Chapter 5
Understand Division

Careers in OUR World

ESSENTIAL QUESTION
What does division mean?

Watch a video!
Operations and Algebraic Thinking

3.OA.2 Interpret whole-number quotients of whole numbers, e.g., interpret 56 ÷ 8 as the number of objects in each share when 56 objects are partitioned equally into 8 shares, or as a number of shares when 56 objects are partitioned into equal shares of 8 objects each.

3.OA.4 Determine the unknown whole number in a multiplication or division equation relating three whole numbers.

3.OA.6 Understand division as an unknown-factor problem.

3.OA.7 Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that 8 × 5 = 40, one knows 40 ÷ 5 = 8) or properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers.

Standards for Mathematical Practice

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

= focused on in this chapter
Write two multiplication sentences for each array.

1.

2.

Identify a pattern. Then find the missing numbers.

3. 30, 25, 20, ___, ___, 5 Pattern:

4. 12, ___, 8, ___, 4, 2 Pattern:

5. 55, 45, 35, ___, 15, ___ Pattern:

Draw the counters in the circles to make equal groups.

6.

7.

8. Colton made 15 party invitations. His brother made 9 invitations. Write a subtraction sentence to find how many more invitations Colton made.

9. Mrs. Jones has 21 pencils. She gives 2 pencils to Carter and 2 pencils to Mandy. Write a subtraction sentence to find how many pencils she has left.

How Did I Do?

Shade the boxes to show the problems you answered correctly.

1 2 3 4 5 6 7 8 9
Review Vocabulary

array  equal groups  pattern  repeated addition

Making Connections
Use the review vocabulary to describe each example in the graphic organizer.

Ways I Can Show
12 Using Equal Groups

12, 8, 4, 0

4 + 4 + 4

How are the examples similar? How are the examples different?
divide (division)

\[ 12 \div 3 = 4 \]

division sentence

\[ 15 \div 3 = 5 \]

fact family

\[ 9 \times 3 = 27 \quad 27 \div 9 = 3 \]
\[ 3 \times 9 = 27 \quad 27 \div 3 = 9 \]

partition

\[ 6 \div 2 = 3 \]

dividend

\[ 15 \div 3 = 5 \]

divisor

\[ 15 \div 3 = 5 \]

inverse operations

\[ 2 \times 5 = 10 \quad 10 \div 2 = 5 \]

quotient

\[ 15 \div 3 = 5 \]
Ideas for Use

• Group 2 or 3 common words. Add a word that is unrelated to the group. Then work with a friend to name the unrelated word.

A number that is being divided.
Circle the dividend in $12 \div 4 = \boxed{3}$. Then write the quotient.

To separate into equal groups, to find the number of groups, or the number in each group.
How can dividing help you share snacks with friends?

The number by which the dividend is being divided.
Write a division sentence in which the divisor is 5. Circle the divisor.

A number sentence using numbers and the $\div$ sign.
Write an example of a division sentence. Then write the sentence using words.

Operations that undo each other, like multiplication and division.
Use inverse operations to write a multiplication and division sentence.

A group of related facts using the same numbers.
Write the numbers in the fact family shown on this card.

The answer to a division problem.
Write and solve a division problem. Circle the quotient.

To divide or “break up.”
*Partition* can mean “a wall that divides a room into different areas.” How does that relate to the math word?
**Lesson 5-5**

**related facts**

3 × 4 = 12
12 ÷ 4 = 3

**Lesson 5-3**

**repeated subtraction**

10 ÷ 2 = 5
### Ideas for Use

- Write an example for each card. Be sure your examples are different from what is shown on each card.

- Write the name of each lesson on the front of each blank card. Write a few study tips on the back of each card.

<table>
<thead>
<tr>
<th>Subtraction of the same number over and over again.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Write a sentence comparing repeated subtraction to repeated addition.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Basic facts using the same numbers.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Why is facts plural in this vocabulary word?</td>
</tr>
</tbody>
</table>
**MY Foldable**

**Definition:**

- **Dividend:** The number to be divided.
- **Divisor:** The number the dividend is divided by.
- **Quotient:** The result of a division problem.
You have 10 stickers.

You want to share equally on 2 papers.

How many stickers will go on each paper?
Hands On
Model Division

**Division** is an operation with two numbers. One number tells you how many items you have. The other tells you how many equal shares, or groups, to form or how many to put in each group.

\[
10 \div 5 = 2
\]

Read \( \div \) as divided by.
10 divided by 5 = 2.

To **divide** means to **partition**, or separate a number into equal groups, to find the number of groups, or find the number in each group.

**Build It**

Find how many in each group. Divide 12 counters into 3 equal groups. How many are in each group?

1. Partition one counter at a time into a group until all of the counters are gone.
2. Draw the groups of counters.
3. Write a **division sentence**, or a number sentence that uses division.

