

Grade 4

# MATH NATION

BY ACCELERATE LEARNING

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THE LEADER in STEM EDUCATION



## What's Inside This Sample Lesson?

- A fully guided lesson written to meet rigorous state and national standards
- **Teacher Edition** pages, **Student Workbook** pages, and other **helpful resources** to fully experience a Math Nation lesson
- Warm-ups, exploration tasks, instructional routines, and teacher prompts
- Support for English learners and students with disabilities
- Integrated reflection, synthesis, and cool-down opportunities

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**Go Online!**

Explore the digital resources for this lesson.



# LESSON 2

## INTERPRET REPRESENTATIONS OF MULTIPLICATIVE COMPARISON

### TEACHER-FACING LEARNING GOAL

- Interpret different representations of multiplicative comparison (situations, diagrams, and equations).

### LESSON TIMELINE

<b>Warm-up</b>	10 min
<b>Activity 1</b>	20 min
<b>Activity 2</b>	15 min
<b>Lesson Synthesis</b>	10 min
<b>Cool Down</b>	5 min

### ALIGNMENT

Addressing	
4.OA.A.1	4.OA.A.2

### LESSON PREPARATION

Instructional Routines
How Many Do You See? (Warm-up)
Materials To Gather
Connecting cubes: Activity 1

### TEACHER REFLECTION QUESTION

Students were asked to draw diagrams to represent times as many. How were students able to connect physical representations to those on paper and equations? What questions might you ask during tomorrow's lesson to support students who are still solidifying these connections?



## LESSON INFORMATION

### Student-Facing Learning Goal

- Let's make sense of representations of problems with "times as many."

### Lesson Narrative

The **objective** of this lesson is for students to represent situations and descriptions of multiplicative comparison using diagrams and equations.

In this lesson, students analyze and interpret images of discrete objects (connecting cubes) and discrete tape diagrams in which each unit is visible. These diagrams are precursors for more abstract tape diagrams that are used in future lessons.

Students also make connections between the multiplicative comparison language and multiplication equations. For example, they interpret "15 is 3 times as many as 5" as  $15 = 3 \times 5$  or  $15 = 5 \times 3$ .

In this unit, the convention of representing the multiplier as the first factor in equations is used. Students may write the factors in any order. In later lessons, students write division equations to represent multiplicative comparisons using their understanding of the relationship between multiplication and division.

This lesson gives students an opportunity to make sense of each equation and how it relates to a corresponding image or diagram (MP2).



**WARM-UP | HOW MANY DO YOU SEE: TIMES AS MANY** 10 minutes

**Instructional Routines**

How Many Do You See?

The purpose of this How Many Do You See is for students to use grouping strategies to describe the images they see. In the synthesis, students describe how two images can be used to describe a multiplicative comparison and connect the images to a multiplication equation.

**LAUNCH**

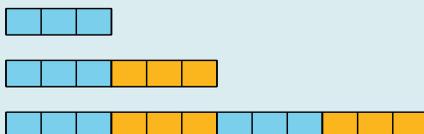
- Groups of 2
- “How many do you see and how you do see them?”
- Flash the image.
- 30 seconds: quiet think time

**ACTIVITY**

- Display the image.
- “Discuss your thinking with your partner.”
- 1 minute: partner discussion
- Record responses. Use multiplication equations when appropriate.
- Repeat for each image.

**STUDENT-FACING TASK STATEMENT**

How many do you see? How do you see them?



**POSSIBLE RESPONSES**

- 3: I see 3 rectangles inside a larger rectangle.
- 6: I see 2 groups of 3 rectangles.
- 12:
  - I see 4 groups of 3 rectangles.
  - I see 6, like in the second image, 2 times.

**ACTIVITY SYNTHESIS**

- “How does this show that the second rectangle has 2 times as many as the first rectangle?”
- “How could we write an equation that shows this comparison?” ( $6 = 2 \times 3$  or  $2 \times 3 = 6$  or  $3 \times 2 = 6$ )



## EXPLORATION ACTIVITY | REPRESENT “TIMES AS MANY”

20 minutes

Instructional Routine	Material To Gather
MLR7 Compare and Connect	Connecting cubes

The purpose of this activity is for students to analyze and describe how images and diagrams can show “ $n$  times as many”. Students generate ideas for how to use a multiplication equation to represent the comparison.

