

Focus on ● Operations and Algebraic Thinking

UNIT

1

Essential Question:
How are multiplication
and division related?

Interpret Products of Whole Numbers

Essential Question:
What does it mean to multiply?

3.OA.1

Words to Know:

multiply
factor
product
multiplication

Guided Instruction

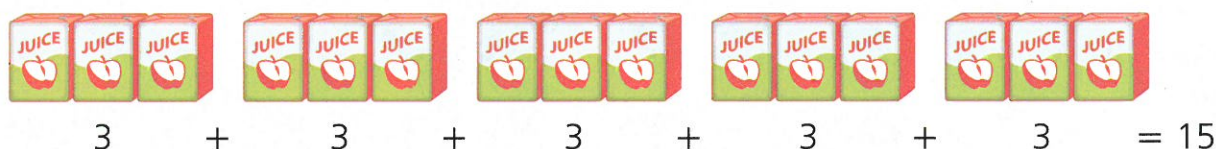
In this lesson you will learn when you can multiply and what happens when you multiply.

Understand: What multiplication means

Bella buys 5 packages of juice boxes.
Each package has 3 juice boxes.
How many juice boxes does Bella buy?

One way to find how many juice boxes in all is to add.

There are 5 groups of 3 boxes each.



The sum of 5 threes is 15.

Each package has the same number of boxes, so the 5 groups are equal in size. When the groups are equal in size, you can multiply to find the number in all.

number of equal groups times number in each group is equal to number in all

$$\begin{array}{ccccccc} 5 \text{ equal groups} & \times & 3 \text{ in each group} & = & 15 \\ 5 & \times & 3 & = & 15 \end{array} \quad \leftarrow \text{Read: 5 times 3 is equal to 15.}$$

Each of the numbers you multiply is a factor.

The number in all is the product.

$$\begin{array}{ccccccc} \text{factor} & \times & \text{factor} & = & \text{product} \\ 5 & \times & 3 & = & 15 \end{array}$$

Multiplying 5×3 is the same as adding 5 threes.

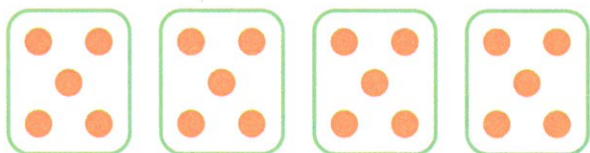
► Bella buys 15 juice boxes.

✎ Why do you think the product and the sum are the same?

Guided Instruction

Understand: What a product means

Max uses stickers to make a picture.
He has 4 cards of dot stickers.
Each card has 5 stickers.
How many stickers are there in all?



4 cards
5 stickers on each card
4 fives equals 20.

$$\begin{array}{ccccccc} \text{factor} & \rightarrow & 4 & \times & 5 & = & 20 & \leftarrow \text{product} \\ & \nearrow & & & \uparrow & & \nwarrow & \\ & \text{the number} & & & \text{the number} & & \text{the number} & \\ & \text{of cards} & & & \text{of stickers on a card} & & \text{of stickers in all} & \end{array}$$

► There are 20 stickers in all.

A product is the result of **multiplication**. The product tells how many objects in all are in a number of equal groups of objects.

• Describe another example. Think of a number of groups of equal things. Draw or tell what they are and write the factors and the product.

Guided Instruction

Connect: Using factors and products to describe problem situations

Describe a situation for which 3×4 shows the total number of objects. Then ask and answer a question about the total number of objects.

To do this, you need to describe a number of equal groups of objects.

Step 1

Think: How many equal groups are there? ____ groups

What could the groups be? The groups could be 3 nests.



Step 2

Think: How many objects are in each group? ____ objects

What objects could be in each nest? Each nest could hold 4 eggs.



Step 3

Think: In what situation could there be 3 nests with 4 eggs?

My friends were in the park. They saw _____ in the trees.

In each nest, there were _____.

Step 4

Think: What is a question about this situation? What is its answer?

► How many _____ in all are in the 3 nests?

There are _____ in the 3 nests.

► Explain why you can multiply to answer your question. Tell what the factors and product are.

Guided Practice

Are all the groups equal? Write *yes* or *no*. Can you multiply to find the total number of stars? Write *yes* or *no*.



