



**THIRD SPACE
LEARNING**

Math Intervention Pack

Multiply 2-digit numbers using
the area model

Grade 4

How to use the resources

1. Title Slide

Use this slide to activate prior knowledge needed for lesson. Students should be encouraged to initially attempt the question presented independently.

2. Let's Learn

Use this slide to introduce the concept. Tutors should work with the student to explore the concept together, usually using diagrams to support understanding.

3. Follow Me + Your Turn

The tutor should work through the follow me slide, modeling the process and explaining their thinking out loud.

Students should use the your turn slide as an opportunity to work through a question similar to the follow me questions. They should apply the method modeled by the tutor in the follow me slide. Students should be encouraged to explain their thinking out loud.

4. You Do

Students should work through a range of questions that build in complexity.

Tutors can offer support but students should initially be encouraged to attempt these questions independently.

5. Go Further

Use this slide to allow students to apply their understanding to a more challenging question in an unfamiliar context.

6. Support for Slides

The support slide is used to support students during the lesson. In the tutor notes, there will be guidance as to when to use the support slide.

7. Check Your Understanding

Tutors should use this slide to assess the student's knowledge and whether or not they have mastered the concept within the lesson.

Standard

4.NBT.5 - Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

Key Mathematical Ideas

1. To use pictorial representations to find the product of two 2-digit numbers.
2. To apply understanding of area to the multiplication of two 2-digit numbers.
3. To understand that area can be found by the sum of the areas of its parts.

Overview

Terminology

- **Partition:** To express a whole in terms of its parts.
- **Area Model:** A method used with multi-digit multiplication that shows the total area as the sum of the area of its parts.
- **Expression:** A combination of numbers and an operation, or operations, without an equal sign.
- **Number Bond:** A way to express a whole in terms of its parts.
- **Product:** The answer to a multiplication problem.
- **Factors:** The numbers being multiplied in a multiplication problem.
- **Partial Products:** The product of one part of a factor and one part of the factor it's being multiplied by. For instance, if I solve 34×23 by first multiplying the parts $30 \times 20 = 600$, 600 is a partial product of 34×23 .

Overview

Sentence Stems

The place value number bond for is... OR Partitioning into place value parts would be...

The product of and is...

The sum of the partial products is...Therefore, the total area is...

Common Misconceptions

Common Misconceptions	Tutoring Strategies	Checks for Understanding
Students may forget how many zeros to place at the end of a given product. For instance, they may answer $30 \times 40 = 120$.	Ask students to estimate the size of products to see if their answer makes sense. In the case of the example to the left, ask students what 3 groups of 40 would be vs. 30 groups of 40.	<ul style="list-style-type: none">• Which is larger, 3 groups of 40, or 30 groups of 40? What do these answers look like?• How do we use the pattern with zeros to multiply with multiples of 10?
Students may have difficulty visualizing how the model represents a larger area being split into smaller areas with side lengths of the partitioned factors.	Introduce the model by reviewing area with students and talk about how area of a quadrilateral is found. Show students that when working with larger numbers, we can break the quadrilateral into smaller pieces and find the area of each piece.	<ul style="list-style-type: none">• What is the length of each side of each part in this partitioned area model?• If we know the area of all the parts, what is the total area?

Title Slide

If stuck

- Help the student recognize the parts of this problem they may be familiar with—they may know their 12 multiplication facts and could use those as a place to start. If they start here, prompt them to think of 23 as parts they could figure out $\times 12$.
- They may know the place value parts of each number and the products of each. This will therefore help them with the area model on the following slides.

Answer

- Answers may vary
- Students may count by twelves, or recognize $12 \times 3 = 36$ and 12×20 is ten times greater than 12×2

Let's Learn

If stuck

- Spend as much time looking at the base 10 blocks model on this slide.
- Help students see the area of each base 10 block by multiplying the side lengths or even counting them if needed.
- Help them to also name the side lengths of each smaller rectangle within the larger rectangle.
- Draw direct connections to the more abstract model below it.