12 counters were divided into \( \underline{\quad} \) groups.

There are \( \underline{\quad} \) counters in each group.

So, \( 12 \div 3 = \underline{\quad} \) in each group.

SAY: Twelve divided by three equals four.
Try It

Find how many groups. Place 12 counters in groups of 3. How many groups are there?

Make groups of 3 until all the counters are gone. Draw the groups.

Write a division sentence. 12 counters were divided into equal groups of _____.

There are _____ groups.

12 ÷ 3 = _____ groups.  
SAY: Twelve divided by three equals four.

Talk About It

1. Explain how you divided 12 counters into equal groups.

2. When you divided the counters into groups of 3, how did you find the number of equal groups?

3. **Mathematical PRACTICE**  
   **Draw a Conclusion** Explain the difference between the way you partitioned the counters in the first activity to the way you partitioned them in the second activity.
Practice It

4. Partition 8 counters one at a time to find the number of counters in each group. Draw the counters.

There are ______ counters in each group; $8 \div 2 = ______$.

5. Circle equal groups of 5 to find the number of equal groups.

There are ______ equal groups; $15 \div ______ = 5$.

6. **Algebra** Use counters to find each unknown.

<table>
<thead>
<tr>
<th>Number of Counters</th>
<th>Number of Equal Groups</th>
<th>Number in Each Group</th>
<th>Division Sentence</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td></td>
<td>3</td>
<td>$9 \div \square = 3$</td>
</tr>
<tr>
<td>14</td>
<td>2</td>
<td>?</td>
<td>$14 \div 2 = ?$</td>
</tr>
<tr>
<td>15</td>
<td></td>
<td>5</td>
<td>$15 \div \square = 5$</td>
</tr>
<tr>
<td>6</td>
<td>?</td>
<td>3</td>
<td>$6 \div ? = 3$</td>
</tr>
</tbody>
</table>

7. Choose one division sentence from Exercise 6. Write and solve a real-world problem for that number sentence.
Apply It

Draw a model to solve. Then write a number sentence.

8. A florist needs to make 5 equal-sized bouquets from 25 flowers. How many flowers will be in each bouquet?

9. **Model Math** Mrs. Wilson called the flower shop to place an order for 9 flowers. She wants an equal number of roses, daisies, and tulips. How many of each kind of flower will Mrs. Wilson receive?

10. **Make a Plan** Mr. Cutler bought 2 dozen roses to equally arrange in 4 vases. How many roses will he put in each vase? (*Hint: 1 dozen = 12*)

11. **Reason** Can 13 counters be partitioned equally into groups of 3? Explain.

Write About It

12. How can I use models to understand division?
Divide 9 counters into 3 equal groups.
Find how many counters are in each group.

Partition 9 counters, one counter at a time, until all the counters are gone.

9 counters were divided into 3 groups.
There are 3 counters in each group.
The division sentence is $9 \div 3 = 3$.

Practice

1. Partition 6 counters, one at a time, to find the number of counters in each group. Draw the counters.

   counters were divided into 2 groups; $6 \div 2 =$ counters in each group.

2. Circle each group of 4 to find the number of equal groups.

   counters were divided into groups of 4; $16 \div 4 =$ groups.
Problem Solving

Draw a model to solve. Then write a number sentence.

3. Nola has 16 bracelets. She hangs an equal number of bracelets on 2 hooks. How many bracelets are on each hook?

4. **Mathematical Practice** Model Math Noah rolled 18 large snowballs to make snowmen. He used 3 snowballs for each snowman. How many snowmen did Noah make?

5. There are 8 mittens drying on the heater. Each student has 2 mittens. How many students have mittens drying on the heater?

Vocabulary Check

Draw a line to connect each vocabulary word with its definition.

6. division sentence
   - sharing objects one at a time until there are none left

7. division
   - a number sentence that shows the number of equal groups and the number in each group

8. partition
   - groups that have the same quantity of objects or have the same value

9. equal groups
   - an operation that tells the number of equal groups and the number in each group
Division as Equal Sharing

One way to divide is to find the number in each group. This can be done by equal sharing.

Math in My World

Example 1
Nolan feeds 6 carrots equally to 3 rabbits. How many carrots does each rabbit get?

Draw one carrot at a time next to each rabbit until there are no more carrots.

Write a division sentence to represent the problem. A division sentence is a number sentence that uses the operation of division.

carrots equally shared by rabbits gives carrots to each rabbit.

6 ÷ 3 = There are carrots for each rabbit.

You can think of division sentences in two ways.

6 items 3 equal groups 2 items in each group

6 ÷ 3 = 2

6 items 2 equal groups 3 items in each group
You can draw an array to help you divide.

**Example 2**

Fifteen scouts equally shared 3 tents. How many scouts are in each tent? Place one counter (scout) at a time next to each tent until all the counters are gone. Draw a sketch of your counters.

```
My Drawing!

 scouts ÷ tents = scouts in each tent

 ÷ =
```

There will be scouts in each tent.