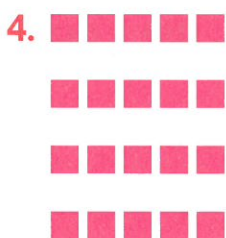
Are all the groups equal? ____

Are all the groups equal? ____

Can you multiply to find
the total? ____

Can you multiply to find
the total? ____

Find the number of groups. Tell how many are in each group.
Then find how many there are in all.



____ groups

____ groups

____ groups

____ in each group

____ in each group

____ in each group

____ in all

____ in all

____ in all

$$4 \times 2 = \underline{\hspace{2cm}}$$

$$4 \times 5 = \underline{\hspace{2cm}}$$

$$3 \times 6 = \underline{\hspace{2cm}}$$

Look at this multiplication: $6 \times 7 = 42$.

6. Name the factors. ____

7. Name the product. ____

Think-Pair-Share

- MP7 8. Draw 3 groups with the same number of things in each group. Explain how you can find the total number of things.

Independent Practice

Find the total number of objects and complete the multiplication. You can use the drawing.



$$3 \times 3 = \underline{\quad}$$



$$6 \times 2 = \underline{\quad}$$



$$4 \times 2 = \underline{\quad}$$



$$4 \times 4 = \underline{\quad}$$

For exercises 5–8, find each product. Use a drawing to justify your answer.

MP4 5. $3 \times 4 = \underline{\quad}$

6. $2 \times 5 = \underline{\quad}$

7. $5 \times 6 = \underline{\quad}$

8. $7 \times 3 = \underline{\quad}$

9. There are 6 boxes of 3 erasers each. Which choice shows how many erasers in all?

- 10.** For which situation is the total number of marbles shown by 7×4 ?

- 11.** Make a drawing that shows the product of 3×8 . Then find the product.

$3 \times 8 = \underline{\quad}$

- 12.** Show that 20 is the same as 4 fives. Explain how you know.

Independent Practice

13. In multiplication, what does the product show?

- a. how many factors there are
- b. how many things are in a group
- c. how many groups there are
- d. how many things in all

MP6 14. Describe a situation where the total number of soccer balls is shown as 4×6 . Include the total number of soccer balls in your answer.

Answer _____

Solve the problem.

MP6 15. There are 5 rows of desks in Jake's classroom. Each row has 5 desks. How many desks are in the classroom?

 **Show your work.**

Answer _____

MP4 16. Mia has 6 pairs of white socks. How many white socks does Mia have?

 **Use a drawing to justify your answer.**

Answer _____

Independent Practice

- MP3 17.** The class library has 6 bookshelves. Each shelf has 5 books. Ann says that there are 11 books in all. Is she correct?

Answer _____

 **Justify your answer using words, drawings, or numbers.**

- MP2 18.** The team needs 16 baseballs. There are 3 baseballs in each package. If Mr. Tam buys 6 packages of baseballs for the team, will there be enough baseballs?

Answer _____

 **Justify your answer using words, drawings, or numbers.**

- MP5 19.** The table shows totals for multiplying the number of groups by the number in each group. Complete the table.

| | | Number in Each Group | | | | | | | | |
|------------------|---|----------------------|----|----|----|---|---|----|---|---|
| Number of Groups | × | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| | 2 | 2 | 4 | 6 | | | | | | |
| | 3 | | | | 12 | | | 21 | | |
| | 4 | | | | | | | | | |
| | 5 | 5 | 10 | 15 | 20 | | | | | |
| | | | | | | | | | | |

Interpret Quotients of Whole Numbers

Essential Question:
What does it mean to divide?

3.OA.2

Words to Know:

division
partition
divide
dividend
divisor
quotient

Guided Instruction

In this lesson you will learn how to use **division** to find the number of objects in an equal share or to find the number of equal shares.

Understand: Using division to find how many in an equal share

Three friends have 12 marbles for a game.
They will share the marbles equally.
How many marbles will each friend get?

To find how many marbles each friend will get, **partition**, or share, the marbles equally.



One way to share the marbles is to use a diagram. Draw 3 circles for the 3 friends. Next draw marbles in each circle, 1 at a time, until you have drawn all 12 marbles. Then count to see that there are 4 marbles in each circle.



Another way to share the marbles is to **divide**.

total number **divided by** number of groups **is equal to** number in each group
 12 in all \div 3 groups $=$ number in each group
 $12 \div 3 = 4$ ← Read: 12 divided by 3 is equal to 4.

