.

Future Learning

CC2 Number Flexibility to 100 · NS Multiplication and Division

In Lesson 9, students will represent given multiplication situations with arrays and multiplication expressions.

Integrating Rigor in Student Thinking

Students extend their **conceptual understanding** of multiplication to include arrays, recognizing that arrays show equal groups in rows and columns.

Vocabulary

Review Vocabulary

array

column

row

CA CCSSM

Addressing

3.OA.1

Interpret products of whole numbers, e.g., **interpret 5 × 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 × 7.

Mathematical Practices: SMP.6, SMP.7, SMP.8

Building On	Building Toward
2.OA.4	

CA ELD Standards: ELD.PI.3.1, ELD.PI.3.3

Building Math Identity

We are a math community.
How do your classmates support you as a doer of math? How do you support your classmates?

Invite students to reflect on this question as they complete this lesson.

Lesson at a Glance

60 min

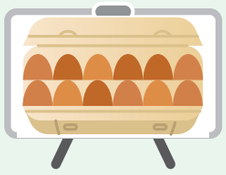
CA CCSSM: 3.OA.1, SMP.6, SMP.7, SMP.8

Warm-Up

Fluency

Whole Class | 10 min

Students use the **How Many Do You See?** routine, in which they develop fluency by describing how they see an arrangement of 12 eggs in a carton. **(SMP.7)**



Activity 1

Small Groups | 15 min

Students search for and identify arrays in the illustrations from the Unit Story. Then they describe how 1 of the arrays they found shows equal groups. **(SMP.6)**

Materials: Activity 1 PDF, chart paper, markers, Visual Display PDF, *Arrays*

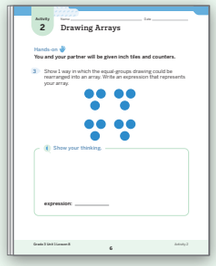
Additional Prep Prepare: *Arrays* chart with markers and chart paper

Activity 2

Independent | 20 min

Students make further connections between equal groups and arrays by rearranging sets of dots to create arrays. They see that a given number of dots can be arranged in more than 1 array and can be represented by more than 1 multiplication expression. **(SMP.8)**

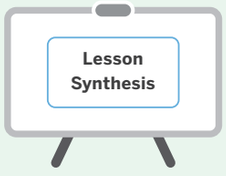
Manipulative Kit: counters (optional), inch tiles (optional)



Synthesis

Whole Class | 10 min

Students review and reflect on their understanding of arrays and how arrays show equal groups.

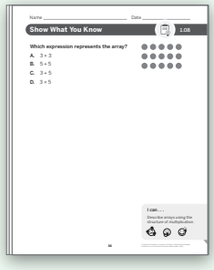


Show What You Know

Independent | 5 min

Students demonstrate their understanding of arrays by identifying an expression that matches an array.

Materials: *Show What You Know* PDF



Math Language Development

Multilingual/English Learners

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

Emerging	Expanding	Bridging
Students use sentence frames and a word bank to describe arrays with a partner. Guided questions are provided for you to ask for students to share one-word responses.	Students use sentence frames and a word bank to describe arrays with a partner. Guided questions are provided for you to ask for students to share simple phrases.	Students use sentence frames and a word bank, if needed, to describe arrays with a partner. Guided questions are provided for you to ask for students to share responses using longer phrases or complete sentences.

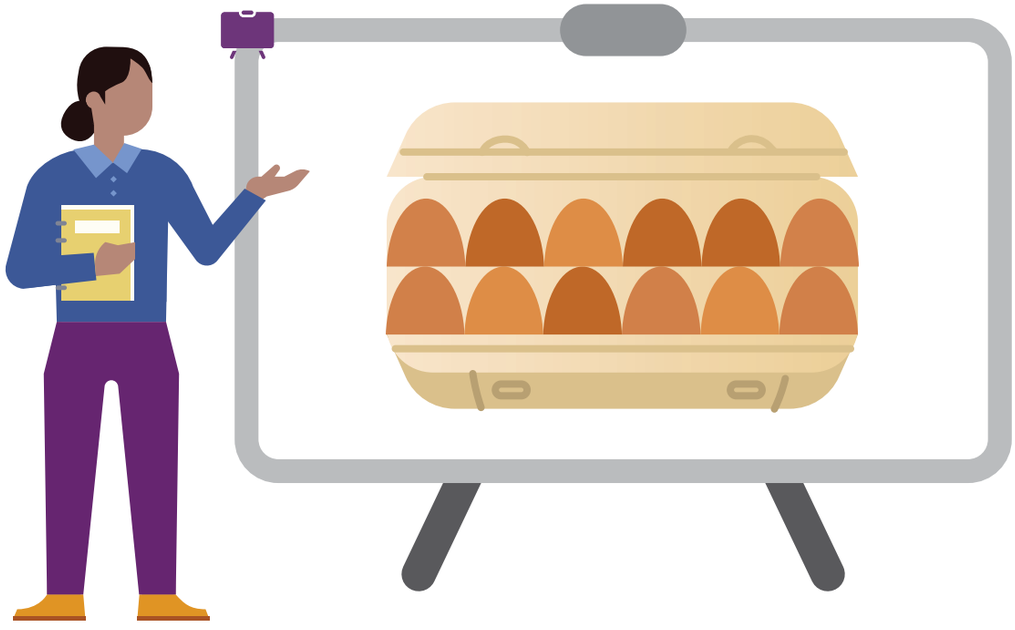
Whole Class | 10 min

Presentation Screens

Warm-Up How Many Do You See?

Fluency

Purpose: Students determine the total number of eggs in a carton to practice decomposing a quantity into equal groups and to review the structure of an array.



Why this image? This image is a familiar context and lends itself to connecting equal-groups situations with arrays.

1 Launch

Use the How Many Do You See? routine.

Display the image and ask, "How many do you see? How do you see them?"

2 Connect

Record students' responses as they share, honoring all explanations and keeping responses displayed.

Ask, "How does this image relate to what you know about multiplication?"

Say, "The eggs are arranged in an array. You may recall from Grade 2 that an *array* is an arrangement of objects in rows and columns. Each *column* has the same number of objects, and each *row* has the same number of objects. You will continue working with arrays today." Consider using gestures or annotating the image to visually distinguish between horizontal rows and vertical columns.

Students might say . . . ELD.PI.3.3.Em, Ex, Br

There are 12 eggs. I know there are 12 eggs in a full carton.

I see 2 rows of eggs, and each row has 6 eggs. 2 × 6 = 12

Each egg in the front row has another egg right behind it, so I counted by 2 going across and got 12.

I split the eggs into groups of 4. 4 + 4 + 4 = 12

The eggs are organized in an array with 2 rows of 6 eggs. 2 groups of 6 equals 12.

Small Groups | 15 min

Activity 1 Array Hunt

Purpose: Students look for arrays in illustrations from the Unit Story and describe how the structure of an array shows equal groups.

Presentation Screens

Materials

Lesson Resources:

- Distribute the Activity 1 PDF to each group.

Classroom materials:

- Refer to the Visual Display PDF, *Arrays* (sample) **(Lesson Resources)** and use chart paper and markers to prepare the *Arrays* chart before the activity.

Short on time? Consider limiting the number of images students analyze for the Array Hunt.

1 Launch

Read aloud the directions and Problem 1.

Say, "When you have completed Problem 1, choose 1 of the arrays you found and discuss the question in Problem 2 with your small group."
ELD.PI.3.3.Em, Ex, Br

EL **Multilingual/English Learners** Display a list of the words about the context that students might not know, such as *illustration* and *object*. Include visuals or translations of each word in languages used by your students. **(Reading and Listening)** ELD.PI.3.1 Em, Ex, Br

A **Accessibility: Visual-spatial processing** Guide visualization by having students trace or color-code the rows and columns they see in each array they find.

2 Monitor

After students have completed **Problem 2**, refer to the D **Differentiation | Teacher Moves** table on the following page.

If students need help getting started . . .

- Ask, "How do you know if a group of objects is arranged in an array?"
- Ask, "Where do you see an array in this illustration?"

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

3 Connect

Invite 2 or 3 groups of students to share an array they found. As each group shares, ask:

- "Where do you see equal groups in this array?"
- "How does this relate to multiplication?"

Display the *Arrays* chart. Annotate the array diagrams on the chart to show that columns are vertical and rows are horizontal. Have students describe how the arrays show equal groups in the rows and in the columns by circling the equal groups.

Key Takeaway: Say, "The rows in an array show equal groups because each row has the same number of objects. The columns also show equal groups because each column has the same number of objects."

Student Edition

Unit 1
Lesson
8

Name _____ Date _____

Number Flexibility to 100 3.OA.1, SMP.6, SMP.7, SMP.8

Searching for Arrays

Let's identify and describe arrays using what we know about multiplication.

Warm-Up eyes on teacher

We are a math community. How do your classmates support you as a doer of math? How do you support your classmates?

Activity
1

Array Hunt

You will be given illustrations from the Unit Story. Work with your group to find 4–5 arrays in the illustrations.

1 For each array you find, record the illustration number and the object(s) that show an array. Sample response shown.

Illustration number	Objects that show an array
1	calendar
1	Mrs. Park's tote bag design
2	tic-tac-toe
3	cards on Harper's desk
4	bugs on book cover

Activity
1

Name _____ Date _____

Array Hunt (continued)

2 Discuss ELD.PI.3.3.Em, Ex, Br

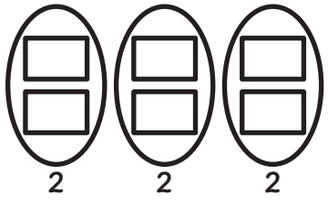
Choose 1 array you found in Problem 1. How does the array show equal groups?

Oral activity: No writing expected. Sample response shown.

The design on Mrs. Park's tote is an array. It shows equal groups because there are 3 squares in each row. The columns also show equal groups because there are 2 squares in each column.

Presentation Screens

D Differentiation | Teacher Moves

Look for students who . . .	For example . . .	Provide support . . .
Almost there Acknowledge that the array has equal groups.	*Mrs. Park's tote design has equal groups.*	**Support** Ask, "Where do you see the equal groups in the tote? Draw the tote design in equal groups to make your explanation more precise."
Show or describe the rows as the equal groups in the array.	*The tote design has an equal number of squares going across — 3 on the top and 3 on the bottom.*	**Strengthen** Ask, "If you wanted to represent this array with a drawing of equal groups, what would that drawing look like?"
Show or describe the columns as the equal groups in the array.		
Show or describe the rows and the columns in the array as having equal groups.	*The rows in the tote design show equal groups because there are 3 parts in each row. The columns also show equal groups because there are 2 parts in each column.*	**Stretch** Ask, "What other ways could you arrange the same amount of objects into an array?"

Independent | 20 min

Activity 2 Drawing Arrays

Purpose: Students rearrange groups of dots into arrays and represent them with expressions to connect the representations. They recognize that, sometimes, more than 1 array and expression can represent the same number of objects.

Presentation Screens

Materials

Manipulative Kit:

- Provide students with access to inch tiles and counters. (optional)

1 Launch

Read aloud Problems 3 and 4 and answer any clarifying questions.

Say, "You may choose to build arrays with inch tiles or counters if they are helpful. Work on Problems 3 and 4 independently and then discuss Problem 5 with a partner."

2 Monitor

After students have completed **Problem 4**, refer to the Differentiation | Teacher Moves table on the following page.

If students need help getting started . . .

- Ask, "How many equal groups do you see?"
- Ask, "When creating an array, what has to be true?"

3 Connect

Invite students to share their responses to Problem 4.

Record students' arrays and expressions as they share.

Use the Think-Pair-Share routine. Ask: ELD.PI.3.1.Em, Ex, Br

- "What is similar and different about the arrays and expressions that have been shared?"
- "Why can more than 1 array be created for a given number of dots?"

EL **Multilingual/English Learners** Use wait time to allow students to formulate a response. Consider having students rehearse what they will say with a partner before sharing with the group. ELD.PI.3.1 Em, Br, Ex

Key Takeaway: Say, "Numbers can be represented with more than 1 expression and more than 1 array."

Activity 2

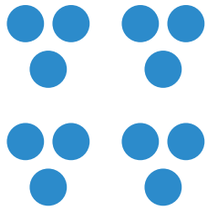
Name _____ Date _____

Drawing Arrays

Hands-on

You and your partner will be given inch tiles and counters.

3 Show 1 way in which the equal-groups drawing could be rearranged into an array. Write an expression that represents your array.



Show your thinking.

Sample response shown.

expression: 2 × 6

Activity 2

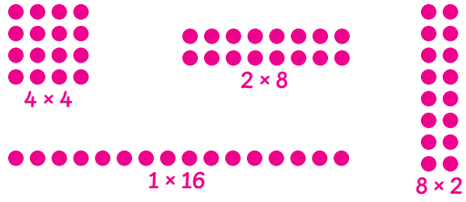
Name _____ Date _____

Drawing Arrays (continued)

4 Create as many arrays as you can using the same number of dots as shown in the image. Label each array with a matching expression.

Show your thinking.

Sample work shown.



5 **Discuss** ELD.PI.3.1.Em, Ex, Br

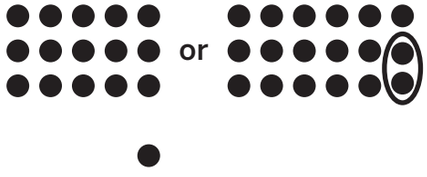
Why can more than 1 array be created for a given number of dots?

Oral activity: No writing expected. Sample response shown.

More than 1 array can be created for a given number of dots because, depending on the number of dots, different equal groups can be made. That means different arrays can also be made.