**Guided Practice**

Use counters to find how many are in each group.

1. 10 counters
   2 equal groups
   _____ in each group
   10 ÷ 2 =

2. 14 counters
   7 equal groups
   _____ in each group
   14 ÷ 7 =

3. 20 counters
   5 equal groups
   _____ in each group
   20 ÷ 5 =

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**Independent Practice**

**Use counters to find how many are in each group.**

4. 12 counters  
   2 equal groups
   ___ in each group  
   ___ ÷ ___ = ___

5. 16 counters  
   4 equal groups
   ___ in each group  
   ___ ÷ ___ = ___

6. 18 counters  
   6 equal groups
   ___ in each group  
   ___ ÷ ___ = ___

**Use counters to find the number of equal groups.**

7. 8 counters  
   ___ equal groups  
   4 in each group  
   8 ÷ ___ = 4

8. 21 counters  
   ___ equal groups  
   7 in each group  
   21 ÷ ___ = 7

9. 18 counters  
   ___ equal groups  
   9 in each group  
   18 ÷ ___ = 9

**Use counters to draw an array. Write a division sentence.**

10. Draw 9 counters in 
    3 equal rows. 
    There are ___ in each row. 
    ___ ÷ ___ = ___

11. Draw 14 counters in 
    2 equal rows. 
    There are ___ in each row. 
    ___ ÷ ___ = ___

**Algebra** Draw lines to match each division sentence with its correct unknown.

12. 24 ÷ ___ = 3
    • 5

13. 30 ÷ 6 = ___
    • 7

14. 42 ÷ ___ = 6
    • 8
Problem Solving

Draw a picture to solve. Then write a division sentence.

15. Marla has $25. How many hamster wheels can she buy?


17. Practice Plan Your Solution

There are 6 juice boxes in a package. How many packages need to be bought if 24 juice boxes are needed for a picnic? Write a division sentence with a symbol for the unknown. Then solve.

HOT Problems

18. Practice Model Math Write a real-world problem that uses the division sentence $12 \div 6 = \square$. Then find the unknown.

19. Building on the Essential Question How is dividing like sharing?
Homework Helper

There are 16 people on a ride at the fair. They are divided evenly among 4 carts. How many people are in each cart?

Use counters to solve the problem.

1. Start with 16 counters to represent the 16 people.
2. Divide the counters evenly among the carts.
3. 16 riders divided equally among 4 carts is 4 riders per cart.

So, \( 16 \div 4 = 4 \).

Practice

Use counters to find how many are in each group.

1. 21 counters
   7 equal groups
   \( \underline{\text{in each group}} \)
   \( 21 \div 7 = \underline{\text{3}} \)

2. 16 counters
   2 equal groups
   \( \underline{\text{in each group}} \)
   \( 16 \div 2 = \underline{\text{8}} \)

3. 18 counters
   3 equal groups
   \( \underline{\text{in each group}} \)
   \( 18 \div 3 = \underline{\text{6}} \)

4. 30 counters
   6 equal groups
   \( \underline{\text{in each group}} \)
   \( 30 \div 6 = \underline{\text{5}} \)
Use counters to find the number of equal groups.

5. 24 counters  
   \[ \frac{24}{3} = 3 \]  
   \[ \text{equal groups} \]

6. 24 counters  
   \[ \frac{24}{6} = 6 \]  
   \[ \text{equal groups} \]

Problem Solving

Draw a picture to solve. Then write a division sentence.

7. Four friends want to share 8 apples equally. How many apples will each person get?

8. **Mathematical Practice**  
   **Model Math**  
   Sarah has 32 crackers. She eats 2 and throws away 2 that she dropped. Sarah puts the rest of the crackers into 4 equal groups. How many crackers are in each group?

Vocabulary Check

Draw an example or write a definition beneath each vocabulary word.

9. array  
10. divide  
11. division sentence

Test Practice

12. There are 25 students in Mr. Copa's class. He divides the students into equal groups of 5. How many students are in each group?

- 5 students  
- 10 students  
- 15 students  
- 20 students
Example 1
A designer makes 15 dresses in equal numbers of red, blue, or yellow. How many dresses of each color are there? Write a division sentence with a symbol for the unknown. Then solve.

\[ 15 \div 3 = \square \] unknown

**One Way  Use models.**

Draw one counter at a time on each dress until all 15 counters are gone.

There are _____ dresses of each color. The unknown is _____.

So, _____ ÷ _____ = _____.

**Another Way  Use a number line.**

You can also divide using **repeated subtraction**. Subtract equal groups of 3 repeatedly until you get to zero.

\[ \begin{array}{cccccc}
15 & 12 & 9 & 6 & 3 & 0 \\
\hline
5 & 4 & 3 & 2 & 1 & \hline
\end{array} \]

For 15 ÷ 3, start at 15.

\[ 15 \div 3 = 5 \]

You subtracted groups of three _____ times.