Questions

- What is 4×10 , or 4 tens? (40)
- What is 20×3 , or 20 3's? (60)
- What is 4×3 , or 4 groups of 3? (12)
- If I know all the products of each part (which we call partial products), how can I use this information to find the final product, or total area of the model?
- What is the area of the rectangle? (312)

Watch out for

- Students not placing the correct number of zeros in the products.
- Students not recognizing the correct lengths of the sides of the parts in the area model.

Answers

b) $4 \times 10 = 40$

c) $20 \times 3 = 60$

d) $4 \times 3 = 12$

$200 + 40 + 60 + 12 = 312$

Follow Me

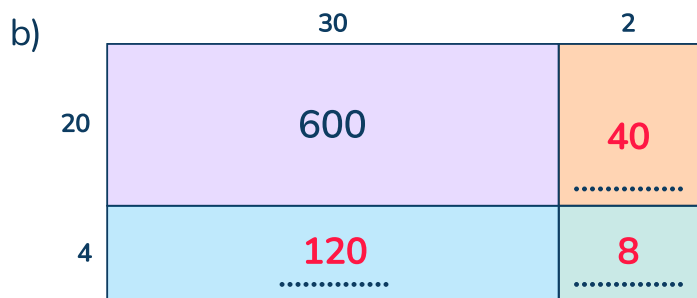
Modeling prompts

- Note that you don't necessarily know 32×24 but you do know how to multiply the numbers that make up 32 and 24.
- The parts that you know how to multiply best are the place value parts, so you partition 32 and 24 into tens and ones.
- If we had a rectangle with side lengths 32 and 24, I can cut those side lengths into the parts I used in part a.
- I can then multiply the parts of the area model by looking at the side lengths of the smaller rectangles inside the larger one.
- $30 \times 20 = 600$, $20 \times 2 = 40$, $30 \times 4 = 120$, and $2 \times 4 = 8$ (Student can answer these with you)
- Now that I have all the areas of the parts (or the partial products) I can add them all together to find the total area.
- $600 + 40 + 120 + 8 = 768$ (note the lines are the same colors as the corresponding boxes)

Answers

a) $32 = 30 + 2$

$24 = 20 + 4$



c) $600 + 40 + 120 + 8 = 768$

Your Turn

If stuck

- The Support Slide shows the Follow me problem pictorially that may assist with this one as well.

Questions

- How would you partition the factors in this problem? Why?
- How would you represent this partitioning using the area model?
- What is the multiplication problem you would use to find the area of each part?
- How would you use the partial products to find the final product?

Watch out for

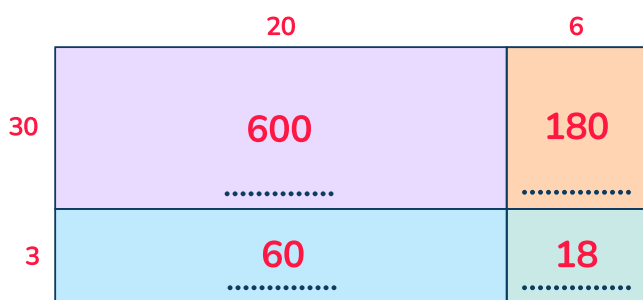
- Students not placing the correct number of zeros in the products (especially on 20×30)
- Students not recognizing the correct lengths of the sides of the parts in the area model.

Answers

a) $26 = 20 + 6$

$33 = 30 + 3$

b)



c) $600 + 180 + 60 + 18 = 858$

You Do

If stuck

- Remind students that they need to start by partitioning the factors into tens and ones.

Questions

- How would you partition the factors in this problem? Why?
- How would you represent this partitioning using the area model?
- What is the multiplication problem you would use to find the area of each part?
- How would you use the partial products to find the final product?

Watch out for

- Students not placing the correct number of zeros in the products (especially on 20×30)
- Students not recognizing the correct lengths of the sides of the parts in the area model.

Answers

a) $36 \times 24 = 864$

	30	6
20	600	120
4	120	24

b) $45 \times 33 = 1,485$

	40	5
30	1,200	150
3	120	15

Go Further

If stuck

- Ask the student which parts of the model look like they are complete and why.
- Look at the completed parts as arrays with side lengths of the corresponding numbers.

