How does the arrangement of clothespins depict the distributive property?

Answer: \(2 \times (5 + 5 + 5) = 10 + 10 + 10\).

Common Core State Standards

3.OA.B.5 Apply properties of operations as strategies to multiply and divide. Examples: If \(6 \times 4 = 24\) is known, then \(4 \times 6 = 24\) is also known. (Commutative property of multiplication.) \(3 \times 5 \times 2\) can be found by \(3 \times 5 = 15\), then \(15 \times 2 = 30\), or by \(5 \times 2 = 10\), then \(3 \times 10 = 30\). (Associative property of multiplication.) Knowing that \(8 \times 5 = 40\) and \(8 \times 2 = 16\), one can find \(8 \times 7\) as \((8 \times 5) + (8 \times 2) = 40 + 16 = 56\). (Distributive property.)

3.OA.A.1 Interpret products of whole numbers, e.g., interpret \(5 \times 7\) as the total number of objects in 5 groups of 7 objects each. For example, describe a context in which a total number of objects can be expressed as \(5 \times 7\).

Distributive Property

Students have worked with multiplication concepts for some time now and have learned some strategies such as using the commutative and associative properties. Another useful strategy is to apply the distributive property. This strategy draws on the student’s experience with array models and decomposing numbers, and it will be useful to students as they develop their mental math skills and prepare for algebra.

Vocabulary

- **Ask:** If I distribute a pencil and 2 pieces of paper to 5 of you, how many pencils do I need? How many pieces of paper?

  Demonstrate by giving a pencil and 2 pieces of paper to each of 5 students, one student at a time.


  Elicit that \(5 \times (1 \text{ pencil} + 2 \text{ pieces of paper}) = ?\) describes the situation and that the result of the distribution is \((5 \times 1 \text{ pencil}) + (5 \times 2 \text{ pieces of paper}) = 5 \text{ pencils} + 10 \text{ pieces of paper}\). Tell students this demonstrates the **distributive property**.

- \(5 \times (1 + 2) = (5 \times 1) + (5 \times 2) = 5 + 10\) is an illustration of the **distributive property**.
**Set the Stage**

**Engage  WHOLE CLASS**

Distribute Color Tiles.

- **Ask:** What if you had 2 bags with 3 tiles in each bag? How would this represent multiplication? [2 groups of 3] How could you show the same multiplication as an array? [2 rows of 3]

Have students build the array of tiles, all the same color, and write the multiplication. \(2 \times 3 = 6\)

Next have students add a tile of a different color to each row.

- **Ask:** If you look only at the new tiles, what multiplication do you see? [2 \(\times\) 1 = 2] If you look at all the tiles, what multiplication do you see? [2 \(\times\) 4 = 8, or 2 \(\times\) (3 + 1) = 8] Anything else? [6 + 2 = 8, or \((2 \times 3) + (2 \times 1) = 8\)]

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**Warm-Up**

Use this short thinking exercise to jump-start the instructional session.

**Foundation Skill Practice**

Use this VersaTiles® activity to help students activate their prior knowledge.

**What’s the Total?**

Find the addition or multiplication sentence that describes the total.

**Answer Box**

Objective: Name an addition or multiplication sentence that is used to find a total.

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<tr>
<td>2 + 4 + 3 = 9</td>
<td>5 (\times) 3 = 15</td>
<td>2 (\times) 2 + 2 = 6</td>
<td>4 (\times) 2 + 4 = 10</td>
<td>6 + 6 = 12</td>
<td>3 (\times) 4 = 12</td>
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<tr>
<td>3 (\times) 3 = 9</td>
<td>4 (\times) 2 = 8</td>
<td>2 (\times) 3 + 2 = 7</td>
<td>2 (\times) 2 = 4</td>
<td>5 (\times) 5 = 10</td>
<td>4 (\times) 5 (\times) 4 = 13</td>
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**VersaTiles® student book, page 6**

**Objective:** Name an addition or multiplication sentence that is used to find a total.

**Answers:**

- A: 2 + 4 + 3 = 9
- B: 5 \(\times\) 3 = 15
- C: 2 \(\times\) 2 + 2 = 6
- D: 4 \(\times\) 2 + 4 = 10
- E: 6 + 6 = 12
- F: 3 \(\times\) 4 = 12
- G: 3 \(\times\) 3 = 9
- H: 4 \(\times\) 2 = 8
- I: 2 \(\times\) 3 + 2 = 7
- J: 2 \(\times\) 2 = 4
- K: 5 \(\times\) 5 = 10
- L: 4 \(\times\) 5 \(\times\) 4 = 13

**Online resource available at hand2mind.com/hosnumbergr3**
**Introduce the Concept**

**Introduce**

Introduce the Concept

**Explore** WHOLE CLASS

Present the problem—

Jaylon’s teacher made 4 rows of 7 chairs in the back of the room. How many chairs are there in all?

