

Name _____

Area Models and Partial Products

Essential Question How can you use area models and partial products to multiply 2-digit numbers?



Number and Operations in Base Ten—4.NBT.B.5

MATHEMATICAL PRACTICES
MP2, MP4, MP5, MP8

Investigate





Materials ■ color pencils


How can you use a model to break apart factors and make them easier to multiply?


A. Outline a rectangle on the grid to model 13×18 . Break apart the model into smaller rectangles to show factors broken into tens and ones. Label and shade the smaller rectangles. Use the colors below.

B. Find the product of each smaller rectangle. Then, find the sum of the partial products. Record your answers.

 = 10×10

 = 10×8

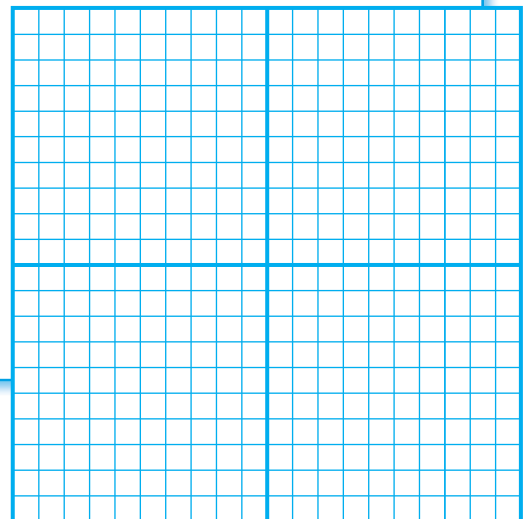
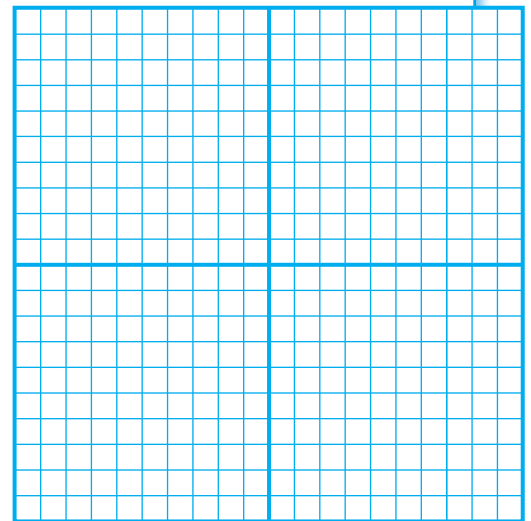
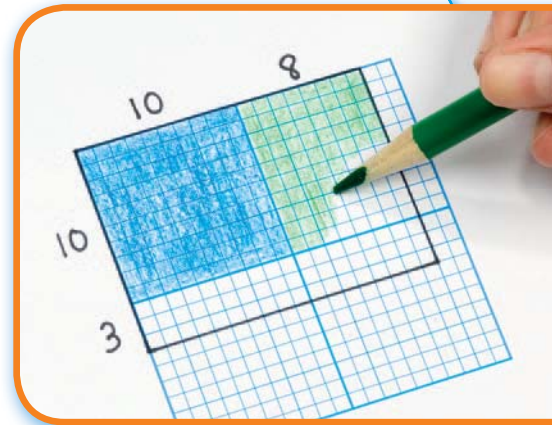
 = 3×10

 = 3×8

 100 +  +  +  = _____

C. Draw the model again. Break apart the whole model to show factors different from those shown the first time. Label and shade the four smaller rectangles and find their products. Record the sum of the partial products to represent the product of the whole model.

_____ + _____ + _____ + _____ = _____



Draw Conclusions

1. Explain how you found the total number of squares in the whole model.

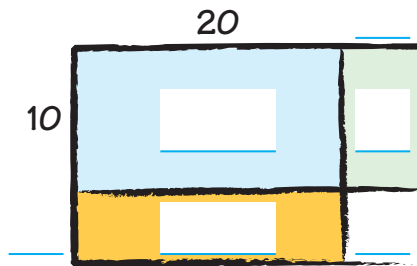
2. Compare the two models and their products. What can you conclude? Explain.

3. To find the product of 10 and 33, which is the easier computation, $(10 \times 11) + (10 \times 11) + (10 \times 11)$ or $(10 \times 30) + (10 \times 3)$? Explain.

Make Connections

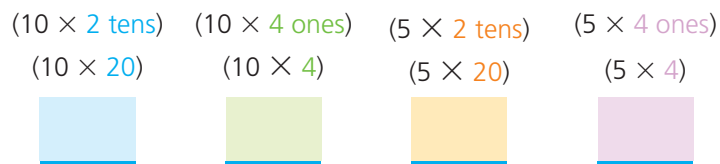
You can draw a simple diagram to model and break apart factors to find a product. Find 15×24 .

STEP 1 Draw a model to show 15×24 . Break apart the factors into tens and ones to show the partial products.



Remember
24 is 2 tens 4 ones.

STEP 2 Write the product for each of the smaller rectangles.



STEP 3 Add to find the product for the whole model.