Presentation Screens

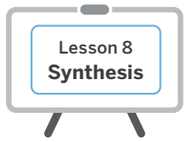
D Differentiation | Teacher Moves

Look for students who . . .	For example . . .	Provide support . . .
Almost there Use some of the dots or add extra dots to make an array.		**Support** Ask, "How many dots are in your array? Create an array that has exactly the same number of dots shown in Problem 4."
Create more than 1 array.	I made an array with 2 rows and 8 columns. Then I started over and made an array with 4 rows and 4 columns.	**Strengthen** Ask, "How could you know that you created all possible arrays for 16?"
Recognize that the number of rows and columns in 1 array can be switched to create a different array.	I made an array with 2 rows of 8 dots. I switched the numbers and made another array with 8 rows of 2 dots.	**Stretch** Ask, "Do you think this could work for any array? Why?"
Decompose an array into parts and rearrange the parts to form a different array.	I took the 4 columns on the right half of the array and moved them underneath the left 4 columns to make 4 rows of 4 dots.	

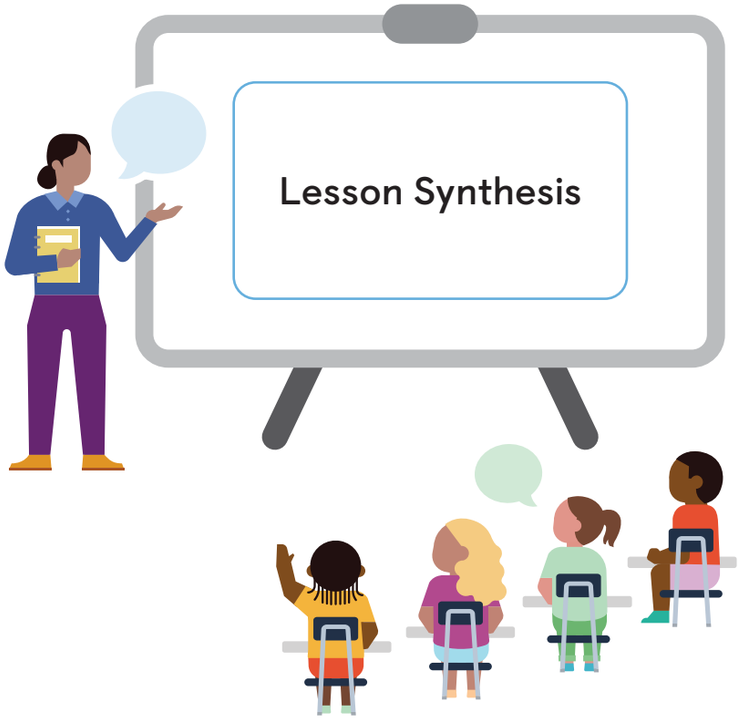
Whole Class | 10 min

Synthesis

Presentation Screen



Lesson Takeaway: Arrays can be used to represent multiplication because they show equal groups. There is an equal number of objects in each row, and there is also an equal number of objects in each column.



Ask:

- "How are the representations alike? How are they different?"
- "Where do you see equal groups in this array? Describe the array using equal-groups language."
- "What multiplication expression represents these drawings?"

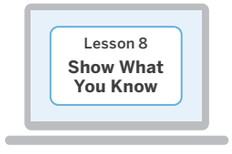
Say, "The rows and columns in this array show equal groups. You can see that there are 4 rows with 5 dots in each row, or there are 5 columns with 4 dots in each column. Because multiplication tells the total number of objects when you have a certain number of equal groups, arrays can be used as another way to represent multiplication."

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

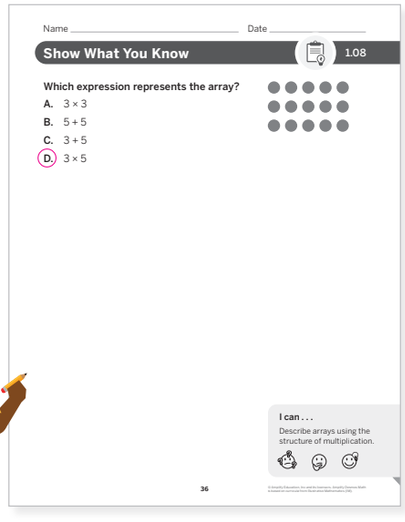
Show What You Know

Independent | 5 min

Students using digital



Show What You Know PDF


Name _____ Date _____

Show What You Know 1.08

Which expression represents the array?

A. 3 × 3
B. 5 + 5
C. 3 + 5
D. 3 × 5

I can . . .
Describe arrays using the structure of multiplication.

36

Today's Goal

1. **Language Goal:** Describe the relationship between arrays, equal groups, and multiplication. **(Speaking and Listening)**
   - In the *Show What You Know*, students explain their thinking on how the array shows equal groups.

D **Differentiation** See the last page of the lesson for differentiation and Math Language Development support.

Practice

Independent

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

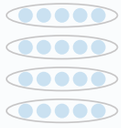
Lesson 8
Practice

Students using digital

Students using print

Summary 1.08

You can use arrays to represent multiplication because arrays show equal groups. There is an equal number of objects in each row, and there an equal number of objects in each column.



4 × 5

Practice 1.08

1 Create 2 different arrays using 12 dots.

Draw

Sample response shown.

2 Choose 1 of your arrays in Problem 1. How is the array related to equal groups? Explain your thinking. Sample response shown.

My second array has 4 columns with the same number of dots in each column. Those are the equal groups. Each column has 3 dots, so there are 4 equal groups of 3 dots.

Grade 3 Unit 1 Lesson 8 8 Summary | Practice

Practice 1.08

Name _____ Date _____

3 Determine whether each image shows an array.

	Yes	No
	✓	
	✓	
	✓	
		✓

4 Show 1 way in which the set of dots could be rearranged into an array.

Sample response shown.

Draw

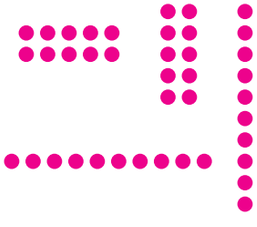
Grade 3 Unit 1 Lesson 8 9 Practice

Practice 1.08

Name _____ Date _____

5 Create as many arrays as you can using the same number of dots as shown in the image.

Draw



Spiral Review

For Problems 6 and 7, determine the value of the expression.

6 47 − 9 38

7 26 + 24 50

8 There are 5 basketball teams in the tournament. Each team has 9 players. How many basketball players are in the tournament?

(A) 50 basketball players
(B) 45 basketball players
(C) 40 basketball players
(D) 14 basketball players

Grade 3 Unit 1 Lesson 8 10 Practice

Practice Problem Item Analysis

	Problem(s)	DOK	CA CCSSM
On-Lesson			
	1, 4	2	3.OA.1, SMP.4
	2, 5	3	3.OA.1, SMP.4, SMP.7
Test Practice	**3**	2	3.OA.1, SMP.7
Spiral Review			
Fluency	**6, 7**	1	2.NBT.5, SMP.6
	8	2	3.OA.7, SMP.2

Need more Practice?

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

D Differentiation Use after Lesson 8

Lesson Goal: Describe the relationship between arrays, equal groups, and multiplication.

Support

Provide targeted intervention for students by using these resources.

If student work identifies: an answer other than D

Respond:

- **Mini-Lesson |** 15 min
  Writing Expressions for Arrays

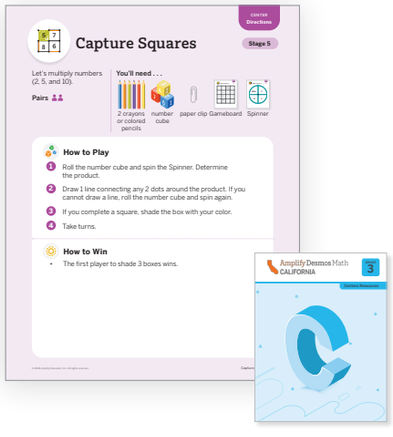
Strengthen

Reinforce students' understanding of the concepts assessed by using these resources.

If student work identifies: answer D with evidence of describing equal groups

Respond:

- **Centers |** 15 min
  Capture Squares, Stage 5
  Cover Up, Stages 10 and 11
  Match It, Stage 1



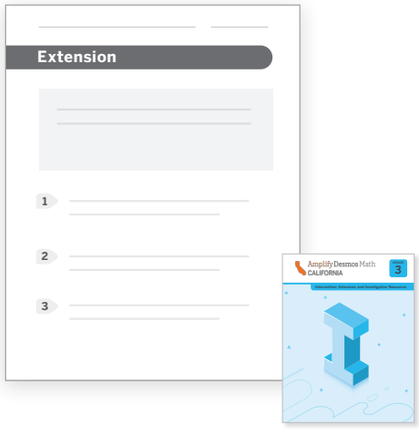
Stretch

Challenge students and extend their learning with these resources.

If student work identifies: answer D with evidence of relating rows and columns to equal group multiplication

Respond:

- **Sub-Unit 2 Extension Activities |** 15 min



Support, *Strengthen*, and *Stretch* learning by assigning these digital resources that adjust to each student's current level of skill and understanding.
• Boost Personalized Learning • Fluency Practice • Math Adventures

Math Language Development

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

- English/Spanish cognates e.g. *column/columna*
- English/Spanish Glossary e.g. *array/formación*
- Frayer Model templates
- Math Language Routine display structures
- Vocabulary routines

Professional Learning

In previous grades, students saw examples of arrays, such as 10-frames and arrangements of counted objects. How does that previous experience support students' work with equal groups in arrays in this lesson?

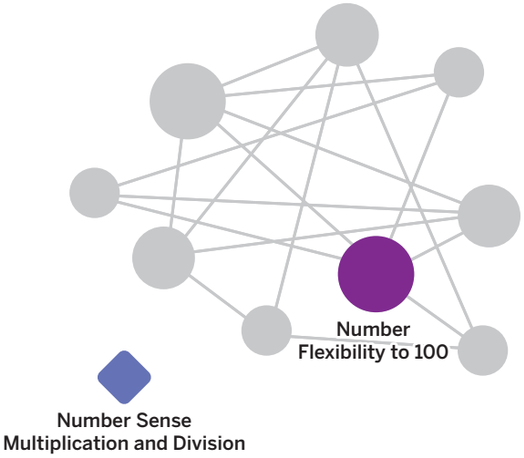
Unit 1
Lesson
9

Arrays of Flavor

Exploring the Commutative Property of Multiplication

Let's look for patterns to make conjectures about multiplication.

Today's Big Ideas



Focus on the Big Ideas

Today's Goals CC2 Number Flexibility to 100 NS Multiplication and Division

1. **Goal:** Recognize the Commutative Property of Multiplication.
2. **Language Goal:** Describe how the order of factors affects the product. **(Speaking and Listening)**

DI Why? In order to . . .	SMP How? Students will . . .	CC What? While . . .
Recognize that the product of 2 factors is the same, independent of order **(DI2)**	Look for patterns and structure in arrays **(SMP.7)**	Identifying equivalent multiplication expressions. **(CC2)**

Connections and Coherence

Students explore array structures and learn the Commutative Property of Multiplication. They create and compare arrays and expressions with the same total objects. Students notice that rearranging arrays does not change the total. They also analyze expressions with the same product, concluding that the order of factors does not affect the result. **(SMP.7, SMP.8)**

Prior Learning CC2 Equal Expressions

In Grades 1 and 2, students explored and applied the Commutative Property of Addition. In Lessons 7 and 8, students connected multiplication expressions and equations with equal-groups drawings, arrays, and situations.

Future Learning CC2 Number Flexibility to 100

In Lessons 10 and 11, students will apply what they know about multiplication to solve problems with unknown factors and unknown products in different contexts.

Integrating Rigor in Student Thinking

Students build their **conceptual understanding** of the Commutative Property of Multiplication and then **apply** their understanding of multiplication to make generalizations about the commutative structure of multiplication.

Vocabulary

New Vocabulary

Commutative Property of Multiplication

Review Vocabulary

factor

product

CA CCSSM

Addressing

3.OA.5

Apply properties of operations as strategies to multiply and divide.

Also Addressing: 3.OA.1

Mathematical Practices: SMP.7, SMP.8

CA ELD Standards: ELD.PI.3.1, ELD.PI.3.3

Building Math Identity

I am a doer of math.
Where do you see arrays in the world around you?

Invite students to reflect on this question as they complete this lesson.

Lesson at a Glance

60 min

CA CCSSM: 3.OA.1, 3.OA.5, SMP.7, SMP.8

Why digital?

Students test their class conjecture to explore the Commutative Property of Multiplication and receive responsive feedback in real time.

Warm-Up

Fluency

Whole Class | 10 min

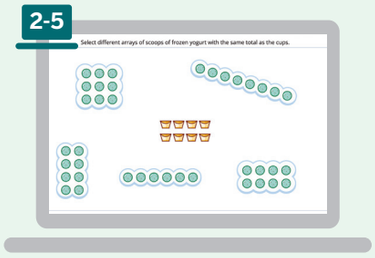
Students use the **Notice and Wonder** routine to share what they notice and wonder about an array. **(SMP.7)**

Activity 1

Pairs | 20 min

Students create expressions and arrays that represent the same total amount. They then make observations about the expressions and arrays to support them in forming conjectures. **(SMP.7)**

Students using print: counters (as needed)



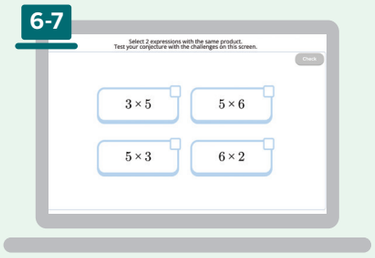
Activity 2

Pairs | 15 min

Students test their class conjecture by selecting pairs of expressions that represent the same product. They notice that multiplication is commutative — changing the order of factors results in the same product. During the Connect, students are introduced to the term **Commutative Property of Multiplication**. **(SMP.8)**

Students using print: counters (as needed)

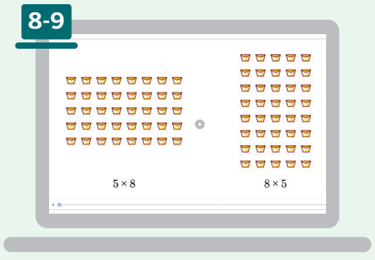
Materials: *Arrays* chart (from Lesson 8)



Synthesis

Whole Class | 10 min

Students review and reflect on the connections between arrays and the Commutative Property of Multiplication.