Questions

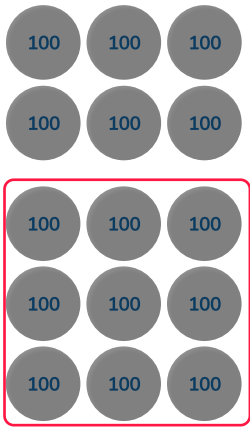
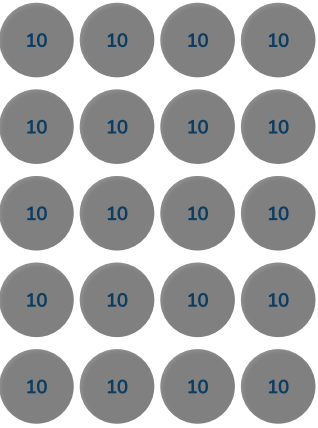
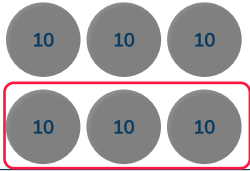
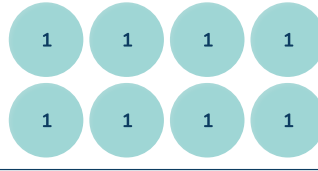
- What parts of this equation has Libby already completed? How do you know?
- What parts are incomplete?
- Can you draw the missing parts?

Watch out for

- Students not recognizing the place value that goes along with each place value disk. For instance, they may say Libby is missing 9 and 3, or even 12 chips.

Answers

- 9 hundreds and 3 tens
- 1,768

x	30	4
50		
2		

Support for Slide(s)

This slide supports the Follow me slide.

If stuck

- Remind students that the factors in the problem can be seen as the sum of their tens and ones.
- Refer to the manipulatives as much as possible.

Questions

- How would we partition the factors in this problem?
- What do you notice about the models below and how are they related to the way you partitioned the factors in the beginning?

Answers

- $600 + 40 + 120 + 8 = 768$

Check Your Understanding

Correct answers

- b) 888 books
- a) The student likely had difficulty determining what operation to use and defaulted to using addition.
- b) To determine the amount of books the bookshelves could hold, the student had an understanding of multiplying using strategies.
- c) The student likely used an appropriate multiplication strategy, but made a mistake and added the digits in the hundreds place incorrectly.
- d) The student likely used an appropriate multiplication strategy, but when multiplying 30×4 , wrote 12, instead of 120.



Today you will learn about

Multiplying 2-digit numbers using the area model



Warm-up question

How would you solve 23×12 ?



Let's learn

When multiplying larger numbers, we can use an **area model** to help us visualize the problem.

Let's use an area model to solve this expression.

24 x 13

First, we partition the numbers in the expression.
We then multiply each part.