So, 15 ÷ 3 = _____.
Example 2

Use repeated subtraction to find $10 \div 2$. Write a division sentence.

**One Way** Use a number line.

Start at 10. Count back by 2s until you reach 0. How many times did you subtract? _____
So, $10 \div 2 = ___$.

**Another Way** Use repeated subtraction.

Subtract groups of 2 until you reach 0. How many groups did you subtract? _____

\[
\begin{array}{cccccc}
1 & 2 & 3 & 4 & 5 \\
\hline
10 & 8 & 6 & 4 & 2 \\
-2 & -2 & -2 & -2 & -2 \\
8 & 6 & 4 & 2 & 0 \\
\end{array}
\]

Guided Practice

**Algebra** Write a division sentence with a symbol for the unknown. Then solve.

1. There are 16 flowers. Each vase has 4 flowers. How many vases are there?

   \[
   \_
   \div 4 = \_
   \]

   There are _____ vases.

2. There are 14 ears. Each dog has 2 ears. How many dogs are there?

   \[
   14 \div \_
   = \_
   \]

   There are _____ dogs.

**Use repeated subtraction to divide.**

3. \[
\begin{array}{cccc}
\hline
1 & 2 & 3 & 4 \\
\hline
0 & 1 & 2 & 3 \\
\end{array}
\]

   \[
12 \div 3 = \_
\]

4. \[
\begin{array}{cccc}
\hline
1 & 2 & 3 & 4 \\
\hline
0 & 1 & 2 & 3 \\
\end{array}
\]

   \[
8 \div 2 = \_
\]
Independent Practice

Algebra Write a division sentence with a symbol for the unknown. Then solve.

5. There are 16 orange slices. Each orange has 8 slices. How many oranges are there?

6. There are 16 miles. Each trip is 2 miles. How many trips are there?

7. There are 25 marbles, with 5 marbles in each bag. How many bags are there?

8. Four friends will share 12 muffins equally. How many muffins will each friend get?

Use repeated subtraction to divide.

9. \[ 10 \div 5 = \]

10. \[ 6 \div 3 = \]

11. \[ 9 \div 3 = \]

12. \[ 8 \div 4 = \]

13. \[ 12 \div 3 = \]

14. \[ 20 \div 4 = \]
Problem Solving

Chicago's Ferris wheel is 10 stories tall. Each cart can seat up to 6 people for a 7-minute ride.

Write a division sentence with a symbol for the unknown. Then solve.

15. It costs $24 for 4 people to ride the Ferris wheel. How much does each ticket cost?

16. **PRACTICE** Use Symbols If 30 students from a class wanted to ride, how many carts would they need?

HOT Problems

17. **PRACTICE** Reason How can knowing that multiplication is repeated addition and division is repeated subtraction help you to understand that multiplication and division are related?

18. **Question** Building on the Essential Question How is division related to subtraction?
Perry divides 9 berries evenly among 3 fruit cups. How many berries does Perry put in each cup? Write a division sentence with a symbol for the unknown. Solve.

\[ 9 \div 3 = \square \rightarrow \text{unknown} \]

**One Way** Use a number line.

1. \[ 3 \]
2. \[ 2 \]
3. \[ 1 \]

0 1 2 3 4 5 6 7 8 9

Subtract equal groups of 3 until you reach 0. There are 3 groups.

So, \( 9 \div 3 = 3 \).

**Another Way** Use repeated subtraction.

\[
\begin{array}{ccc}
1 & 2 & 3 \\
9 & 6 & 3 \\
-3 & -3 & -3 \\
6 & 3 & 0
\end{array}
\]

Keep subtracting 3 until you reach 0. You subtracted 3 groups.

So, \( 9 \div 3 = 3 \).

**Practice**

Use repeated subtraction to divide.

1. \( 14 \div 2 = \)

2. \( 12 \div 6 = \)

3. \( 28 \div 7 = \)

4. \( 30 \div 10 = \)
Problem Solving

Algebra Write a division sentence with a symbol for the unknown. Then solve.

5. There are 24 juice bottles, with 6 bottles in each package. How many packages of juice bottles are there?

6. A mechanic equally divides 4 hours of his time to repair 8 cars. How many cars does he repair in one hour?

7. On Monday, Helen’s math teacher gave the class 45 problems to finish by Friday. Helen will do the same number of problems each day. How many problems will she do on Friday?

Vocabulary Check

Choose the correct word(s) to complete each sentence.

number line repeated subtraction

8. Skip count backwards on a _______ to divide.

9. Use _______ to subtract equal groups repeatedly until you reach zero.

Test Practice

10. Sal made 6 cups of oatmeal for himself and his 2 brothers. Each received an equal number of cups of oatmeal. Which number sentence represents this problem?