- **Ask:** What kind of problem is this? [multiplication]
  - How do you know? [It asks how many there are in 4 groups of 7.]
  - What is the multiplication you need to solve? [4 × 7 = ?]

Ask students to recall what they did during the Engage session and think about how they might build up an array of tiles to model the problem.

- **Ask:** Do you know what 4 × 1 is? 4 × 2? 4 × 3?

Have students explore, using the color of the tiles to help them see how the problem can be turned into a combination of simpler problems.

- **Ask:** If you know 4 × 5 = 20 and 4 × 2 = 8, how can you use this to solve the problem?

Acknowledge that together, (4 × 5) and (4 × 2) make 4 × (5 + 2), or 4 × 7. So 4 × 7 is 20 + 8, or 28.

Have students draw their models and share their findings with partners.

**Explore & Explain** SMALL GROUPS

Prepare ahead Students will need Color Tiles.

The activity helps students visualize how the distributive property is used to change a multiplication into a sum of simpler products. Students build models using Color Tiles, draw representations of the models, and write the simpler products they find. In problems 5–8, students complete number sentences. Problems 9 and 10 are word problems.
**Reinforce the Concept**

**Explain & Elaborate**  **WHOLE CLASS**

Ask students to list some simple multiplication facts that they know from memory.

- **Say:** If you don’t know it really fast, then don’t list it.
- **Say:** Now use the easy facts to find some facts you don’t know well. Use the distributive property. Show your work using drawings and equations.

**Evaluate**  **WHOLE CLASS**

- **Ask:** When you make a simpler problem by breaking apart a factor, can you break the factor into more than two parts? [Yes]
- **Say:** Show how you might do this to find 4 × 9.

Have students use drawings and/or equations to show you their work. They can decompose either factor into as many addends as they like so long as the sum of the addends is equal to the factor and the product is 36.

**Independent Practice**

Use this VersaTiles® activity to give students more practice with the skills they learned in the lesson.

**Distributive Property**

**Example**

Complete the number sentence.

2 × (2 + 3) = (2 × 2) + (2 × 3)

The shaded part models 2 × 2.

The unshaded part models 2 × 3.

The array is the sum of the shaded and unshaded parts.

So the completed number sentence is 2 × (2 + 3) = (2 × 2) + (2 × 3)

**Complete the number sentence.**

1. 4 × (5 + 3) = (4 × 5) + (4 × 3)
2. 3 × (3 + 2) = (3 × 3) + (3 × 2)
3. 4 × (4 + 3) = (4 × 4) + (4 × 3)
4. 6 × (5 + 3) = (6 × 5) + (6 × 3)
5. 6 × (6 + 5) = (6 × 6) + (6 × 3)
6. 5 × (4 + 3) = (5 × 4) + (5 × 3)
7. 5 × (5 + 3) = (5 × 5) + (5 × 3)
8. 3 × (3 + 3) = (3 × 3) + (3 × 2)
9. 6 × (6 + 5) = (6 × 6) + (6 × 4)
10. 4 × (5 + 2) = (4 × 5) + (4 × 2)
11. 3 × (2 + 3) = (3 × 2) + (3 × 3)

**Answer Key**

- A: 6 + 3
- B: 3 × 3
- C: 5 × 4
- D: 4 × 2
- E: 4 × 4
- F: 3 + 2
- G: 3 × 2
- H: 5 × 6
- I: 6 × 3
- J: 4 × 3
- K: 5 + 3
- L: 5 + 4

**Use this page to give students additional concrete-to-representational-to-abstract practice.**

**Properties and Problem Solving**

**Re-Engage**

**Use this page to give students additional concrete-to-representational-to-abstract practice.**

**Independent Practice**

**Draf**
Try This
Andrea has 4 boxes of pencils. Each box contains 7 pencils. How many pencils are there in all? Show how to make an easier problem.

■ Use Color Tiles to build an array for the problem.
■ Draw your array on the grid.
■ Show the parts by drawing a line.
■ Complete the number sentences.

1  $4 \times 8 = 4 \times (____ + ____ ) = ____$

2  $5 \times 7 = 5 \times ( ____ + ____ ) = ____$

3  $6 \times 7 = 6 \times (____ + ____ ) = ____$

4  $5 \times 9 = 5 \times ( ___ + ___ ) = ____$

$4 \times 7 = 4 \times (5 + 2) = 28$

$(4 \times 5) + (4 \times 2) = 20 + 8$
Distributive Property

Complete the number sentence.