a $20 \times 10 = 200$

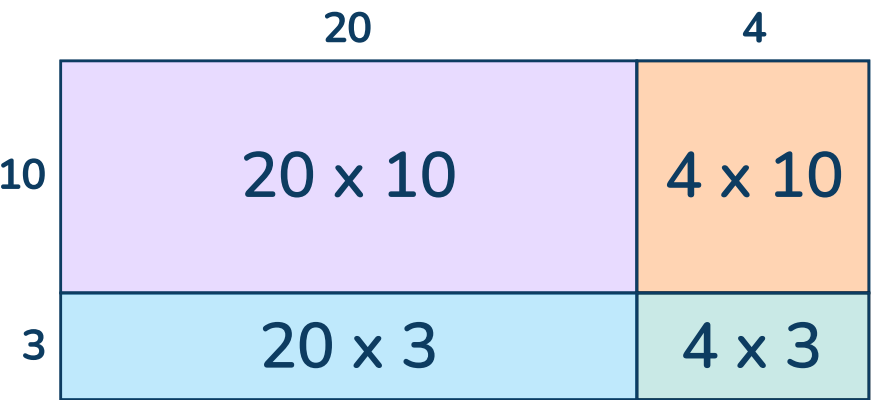
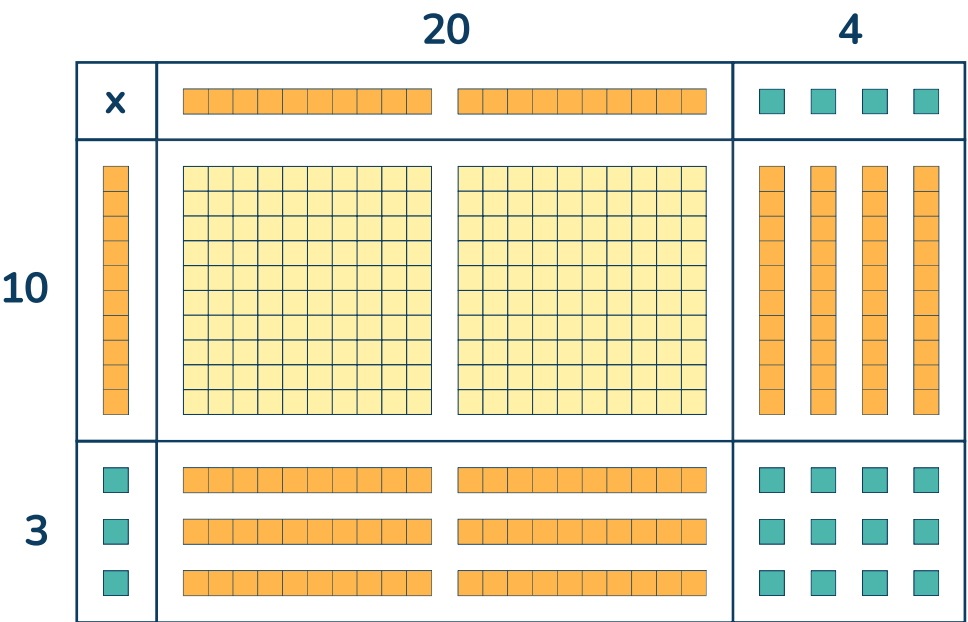
b $4 \times 10 =$

c $20 \times 3 =$

d $4 \times 3 =$

e $200 + \dots + \dots + \dots = \dots$

We call the answers to these problems the **partial products**.



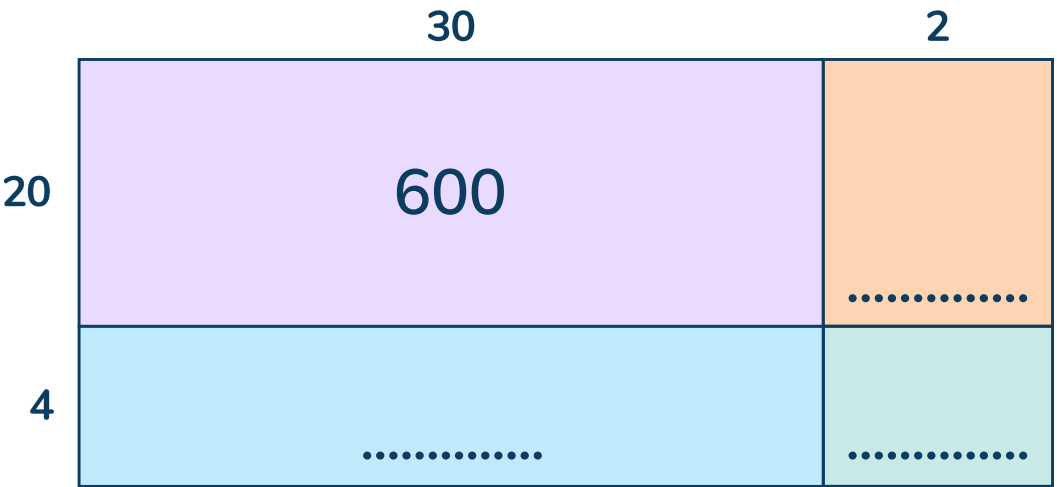
Follow me



Let's look at this expression.