Show What You Know

Independent | 5 min

Students demonstrate their understanding of the Commutative Property of Multiplication by selecting 2 expressions with the same product.

Students using print: *Show What You Know* PDF

Math Language Development

Multilingual/English Learners

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

Emerging	Expanding	Bridging
Students use a graphic organizer, sentence frames, and a word bank to prove the conjecture. Guided questions are provided for you to ask for students to gesture or share one-word responses.	Students use a graphic organizer, sentence frames, and a word bank to prove the conjecture. Guided questions are provided for you to ask for students to share simple phrases.	Students use a graphic organizer, sentence frames, and a word bank, if needed, to prove the conjecture. Guided questions are provided for you to ask for students to share responses using longer phrases or complete sentences.

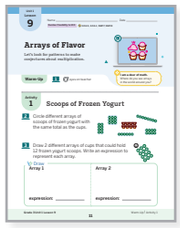
Whole Class | 15 min | Suggested Pacing: Screen 1

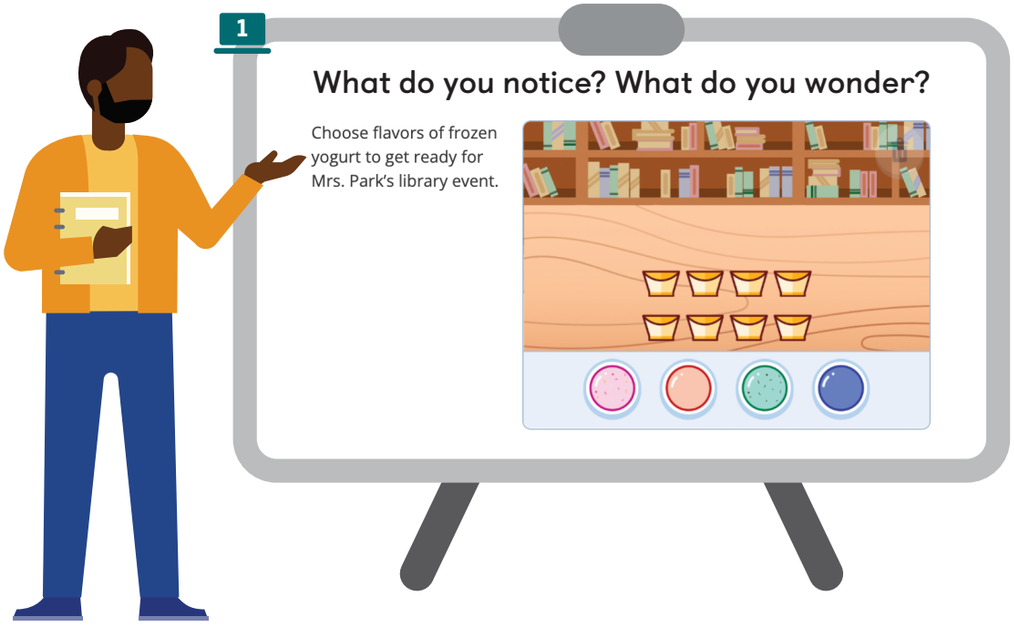
Warm-Up Notice and Wonder

Fluency

Purpose: Students examine an array to prepare for exploring the Commutative Property of Multiplication.

Students using print





1 Launch

1 **Display** the empty cups.

Say, "Mrs. Park is setting up cups of frozen yogurt for a library event."

Use the Notice and Wonder routine.

Use the Think-Pair-Share routine. Ask, "What do you notice? What do you wonder?"

2 Connect

1 **Record** students' responses. As they share, demonstrate adding frozen yogurt scoops to the cups.

Ask, "How could you determine the total number of frozen yogurt scoops that fit in the array of cups?"

Students might say . . . ELD.PI.3.1.Em, Ex, Br

I notice that if you add more than 8 scoops of frozen yogurt, the yogurt lands on the table.

I notice that the cups are organized in an array with 2 rows and 4 in each row.

I wonder why more cups aren't added when you add more frozen yogurt scoops.

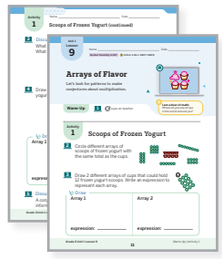
I wonder what would happen if you organized the cups in a different way.

Pairs | 20 min | Suggested Pacing: Screen 2, Screens 3-4, Screen 5

Activity 1 Scoops of Frozen Yogurt

Purpose: Students make observations about different arrays with the same total to make a conjecture about how the order of the factors affects the product.

Students using print



Additional Print Materials

Manipulative Kit:
- Provide each pair with access to counters (as needed).

1 Launch

2 **Display** the arrays.

Say, "To set up for the library event, Mrs. Park wants to put 1 scoop of frozen yogurt into each cup. Select different arrays of scoops of frozen yogurt with the same total as the cups."

Invite pairs to share their responses and strategies from Screen 2.

3 **Say**, "Continue on to Screen 3 to create 2 different arrays of cups that could hold the number of frozen yogurt scoops shown. When you are finished, share your arrays with your partner and discuss what you notice and wonder about the arrays and expressions. Then continue on to Screen 4."

A **Accessibility: Visual-spatial processing** Provide access to counters for students to model their arrays.

2 Monitor

After students have completed **Screen 3**, refer to the D **Differentiation | Teacher Moves** table on the following page..

3-4 **If students need help getting started . . .**

- Ask, "How could you use what you did on Screen 2 to help you organize the same number of scoops in a different array?"
- Ask, "How could you use what you know about rows to create an expression to represent your array?"

3 Connect

5 **Display** the arrays.

Use the Notice and Wonder routine by asking students what they notice and wonder about the arrays and expressions. ELD.PI.3.1.Em, Ex, Br

Ask, "What do you notice about the total number of scoops in each array? Where do you see each factor represented in each array?"

MLR **MLR8: Discussion Supports — Make a Conjecture**
Ask, "Now, you will make a conjecture. A conjecture is a statement you believe is true based on the information you have. What conjectures could you make about multiplication using patterns you notice in these arrays?" ELD.PI.3.3.Em, Ex, Br

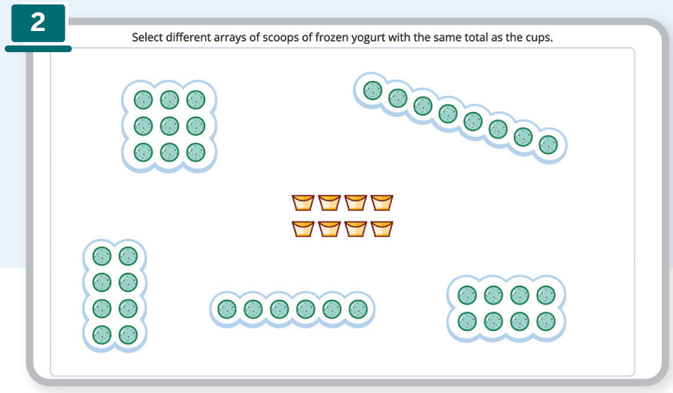
Have students share their conjectures to begin creating and recording a class conjecture on the board. Then discuss the following questions:

- "How do you know whether our conjecture is always true?"
- "Are there any examples that show this conjecture is false?"

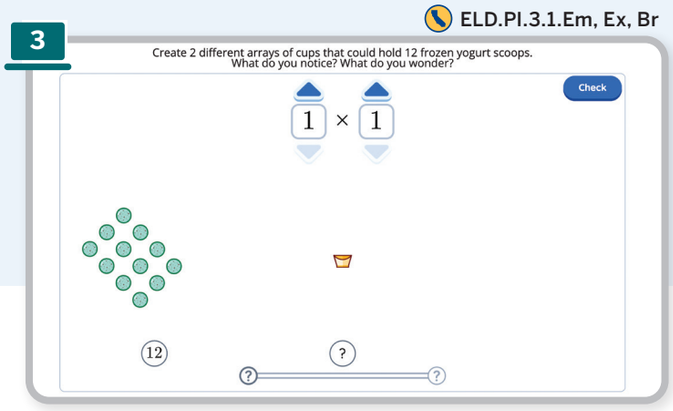
Key Takeaway: Say, "You will continue to explore patterns in multiplication in the next activity by testing our class conjecture."

Students using digital

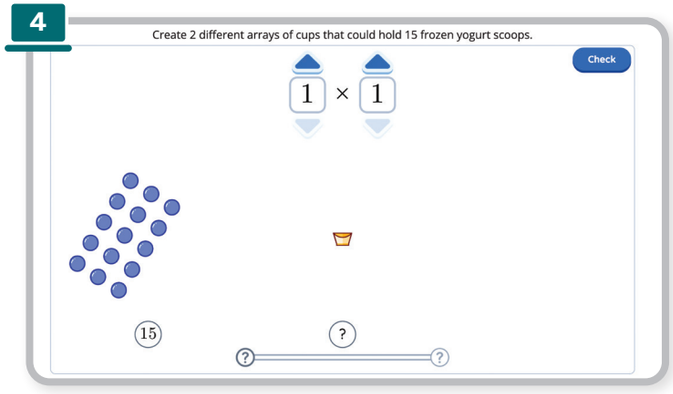
ELD.PI.3.1.Em, Ex, Br



Students select arrays that represent the same total.

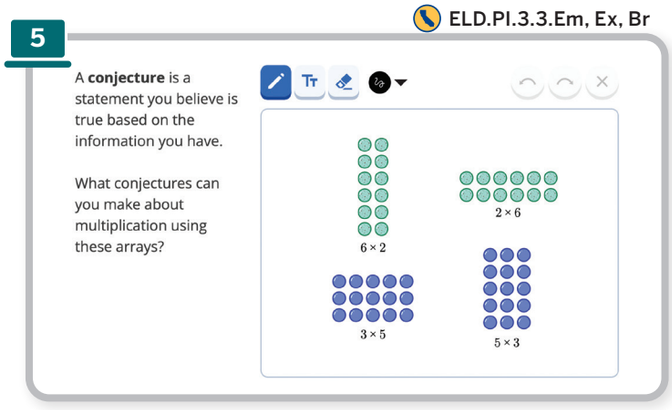


Students create 2 arrays that represent the same total and compare their arrays with a partner.



Students create 2 arrays that represent the same total.

ELD.PI.3.3.Em, Ex, Br



Students make conjectures about the relationship between multiplication and arrays.

Students using print **will arrive at similar answers.**

D Differentiation | Teacher Moves

Look for students who . . .	For example . . .	Provide support . . .
Notice that there are a variety of arrays that show the same total.	*I notice that different arrays can show a total of 12.*	**Support** Ask, "What do you notice is similar about the arrays? What is different?"
Notice that some arrays look similar but rotated, with the number of rows and the number of objects in each row switched.	*I notice that these arrays look the same, but one is rotated. The left array shows 3 rows of 4, and the right array shows 4 rows of 3.*	**Strengthen** Ask, "What do the factors in the expressions represent in the arrays?"
Notice that some expressions represent the same total number of objects and have the same factors, but the factors are in different orders.	*I notice that when the same factors are used, they are sometimes in a different order even though the totals are the same.*	

Pairs | 15 min | Suggested Pacing: Screen 6, Screen 7

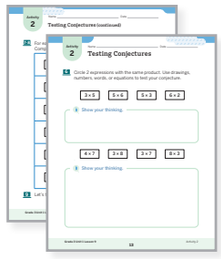
Activity 2 Testing Conjectures

Purpose: Students test the class conjecture by selecting expressions that have the same value, recognizing that the factors can be multiplied in any order and the product will be the same.

Additional Print Materials

Manipulative Kit:
- Provide each pair with access to counters (as needed).

Classroom materials:
- Record on the *Arrays* chart (from Lesson 8) during the Connect.



1 Launch

6 **Display** the expressions.

Say, "As you work on Screen 6, consider our class conjecture. Select 2 expressions with the same product. Complete as many challenges as you have time for. Determine if the class conjecture is always true."

Have students work on Screen 6, and ensure all students complete the first 3 challenges.

A **Accessibility: Visual-spatial processing** Provide access to counters for students to model the expressions.

2 Monitor

While students complete **Screen 6**, refer to the D **Differentiation | Teacher Moves** table on the following page.

6 **If students need help getting started . . .**
- Ask, "What do you notice about the expressions?"
- Ask, "How could you use what you know about arrays to help you select expressions with the same product?"

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

3 Connect

6 **Pause:** Screen 6.

Use the Think-Pair-Share routine. Ask, "Is the class conjecture always true? How do you know?" **ELD.PI.3.1.Em, Ex, Br**

7-8 **Display** the equations.

Ask:
- "How do you know that each of these equations is true?"
- "How can arrays help you prove that changing the order of the factors does not change the product?"

EL **Multilingual/English Learners** As students describe the connections between the equations and arrays, annotate the equations on the screen to illustrate the connections. The annotations could include the number of rows, the number of objects in each row, and the products. **ELD.PI.3.1.Em, Ex, Br**

8 **Define The Commutative Property of Multiplication.** Demonstrate determining the product of 3 × 5 and 5 × 3 using the multiplication table. Demonstrate with additional multiplication expressions as needed.