► Each friend will get 4 marbles.

Guided Instruction

Understand: Using division to separate

Payten has 18 heart stickers. She can put 6 stickers on each page of her sticker book. How many pages will Payten fill?



To find the number of pages, separate the total number of stickers into equal groups of 6.

One way to find the number of pages is to draw a diagram. Draw 18 dots to represent the 18 stickers.



Circle groups of 6 dots.



There are no stickers left over. Count to see that there are 3 groups.

Another way to find the number of pages is to divide.

total number **divided by** number in each group **is equal to** number of groups

$$\begin{array}{ccccccc}
 18 & & \div & & 6 & & = & & 3 \\
 \uparrow & & & & \uparrow & & & & \uparrow \\
 \text{dividend} & & & & \text{divisor} & & & & \text{quotient}
 \end{array}$$

The **dividend** is the total number.

The **divisor** is the number by which the dividend is divided.

The **quotient** is the result of the division.

Each part of a division has a name.

► Payten fills 3 pages of her sticker book.

► Describe another example. Think of a number of things you can partition into equal shares. Draw or tell what they are and write the division.

Guided Instruction

Connect: Using equal shares to describe problem situations

Describe a situation for which $35 \div 5$ shows the number in an equal share. Then ask and answer a question about the situation.

To do this, you need to describe a number of objects and the number of equal shares.

Step 1

Think: How many objects are there? ____ objects

What could the objects be?

The objects could be 35 oranges.



Step 2

Think: What does the 5 represent?

Five represents the _____ of shares.

What could be used to make the shares?

The shares could be 5 bags.

You can draw circles to represent the bags.



Step 3

Think: What situation tells about 35 oranges shared into 5 bags?

The Greenes pick _____ in an orange grove. They divide them equally among _____.



Step 4

Think: What is a question about this situation? What is its answer?

► How many _____ are in one bag?

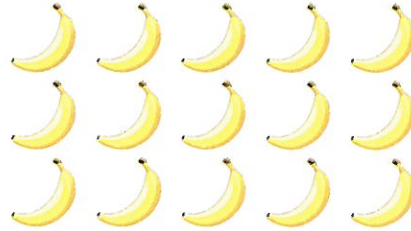
There are _____ in one bag.

► Explain how you answered the question. Tell why the number of oranges in one bag is the number in an equal share.

Guided Practice

Solve each problem. You can use the picture to the right of the problem.

1. The zookeeper has 15 bananas. If he shares the bananas equally among 3 monkeys, how many bananas will each monkey get?



15 bananas

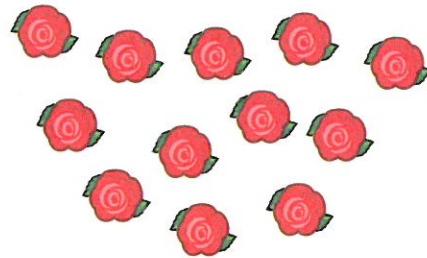
3 monkeys

There are ____ bananas in each equal share.

$$15 \div 3 = \underline{\quad}$$

Each monkey will get ____ bananas.

2. There are 12 flowers. If you put 6 flowers in each vase, how many vases will you need?



12 flowers

6 flowers in each vase

You make ____ equal groups of flowers.

$$12 \div 6 = \underline{\quad}$$

You will need ____ vases.

3. Make a drawing to show $40 \div 5$. Then find the quotient.

$$40 \div 5 = \underline{\quad}$$

Think • Pair • Share

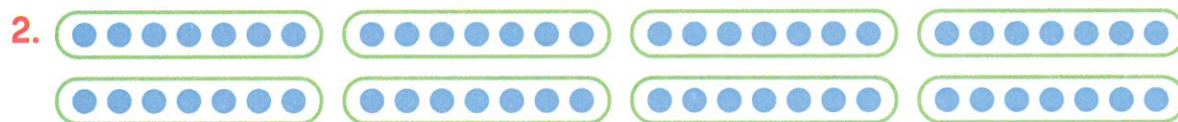
- MP1** 4. Write two word problems for the division $42 \div 6 = 7$. In one, you have to find the number in each share. In the other, you have to find the number of equal shares.