Students begin by interpreting an image in which the multiplier (3) and the numbers are given. They explain how some number of times of the smaller amount can be seen in the larger amount. Next, they create their own diagram and see different ways of representing the iterations (groups of) the smaller amount to create the larger amount.

During the activity, make connecting cubes accessible for students who may choose to use them for problem solving—either to reason about the quantities or to explain their reasoning.

### LAUNCH

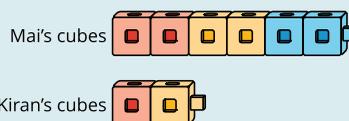
- Groups of 2
- Give students access to connecting cubes.
- Display the image of Mai’s cubes and Kiran’s cubes.
- “How do these cubes represent 3 times as many?” (Mai has 6 cubes and Kiran has 2. Mai has 3 groups of 2 cubes. Mai has 6 cubes and Kiran has 2. Three times as many as 2 is 6, or 3 times 2 is 6.)
- Give students access to cubes.
- Read the statement about Jada and Kiran’s cubes as a class.
- 1 minute: quiet think time

### ACTIVITY

#### MLR7 Compare and Connect

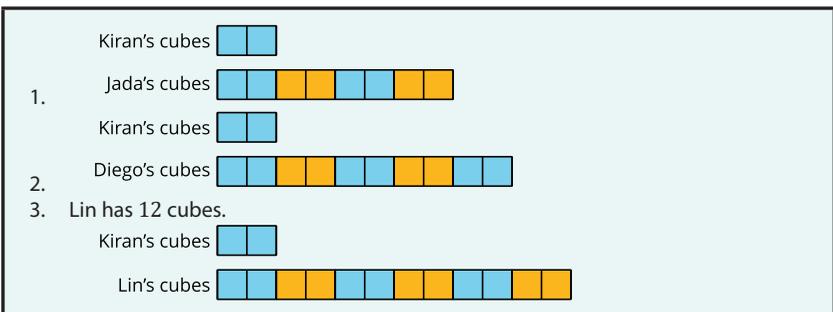
- “Create a visual display that shows your thinking about the cubes in each problem and include details to help others understand your thinking.”
- 6–8 minutes: independent or group work
- 3 minutes: gallery walk
- “How does each representation show ‘times as many?’”
- 30 seconds quiet think time
- 1 minute: partner discussion
- Monitor for students who create diagrams that are similar to connecting cube images and discrete tape diagrams to share in the synthesis.

### STUDENT-FACING TASK STATEMENT



1. Jada has 4 times as many cubes as Kiran. Draw a diagram to represent the situation.
2. Diego has 5 times as many cubes as Kiran. Draw a diagram to represent the situation.
3. Lin has 6 times as many cubes as Kiran. How many cubes does Lin have? Explain or show your reasoning.

**POSSIBLE RESPONSES**



**ADVANCING STUDENT THINKING**

- Students may compare additively instead of multiplicatively when using cubes or drawing diagrams. Consider asking: "How would you use the cubes to show 3 more?" and "How would you use the cubes to show 3 times as many?"

**ACTIVITY SYNTHESIS**

- Have selected students share diagrams and explain how they show "times as many".
- If needed, use cubes to represent statements.
- "How could you write an equation to compare Kiran's and Jada's cubes?"
- "What do the numbers in the equation represent in the situation?" (Four is the "4 times as many". Two is how many Kiran had. Eight is how many Jada had.)
- Write equations for each situation and ask about what students notice about the relationships.



**EXPLORATION ACTIVITY | DIAGRAMS TO SOLVE MULTIPLICATIVE COMPARISON PROBLEMS** 15 minutes

The purpose of this activity is for students to deepen their understanding of how diagrams and multiplication equations can represent "n times as many". Students explain how the diagrams and equations represent the situation. In order to match situations, diagrams, and equations, students reason abstractly and quantitatively (MP2).