32 x 24

- a Partition the numbers in the expression.
- b Complete the area model by multiplying the parts.



- c Finally, add the products.

600 + + + =

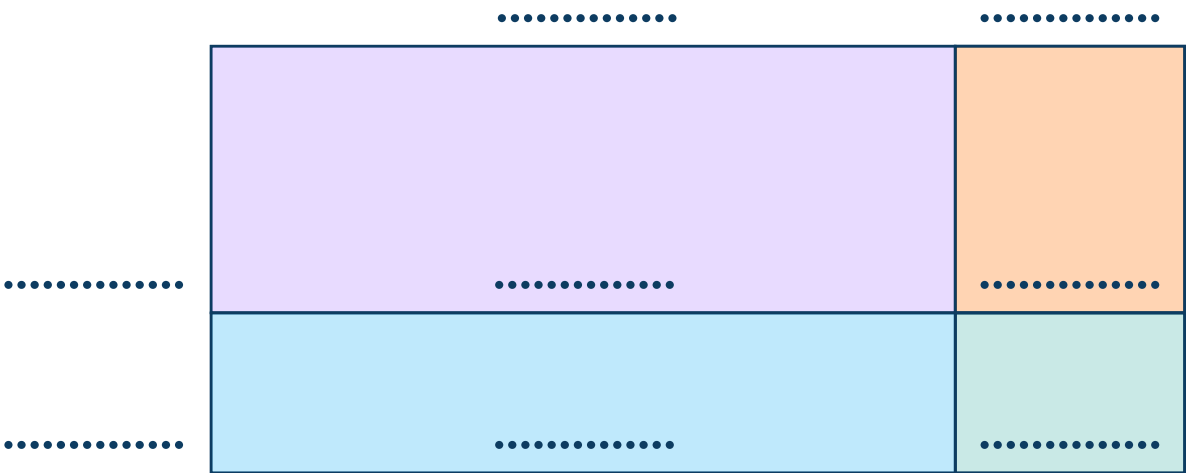
Your turn



Let's look at this expression.

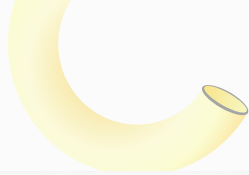
26 x 33

- a Partition the numbers in the expression.
- b Complete the area model by multiplying the parts.



- c Finally, add the products.

..... + + + =



You do



Use the area model to solve these expressions.

a $36 \times 24 =$

.....	
.....	

b $45 \times 33 =$

.....	
.....	

Libby has started solving an equation but hasn't finished it.

What does she need to add to complete the equation?