Independent Practice

For exercises 1 and 2, use the drawing to find the quotient.



$$27 \div 3 = \underline{\quad}$$



$$56 \div 8 = \underline{\quad}$$

3. For which situation is the number in a share expressed as $36 \div 9$?

- a. Betty shares 36 tickets for the softball game among 4 friends.
- b. Mrs. Baker makes 9 big batches of 36 muffins each for the school picnic.
- c. Lizzie has 36 guppies and 9 goldfish in her aquarium.
- d. Ms. Juarez shares 36 boxes of copy paper among the 9 classrooms in her school.

MP6 4. Describe a situation where the number of apples in a basket is expressed as $42 \div 6$. Then ask a question about the situation.

Independent Practice

- MP2 5. Explain how to share 36 things equally among 4 groups.
Then find the quotient.

Find each quotient. Make a drawing to justify your answer.

MP4 6. $25 \div 5 = \underline{\quad}$

7. $14 \div 2 = \underline{\quad}$

Find each quotient. Describe a situation that can be represented by the division.

MP6 8. $6 \div 3 = \underline{\quad}$

MP6 9. $32 \div 8 = \underline{\quad}$

MP6 10. $20 \div 4 = \underline{\quad}$

Independent Practice

- 11.** There are 24 boxes of cereal at the food pantry. Each family will receive 3 boxes. Which choice shows how many families will receive boxes of cereal?

a. 3

b. 24×3

c. $24 \div 3$

d. 24

- 12.** Ms. Tucker has a package of 12 small notebooks. She makes a list to show how many she can give to different numbers of friends if she shares them equally. Complete the list.

2 friends Each friend will get ____ notebooks.

3 friends Each friend will get ____ notebooks.

4 friends Each friend will get ____ notebooks.

6 friends Each friend will get ____ notebooks.

Solve the problems.

- MP6 13.** Dan has 40 grapes. He wants to share the grapes equally among 5 fruit salads. How many grapes will Dan put in each fruit salad?

 **Show your work.**

Answer _____

- MP7 14.** A toy store has 56 plush animals. The store clerk puts the plush animals on 7 shelves. Each shelf has the same number of plush animals. How many plush animals are on each shelf?

 **Show your work.**

Answer _____

Independent Practice

- MP4 15.** The 24 students in Mr. Lee's class will rent vans to go on a field trip. Six students and 1 adult will ride in each van. How many vans are needed?

Answer _____

 **Justify your answer using words, drawings, or numbers.**

- MP3 16.** Nicholas says that $10 \div 2 = 8$. Is he correct?

Answer _____

 **Justify your answer using words, drawings, or numbers.**

- MP2 17.** Kara partitions 16 dimes into equal groups in 3 different ways. She puts more than 1 dime in each group. She makes 2 or more groups for each way. Describe the groups that Kara made.

Answer _____

 **Justify your answer using words, drawings, or numbers.**

Problem Solving: Multiplication/Division and Equal Groups

Essential Question:

How can you use multiplication and division to solve problems involving equal groups?

3.OA.3

Words to Know:

equation
unknown

Guided Instruction

In this lesson you will learn how to solve problems involving equal groups.

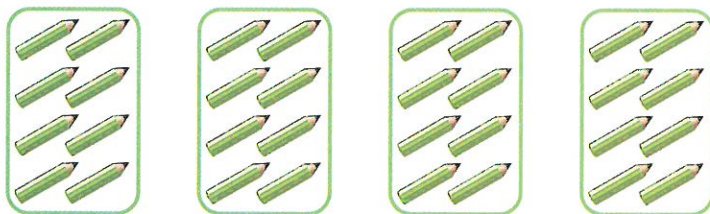
Understand: Using multiplication to solve problems involving equal groups

Lindsay has 4 pencil cases. She wants to put 8 pencils in each case. How many pencils does Lindsay need?

The number of pencils Lindsay needs is represented by 4×8 . Find the product 4×8 .

One way to find 4×8 is to draw a diagram.

Draw 4 pencil cases with 8 pencils in each case.



You can count or add to find that there are 32 pencils.

Another way to find 4×8 is to multiply.

You can use a symbol for the unknown number to write a multiplication **equation** that relates the factors to the product. The **unknown** represents the number of pencils Lindsay needs. To find the value of the unknown number, solve the equation.

$$4 \times 8 = \square$$

$$4 \times 8 = 32$$

► Lindsay needs 32 pencils.

