MATH NATION
BY ACCELERATE LEARNING

Take & Teach
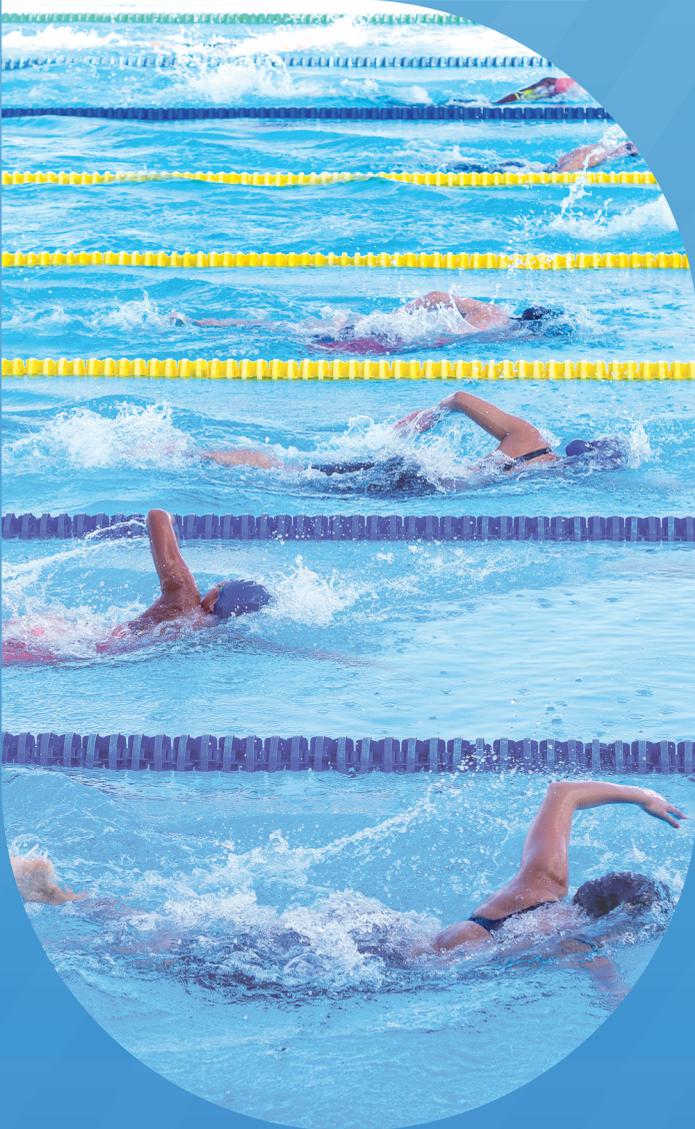
What's Inside This Sample Lesson?

- 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

Table of Contents
Grade 5, Unit 4, Lesson 2 - Partial Products in Diagrams

Go Online!
Explore the digital resources for this lesson.

LESSON 2
PARTIAL PRODUCTS IN DIAGRAMS

TEACHER-FACING LEARNING GOAL

- Interpret partial products diagrams.
- Multiply a three-digit number and a two-digit number.

ALIGNMENT

Addressing
5.NBT.B
Building Towards
5.NBT.B.5

LESSON PREPARATION

Instructional Routines
Which One Doesn't Belong? (Warm-up)

LESSON TIMELINE

Warm-up	10 min
Activity 1	15 min
Activity 2	20 min
Lesson Synthesis	10 min
Cool Down	5 min

TEACHER REFLECTION QUESTION

Think about which students haven't shared their strategies in class lately. Were there missed opportunities to highlight their thinking during recent lessons? How can you take advantage of those opportunities when they arise?

LESSON INFORMATION

Student-Facing Learning Goal

- Let's interpret diagrams that can help up find products.

Lesson Narrative

The purpose of this lesson is for students to multiply multi-digit whole numbers using strategies based on place value and the properties of operations.

This lesson builds on the partial products representation students saw in grade 4 to help organize calculations of whole number products. This becomes even more important for the product of a two-digit and three-digit number as the number of partial products is larger, depending on the diagram that is used. Part of the value of the standard algorithm which students will also see in later lessons is that it condenses the calculations and the number of partial products.

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2   5th Grade Mathematics · Unit 4

WARM-UP | WHICH ONE DOESN'T BELONG: DIAGRAMS TO FIND PRODUCTS 10 minutes

Instructional Routines

Which One Doesn't Belong?