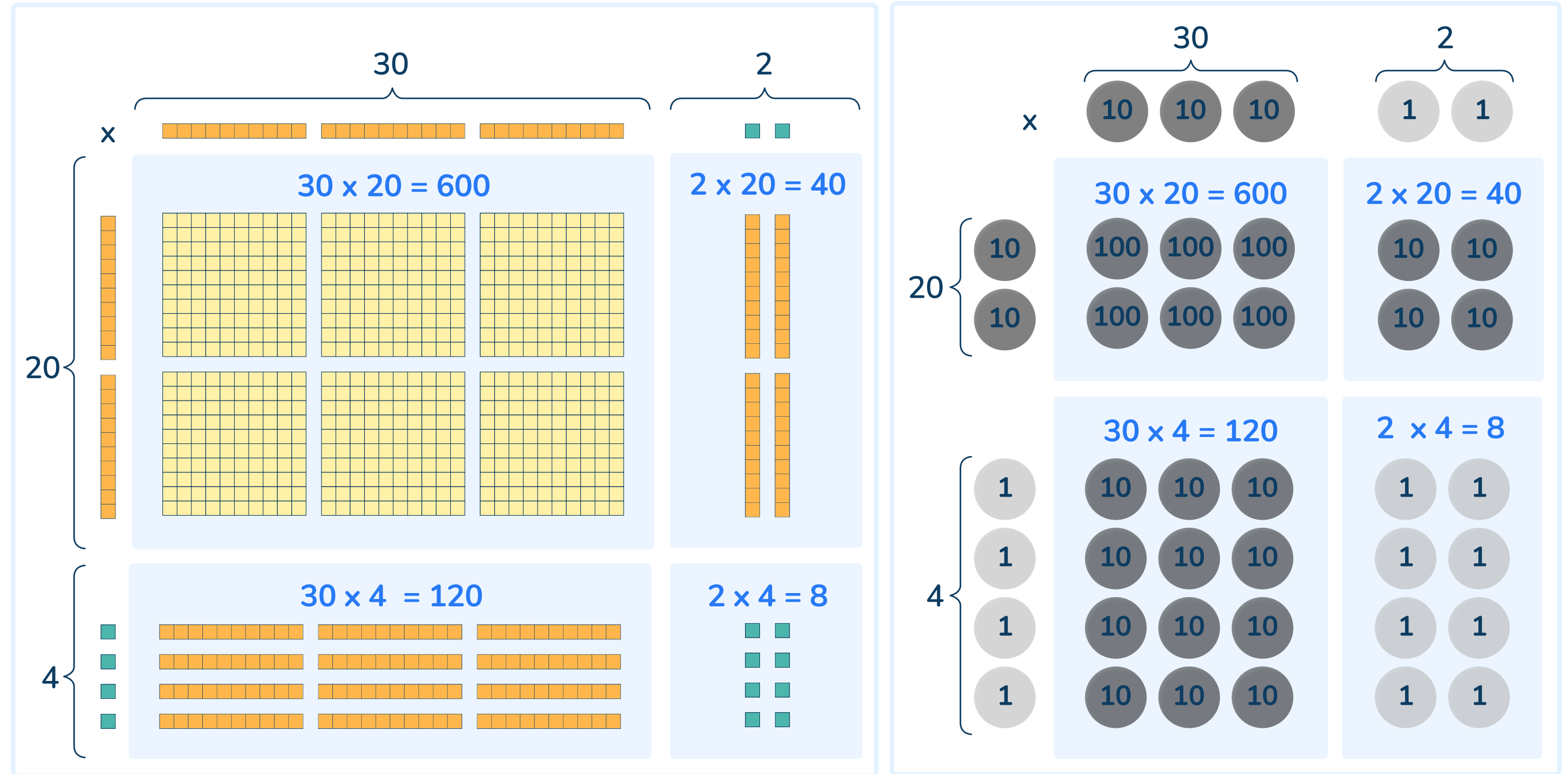
x	30	4
50	<div><div>100</div><div>100</div><div>100</div><div>100</div><div>100</div><div>100</div></div>	<div><div>10</div><div>10</div><div>10</div><div>10</div><div>10</div><div>10</div><div>10</div><div>10</div><div>10</div><div>10</div></div>
2	<div><div>10</div><div>10</div><div>10</div></div>	<div><div>1</div><div>1</div><div>1</div><div>1</div><div>1</div><div>1</div></div>

Let's explore this more

Let's look at showing the following expression using base 10 blocks and place value counters.

$$32 \times 24$$

To find the answer to 32×24 , we need to add the parts together. We call these the **partial products**.



Check your understanding

A bookstore has 24 bookshelves in its fiction section.
Each bookshelf holds 37 books.
How many books can the bookshelves hold?

a

61 books

b

888 books

c

788 books

d

240 books

Why do I need to try this question
on my own first?

- To show your tutor what you understand
- To give you more practice
- To show your teacher how you are doing



Do you have a group of students who need a boost in math?

Each student could receive personalized lessons every week from our specialist one-on-one math tutors.




- ✓ Differentiated instruction for each student
- ✓ Aligned to your state's standards
- ✓ Scaffolded learning to close gaps

“We just had our first session and it went great! The kids really liked it and felt like they were learning! One even said he finally felt like math was making sense.”



Michelle Craig, Instructional Coach,
Sherwood Forest Elementary, Washington

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