► Why can you multiply to solve this problem?

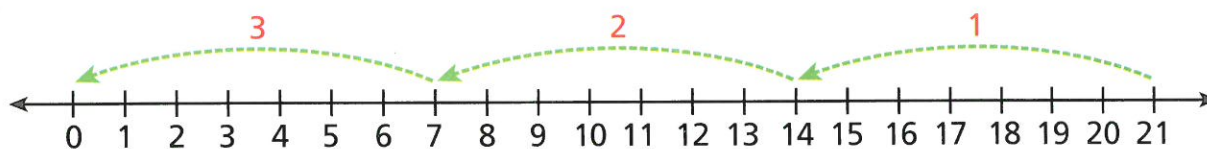
Guided Instruction

Understand: Using division to find the number of equal groups

Mr. Kane asks 21 students to form lines of 7 students each.
How many lines can the students form?

To solve, separate the 21 students into equal groups.

One way is to use a number line diagram. Start at 21. Draw jumps to show equal groups of 7 until you reach 0.



There are 3 equal groups of 7.

Another way is to divide.

$$21 \div 7 = \square$$

$$1 \div 7 = 3$$

Remember!

Using division to separate:
The number in all divided by the
number in each group is equal to
the number of groups.

➡ Mr. Kane's students can form 3 lines.

Understand: Using division to find the number in each group

Three children share 18 pieces of sidewalk chalk. How many pieces of chalk does each child get?

To solve, make 3 groups of equal shares.

One way is to use a diagram. Draw 3 boxes. Draw 1 line in each box, 1 at a time until you have drawn all 18 lines. Count the 6 lines in each box.



Another way is to divide.

$$18 \div 3 = \square$$

$$18 \div 3 = 6$$

➡ Each child gets 6 pieces of sidewalk chalk.

Remember!

Using division to share:
The number in all divided by the
number of groups is equal to the
number in each group.

Guided Instruction

Connect: What you know about multiplication and division to solve problems

Ms. Chavez uses the 4 windows in her bookstore to display 12 new books. She puts the same number of books in each window. How many books are in each window?

Step 1

Decide what information is known and what is unknown.

Known: the number of new books she has — 12
the number of windows she uses — 4

Unknown: the number of books in each window

Step 2

Use a diagram to represent the situation. First sketch the windows.

Now represent the 12 books in the 4 windows so that the same number of books is in each window.




Step 3

The diagram shows that you can write and solve a division equation to answer the question.

$$12 \div 4 = \square$$

$$12 \div 4 = \underline{\quad}$$

➡ There are _____ in each window.

 What multiplication fact is represented by your diagram of the 12 books in the 4 windows? Explain why the diagram can show both multiplication and division.

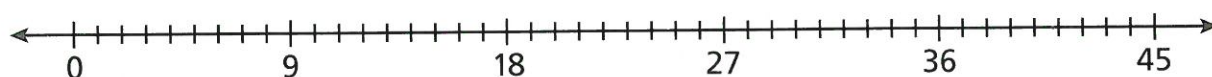
Guided Practice

1. Tony is making a picture frame. He needs 4 pieces of wood, each 9 inches long. How many inches of wood does Tony need in all?

4 times 9 inches equals how much?

$$4 \times 9 = \square$$

Use the number line. Represent the 4 pieces of wood, each 9 inches long.



Answer Tony needs ____ inches of wood.

2. Una and her four friends want to share 40 markers equally. How many markers will each person have?

40 markers shared equally by 5 persons is the unknown number of markers each person will have.

$$40 \div 5 = \square$$

Make 5 groups. Show how to share the 40 markers equally.



Answer Each person will have ____ markers.

Think • Pair • Share

- MP2** 3. Twenty-seven students sat in 3 rows of 9 chairs to watch a science video. Draw a diagram to represent the situation. Then explain how the diagram represents the two equations $3 \times 9 = 27$ and $27 \div 9 = 3$.

Independent Practice

In exercises 1–3, use the drawing to represent the problem. Then write an equation and solve.

- MP4** 1. Sandy buys 7 bags of pears. Each bag holds 4 pears. How many pears does Sandy buy in all?

 Show your work.