A 6 – 2 = 4  
B 6 ÷ 3 = 2
C 6 × 2 = 12  
D 6 – 3 = 3
Vocabulary Check

Use the word bank to label each definition.

array  division  division sentence

equal groups  repeated subtraction

1. 

2. 

10 ÷ 5 = 2

3. 

4. 

5. array is an operation where one number tells you how many things you have and the other tells you how many equal groups to form or how many to put in each group.
Concept Check

Write a division sentence and divide to find how many are in each group.

6. 12 counters
   3 equal groups

   _____ ÷ _____ = _____

   There are ____ in each group.

7. 15 counters
   5 equal groups

   _____ ÷ _____ = _____

   There are ____ in each group.

Use repeated subtraction to divide.

8. 

   0 2 4 6 8 10 12

   12 ÷ 4 = _____

9. 

   0 2 4 6 8 10 12 14 16

   16 ÷ 8 = _____

Problem Solving

Algebra Write a division sentence with a symbol for the unknown. Then solve.

10. Coach Shelton divided 18 players into 3 equal-sized teams. How many players are on each team?

11. Chang has 15 frogs in his pond. If he catches 3 a day, how many days will it take him to catch all of the frogs?

Test Practice

12. Kayla spends $20 to buy 4 candles. Each candle is the same price. What is the cost of one candle?
   
   \( \text{A} \) $4  \( \text{B} \) $5
   \( \text{C} \) $16  \( \text{D} \) $24

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Division and multiplication are related operations.

**Build It**

**Find 21 ÷ 3.**

1. Model 21 counters divided into 3 equal groups. Draw the model. How many counters are in each group?

   ______ counters

2. Write a division sentence.

   number in all \[ \div \] number of groups = number in each group

   The **dividend** is the number to be divided. The **divisor** is the number by which the dividend is divided. The answer is the **quotient**.

3. Write a multiplication sentence.

   number of groups \[ \times \] number in each group = number in all

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Try It

Find \(20 \div 4\).

1. Model 20 connecting cubes divided into 4 equal rows. Draw the model. How many cubes are in each row?

   _____ cubes

2. Write a division sentence.

   \[
   \begin{array}{ccc}
   \text{dividend} & \div & \text{divisor} \\
   \hline
   \square & \div & \square \\
   \hline
   \end{array}
   \]

   \[=\]

   \[
   \begin{array}{ccc}
   \text{quotient} \\
   \hline
   \square \\
   \hline
   \end{array}
   \]

3. Write a multiplication sentence.

   \[
   \begin{array}{ccc}
   \text{factor} & \times & \text{factor} \\
   \hline
   \square & \times & \square \\
   \hline
   \end{array}
   \]

   \[=\]

   \[
   \begin{array}{ccc}
   \text{product} \\
   \hline
   \square \\
   \hline
   \end{array}
   \]

Talk About It

1. Explain how you used models to show \(21 \div 3\).

2. \textbf{Mathematical \textit{PRACTICE \(\color{red}{16}\)}} Explain to a Friend Explain how the array shows that \(21 \div 3 = 7\) is related to \(3 \times 7 = 21\).

3. \textbf{Mathematical \textit{PRACTICE \(\color{red}{18}\)}} Look for a Pattern What pattern do you notice between the number sentences in the two activities?

4. How can multiplication facts be used to divide?
Practice It

Write a related division and multiplication sentence for each.

5.  

6.  

Use connecting cubes to solve. Draw your model. Write a division sentence.

7. Model 10 connecting cubes divided into 2 equal rows. How many cubes are in each row?

8. Model 6 connecting cubes divided into 3 equal rows. How many cubes are in each row?

Algebra Use counters to model each problem. Find the unknown. Then write a related multiplication sentence.

9. $12 \div 6 =$  
   The unknown is ___.

10. $21 \div 7 =$  
    The unknown is ___.

11. $25 \div 5 =$  
    The unknown is ___.

Lesson 4 Hands On: Relate Division and Multiplication 267
Apply It

Draw a model to solve. Then write a division sentence.

12. A scientist organizes 14 bugs into 2 equal rows. How many bugs are in each row?

13. A teacher divides her 24 students into 4 equal activity groups. How many students are in each group?

14. Arianna divides 25 gold stars between herself and 4 friends. How many stars does each friend receive?

15. Mark checked out 12 books from the library. He reads an equal amount of books each week for 4 weeks. How many books does he read each week?

16. **Mathematical Practice** Make a Plan Eli had 20 lemons. He used an equal number in each of 3 pitchers of lemonade. He has 2 lemons left. How many lemons did Eli use to make one pitcher of lemonade?

Write About It

17. How are arrays used in both multiplication and division?
Homework Helper

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1. Model 32 counters divided into 4 equal groups. There are 8 counters in each group.