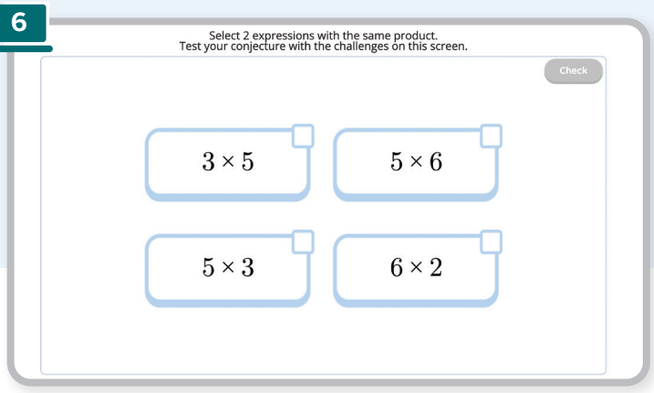
Record and annotate the expressions to represent the arrays on the *Arrays* chart.

Key Takeaway: Say, "Arrays can help show that factors can be multiplied in any order and the product will be the same. This is called the **Commutative Property of Multiplication**."

Students using digital

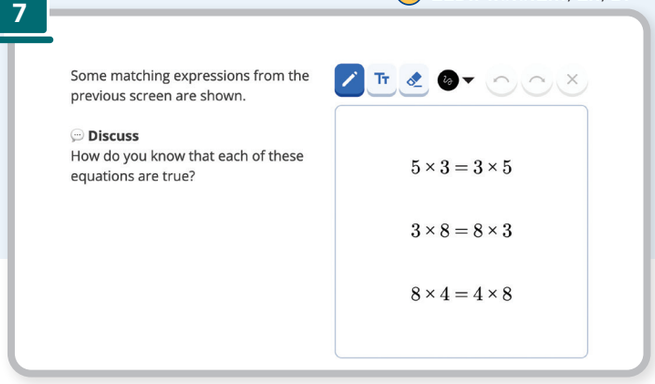
ELD.PI.3.3.Em, Ex, Br

6

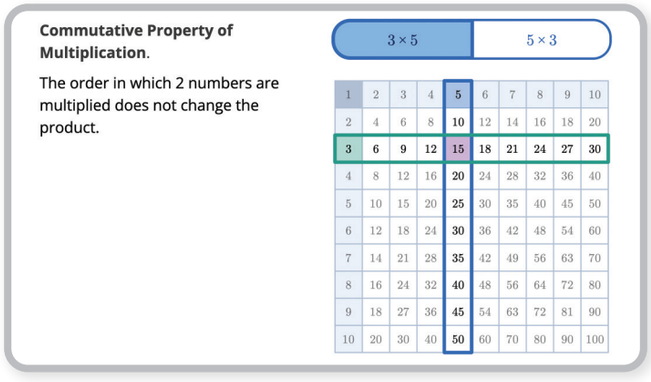


Students test their class conjecture by selecting 2 multiplication expressions that represent the same product.

7



Students reflect on their class conjecture.



Students using print **will arrive at similar answers.**

D Differentiation | Teacher Moves

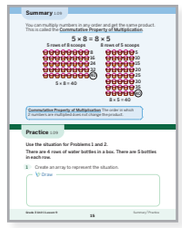
Look for students who . . .	For example . . .	Provide support . . .
Almost there: Select expressions based on 1 factor being the same.	*I selected 5 × 3 and 5 × 6 because both expressions have 5 as one of the factors.*	**Support** Ask, "What is the product of each of these expressions?"
Select expressions based on both factors being the same.	*I selected 5 × 3 and 3 × 5 because both expressions have a 5 and a 3.*	**Strengthen** Ask, "How do you know the expressions you selected have the same product?"
Select expressions based on the product.	*I determined the product of all 4 expressions and selected 3 × 5 and 5 × 3 because they both have a product of 15.*	**Strengthen** Ask, "What do you notice about the factors in the expressions you selected? How does this help you test our conjecture?"
Select expressions based on the Commutative Property of Multiplication.	*I selected 3 × 5 and 5 × 3 because I know that it doesn't matter what order the factors are in; when you multiply them, you will get the same product.*	**Stretch** Ask, "Would this also be true for expressions with greater factors, such as 43 × 2 and 2 × 43? How do you know?"

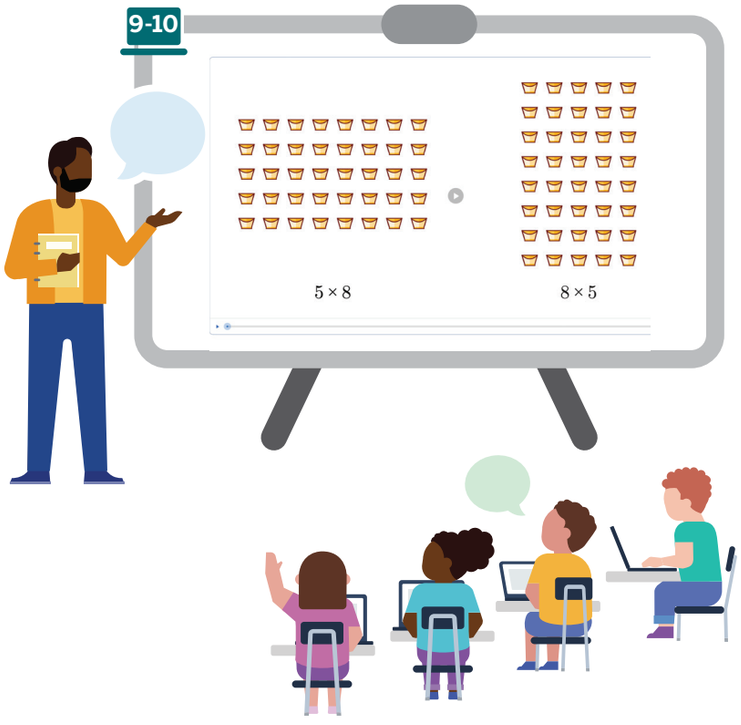
Whole Class | 10 min | Suggested Pacing: Screen 9, Screen 10

Synthesis

Lesson Takeaway: The order in which numbers are multiplied does not change the product. This is called the **Commutative Property of Multiplication**.

Students using print





9 **Display** the array.

Ask, "Jada and Diego are determining the product of 5 × 8. Jada says she can determine the product by counting by 8. Diego says he can determine the product by counting by 5. Who do you agree with and why?"

Use the Think-Pair-Share routine. Ask, "How can knowing the Commutative Property of Multiplication be helpful when determining the product of 2 numbers?"

10 **Play** the animation.

Say, "Similar to adding 2 numbers in any order and getting the same sum, you can multiply numbers in any order and get the same product."

Formalize vocabulary: Commutative Property of Multiplication The order in which 2 numbers are multiplied does not change the product.

(optional) **Consider using the Total Physical Response routine** by inviting students to demonstrate the changing of order of factors by crossing and uncrossing their hands. **ELD.PI.3.1 Em, Ex, Br**

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

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

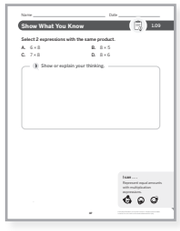
Show What You Know

Independent | 5 min |

Suggested Pacing: Screens 10-11

Students using print

(Show What You Know PDF)



Students using digital

Today's Goals

1. **Goal:** Recognize the Commutative Property of Multiplication.
   - In the *Show What You Know*, students determine which expressions have the same product using the commutative structure of multiplication.
2. **Language Goal:** Describe how the order of factors affects the product. **(Speaking and Listening)**
   - In the *Show What You Know*, students describe how the order of the factors does not affect the product.

D **Differentiation** See the last page of the lesson for differentiation and Math Language Development support.

Practice

Independent

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

Lesson 9
Practice

Students using digital

Students using print

Summary 1.09

You can multiply numbers in any order and get the same product.
This is called the **Commutative Property of Multiplication**.

$5 \times 8 = 8 \times 5$

5 rows of 8 scoops

$5 \times 8 = 40$

8 rows of 5 scoops

$8 \times 5 = 40$

Commutative Property of Multiplication The order in which 2 numbers are multiplied does not change the product.

Practice 1.09

Use the situation for Problems 1 and 2.

There are 4 rows of water bottles in a box. There are 5 bottles in each row.

1 Create an array to represent the situation.

Draw

Sample response shown.

Grade 3 Unit 1 Lesson 9 — Summary | Practice — 15

Practice 1.09

Name _____ Date _____

2 Write 2 multiplication expressions that could be used to determine the total number of water bottles.

4×5 _____ 5×4 _____

Use the situation for Problems 3 and 4.

A paint set has 3 rows of paint colors. Each row has 8 paint colors.

3 Create an array to represent the situation.

Draw

Sample response shown.

4 Write 2 multiplication expressions that could be used to determine the total number of paint colors.

3×8 _____ 8×3 _____

5 Create an array to represent the multiplication equation $5 \times 3 = 15$.

Draw

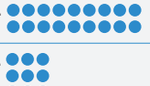
Sample response shown.

Grade 3 Unit 1 Lesson 9 — Practice — 16

Practice 1.09

Name _____ Date _____

6 Determine which array represents the expression 3×6.

	Yes	No
A. 	✓	
B. 		✓
C. 		✓
D. 		✓

Spiral Review

For Problems 7 and 8, determine the value of the expression.

7 $47 + 10$ 57

8 $80 - 60$ 20

9 There are 8 tricycles on display at the store. If each tricycle has 3 wheels, how many wheels are there? Write a multiplication equation to represent the problem. Use a ? for the unknown value.

$8 \times 3 = ?$ or $? = 8 \times 3$

Grade 3 Unit 1 Lesson 9 — Practice — 17

Practice Problem Item Analysis

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

Need more Practice?

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

Differentiation Use after Lesson 9

Lesson Goal: Recognize the Commutative Property of Multiplication.

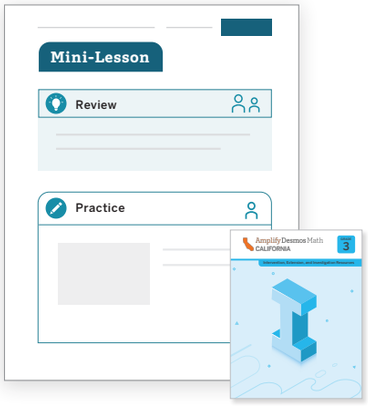
Support

Provide targeted intervention for students by using these resources.

If student response identifies: any choices other than A and D

Respond:

- **Mini-Lesson |** 15 min
  Writing Two Expressions to Represent an Array



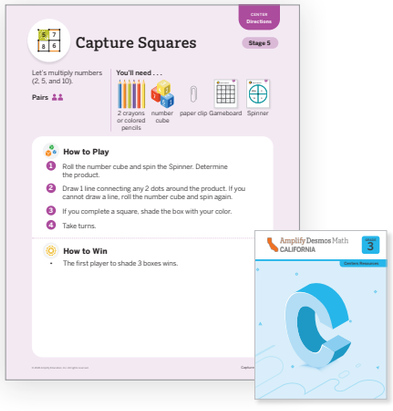
Strengthen

Reinforce students' understanding of the concepts assessed by using these resources.

If student response identifies: answers A and D with an explanation that the factors are the same

Respond:

- **Centers |** 15 min
  Capture Squares, (Stage 5)
  Cover Up, (Stages 10 and 11)
  Match It, (Stage 1)



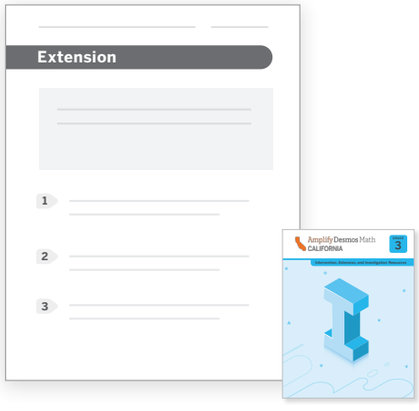
Stretch

Challenge students and extend their learning with these resources.

If student response identifies: answers A and D with an explanation that the order of the factors does not affect the product

Respond:

- **Sub-Unit 2 Extension Activities |** 15 min



Support, *Strengthen*, and *Stretch* learning by assigning these digital resources that adjust to each student's current level of skill and understanding.
• **Boost Personalized Learning** • **Fluency Practice** • **Math Adventures**

Math Language Development

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

- English/Spanish cognates e.g., *factor/factor*
- English/Spanish Glossary e.g., *product/producto*
- Frayer Model templates
- Math Language Routine display structures, e.g., **MLR8: Discussion Supports – Make a Conjecture**
- Vocabulary routines

Professional Learning

What part of the lesson went well today in terms of students' learning? What did you do that made that part go well?

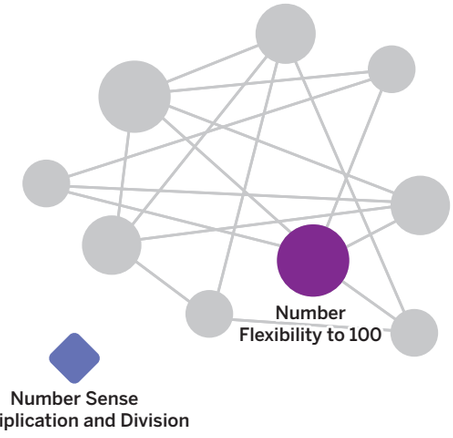
Unit 1
Lesson
10

Organizing Art Supplies

Solving Problems With Arrays

Let's analyze situations that involve arrays.