The purpose of this warm-up is for students to compare and contrast different diagrams that can be used to represent and calculate products of two-digit numbers. Students used these partial products diagrams in Grade 4. They will extend them to represent the product of a three-digit number and a two-digit number later in the lesson.

These rectangular diagrams use the intuition and properties of area to support representing multiplication. But, a genuine area diagram would be difficult to read, so the individual pieces are not drawn to scale.

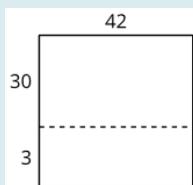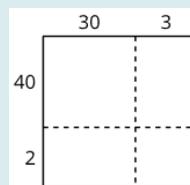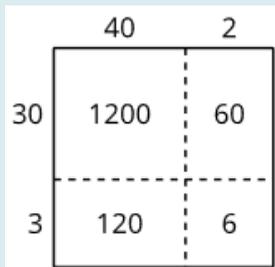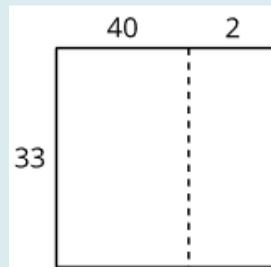| **LAUNCH**	• Groups of 2 • Display the image. • "Pick one that doesn't belong. Be ready to share why it doesn't belong." • 1 minute: quiet think time
ACTIVITY	• "Discuss your thinking with your partner." • 2–3 minutes: partner discussion • Share and record responses.
STUDENT-FACING TASK STATEMENT	Which one doesn't belong?
POSSIBLE RESPONSES	• A doesn't belong because it is not divided vertically. • B doesn't belong because the large number is not on the horizontal side. • C doesn't belong because it is the only one that shows all the partial products; it's not empty inside. • D doesn't belong because it is not divided horizontally.

ACTIVITY SYNTHESIS	• "How might Diagram C be helpful for calculating the product 42×33?" (I can add those numbers to get the value of 42×33.) • Highlight that this is the type of diagram that will be used throughout the next several lessons. The purpose of the diagram is to help see different ways to calculate products of numbers.

EXPLORATION ACTIVITY | DECOMPOSE IN MANY WAYS 15 minutes

The purpose of this activity is for students to use a diagram to help calculate the product of a three-digit number and a two-digit number. The diagram helps to organize the individual products that can be used to find the larger product. During the activity synthesis, students connect the diagram to the distributive property when they explain how the sum of the individual products gives the larger product (MP7).

Support for Students with Disabilities

MLR8 Discussion Supports. For each observation that is shared, invite students to turn to a partner and restate what they heard using precise mathematical language.

Advances: Listening, Speaking

| **LAUNCH**	• Groups of 2 • Display the image from the student workbook. • "In these problems, write each product inside the part of the diagram that represents that product." • Demonstrate by writing 1,200 inside the rectangle with sides marked 30 and 40.

ACTIVITY	• 1–2 minutes: quiet think time • 6–8 minutes: partner work time • Monitor for students who use their work for the first product to find the second product.

STUDENT-FACING TASK STATEMENT	 1. Write the value of each product inside the rectangles. 2. Find the value of 42×33. 3. This diagram represents 142×33.

Math Nation – Grade 5

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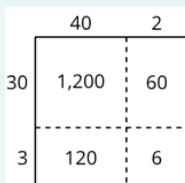| STUDENT-FACING TASK STATEMENT *CONTINUED*	
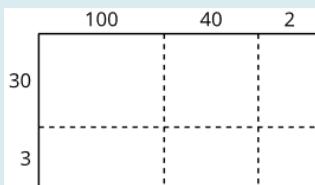
Write the value of each product inside the rectangles.
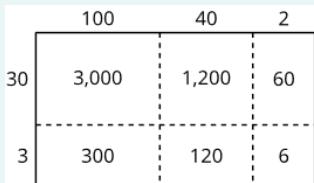
4. Find the value of 142×33.

POSSIBLE RESPONSES

1.

2. 1,386

3.

4. 4,686

ACTIVITY SYNTHESIS

- Invite students to share their work for finding the product 42×33.
- Display: $42 \times 33 = (40 + 2) \times (30 + 3)$
- "How does the diagram represent this equation?" (It shows 42 broken up into 40 and 2 and 33 broken up into 30 and 3.)
- Display: $(40 + 2) \times (30 + 2) = (40 \times 30) + (2 \times 30) + (40 \times 3) + (2 \times 3)$
- "How do you know this equation is true?" (The diagram shows 42×33 broken up into those 4 partial products.)
- "How is finding the product 142×33 related to finding the product 42×33?" (The products and partial products are the same, except that I also have 100×33 in 142×33.)