2. Write a division sentence.

\[ \frac{32}{4} = 8 \]

- **dividend**: 32
- **divisor**: 4
- **quotient**: 8

3. Write a multiplication sentence.

\[ 4 \times 8 = 32 \]

- **number of groups**: 4
- **number in each group**: 8
- **number in all**: 32

So, 32 ÷ 4 = 8.

Practice

Write a related division and multiplication sentence for each.

1. 

2. 

Lesson 4 My Homework 269
Problem Solving

Draw a model to solve. Then write a division sentence.

3. 42 students need to divide equally into 7 vans going to the museum. How many students will be in each van?

4. **Mathematical PRACTICE ** Model Math Carla is giving out pencils to 30 students. The students are divided equally among 6 tables. How many pencils will Carla leave at each table?

5. Mr. Rina has 7 glass figures. He will use 1 box to mail each glass figure to a customer. How many boxes does Mr. Rina need?

Vocabulary Check

Use the vocabulary to label each number in the division sentence.

quotient divisor dividend

6. \[48 \div 8 = 6\]
7. 
8. 

Inverse Operations

You have learned how division and multiplication are related. Operations that are related are **Inverse operations** because they undo each other.

**Math in My World**

**Example 1**

A baker has made a tray of fresh muffins. Use the array to write a related multiplication and division sentence to find the unknown. How many muffins are there in all?

![Image of muffins]

**Multiplication**

- number of rows: 3
- number in each row: [ ]
- number in all: [ ]

\[ 3 \times [ ] = [ ] \]

**Division**

- number in all: [ ]
- number of rows: 3
- number in each row: [ ]

\[ [ ] \div 3 = [ ] \]

The unknown is [ ].

So, there are [ ] muffins in all.

The multiplication sentence multiplies 3 by [ ] to get 12. The division sentence undoes the multiplication by dividing 12 by 3 to get [ ].
A group of related facts using the same numbers is a fact family. Each fact family follows a pattern by using the same numbers.

**Fact Family 3, 4 and 12**
- $3 \times 4 = 12$
- $4 \times 3 = 12$
- $12 \div 3 = 4$
- $12 \div 4 = 3$

**Fact Family 7 and 49**
- $7 \times 7 = 49$
- $49 \div 7 = 7$

**Example 2**

Complete the fact family for the numbers 3, 6, and 18.

\[
\begin{array}{c}
3 \times 6 = \square \\
\boxplus 
\end{array}
\quad
\begin{array}{c}
18 \div \square = 6 \\
\boxplus 
\end{array}
\quad
\begin{array}{c}
\square \times 3 = 18 \\
\boxplus 
\end{array}
\quad
\begin{array}{c}
18 \div 6 = \square \\
\boxplus 
\end{array}
\]

The pattern shows that 3, 6, and 18 are used in each number sentence.

**Guided Practice**

Use the arrays to find each unknown.

1. \[
\begin{array}{c}
\square \times 5 = 15 \\
? \div 3 = 5 \\
\square = \quad \square \\
? = \quad \square 
\end{array}
\]

2. \[
\begin{array}{c}
4 \times ? = 24 \\
24 \div \square = 6 \\
? = \quad \square \\
\square = \quad \square 
\end{array}
\]

3. Write the fact family for 2, 6, and 12.

\[
\begin{array}{c}
\square \times 6 = \square \\
12 \div \square = \square \\
\square \times \square = 12 \\
\square \div \square = 2 
\end{array}
\]

**Talk MATH**

Why are the product and the dividend the same in $3 \times 7 = 21$ and $21 \div 3 = 7$?
Independent Practice

Algebra Use the arrays and inverse operations to find each unknown.

4. \( \square \times 2 = 8 \)
   \( \square \div 4 = 2 \)
   \( \square = \)_______
   \( \square = \)_______

5. \( 2 \times \square = 4 \)
   \( 4 \div \square = 2 \)
   \( \square = \)_______

6. \( \square \times 2 = 14 \)
   \( \square \div 2 = 7 \)
   \( \square = \)_______
   \( \square = \)_______

7. \( 4 \times \square = 20 \)
   \( 20 \div \square = 4 \)
   \( \square = \)_______

Write the fact family for each set of numbers.

8. 2, 3, 6
   _______
   _______

9. 2, 7, 14
   _______
   _______

10. 4, 8, 32
    _______
    _______

11. 4, 3, 12
    _______
    _______

Write the set of numbers for each fact family.

12. \( 5 \times 9 = 45 \)
    \( 9 \times 5 = 45 \)
    \( 45 \div 9 = 5 \)
    \( 45 \div 5 = 9 \)

13. \( 7 \times 4 = 28 \)
    \( 4 \times 7 = 28 \)
    \( 28 \div 7 = 4 \)
    \( 28 \div 4 = 7 \)

14. \( 3 \times 3 = 9 \)
    \( 9 \div 3 = 3 \)
Problem Solving

Write a division sentence to solve.