Today's Big Ideas



Focus on the Big Ideas

Today's Goals

CC2 Number Flexibility to 100 NS Multiplication and Division

1. **Goal:** Write equations with a symbol for the unknown number to represent array story problems with unknown factors.
2. **Language Goal:** Solve story problems involving multiplication and explain strategies used. **(Speaking and Listening)**

DI Why? In order to . . .	SMP How? Students will . . .	CC What? While . . .
Understand and explain arrays within contextual problems **(DI1)**	Use drawings of arrays to visualize the situation **(SMP.1)**	Writing an equation using a symbol for an unknown value. **(CC2)**

Connections and Coherence

Students solve contextual problems involving arrays and write multiplication equations to represent them. They consider which number represents the unknown value and then write equations using a symbol for the unknown. Students solve for the unknown using any strategy. **(SMP.1, SMP.2)**

Prior Learning

CC2 Number Flexibility to 100 NS Multiplication and Division

In Lesson 9, students represented multiplication situations with arrays and expressions.

Future Learning

CC2 Number Flexibility to 100

In Lesson 11, students will use their understanding of arrays to plan different seating arrangements for a library reading event.

Integrating Rigor in Student Thinking

Students deepen their **conceptual understanding** of multiplication by representing array story problems with equations involving unknown values and **apply** multiplication to solve problems with unknown factors and products.

Vocabulary

Review Vocabulary

array

CA CCSSM

Addressing

3.OA.3

Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities.

Also Addressing: 3.OA.1, 3.OA.7

Mathematical Practices: SMP.1, SMP.2, SMP.7, SMP.8

CA ELD Standards: ELD.PI.3.1, ELD.PI.3.3, ELD.PI.3.6, ELD.PI.3.12

Building Math Identity

I can be all of me in math class.
How are you like Harper in math class? How are you different?

Invite students to reflect on this question as they complete this lesson.

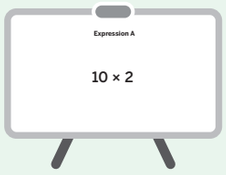
Lesson at a Glance 60 min

CA CCSSM: 3.OA.1, 3.OA.3, 3.OA.7, SMP.1, SMP.2, SMP.7, SMP.8

Warm-Up Fluency

Whole Class | 10 min

Students use the **Number Talk** routine, in which they look for structure and use repeated reasoning based on their own previous strategies or the strategies of others as they study a sequence of multiplication expressions with a factor of 2 and a factor that decreases by 1. **(SMP.7, SMP.8)**



Activity 1

Independent | 15 min

Students solve problems involving arrays that have an unknown amount of rows or an unknown amount in each row. Then they write multiplication equations to represent the problem and identify how each part of the equation represents it. **(SMP.1, SMP.2)**

Manipulative Kit: connecting cubes or counters (as needed)

Activity 2

Pairs | 20 min

Students represent array problems by writing equations with symbols for unknown values. They then solve for the unknown value using any strategy. **(SMP.2)**

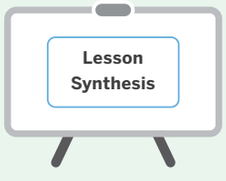
Manipulative Kit: connecting cubes or counters (optional)

Materials: *Ways to Represent Multiplication Situations* chart (from prior lesson)

Synthesis

Whole Class | 10 min

Students review and reflect on situations that could represent an array and strategies to solve for the unknown.

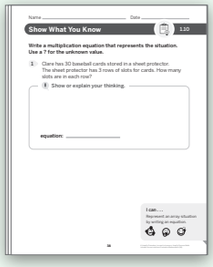


Show What You Know

Independent | 5 min

Students demonstrate their understanding of the connections between arrays and multiplication equations by writing an equation with a symbol for the unknown value to solve a given problem.

Materials: *Show What You Know* PDF



Math Language Development

EL Multilingual/English Learners

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

Emerging	Expanding	Bridging
Emerging text goes here.	Expanding text goes here.	Bridging text goes here.

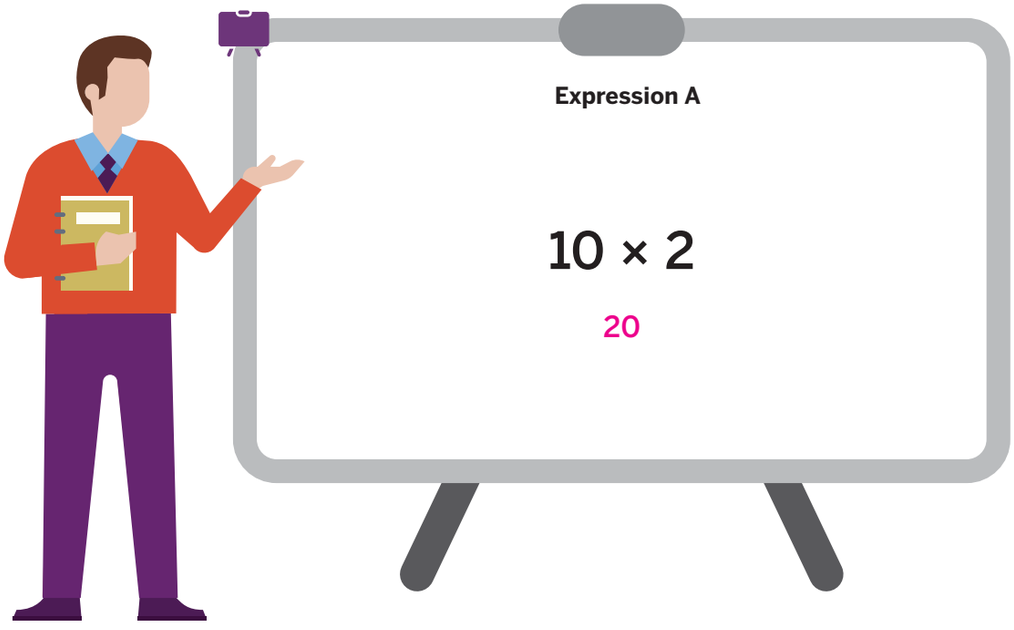
Whole Class | 10 min

Presentation Screens

Warm-Up Number Talk

Fluency

Purpose: Students evaluate multiplication expressions to look for patterns and begin to work toward fluency with multiplication facts in which 2 is a factor.



Expression B

9 × 2

18

Expression C

8 × 2

16

Expression D

7 × 2

14

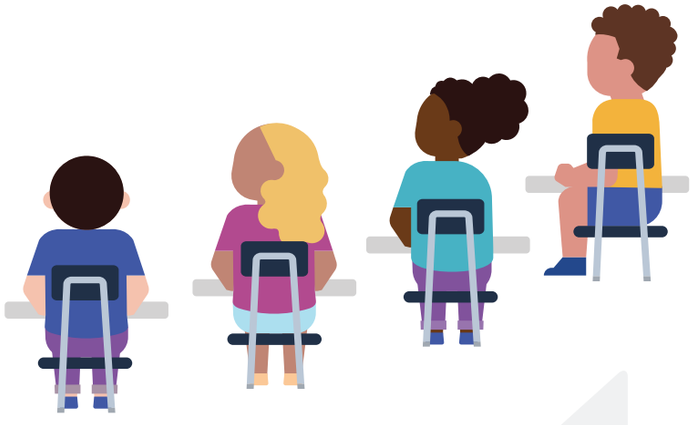
Why these problems? These expressions provide an opportunity for students to recognize that as the first factor decreases by 1, the product decreases by 2.

1 Launch

Use the Number Talk routine.

Display 1 expression at a time.

Say, "Take your time to find the value mentally. Give me a signal when you have an answer and can explain how you determined it."



2 Connect

Record products and 2 or 3 strategies as students share, honoring all strategies and keeping expressions and work displayed.

Repeat with each expression, spending the most time discussing Expressions C and D.

Ask (if not yet mentioned during discussion), "What pattern can you determine as you look at all of the expressions and products? How can you explain why that is happening?"

Students might say . . . ELD.PI.3.1.Em, Ex, Br

A: *I know 10 groups of 2 is 20.*

B: *9 × 2 means 9 groups of 2, so I skip counted by 2 nine times and ended at 18.*

C: *9 × 2 is 18, so 8 × 2 has to be 1 less group of 2. So, 8 × 2 = 16.*

D: *I notice that there is 1 less group of 2 each time, and the product goes down by 2 each time. So, 7 × 2 must be 14.*

Independent | 15 min

Activity 1 Array of Colors

Purpose: Students write a multiplication equation to represent problems involving arrays to identify what is unknown.

Presentation Screens

Materials

Manipulative Kit:

- Provide students with access to connecting cubes or counters (as needed).

Short on time? Consider solving Problems 1 and 2 as a class.

1 Launch

Read aloud the introduction and Problems 1 and 2.

Say, "Complete Problems 1 and 2 independently and then discuss Problem 3 with a partner." ELD.PI.3.1.Em, Ex, Br

EL **Multilingual/English Learners** Display a list of the words about the context that students might not know, such as *palette*. Include visuals or translations of each word in languages used by your students. **(Reading and Listening)**

A **Accessibility: Visual-spatial processing** Provide connecting cubes or counters students can choose to use while solving the problem.

2 Monitor

After students have completed **Problem 3**, refer to the D **Differentiation | Teacher Moves** table on the following page.

If students need help getting started . . .

- Ask, "What are the numbers in this problem? What do each of the numbers represent?"
- Ask, "What information are you missing? How can you determine that missing information?"

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

3 Connect

MLR This Connect is structured using the *MLR7: Compare and Connect* routine.

Invite students to share their responses for Problem 3. ELD.PI.3.3.Em, Ex, Br

Use the Think-Pair-Share routine. Ask: ELD.PI.3.1.Em, Ex, Br

- "What is similar about these equations? What is different about these equations?"
- "What is the unknown value in the first equation? Second equation?" Consider circling the unknown value in each equation as students share.
- "How did you identify the unknown value in the situation?"

Key Takeaway: Say, "When given a multiplication situation involving arrays, sometimes you will determine an unknown number of rows or an unknown number of objects in each row."

Student Edition

Unit 1
Lesson
10

Name _____ Date _____

Number Flexibility to 100 3.OA.3, 3.OA.1, 3.OA.7, SMP.1, SMP.2, SMP.7, SMP.8

Organizing Art Supplies

Let's analyze situations that involve arrays.

Warm-Up eyes on teacher

I can be all of me in math class.
How are you like Harper in math class? How are you different?

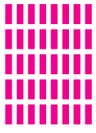
Activity
1

Array of Colors

Solve each problem and write an equation that represents it.
Sample work shown. ELD.PI.3.6.Em, Ex, Br

Show or explain your thinking.

1 There are 5 rows of crayons in a box. The box has 40 crayons in it. If each row has the same number of crayons, how many crayons are in each row?



answer: 8 crayons

equation: 5 × 8 = 40 or 40 = 5 × 8

Activity
1

Name _____ Date _____

Array of Colors (continued)

Show or explain your thinking.

2 There are 5 watercolor paints in each row of a palette. The palette has 40 paints in it. If each row has the same number of paints, how many rows of paints are there?

I already know 5 × 8 = 40, so using the commutative property, I know 8 × 5 = 40.

answer: 8 rows

equation: 8 × 5 = 40 or 40 = 8 × 5

3 Discuss ELD.PI.3.1.Em, Ex, Br
How does each part of your equation represent the situations?
Oral activity: No writing expected. Sample response shown.

The first factor represents the number of rows. The second factor represents the number of objects in each row. The product represents the total number of objects.

Presentation Screens

D Differentiation | Teacher Moves

Look for students who . . .	For example . . .	Provide support . . .
Almost there Describe the numbers in general terms in their work.	5 is along the side, 8 is on the top, and 40 is all over.	**Support** Ask, "What does 5 represent? What does 8 represent? What does 40 represent?"
Relate each part of the equation as representing a different part of the multiplication situation.	5 represents the number of rows. 8 represents the number in each row. 40 represents the total.	**Strengthen** Ask, "What other multiplication equation could you write to match this situation?"
Relate each part of the equation as representing a different part of the multiplication situation and use the commutative property to relate the equation to another equation.	I can write 5 × 8 = 40 because there are 5 rows with 8 in each row. I can also write 8 × 5 = 40 because of the commutative property. I know that there are still 8 markers in 5 rows.	**Strengthen** Ask, "How does the equation you write to match the situation affect how you could solve for the unknown value?"

Pairs | 20 min

Activity 2 Arrays of Art Supplies

Purpose: Students identify the unknown in an array situation to be able to use a symbol to represent the unknown in an equation and then solve using any strategy.

Presentation Screens

Materials

Manipulative Kit:

- Provide students with access to connecting cubes or counters (optional).

Classroom materials:

- Display the *Ways to Represent Multiplication Situations* chart (from prior lessons) throughout the activity.

1 Launch

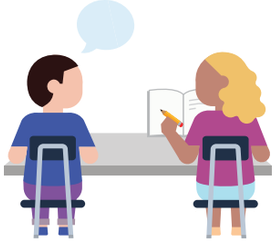
Provide access to connecting cubes or counters. (optional)

Read aloud the directions and Problems 4 and 5.

A **Accessibility: Memory and attention** Activate prior knowledge by having students refer back to previous activities in their Student Editions for strategies to solve similar problems.

EL **Multilingual/English Learners** Monitor and clarify any questions about the context. As students look over the problems, ask, "Are there any words or phrases that are unfamiliar? What questions do you have about any of the words or phrases?" ELD.PI.3.12.Em, Ex, Br

2 Monitor



After students have completed **Problem 5**, refer to the D **Differentiation | Teacher Moves** table on the following page.

If students need help getting started . . .

- Suggest that students visualize the situation. Ask, "What representation does this problem make you think of?"
- Ask, "Tell me about the equation you wrote. How could you represent this equation with a drawing or an array?" Refer students to the *Ways to Represent Multiplication Situations* chart.

3 Connect

Invite students to share the equations they wrote and their solution strategies for Problem 5. Select and sequence their responses in the order shown in the *Differentiation* table.

Ask, "How did you decide what strategy to use to solve for the unknown?"

Key Takeaway: Say, "It can be helpful to think about a situation using an equation to represent what is known, what is unknown, and how those things are related. When you write an equation that represents what is known and unknown, you can use any strategy to solve for the unknown."