5 \[ 6 \times (5 + 4) = (\_\_ \times \_\_ ) + (\_\_ \times \_\_ ) \]

6 \[ 8 \times (5 + 1) = (\_\_ \times \_\_ ) + (\_\_ \times \_\_ ) \]

7 \[ \_\_ \times (5 + 5) = (5 \times 5) + (5 \times 5) \]

8 \[ \_\_ \times (5 + 3) = (6 \times 5) + (6 \times 3) \]

Solve the problem.

9 Roberta solved 8 math problems every day for 7 days. How many problems did she solve in all?

\[ 7 \times 8 = 7 \times (\_\_ + \_\_ ) = (\_\_ \times \_\_ ) + (\_\_ \times \_\_ ) = \_\_ + \_\_ = \_\_ \]

10 The library has 4 rows of tables. There are 9 tables in each row. How many tables are there?

\[ 4 \times 9 = 4 \times (\_\_ + \_\_ ) = (\_\_ \times \_\_ ) + (\_\_ \times \_\_ ) = \_\_ + \_\_ = \_\_ \]
Distributive Property

Example

Complete the number sentence.

2 × (2 + 3) = □ + (2 × 3)
2 × (2 + 3) is modeled as an array with 2 rows and (2 + 3) columns.
The shaded part models 2 × 2.
The unshaded part models 2 × 3.
The array is the sum of the shaded and unshaded parts.
So the completed number sentence is 2 × (2 + 3) = (2 × 2) + (2 × 3)

Complete the number sentence.

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<tr>
<td>1</td>
<td>4 × (5 + 3) = (4 × 5) + (□)</td>
<td>2</td>
<td>3 × (3 + 2) = (□) + (3 × 2)</td>
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<tr>
<td>3</td>
<td>4 × (4 + 3) = (□) + (4 × 3)</td>
<td>4</td>
<td>6 × (5 + 3) = (6 × 5) + (□)</td>
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<tr>
<td>5</td>
<td>6 × (□) = (6 × 5) + (6 × 3)</td>
<td>6</td>
<td>5 × (□) = (5 × 6) + (5 × 3)</td>
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<tr>
<td>7</td>
<td>5 × (4 + 3) = (□) + (5 × 3)</td>
<td>8</td>
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<td></td>
</tr>
<tr>
<td>11</td>
<td>6 × (□) = (6 × 5) + (6 × 4)</td>
<td>12</td>
<td>3 × (2 + 3) = (□) + (3 × 3)</td>
<td></td>
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Answer Box

<table>
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<tr>
<td>6 + 3</td>
<td>3 × 3</td>
<td>5 × 4</td>
<td>4 × 2</td>
<td>4 × 4</td>
<td>3 + 2</td>
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<td>L</td>
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<tr>
<td>3 × 2</td>
<td>5 × 6</td>
<td>6 × 3</td>
<td>4 × 3</td>
<td>5 + 3</td>
<td>5 + 4</td>
</tr>
</tbody>
</table>

Objective: Apply the distributive property.
Use Color Tiles to build the model. Write the missing numbers.

1. You had 4 rows of 5 chairs. Then you added a chair to each row. How many chairs do you have now?
   \[4 \times (5 + 1) = ?\]
   \[(4 \times 5) + (4 \times 1) = \____ + \____\]
   \[= \____\]

2. You had 3 groups of 3 books. Then you added 2 books to each group. How many books do you have now?
   \[3 \times (3 + 2) = ?\]
   \[(\____ \times \____) + (\____ \times \____)\]
   \[= \____ + \____ = \____\]

Use Color Tiles to model the problem. Draw your model on the grid. Write the missing numbers.

3. \[6 \times 8 = 6 \times (5 + \____)\]
   \[(\____ \times \____) + (\____ \times \____)\]
   \[= \____ + \____ = \____\]

4. \[4 \times 9 = 4 \times (\____ + \____)\]
   \[(\____ \times \____) + (\____ \times \____)\]
   \[= \____ + \____ = \____\]

Complete the number sentence.

5. \[3 \times (5 + 1)\]
   \[= (\____ \times \____) + (\____ \times \____)\]

6. \[8 \times (5 + 3)\]
   \[= (\____ \times \____) + (\____ \times \____)\]

7. \[\____ \times (4 + 1) = (5 \times 4) + (5 \times 1)\]

8. \[\____ \times (5 + 4) = (6 \times 5) + (6 \times 4)\]