**Support for English Language Learners**

*MLR8 Discussion Supports.* Students should take turns finding a match and explaining their reasoning to their partner. Display the following sentence frames for all to see: "I noticed \_\_\_\_\_, so I matched . . . ." Encourage students to challenge each other when they disagree.

*Advances: Conversing, Representing, Speaking*

**Support for Students with Disabilities**

*Engagement: Provide Access by Recruiting Interest.*  
*Synthesis: Optimize meaning and value.* Invite students to look and listen for examples of multiplicative comparison in their own lives. Encourage them to share these throughout the unit.

*Supports accessibility for: Conceptual, Processing, Language, Attention*

**LAUNCH**

- Groups of 2
- “Take turns reading a description and finding a diagram and an equation that also represent the situation. Explain your reasoning to your partner.”

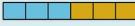
**ACTIVITY**

- 5–7 minutes: partner work time
- Monitor for students who connect the factors and product of the equation to the situation and diagram
- If students finish early, give them blank index cards. Ask them to make several sets of matching representations, shuffle the cards, and trade them with another group that is also creating their own representations.

**STUDENT-FACING TASK STATEMENT**

Here are four sets of descriptions, diagrams, and equations that compare pairs of quantities.

Match each description to a diagram and an equation that represent the same situation. Be prepared to explain your reasoning.

- |  |   |
|--|---|
| A. Lin has 3 cubes. Jada has 2 times as many.  | B. Han has 3 cubes. Elena has 3 times as many.  |
| C. $2 \times 3 = 6$  | D. Priya had 5 cubes. Noah had 3 times as many.   |
| E. $3 \times 5 = 15$   | F. $4 \times 4 = 16$  |
| G. quantity 1 <br>quantity 2  | H. quantity 1 <br>quantity 2  |
| I. $3 \times 3 = 9$  | J. Mai has 4 cubes. Diego has 4 times as many.  |
| K. quantity 1 <br>quantity 2   | L. quantity 1 <br>quantity 2  |

Record your matches here:

- Set 1: \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_  
 Set 2: \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_  
 Set 3: \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_  
 Set 4: \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_

**POSSIBLE RESPONSES**

- Matches:
- A, C, and H
  - B, I, and K
  - D, E, and G
  - F, J, and L

**ADVANCING STUDENT THINKING**

- Students may consider the total amount represented on a card rather than making comparisons. For example, on card K, they might see 4 groups of 3 in the two quantities combined. Consider asking:
- “How would you compare the two quantities shown on the card?”
  - “Where might you see two quantities being compared in the equation on card E?”

**ACTIVITY SYNTHESIS**

- Select students to share their matches.
- Record student explanations to show how they connected the diagrams and equations (display or draw the diagrams and equations and annotate).



**LESSON SYNTHESIS** 10 minutes

"Today we looked at a new way to use multiplication equations. Multiplication equations can describe equal groups, but they also represent multiplicative comparison."

Display a student's representation of Kiran's cubes and Jada's cubes from the first activity.

"Explain how you see  $4 \times 2 = 8$  in this diagram." (There are 4 groups of 2 cubes each or Jada has 4 times as many as Kiran does)

"In this case, the value of the product is 8. How is one of the factors being compared to 8 in this diagram?"

If not mentioned by students, highlight that:

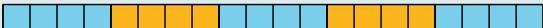
- "In the first case, the multiplication equation represents equal groups of objects."
- "In the second case, the multiplication equation represents multiplicative comparison. It allows us to see how many times as many objects one person has compared to another person."