Activity 2

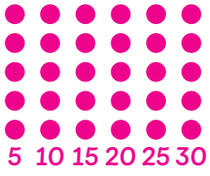
Name _____ Date _____

Arrays of Art Supplies

Write an equation to represent each problem, using a symbol for the unknown value. Then determine the unknown value.
Sample work shown.

Show or explain your thinking.

4 A case of markers is arranged into 6 sections. There are 30 markers in the case. How many markers are in each section?



equation: 6 × ? = 30 or 30 = 6 × ?

answer: 5 markers

Activity 2

Name _____ Date _____

Arrays of Art Supplies (continued)

Show or explain your thinking.

5 A box of pencils has 14 pencils arranged in an array. Each row has 7 pencils. How many rows of pencils are there?

I know 7 doubled is 14.

equation: ? × 7 = 14 or 14 = ? × 7

answer: 2 rows

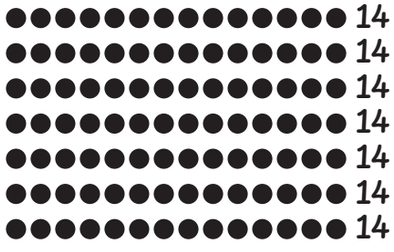
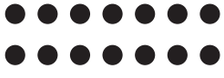
6 Discuss ELD.PI.3.3.Em, Ex, Br

How are Problems 4 and 5 similar? How are they different?
Oral activity: No writing expected. Sample response shown.

They both have situations where a factor is unknown. However, in Problem 4, the second factor is unknown, which represents the number in each row. In Problem 5, the first factor is unknown, which represents the number of rows.

Presentation Screens

D Differentiation | Teacher Moves

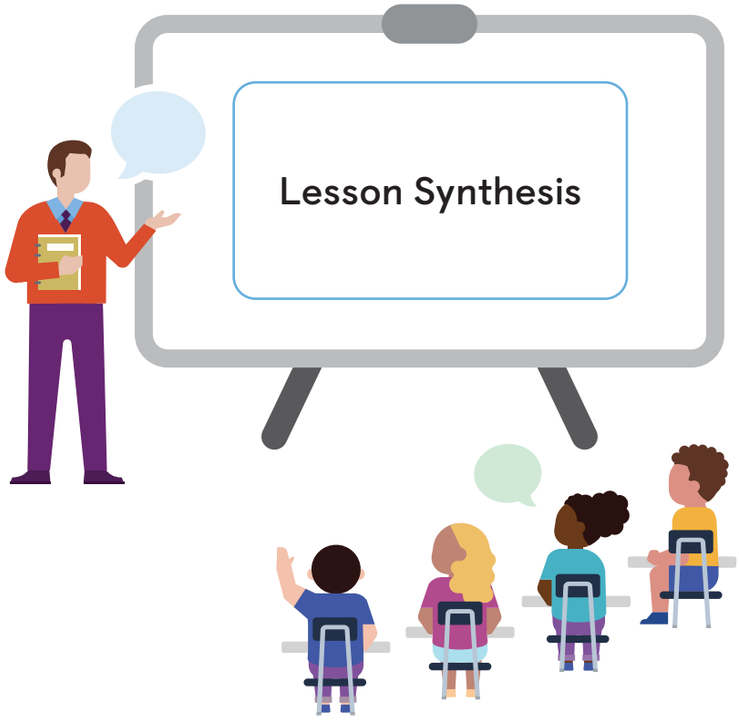
Look for students who . . .	For example . . .	Provide support . . .
Almost there Determine the product of the known values.		**Support** Ask, "What does the unknown amount in the equation represent?"
Create an array or equal groups to determine the unknown value.	 There are 2 rows of colors.	**Strengthen** Ask, "How did you know this strategy would work? How would your strategy change if you knew the number of rows but did not know the number of colors in each row?"
Use the structure of their equation to reason about and calculate the unknown value.	The unknown value is the number of groups. So I thought about how many groups of 7 are in 14. There are 2 groups of 7 in 14, so there are 2 rows of colors.	**Stretch** Say, "You said there are 2 groups of 7 in 14. You could represent that as 7 + 7 = 14 or as 2 × 7 = 14. Compare these equations and talk about how they relate to each other."

Whole Class | 10 min

Synthesis

Presentation Screen

Lesson Takeaway: Problems involving rows or columns can be represented with multiplication equations, using a symbol for the unknown value. Different strategies can be used to determine the missing value.



Ask:

- "What situation could this image be about?"
- "How could you represent that situation with an equation to represent the unknown?"
- "How would you solve for the unknown value?"

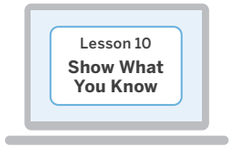
Say, "You will continue thinking about how the structure of arrays relates to factors, products, and equations in the next lesson."

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

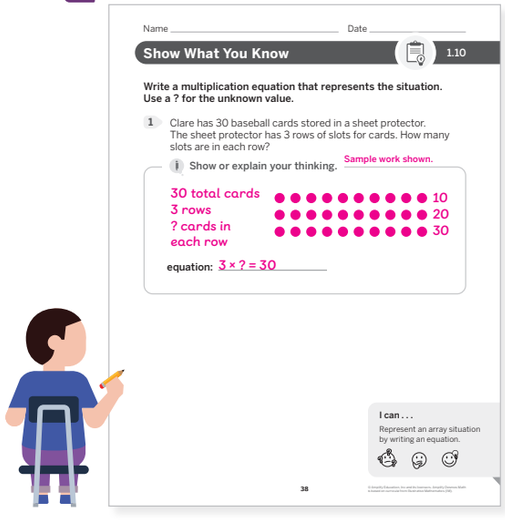
Show What You Know

Independent | 5 min

Students using digital



Show What You Know PDF


Name _____ Date _____

Show What You Know 1.10

Write a multiplication equation that represents the situation. Use a ? for the unknown value.

1 Clare has 30 baseball cards stored in a sheet protector. The sheet protector has 3 rows of slots for cards. How many slots are in each row?

Show or explain your thinking. Sample work shown.

30 total cards
3 rows
? cards in each row

10
20
30

equation: 3 × ? = 30

I can . . .
Represent an array situation by writing an equation.

38

Today's Goals

1. **Goal:** Write equations with a symbol for the unknown number to represent array story problems with unknown factors.
   - In the *Show What You Know*, students write an equation to represent an array story problem using a symbol to represent an unknown number.
2. **Language Goal:** Solve story problems involving multiplication and explain strategies used. **(Speaking and Listening)**

D **Differentiation** See the last page of the lesson for differentiation and Math Language Development support.

Practice

Independent

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

Lesson 10
Practice

Students using digital

Students using print

Summary 1.10

You can represent problems involving arrays with multiplication equations, using a symbol for the unknown. Then you can choose a strategy to determine the value of the unknown number.

? × 4 = 20

Practice 1.10

Use the information for Problems 1 and 2.

There are 20 chairs set up in an array in a classroom. There are 4 chairs in each row. How many rows of chairs are there?

1 Write a multiplication equation to represent the problem. Use a ? for the unknown value.

20 = ? × 4 or ? × 4 = 20

2 Determine the number of rows of chairs. Then rewrite the equation with the number that makes it true. Sample work shown.

Show or explain your thinking.

4
8
12
16
20

rows: 5

equation: 20 = 5 × 4 or 5 × 4 = 20

Grade 3 Unit 1 Lesson 10 22 Summary | Practice

Practice 1.10

Name _____ Date _____

Use the information for Problems 3 and 4.

There are 30 eggs placed in an array in a carton. There are 5 eggs in each row. How many rows of eggs are there?

3 Write a multiplication equation to represent the problem. Use a ? for the unknown value.

30 = ? × 5 or ? × 5 = 30

4 Determine the number of rows of eggs. Then rewrite the equation with the number that makes it true.

Show or explain your thinking.

Sample work shown.

5
10
15
20
25
30

answer: 6 rows

equation: 6 × 5 = 30 or 30 = 6 × 5

5 Jada is playing a card game. She placed 42 cards in an array with 6 rows. Select the equations that could be used to determine the number of cards in each row.

	Yes	No
A. 6 × ? = 42	✓	
B. 6 × 42 = ?		✓
C. 6 + ? = 42		✓
D. ? × 6 = 42	✓	
E. ? × 42 = 6		✓

Grade 3 Unit 1 Lesson 10 23 Practice

Practice 1.10

Name _____ Date _____

6 A music teacher places 18 chairs in an array. There are 6 chairs in each row. How many rows of chairs are there?

(A) 2 rows (B) 3 rows
(C) 4 rows (D) 6 rows

Spiral Review

For Problems 7–10, determine the value of the expression.

7 25 + 25 50

8 70 – 15 55

9 40 + 40 80

10 32 – 6 26

11 An art teacher has 30 large buttons and 55 small buttons. She used some of the buttons for a project. Now, the art teacher has 25 buttons. How many buttons did she use?

Show or explain your thinking.

Sample work shown.

30 + 55 = 85
85 – 25 = 25
25 + 60 = 85

The art teacher used 60 buttons.

answer: 60 buttons

Grade 3 Unit 1 Lesson 10 24 Practice

Practice Problem Item Analysis

	Problem(s)	DOK	CA CCSSM
On-lesson			
	1–4	2	3.OA.3, SMP.2, SMP.4
Test Practice	**5, 6**	2	3.OA.3, SMP.2, SMP.4
Spiral Review			
Fluency	**7–10**	1	2.NBT.5
	11	2	2.NBT.5, SMP.4

Need more Practice?

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

Differentiation Use after Lesson 10

Lesson Goal: Write equations with a symbol for the unknown number to represent array story problems with unknown factors.

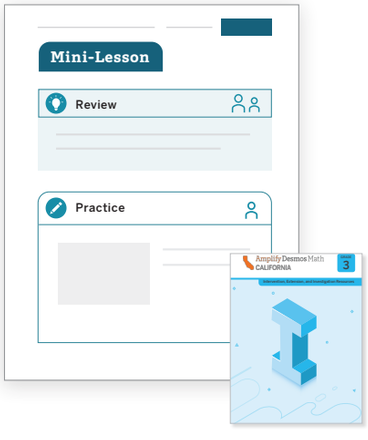
Support

Provide targeted intervention for students by using these resources.

If student response identifies: an equation other than 3 × ? = 30 or 3 × 10 = 30

Respond:

- **Mini-Lesson |** 15 min
  Relating Array Situations to Equations



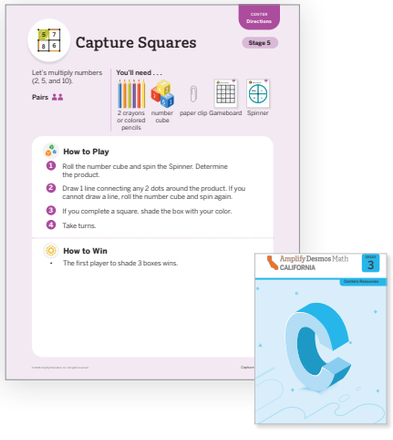
Strengthen

Reinforce students' understanding of the concepts assessed by using these resources.

If student response identifies: 3 × 10 = 30 or 30 = 3 × 10

Respond:

- **Center |** 15 min
  Capture Squares, Stage 5
  Cover Up, Stage 11
  Match It, Stage 1



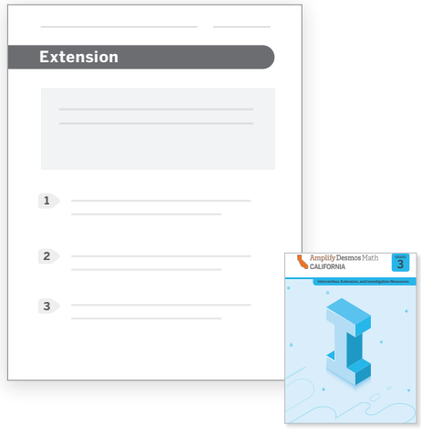
Stretch

Challenge students and extend their learning with these resources.

If student response identifies: 3 × ? = 30 or 30 = 3 x ?

Respond:

- **Sub-Unit 2 Extension Activities |** 15 min



Support, *Strengthen*, and *Stretch* learning by assigning these digital resources that adjust to each student's current level of skill and understanding.
• **Boost Personalized Learning** • **Fluency Practice** • **Math Adventures**

Math Language Development

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

- English/Spanish cognates
- English/Spanish Glossary e.g., *array/formación*
- Frayer Model templates
- Math Language Routine display structures, e.g., **MLR7: Compare and Connect**
- Vocabulary routines

Professional Learning

Who has been sharing their ideas in class lately? Make a note of students whose ideas have not been shared and look for an opportunity for them to share their thinking in the next lesson.

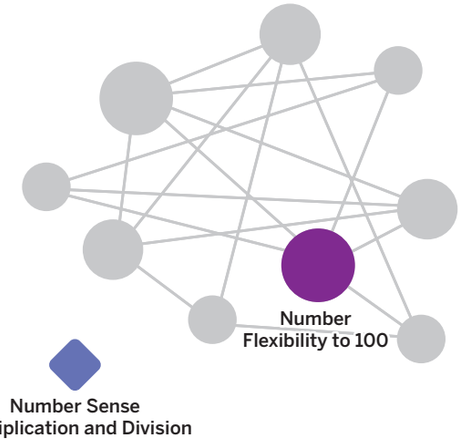
Unit 1
Lesson
11

A Community Reading Event

Different Representations of Multiplication

Let's see how Harper can use math in her reading community.