15. All 5 members of the Malone family went to the movies. Their tickets cost a total of $30. How much was each ticket?

16. The petting zoo has 21 animals. There are an equal number of goats, ponies, and cows. How many of each animal are there?

17. **Practice** Use Math Tools Mr. Thomas travels 20 miles each week to and from work. If he works 5 days a week, how many miles does Mr. Thomas travel each day to go to work?

HOT Problems

18. **Practice** Draw a Conclusion Look back to Exercise 14 on the previous page. Why are there only 2 numbers in each fact family instead of 3 numbers?

19. **Building on the Essential Question** How can I use multiplication facts to remember division facts? Give an example.
Homework Helper

The array represents 27 children lined up in 3 rows. Use the array to find each unknown.

\[ 9 \times \square = 27 \]
\[ ? \div 3 = 9 \]
\[ \square = 3 \]
\[ ? = 27 \]

You know 3 rows of 9 = 27.
So, 9 rows of 3 = 27 and 27 \div 3 = 9.

Practice

Algebra Use the array to find each unknown.

1. \[ \square \times 4 = 20 \]
   \[ ? \div 5 = 4 \]
   \[ \square = \_\_\_\_\_\_\_\_ \]
   \[ ? = \_\_\_\_\_\_\_\_ \]

2. \[ 4 \times \square = 16 \]
   \[ ? \div 4 = 4 \]
   \[ \square = \_\_\_\_\_\_\_\_ \]
   \[ ? = \_\_\_\_\_\_\_\_ \]

3. \[ 7 \times \square = 21 \]
   \[ ? \div 7 = 3 \]
   \[ \square = \_\_\_\_\_\_\_\_ \]
   \[ ? = \_\_\_\_\_\_\_\_ \]

4. \[ 2 \times \square = 12 \]
   \[ ? \div 2 = 6 \]
   \[ \square = \_\_\_\_\_\_\_\_ \]
   \[ ? = \_\_\_\_\_\_\_\_ \]
Write the fact family for each set of numbers.

5. 5, 8, 40

6. 6, 7, 42

Write the set of numbers for each fact family.

7. $4 \times 9 = 36 \quad 36 \div 4 = 9$
   $9 \times 4 = 36 \quad 36 \div 9 = 4$

8. $2 \times 8 = 16 \quad 16 \div 2 = 8$
   $8 \times 2 = 16 \quad 16 \div 8 = 2$

Problem Solving

9. Model Math Tia has $35 to spend on socks for the family. If each pair of socks costs $5, how many pairs can she buy? Write a division sentence to solve.

Vocabulary Check

Draw a line to connect each vocabulary word with its definition.

10. dividend • the number being divided

11. divisor • a group of related facts that use the same numbers

12. fact family • the answer to a division problem

13. inverse operations • the number by which a dividend is divided

14. quotient • operations that undo each other

Test Practice

15. Which pair shows inverse operations?
   
   A. $2 \times 2 = 4; 4 \div 2 = 2$
   B. $2 \times 2 = 4; 4 - 2 = 2$
   C. $2 \times 2 = 4; 8 \div 4 = 2$
   D. $2 \times 2 = 4; 4 \div 4 = 1$
Learn the Strategy

Mia has 18 items that need to be split evenly among 3 welcome baskets. How many items will Mia put in each basket?

1 Understand
What facts do you know?

________ items need to be split evenly among ________ baskets.

What do you need to find?

the number of ________

2 Plan
I will make a model to find ________.

3 Solve
I will use counters to model the problem by placing ________ counter at a time in each group.
The model shows that 18 ÷ 3 = ________.
So, Mia will fill each basket with ________ items.

4 Check
Does your answer make sense? Explain.
Practice the Strategy

A veterinarian helped 20 pets from Monday to Friday. She helped an equal number of pets each day. How many pets did she help each day?

1 Understand

What facts do you know?

What do you need to find?

2 Plan


3 Solve


4 Check

Does your answer make sense? Explain.
1. Solve each problem by using a model.

Mathematical Practice 5: Use Math Tools

Jill has 27 blocks. She wants to divide them equally into the bowls shown below. How many blocks will be in each bowl?

2. The owner of an apartment building needs to fix 16 locks in four of his apartments. Each apartment has the same number of locks that need to be fixed. How many locks in each apartment need to be fixed?

3. A baker used a dozen eggs to make 3 cakes. The recipe called for each cake to have the same number of eggs. How many eggs were used in each cake? (Hint: 1 dozen = 12)

4. There are 13 girls and 11 boys that want to play a game. They need to make 4 teams. How many players will be on each team if each team needs an equal number of players?
Review the Strategies

5. **Use Number Sense** Sarah needs 15 pieces of chalk for a project. Each box contains 3 pieces of chalk. How many boxes of chalk will she need to buy?