🛺 EXPLORATION ACTIVITY | CALCULATE IN MANY WAYS 20 minutes

The purpose of this activity is for students to write expressions to represent different ways to decompose a product. Then they choose one of the decompositions to find the product. Students consider how certain decompositions are more helpful than others, depending on the specific numbers in the problem. The diagrams used here relate to the partial products and standard algorithm methods which students will learn in future lessons.

Support for Students with Disabilities

Engagement: Provide Access by Recruiting Interest. Provide choice. Invite students to decide which problem to start with and how they want to write the expressions.

*Supports accessibility for: Attention*

|	
LAUNCH	• Groups of 2 • Give students time to read the task statement. • "This time, you will write an expression in each piece of the diagram, rather than a number."

ACTIVITY	• 1 minute: independent think time
	• 7–8 minutes: partner work time
	• Monitor for students who:
	  ○ use the first diagram to help calculate the values for the other two diagrams.
	  ○ choose different diagrams for their calculations.

STUDENT-FACING TASK STATEMENT

Here are some different diagrams that represent 315×24. For each diagram, write a multiplication expression inside each rectangle to represent the product.

1.

2.

3.
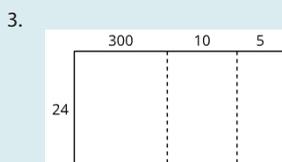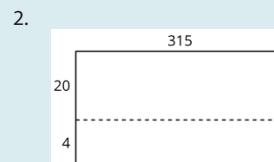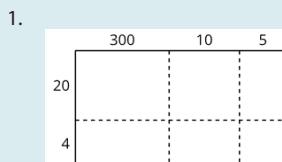
4. Use one of the diagrams to find the value of 315×24.
5. Explain why you chose that diagram to find the product.

POSSIBLE RESPONSES

1.

2.

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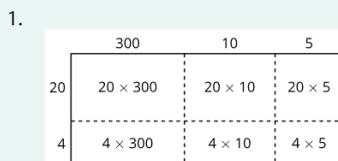
POSSIBLE RESPONSES *CONTINUED*

3.

	300	10	5
24	24×300	24×10	24×5

4. Sample response: $24 \times 300 = 7{,}200$, $24 \times 10 = 240$, $24 \times 5 = 120$, $7{,}200 + 240 + 120 = 7{,}560$.
5. The first way leaves 6 products to find but they are all products of one-digit numbers with some factors of 10. In the second way, there are just two products to find. With the third way, there are 3 products to find but each one is simpler.

ADVANCING STUDENT THINKING

If students do not write the correct partial product in the diagram, ask, "What is a reasonable estimate for the product of 315×24?"

ACTIVITY SYNTHESIS

- Display: 20×30
- "How does this expression relate to the product 315×24?" (It represents one of the products in the first diagram.)
- "Why isn't this expression written in any of the other diagrams?" (Because the other diagrams are decomposed differently.)
- Invite students to share the diagram they chose to find the product and how it was helpful. As students share, record equations to represent each partial product.
- "What are the advantages or disadvantages of this way to calculate 315×24?" (For full partial products, each product is simple to calculate. I do have 6 different numbers to add up at the end. When I broke the full product into two products, the calculations I used to find each product were harder, but once I had them, there were only two things to add. When I broke the full product into 3 products, this was a good compromise. The products were not too hard to calculate and there were just 3 of them to add.)

LESSON SYNTHESIS 10 minutes

"Today we multiplied numbers and thought about how diagrams could help."

Display the first image from the last activity.

"How can the diagram help us find the value of the product ?" (It helps me break up the product by place value. I take the hundreds, tens, and ones of one number and multiply them by the tens and ones of the other number.)
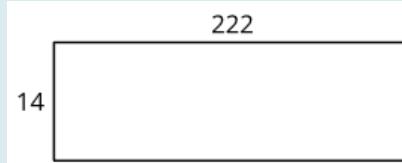
"Tomorrow we are going to work with partial products and organize them in a different way."

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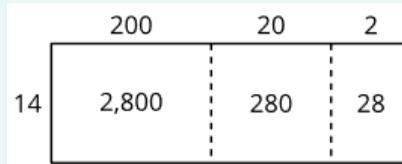# COOL DOWN | 222 × 14 5 minutes

STUDENT-FACING TASK STATEMENT	Here is a diagram that represents 222 × 14.