Today's Big Ideas



Focus on the Big Ideas

Today's Goals

CC2 Number Flexibility to 100 NS Multiplication and Division

1. **Goal:** Represent and solve real-world problems involving arrays.
2. **Language Goal:** Explain how arrays represent real-world multiplication situations. **(Speaking and Listening)**

DI Why? In order to . . .	SMP How? Students will . . .	CC What? While . . .
Make sense of real-world problems involving multiplication **(DI1)**	Use mathematical modeling to represent seating arrangements **(SMP.4)**	Generating expressions and arrays. **(CC2)**

Connections and Coherence

Students create arrays to represent real-world situations, applying what they know about the Commutative Property of Multiplication while reasoning through different configurations for real-world scenarios. They are introduced to a new stage of the Center *Cover Up*, in which they are given the opportunity to build fluency as they multiply with factors 1–5 and 10. **(SMP.1, SMP.4, SMP.8)**

Prior Learning

CC2 Number Flexibility to 100 NS Multiplication and Division

In Lesson 10, students used equations and arrays to represent and solve problems using symbols for unknown values.

Future Learning

CC1 Represent Multivariate Data

In Unit 2, students will continue to explore the concept of multiplication as it relates to another new concept — the area of two-dimensional shapes.

Integrating Rigor in Student Thinking

Students **apply** their understanding of representing multiplication in real-world scenarios, building **strategies for computation** with multiplication involving factors of 1–5 and 10, reducing reliance on models to determine products.

Vocabulary

Review Vocabulary

array

Commutative Property of Multiplication

CA CCSSM

Addressing

3.OA.3

Use multiplication and division **within 100 to solve word problems in situations involving equal groups, arrays,** and measurement quantities.

Also Addressing: 3.OA.7

Mathematical Practices: SMP.1, SMP.4, SMP.7, SMP.8

Building On	Building Toward
2.NBT.5	**3.NBT.2**

CA ELD Standards: ELD.PI.3.1, ELD.PI.3.3, ELD.PI.3.6, ELD.PI.3.9

Building Math Identity

We are a math community.
What makes your math class a community? How are you a part of that community?

Invite students to reflect on this question as they complete this lesson.

Lesson at a Glance 60 min

CA CCSSM: 3.OA.3, 3.OA.7, SMP.1, SMP.4, SMP.7, SMP.8

Warm-Up Fluency

Whole Class | 10 min

Students use the **Number Talk** routine, in which they look for structure and use repeated reasoning based on their own previous strategies or the strategies of others as they study a sequence of related subtraction expressions. **(SMP.7, SMP.8)**

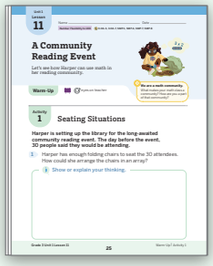
Activity 1

Small Groups | 20 min

Students explore a real-world application of arrays as they design seating arrangements for a changing number of attendees at a reading event using arrays. They examine the work of others by participating in a **Gallery Tour.** **(SMP.1, SMP.4)**

Manipulative Kit: inch tiles (as needed)

Materials: tools to create a visual display



Activity 2

Pairs | 15 min

Students are introduced to the Center *Cover Up, Stage 12*, in which they determine the product of 2 numbers. Students use repeated reasoning to build fluency by writing and evaluating expressions involving factors of 1–5 and 10. **(SMP.8)**

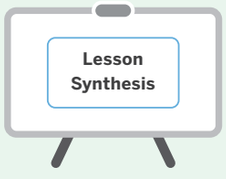
Manipulative Kit: base-ten units, counters, inch tiles (as needed)

Centers Resources: Gameboards A and B

Synthesis

Whole Class | 10 min

Students review and reflect on the work of the lesson and the sub-unit, including how equal groups, arrays, expressions, and equations represent multiplication.

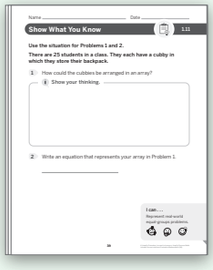


Show What You Know

Independent | 5 min

Students demonstrate their understanding by representing a real-world situation with an array and a multiplication equation.

Materials: *Show What You Know* PDF



Math Language Development

EL Multilingual/English Learners

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

Emerging	Expanding	Bridging
Students make sense of real-world problems using a graphic organizer and sentence frames. Guided questions are provided for you to ask for students to share one-word responses.	Students make sense of real-world problems using a graphic organizer and sentence frames. Guided questions are provided for you to ask for students to share simple phrases.	Students make sense of real-world problems using a graphic organizer and sentence frames. Guided questions are provided for you to ask for students to share responses using longer phrases or complete sentences.

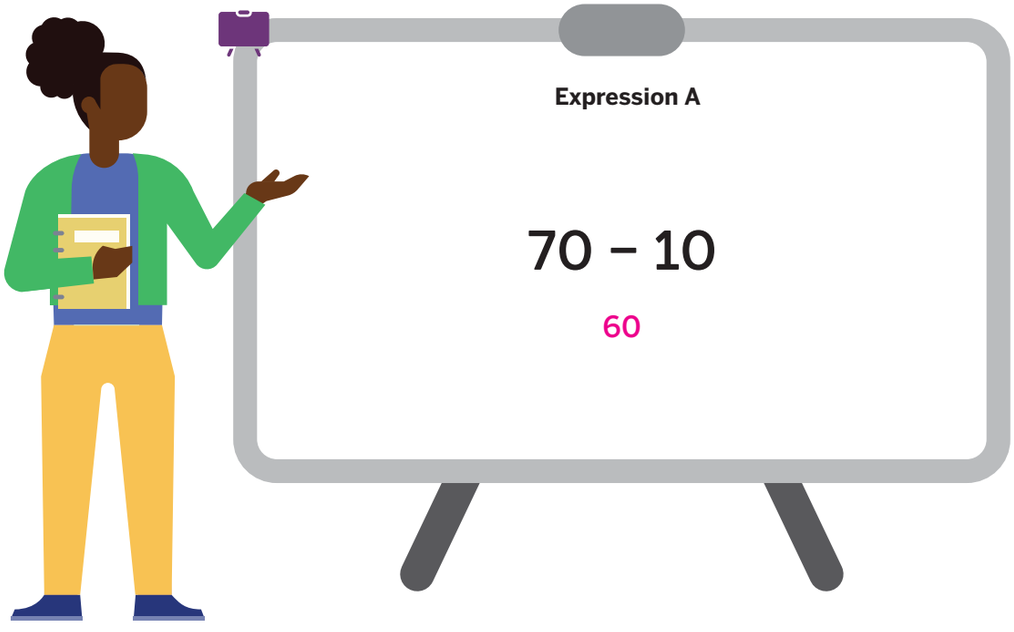
Whole Class | 10 min

Presentation Screens

Warm-Up Number Talk

Fluency

Purpose: Students subtract related pairs of numbers to practice and develop fluency with subtraction within 100.



Expression B

68 – 10

58

Expression C

70 – 12

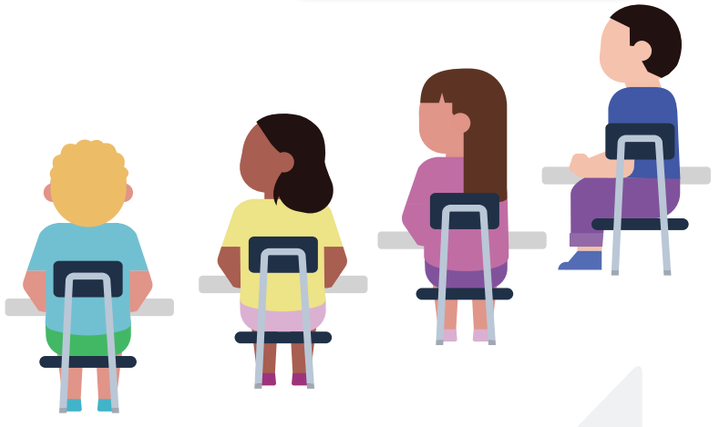
58

Expression D

68 – 12

56

Why these problems? These expressions lend themselves to using subtraction strategies based on place value.



1 Launch

Use the Number Talk routine.

Display 1 expression at a time.

Say, "Take your time to find the value mentally. Give me a signal when you have an answer and can explain how you determined it."

2 Connect

Record differences and 2 or 3 strategies as students share, honoring all strategies and keeping expressions and work displayed.

Repeat with each expression, spending the most time discussing Expression D.

Ask, "How can you use Expressions B or C to help you find the value of Expression D?"

Students might say . . . ELD.PI.3.1.Em, Ex, Br

A: *I know 7 tens minus 1 ten is 6 tens.*

B: *It's just like the first one, but the number you are subtracting from is 2 less. So, the difference would be 2 less, which is 58.*

C: *This is like the first problem, but you are subtracting 2 more from 70. So, instead of 60, it is 58.*

D: *68 is 2 less than 70, so the answer is 2 less than 70 minus 12, which is 56.*

Small Groups | 20 min

Activity 1 Seating Situations

Purpose: Students create arrays that represent seating arrangements. They examine classmates' arrays to consider others' reasoning for creating different configurations that represent a real-world situation.

Presentation Screens

Materials

Manipulative Kit:

- Provide students with access to inch tiles during the Monitor (as needed).

Classroom materials:

- Distribute tools for students to create a visual display.

1 Launch

Ask, "Think of an event you attended where chairs were set up for people to sit. What do you remember about how the chairs were arranged?"

Read aloud the introduction and Problem 1.

Have students complete Problem 1 and then pause for a class discussion.

Invite 2–3 students to share their arrays. Ask, "What equation could represent how you arranged the chairs?"

MLR **MLR6: Three Reads** Read the story problem aloud 3 times.

- **Read 1:** Say, "Tell your partner what the situation is about without using any numbers."
- **Read 2:** Ask, "What values are known and what values are unknown?"
- **Read 3:** Ask, "How could you use the relationship between these values to solve the problem?" **ELD.PI.3.6.Em, Ex, Br**

Read aloud Problems 2 and 3.

2 Monitor

After students have completed **Problem 2**, refer to the D **Differentiation | Teacher Moves** table on the following page.

If students need help getting started . . .

- Ask, "Tell me about the number 36. How can 36 be shown with equal groups?"
- For Problem 2, ask, "What do you know now about the number of people coming? What problem does Harper have?"

A **Accessibility: Visual-spatial processing** Provide access to inch tiles to model the seating arrangements in the student-facing task statement. Students can move the tiles to reflect the changes happening from Problem 1 to Problem 2.

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

3 Connect

Use the Gallery Tour routine. Say, "We will do a Gallery Tour. You will take a tour around our classroom to look at your classmates' work and have a discussion with your group. As you look at the representations, think about what is similar and what is different."

Invite students to share their reasoning behind their arrays and why they organized the chairs the way they did given the context.
ELD.PI.3.9.Em, Ex, Br
Ask, "Why do you think arrays are often used in these kinds of situations, like arranging chairs or other objects?

Key Takeaway: Say, "You can make arrays for different totals using the same number of rows or the same number of columns — both of which makes them helpful to organize or arrange things in real-world situations. Depending on the context, it may make more sense to have 1 array arrangement than another."

Student Edition

Unit 1
Lesson
11

Name _____ Date _____

Number Flexibility to 100 3.OA.3, 3.OA.7, SMP.1, SMP.4, SMP.7, SMP.8

A Community Reading Event

Let's see how Harper can use math in her reading community.

Warm-Up eyes on teacher

We are a math community. What makes your math class a community? How are you a part of that community?

Activity
1

Seating Situations

Harper is setting up the library for the long-awaited community reading event. The day before the event, 30 people said they would be attending. ELD.PI.3.6.Em, Ex, Br

1 Harper has enough folding chairs to seat the 30 attendees. How could she arrange the chairs in an array?

Show or explain your thinking.

Sample response shown.

She could arrange them in 6 rows of 5 chairs or in 5 rows of 6 chairs.

Activity
1

Name _____ Date _____

Seating Situations (continued)

2 The next morning, Harper did one last check online for the number of people attending and saw that it went up to 48 attendees! Harper only has 36 folding chairs, so she will have to use beanbags from some of the reading corners for the rest of the seats.

How could Harper arrange the seating so that the folding chairs are together in 1 array and the beanbags are together in another array? Write an equation that represents each array.

Show or explain your thinking. Sample responses shown.

Folding chairs:

I added another row of 6 to the 30 chairs in Problem 1.

equation: 6 × 6 = 36

Beanbags:

She could arrange them in 2 rows of 6. I wouldn't do 6 rows of 2 because that would take up a lot of space and people in the back wouldn't be able to see.

equation: 2 × 6 = 12

3 Work with your group to create a poster showing the seating arrangement you created for the community reading event.
Answers may vary. See students' posters. ELD.PI.3.10.Em, Ex, Br

Presentation Screens

D Differentiation | Teacher Moves

Look for students who . . .	For example . . .	Provide support . . .
Use trial and error strategies to build the arrays.	*I tried rows of 5 first, but I had 1 left over. Then I tried rows of 6, and it worked with 6 rows.*	**Strengthen** Say, "Describe the array and how you determined the equal rows and equal columns."
Represent the 36 folding chairs and 12 beanbags, reasoning about the 2 seating arrangements independently of each other.	*I arranged the inch tiles in 3 rows of 12. I arranged the counters in 2 groups of 6.*	**Strengthen** Ask, "What is another way that the seating could be arranged?"
Think about how the context of the situation affects their arrangements.	*I could do 6 rows of 2 for the beanbags, but people toward the back might not be able to see the reader. I think 2 rows of 6 would be better so everyone is close to the reader.*	**Strengthen** Ask, "Why is it important to think about the situation while you think about the math?"

Pairs | 15 min

Activity 2 Introducing the Center Cover Up, Stage 12

Fluency

Purpose: Students play a game to practice multiplying with factors of 1–5 and 10.

Presentation Screens

Materials

Manipulative Kit:

- Distribute two base-ten units, inch tiles (as needed), and 25 two-color counters to each pair.

Centers Resources:

- Distribute Gameboards A and B to each pair.

Short on time? Consider reducing the amount of time students play the game.