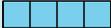


**COOL DOWN | COMPARING CUBES** 5 minutes

**STUDENT-FACING TASK STATEMENT**

1. Circle the statement and the multiplication equation that show a comparison of Tyler's and Elena's cubes.

Tyler's cubes 

Elena's cubes 

Tyler has 4 more cubes than Elena.  $6 \times 4 = 24$

Elena has 5 times as many cubes as Tyler.  $2 \times 10 = 20$

Tyler has 5 times as many cubes as Elena.  $4 \times 4 = 16$

Tyler has 4 times as many cubes as Elena.  $5 \times 4 = 20$

2. Explain your choices.

**POSSIBLE RESPONSES**

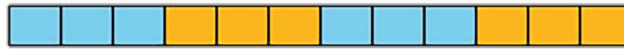
- Tyler has 5 times as many cubes as Elena.  $5 \times 4 = 20$
- Sample responses:
  - We can see Elena has 4 and Tyler has 20. The diagram shows that Tyler has 5 groups of 4 cubes, so he has 5 times as many as Elena, who has 4 cubes.
  - The equation  $5 \times 4 = 20$  shows that the number of cubes that Tyler has, 20, is 5 times 4, the number of cubes that Elena has.

## Unit 5, Lesson 2: Interpret Representations of Multiplicative Comparison



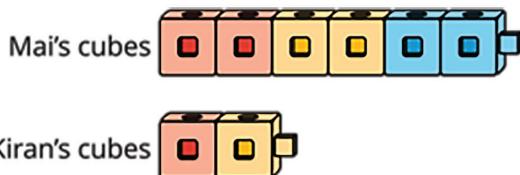
### How Many Do You See: Times as Many

How many do you see? How do you see them?





### Represent "Times as Many"



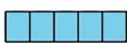
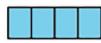
1. Jada has 4 times as many cubes as Kiran. Draw a diagram to represent the situation.
  
  
  
  
  
  
  
  
  
  
2. Diego has 5 times as many cubes as Kiran. Draw a diagram to represent the situation.
  
  
  
  
  
  
  
  
  
  
3. Lin has 6 times as many cubes as Kiran. How many cubes does Lin have? Explain or show your reasoning.



## Diagrams to Solve Multiplicative Comparison Problems

Here are four sets of descriptions, diagrams, and equations that compare pairs of quantities.

Match each description to a diagram and an equation that represent the same situation. Be prepared to explain your reasoning.

<p>A. Lin has 3 cubes. Jada has 2 times as many.</p>	<p>B. Han has 3 cubes. Elena has 3 times as many.</p>
<p>C. <math>2 \times 3 = 6</math></p>	<p>D. Priya had 5 cubes. Noah had 3 times as many.</p>
<p>E. <math>3 \times 5 = 15</math></p>	<p>F. <math>4 \times 4 = 16</math></p>
<p>G. quantity 1  quantity 2 </p>	<p>H. quantity 1  quantity 2 </p>
<p>I. <math>3 \times 3 = 9</math></p>	<p>J. Mai has 4 cubes. Diego has 4 times as many.</p>
<p>K. quantity 1  quantity 2 </p>	<p>L. quantity 1  quantity 2 </p>

Record your matches here:

Set 1: \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_

Set 2: \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_

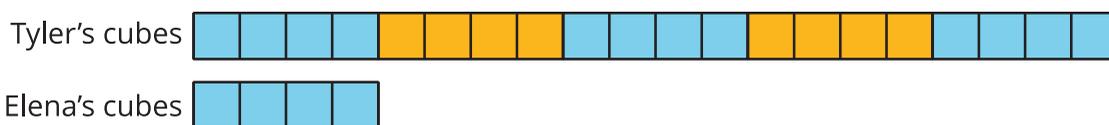
Set 3: \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_

Set 4: \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_

# Lesson 2: Interpret Representations of Multiplicative Comparison

## Cool Down: Comparing Cubes

1. Circle the statement and the multiplication equation that show a comparison of Tyler's and Elena's cubes.



- |   |                    |
|---|--------------------|
| Tyler has 4 more cubes than Elena.        | $6 \times 4 = 24$  |
| Elena has 5 times as many cubes as Tyler. | $2 \times 10 = 20$ |
| Tyler has 5 times as many cubes as Elena. | $4 \times 4 = 16$  |
| Tyler has 4 times as many cubes as Elena. | $5 \times 4 = 20$  |

2. Explain your choices.

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