So, $15 \times 24 = 360$.

The model shows four parts. Each part represents a partial product. The partial products are 200, 40, 100, and 20.

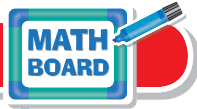


MATHEMATICAL PRACTICES 2

Use Reasoning How does breaking apart the factors into tens and ones make finding the product easier?

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Share and Show

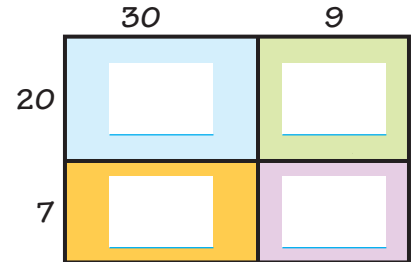
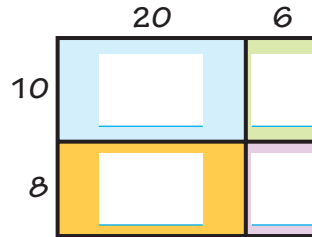
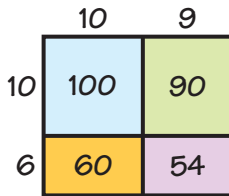


Find the product.

1. $16 \times 19 =$ _____

2. $18 \times 26 =$ _____

3. $27 \times 39 =$ _____



Draw a model to represent the product.
Then record the product.

4. $14 \times 16 =$ _____

5. $23 \times 25 =$ _____

Problem Solving • Applications



6. **MATHEMATICAL PRACTICE 6** Explain how modeling partial products can be used to find the products of greater numbers.

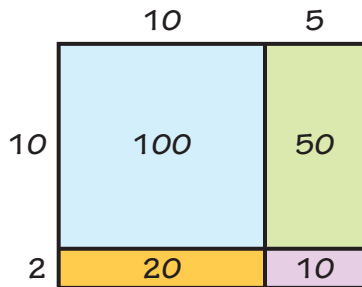
7. **GO DEEPER** Emma bought 16 packages of rolls for a party. There were 12 rolls in a package. After the party there were 8 rolls left over. How many rolls were eaten? Explain.

Sense or Nonsense?

8. **THINK SMARTER** Jamal and Kim used different ways to solve 12×15 by using partial products. Whose answer makes sense? Whose answer is nonsense? Explain your reasoning.

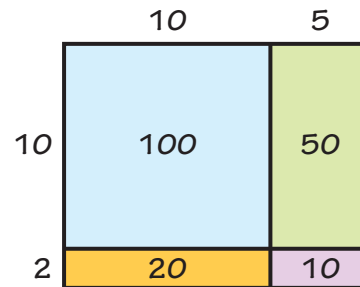


Jamal's Work



$$100 + 20 + 10 = 130$$

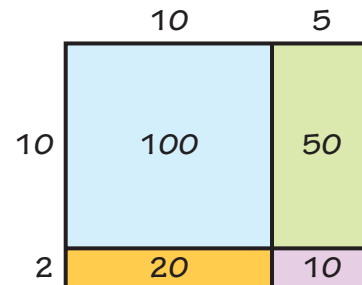
Kim's Work



$$120 + 60 = 180$$

- a. For the answer that is nonsense, write an answer that makes sense.

- b. Look at Kim's method. Can you think of another way Kim could use the model to find the product? Explain.



9. **THINK SMARTER** Look at the model in 8b. How would the partial products change if the product was 22×15 ? Explain why you think the products changed.

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Area Models and Partial Products



COMMON CORE STANDARD—4.NBT.B.5
Use place value understanding and properties of operations to perform multi-digit arithmetic.

Draw a model to represent the product.
Then record the product.

1. 13×42

2. 18×34

3. 22×26

	40	2
10	400	20
3	120	6

$400 + 20 + 120 + 6 = \underline{546}$

Problem Solving



4. Sebastian made the following model to find the product 17×24 .

	20	4
10	200	40
7	14	28

$200 + 40 + 14 + 28 = 282$

Is his model correct? **Explain.**

5. Each student in Ms. Sike's kindergarten class has a box of crayons. Each box has 36 crayons. If there are 18 students in Ms. Sike's class, how many crayons are there?

6. **WRITE** *Math* Describe how to model 2-digit by 2-digit multiplication using an area model.

Lesson Check (4.NBT.B.5)

1. What product does the model below represent?

	20	3
10	200	30
7	140	21

2. What product does the model below represent?

	13	2
10	130	20
5	65	10

Spiral Review (4.OA.A.3, 4.NBT.B.5)

3. Mariah builds a tabletop using square tiles. There are 12 rows of tiles and 30 tiles in each row. How many tiles does Mariah use?
4. Trevor bakes 8 batches of biscuits, with 14 biscuits in each batch. He sets aside 4 biscuits from each batch for a bake sale and puts the rest in a container. How many biscuits does Trevor put in the container?
5. Li feeds her dog 3 cups of food each day. About how many cups of food does her dog eat in 28 days?
6. Find the product of $20 \times 9 \times 5$. Tell which property you used.