1 Launch

Display the Center materials, the Directions, the Recording Sheet, and Gameboard A.

Demonstrate how to play *Cover Up,* Stage 12 by inviting a student to act as a partner. While demonstrating:

- **Say**, "You are going to play *Cover Up.*"
- **Say**, "First, I need to place each cube on a number in the gray row."
- **Use the Think-Pair-Share routine**. Ask, "2 and 4 are the factors. What multiplication expression can I write using these numbers? How could I determine the product of this expression?" Record 1 or both possible expressions and the product on the Recording Sheet. **ELD.PI.3.1.Em, Ex, Br**
- **Say**, "Next, I cover the product with a counter."
- **Say**, "Now, my partner will move one of the cubes, multiply the 2 numbers, and cover the product, if it is not already covered. Then my partner will record the expression and product on the Recording Sheet. Take turns playing the game. The first player to cover 5 squares in a row wins."

Accessibility: Visual-spatial processing Provide inch tiles or other objects students can choose to use while playing the game.

2 Monitor

Use the Differentiation | Teacher Moves table on the following page.

If students need help getting started . . .

- Ask, "When multiplying 2 numbers, what does the first factor represent? What does the second factor represent?"

3 Connect

Invite students to share strategies they used to determine the value of expressions in the order shown in the *Differentiation* table.

Ask:

- "Did you use this strategy every time?"
- "Which strategy do you prefer? Why?"

Key Takeaway: Say, "You can calculate the product of 2 numbers using strategies, such as representing the equal groups and counting all, skip counting, repeated addition, or using other known products."

Activity 2

Name _____ Date _____

Introducing the Center, Cover Up Stage 12

Pairs Let's multiply using factors of 1–5 and 10.

You'll need: 2 base-ten units, two-color counters, Gameboard A or B, Recording Sheet

Set Up
- Choose a Gameboard.
- Choose who will use red counters and who will use yellow counters.

How to Play

1. **Player A:**
   - Place each cube on a number in the gray row. Each cube can be on a different number, or both cubes can be on the same number. Multiply the numbers.
   - Cover the product of the two numbers with a counter.
   - Record the multiplication expression and product.
2. **Player B:**
   - Move one of the cubes. Multiply the numbers.
   - If the product is not already covered with a counter, cover it.
   - Record the multiplication expression and product.
3. Take turns moving one cube at a time. Record each multiplication expression and product, even if you were unable to cover the product.

How to Win The first player to cover 5 squares in a row wins.

CENTER Recording Sheet

Name _____ Date _____

Cover Up (continued)

Multiplication expression	Product

Presentation Screens

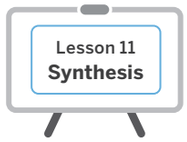
D Differentiation | Teacher Moves

Look for students who . . .	For example . . . (5 × 4)	Provide support . . .
Create an equal-groups drawing or array to represent 5 groups of 4 objects and then count by 1 to determine the product.	 1, 2, 3, 4, 5, 6,..., 20	**Strengthen** Ask, "How many dots are in each [group, row, or column]? If you know there are 4 dots in each group, how could you determine the total without counting each dot one by one?"
Determine the product using skip counting or repeated addition.	● ● ● ● ● 5 ● ● ● ● ● 10 ● ● ● ● ● 15 ● ● ● ● ● 20 5 + 5 + 5 + 5 = 20	**Strengthen** Ask, "What other products do you know with 4 or 5 as a factor? How could you use those known products to help you determine the value of this expression?"
Use an expression or product from a previous turn to calculate the product.	I found 4 × 4 = 16 for another turn. 5 × 4 means I can add another 4 to 16 to get 20. So, 5 × 4 = 20.	**Stretch** Ask, "How could you determine the product of 6 × 4? How could you determine the product of 8 × 4?"

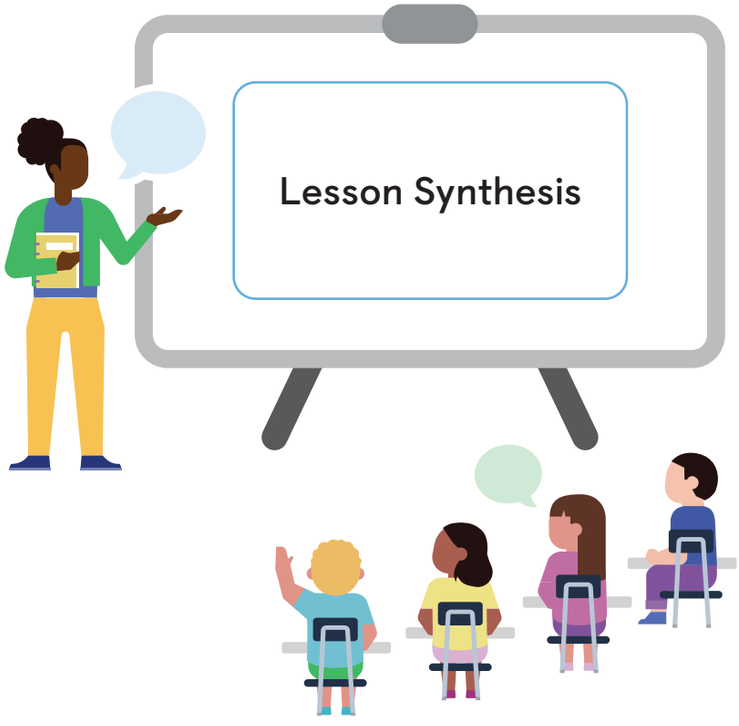
Whole Class | 10 min

Synthesis

Presentation Screen



Lesson Takeaway: Arrays can show different ways objects can be arranged in equal groups, making real-world situations visually clear. Many strategies can be used to determine the product of 2 numbers.



Say, "You saw many strategies you can use when multiplying."

Ask, "Where do you see each strategy represented in this array?"

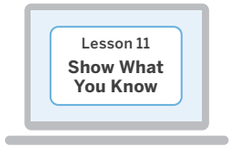
Say, "In this sub unit, you worked with arrays to represent multiplication. Throughout the year, you will continue to build on your understanding of multiplication."

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

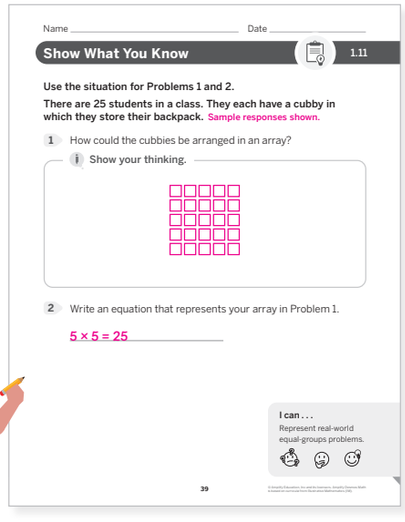
Show What You Know

Independent | 5 min

Students using digital



Show What You Know PDF


Name _____ Date _____

Show What You Know 1.11

Use the situation for Problems 1 and 2.

There are 25 students in a class. They each have a cubby in which they store their backpack. Sample responses shown.

1 How could the cubbies be arranged in an array?

i Show your thinking.

2 Write an equation that represents your array in Problem 1.

5 × 5 = 25

I can . . .
Represent real-world equal-groups problems.

39

Today's Goals

1. **Goal:** Represent and solve real-world problems involving arrays.
   - In the *Show What You Know*, students solve a real-world problem involving multiplication using an array.
2. **Language Goal:** Explain how arrays represent real-world multiplication situations. **(Speaking and Listening)**

Differentiation See the last page of the lesson for differentiation and Math Language Development support.

Practice

Independent

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

Lesson 11
Practice

Students using digital

Students using print

Summary 1.11

You can use multiplication and the different representations of multiplication to solve problems involving equal groups.

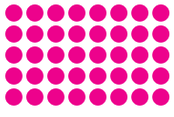
5 × 3 = 15
or
3 × 5 = 15

Practice 1.11

Sample responses shown for Problems 1–3.

1 A band will be marching in a parade. There are 40 people in the band. Show how they could be lined up in an array.

Draw



2 An elevator has buttons for 24 floors. Show how the elevator buttons could be organized in an array.

Draw

Grade 3 Unit 1 Lesson 11 29 Summary | Practice

Practice 1.11 Name _____ Date _____

3 Volunteers are placing 18 chairs in the gym for guests to watch a school performance. Show how the chairs could be organized in an array.

Draw

4 A muffin pan can make 12 muffins.

Determine which arrays could represent the muffin pan.

	Yes	No
A. 	✓	
B. 		✓
C. 	✓	
D. 	✓	

Grade 3 Unit 1 Lesson 11 30 Practice

Practice 1.11 Name _____ Date _____

Spiral Review

For Problems 5–8, determine the value of the expression.

5 60 − 30 30

6 17 + 13 30

7 60 − 35 25

8 21 + 14 35

9 There are 32 pencils sitting on tables. Each table has 8 pencils on it. How many tables are there? Write a multiplication equation to represent the problem. Use a ? for the unknown value.

? × 8 = 32 or 32 = ? × 8

10 Han and Diego are collecting rocks. Han collected 16 fewer rocks than Diego. Han collected 33 rocks. How many rocks did Diego collect?

Show your thinking.

Sample work and equation shown.

33 + 16
30 + 10 = 40
3 + 6 = 9
40 + 9 = 49

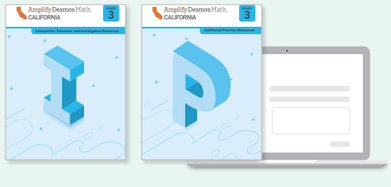
answer: 49 rocks equation: 33 + 16 = 49

Grade 3 Unit 1 Lesson 11 31 Practice

Practice Problem Item Analysis

	Problem(s)	DOK	CA CCSSM
On-lesson			
	1–3	2	3.OA.3, SMP.4
Test Practice	4	2	3.OA.3, SMP.4
Spiral Review			
Fluency	5–8	1	2.NBT.5
	9	2	3.OA.4, SMP.2, SMP.4
	10	2	2.OA.1, SMP.2, SMP.4

Need more Practice?



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

Differentiation Use after Lesson 11

Lesson Goal: Represent and solve real-world problems involving arrays.

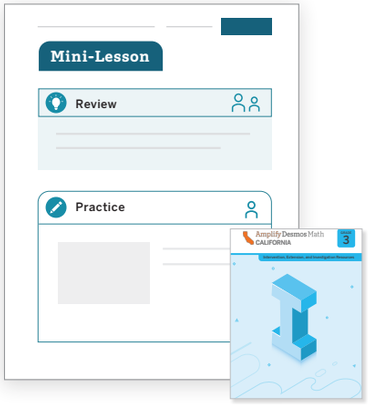
Support

Provide targeted intervention for students by using these resources.

If student work shows: more or less than 20, or unequal groups

Respond:

- **Mini-Lesson |** 15 min
  Solving Multiplication Problems Using Arrays



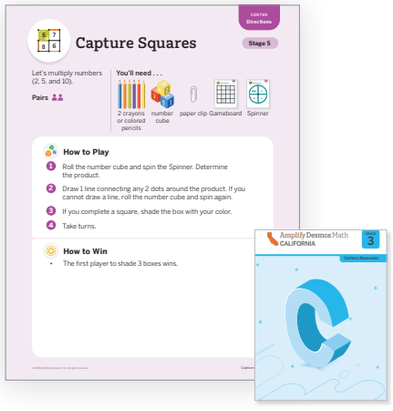
Strengthen

Reinforce students' understanding of the concepts assessed by using these resources.

If student work shows: 20 arranged into an array

Respond:

- **Centers |** 15 min
  Capture Squares, Stage 5
  Cover Up, Stage 11
  Match It, Stage 1



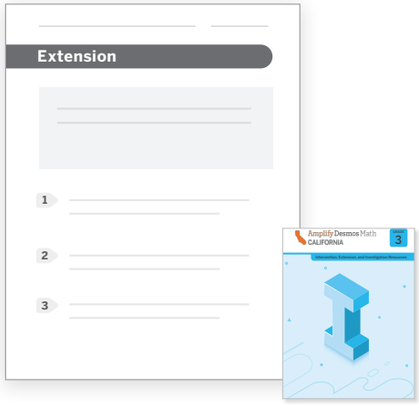
Stretch

Challenge students and extend their learning with these resources.

If student work shows: any of the following equations: $4 \times 5 = 20$, $5 \times 4 = 20$, $2 \times 10 = 20$, $10 \times 2 = 20$

Respond:

- **Sub-Unit 2 Extension Activities |** 15 min



Math Language Development

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

- English/Spanish cognates
- English/Spanish Glossary e.g., *array/formación*
- Frayer Model templates
- Math Language Routine display structures e.g., MLR6: Three Reads
- Vocabulary routines

Professional Learning

How did creating the visual display for the Gallery Tour support collaboration between students?

Sub-Unit Summary

Sub-Unit 2 | Summary

Sub-Unit Summaries and other helpful resources can be accessed on the **Caregiver Hub** at **amplify.com/caregiver-hub.**

In this sub-unit . . .

- We discovered that arrays are related to equal groups and to multiplication. We represented arrays with expressions and equations.

Equal groups	Array
	
Expression	**Equation**
3×5	$3 \times 5 = 15$

Math tip: The rows and columns of arrays show equal groups. When representing arrays with expressions, you can think about the factors as the number of rows (or columns) and the number of objects in each row (or column).

- Using our understanding of arrays, we saw that we can multiply numbers in any order and still get the same product. This is called the **Commutative Property of Multiplication**.

$3 \times 5 = 15$ $5 \times 3 = 15$ $3 \times 5 = 5 \times 3$

Grade 3 Unit 1 Sub-Unit 2 | Summary

Notes:

Notes

Notes

Visit us online to explore digital lessons and learn more.

amplify.com/mathca

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