6. Brooke volunteers to read with young children 5 nights a month. She spends 2 hours each visit. This month, she volunteered one extra night. How many hours did she read with the children this month?

7. **Model Math** A chef will make pizzas. He has broccoli, peppers, onions, pepperoni, and sausage. How many types of pizzas can be made with one type of vegetable and one type of meat? Name the combinations.

8. A scientist estimates that a brown bear weighs 700 pounds. It actually weighs 634 pounds. How much more is the estimate than the actual weight?
Lucy needs 7 craft sticks to make a puzzle. She has 28 craft sticks. How many puzzles can Lucy make? Use a model to solve.

1. **Understand**
   Lucy has 28 craft sticks. She needs 7 sticks to make a puzzle. Find how many puzzles Lucy can make.

2. **Plan**
   Divide 28 craft sticks into equal groups of 7.

3. **Solve**
   There are 4 equal groups of 7 craft sticks. The model shows that $28 \div 7 = 4$. So, Lucy can make 4 puzzles.

4. **Check**
   Use multiplication to check. $4 \times 7 = 28$. So, the answer is correct.

**Problem Solving**

1. Brandon spent $20 on school supplies. He bought five different items that each cost the same amount. How much did each item cost? Use a model to solve.

   Each item cost $\_\_\_\_\_\_.$
Solve each problem by using a model.

2. Use Math Tools Alice planted 6 tomato plants, 4 bean plants, and 2 pepper plants. Each row had 6 plants. How many rows did Alice plant?

3. At the circus, there are 18 clowns. The clowns drive around in little cars. If there are 3 clowns in each car, how many cars are there?

4. Mr. and Mrs. Carson took Sarah, Brent, and Joanie to see a movie. They paid $50 in all. The Carsons spent $15 on snacks. How much did each ticket cost?

5. Mrs. Glover had 25 rare coins. She divided them evenly among her 5 grandchildren. How many coins did each grandchild get?

6. A singer performed 9 songs at a recital. She had 3 weeks to practice. How many songs did she practice each week if she practiced an equal number of songs each week?
Use the word bank to complete each sentence.

array     divide     fact family     Inverse operations
partition     related facts     repeated subtraction

1. ___________ are a set of basic facts using the same three numbers.
2. An arrangement of objects into equal rows and equal columns is an (n) _________________.
3. A way to divide by sharing one object at a time until all the objects are gone is to _________________.
4. To __________ means to separate a number into equal groups, to find the number of groups, or find the number in each group.
5. __________ is a way to subtract the same number over and over again until you reach 0.
6. Operations that are related are __________ because they undo each other.
7. $3 \times 5 = 15$, $5 \times 3 = 15$, $15 \div 5 = 3$, and $15 \div 3 = 5$ are the facts in the $3$, $5$, $15$ _________.
8. Write a division sentence in the space below. Label the dividend, divisor, and quotient.
Concept Check

Use counters to find how many are in each group.

9. 14 counters
   2 equal groups
   \( \_ \div \_ = \_ \) in each group

10. 25 counters
    5 equal groups
    \( \_ \div \_ = \_ \) in each group

Use repeated subtraction to divide.

11. \( 12 \div 6 = \_ \)

12. \( 20 \div 4 = \_ \)

Write a related division and multiplication sentence for each.

13. \[
\begin{array}{c}
\square \\
\square \\
\square \\
\square \\
\end{array}
\]

14. \[
\begin{array}{c}
\bigcirc \\
\bigcirc \\
\bigcirc \\
\bigcirc \\
\end{array}
\]

Write the fact family for each set of numbers.

15. 4, 7, 28
    \( \_ \times \_ = \_ \), \( \_ = \_ \times \_ \)

16. 3, 9, 27
    \( \_ \times \_ = \_ \), \( \_ = \_ \times \_ \)
Problem Solving

17. Brandon's dentist gave him 12 toothbrushes. Brandon wants to share them equally among himself and his 2 friends. How many toothbrushes will each person get? Write a division sentence.

18. A teacher has 24 pencils. She keeps 4 and shares the others equally with 5 students. How many pencils did each student get?

19. Circle the number sentence that does not belong. Explain. Then write the missing number sentence.

\[ 3 \times 6 = 18 \]
\[ 18 \div 2 = 9 \]
\[ 18 \div 6 = 3 \]
\[ 6 \times 3 = 18 \]

Test Practice

20. Harper saved $30 from mowing lawns April through September. She saved an equal amount each month. How much money did Harper save each month?

A $5  C $8
B $6  D $10
Use what you learned about division to complete the graphic organizer.

Real-World Problem

Vocabulary

Draw a Model

Write a Number Sentence

ESSENTIAL QUESTION
What does division mean?

Reflect on the ESSENTIAL QUESTION Write your answer below.