Model Factors

Essential Question How can you use models to find factors?

🔑 Unlock the Problem Real World

A **factor** is a number multiplied by another number to find a product. Every whole number greater than 1 has at least two factors, that number and 1.

$$18 = 1 \times 18 \qquad 7 = 7 \times 1 \qquad 342 = 1 \times 342$$

    ↑   ↑
  factor factor
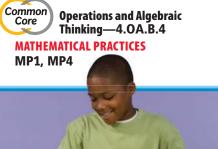
Many numbers can be broken into factors in different ways.

$$16 = 1 \times 16 \qquad 16 = 4 \times 4 \qquad 16 = 2 \times 8$$

🔑 Activity Model and record the factors of 24.

Materials ■ square tiles

Use all 24 tiles to make as many different arrays as you can. Record the arrays in the grid, and write the factors modeled.
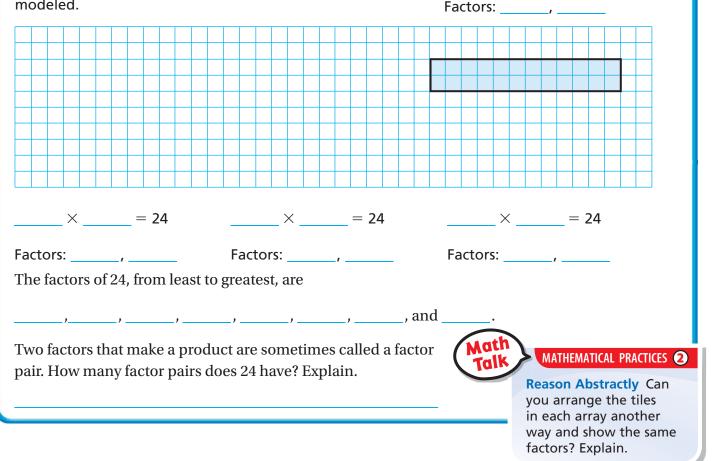
Math Idea

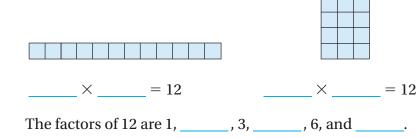When you are asked to find factors of a whole number, only list factors that are also whole numbers.
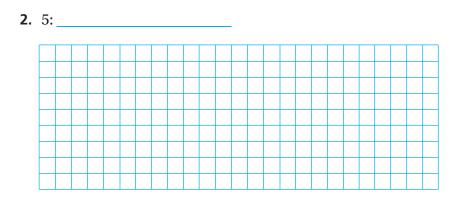
$2 \times 12 = 24$

Factors: _____, _____

_____ × _____ = 24   _____ × _____ = 24   _____ × _____ = 24

Factors: _____, _____   Factors: _____, _____   Factors: _____, _____

The factors of 24, from least to greatest, are

_____, _____, _____, _____, _____, _____, _____, and _____.

Two factors that make a product are sometimes called a factor pair. How many factor pairs does 24 have? Explain.

_____

Math Talk

MATHEMATICAL PRACTICES ②

Reason Abstractly Can you arrange the tiles in each array another way and show the same factors? Explain.

1. Use the arrays to name the factors of 12.

_____ × _____ = 12   _____ × _____ = 12   _____ × _____ = 12

The factors of 12 are 1, _____, 3, _____, 6, and _____.

Use tiles to find all the factors of the product. Record the arrays and write the factors shown.

2. 5: _____

3. 20: _____

4. 25: _____

Math Talk

MATHEMATICAL PRACTICES ⑥

Use Math Vocabulary Explain how the numbers 3 and 12 are related. Use the word *factor* in your explanation.

Name _____

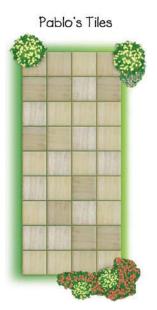**Practice: Copy and Solve** Use tiles to find all the factors of the product. Record the arrays on grid paper and write the factors shown.

5. 9   **6.** 21   **7.** 17   **8.** 18

Problem Solving • Applications *Real World*

Use the diagram for 9–10.

Pablo's Tiles

9. **MATHEMATICAL PRACTICE 6** Pablo is using 36 tiles to make a patio. Can he arrange the tiles in another way and show the same factors? Draw a quick picture and **explain**.

_____

_____

_____

10. **THINK SMARTER** How many different rectangular arrays can Pablo make with all 36 tiles, so none of the arrays show the same factors?

_____

11. If 6 is a factor of a number, what other numbers must be factors of the number?

_____

12. **GO DEEPER** Jean spent $16 on new T-shirts. If each shirt cost the same whole-dollar amount, how many could she have bought?

_____

🔑 Unlock the Problem · Real World

13. **GO DEEPER** Carmen has 18 connecting cubes. She wants to model a house shaped like a rectangle. If the model has a height of one connecting cube, how many different ways can Carmen model the house using all 18 connecting cubes?

a. What do you need to know? _____

_____

b. How is finding the number of ways to model a rectangular house

related to finding factor pairs? _____

_____

_____

c. Why is finding the factor pairs only the first step in solving the problem? _____

_____

_____

d. Show the steps you used to solve the problem.

_____

_____

_____

_____

e. Complete the sentences. Factor pairs for

18 are _____

_____

There are _____ different ways Carmen can arrange the cubes to model the house.

14. **THINK SMARTER** Sarah was organizing vocabulary words using index cards. She arranged 40 index cards in the shape of a rectangle on a poster. For 14a–14e, choose Yes or No to tell whether a possible arrangement of cards is shown.

14a. 4 rows of 10 cards   ○ Yes   ○ No

14b. 6 rows of 8 cards   ○ Yes   ○ No

14c. 20 rows of 2 cards   ○ Yes   ○ No

14d. 40 rows of 1 card   ○ Yes   ○ No

14e. 35 rows of 5 cards   ○ Yes   ○ No

Model Factors

Use tiles to find all the factors of the product.
Record the arrays on grid paper and write the factors shown.

1. 15

$1 \times 15 = 15$

$3 \times 5 = 15$

1, 3, 5, 15

2. 30

_____

_____

3. 45

_____

_____

4. 19

_____

_____

5. 40

_____

_____

_____

6. 36

_____

_____

_____

7. 22

_____

_____

_____

8. 4

_____

_____

_____

Problem Solving Real World

9. Brooke has to set up 70 chairs in equal rows for the class talent show. But, there is not room for more than 20 rows. What are the possible number of rows that Brooke could set up?

_____

10. Eduardo thinks of a number between 1 and 20 that has exactly 5 factors. What number is he thinking of?

_____

11. **WRITE** ▸*Math* Have students write the answer to the Essential Question and draw examples to explain their answer.

_____

_____

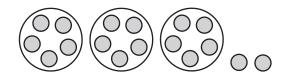_____

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Lesson Check (4.OA.B.4)
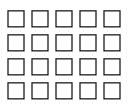
1. List all the factors of 24.

2. Natalia has 48 tiles. Write a factor pair for the number 48.

Spiral Review (4.OA.A.1, 4.NBT.B.5, 4.NBT.B.6)
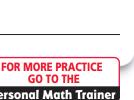
3. The Pumpkin Patch is open every day. If it sells 2,750 pounds of pumpkins each day, about how many pounds does it sell in 7 days?

4. What is the remainder in the division problem modeled below?

5. Represent the model shown below using a multiplication equation.

6. Channing jogs 10 miles a week. How many miles will she jog in 52 weeks?