Find the value of 222 × 14. Use the diagram if it is helpful. Explain or show your reasoning.

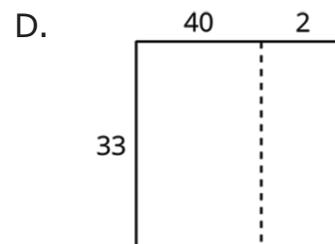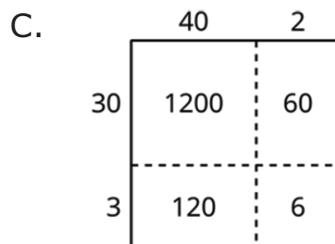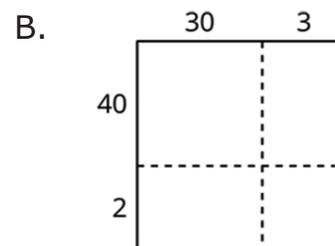| POSSIBLE RESPONSES	3,108. Sample response: I broke 222 down into hundreds, tens, and ones, and multiplied each by 14.

The product is 2,800 + 280 + 28, which is 3,108.

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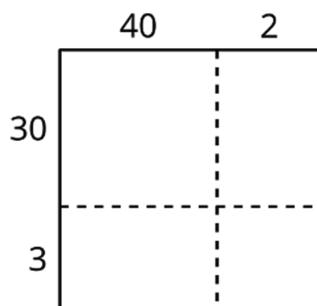# Unit 4, Lesson 2: Partial Products in Diagrams

Which One Doesn't Belong: Diagrams to Find Products

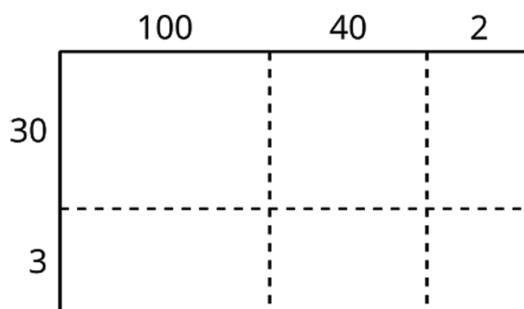Which one doesn't belong?

A.

B.

C.

D.

Decompose in Many Ways

1. Write the value of each product inside the rectangles.

2. Find the value of 42×33.

3. This diagram represents 142×33.

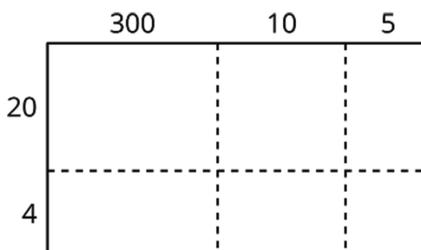

Write the value of each product inside the rectangles.

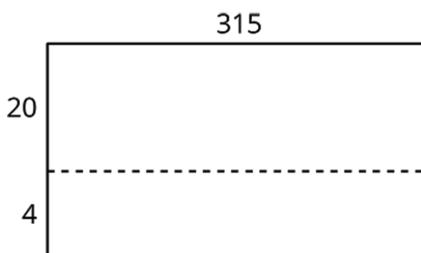4. Find the value of 142×33.

🔭 Calculate in Many Ways

Here are some different diagrams that represent 315×24. For each diagram, write a multiplication expression inside each rectangle to represent the product.
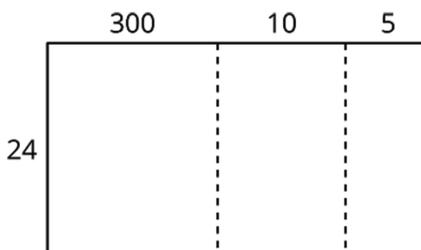
1.

	300	10	5
20			
4			

2.

	315
20	
4	

3.

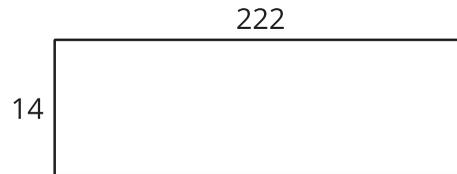|	300	10	5
24			

4.   Use one of the diagrams to find the value of 315×24.

5. Explain why you chose that diagram to find the product.

Lesson 2: Partial Products in Diagrams

Cool Down: 222×14

Here is a diagram that represents 222×14.

Find the value of 222×14. Use the diagram if it is helpful. Explain or show your reasoning.

Notes

Notes

Notes

Ready to see the full program?

Scan here!

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