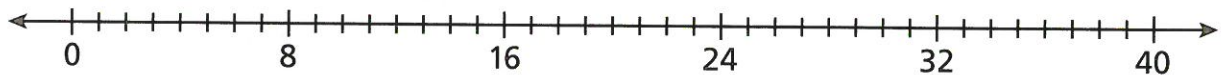


$$7 \times \underline{\quad} = \underline{\quad}$$

Answer Sandy buys $\underline{\quad}$ pears.

- MP5** 2. Joe is packing for a campout. He has 24 flashlight batteries. He puts 8 batteries each into some boxes. How many boxes does he use?

 Show your work.



$$24 \div \underline{\quad} = \underline{\quad}$$

Answer Joe uses $\underline{\quad}$ boxes.

Independent Practice

- MP4 3. Mrs. McGwin's students are planting flower seeds. If they plant 5 seeds in each of 8 flower pots, how many seeds do they plant in all?

 Show your work.



$$8 \times \underline{\quad} = 40$$

Answer They plant $\underline{\quad}$ seeds in all.


- MP1 4. The third grade class is selling baskets to raise money. The class has 15 baskets to sell.

- a. If the class sells 3 baskets each day, how many days will it take to sell all 15 baskets?

$$\square = 15 \div 3$$

$$\underline{\quad} = 15 \div 3$$

Answer It will take $\underline{\quad}$ days to sell all 15 baskets.


 Justify your answer using words or drawings.

- b. If the class sells 5 baskets each day, how many days will it take to sell all 15 baskets?

$$\bullet = 15 \div 5$$

$$\underline{\quad} = 15 \div 5$$

Answer It will take $\underline{\quad}$ days to sell all 15 baskets.

 Justify your answer using words or drawings.

Independent Practice

Solve the problems.

- MP2** 5. A group of 10 hikers takes 30 snack bars on their hike. If they share the snack bars equally, how many will each hiker get?

 **Show your work.**

Answer _____

- MP4** 6. A group of campers is using 7 rowboats for fishing. Three campers are in each boat. How many campers are fishing?

 **Show your work.**

Answer _____

- MP5** 7. A rubber band is 9 centimeters long. It is stretched to be 3 times as long. How long is the stretched rubber band?

 **Show your work.**

Answer _____

Independent Practice

- MP6 8.** Mr. Lee ran 35 miles this week. He runs every day from Monday through Friday but does not run on the weekend. This week he ran the same distance every day. How far did Mr. Lee run each day?

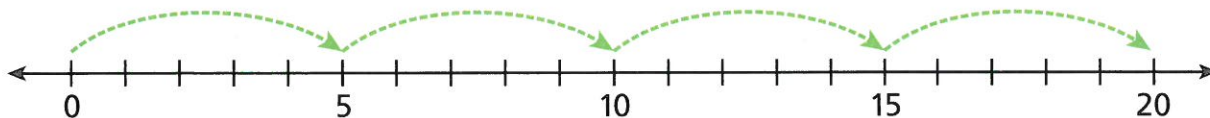
 **Show your work.**

Answer _____

- MP3 9.** Alexi drew this picture to show 3 bags with 4 oranges in each bag. What is wrong with Alexi's picture? Correct it.



- MP4 10.** Brie drew this number line to show 3 jumps of 5 inches each. What is wrong with Brie's picture? Correct it.



Problem Solving: Multiplication/Division and Arrays

Essential Question:
How can you use an array to solve a word problem?

3.OA.3

Words to Know:
array

Guided Instruction

In this lesson you will learn how to solve word problems using arrays.

Understand: Using arrays to solve problems

The trumpet players in the Youth Band march 6 in a row. When they march, they make 3 full rows. How many trumpet players are in the Youth Band?

To solve this problem, find 3×6 .

One way to find 3×6 is to use an array. An **array** is an arrangement of objects or symbols in equal rows and equal columns.

Use a dot to represent a band member.

Draw 3 rows of 6 dots.

Then add or count to find the total.

There are 18 dots.



Another way to find 3×6 is to use an equation. The equals sign in an equation shows that the two sides of the equation are equal.

■ = 3×6 ← ■ represents the value of 3×6 .

■ = 18 ← Multiply to find the value of ■.

➡ There are 18 trumpet players in the Youth Band.

Remember!

When you do not know the value of a number, use a ■ or other symbol to represent the number.

🗨️ Explain why you can use an array or an equation to solve the problem.

Guided Instruction

Understand: Representing problem situations with arrays

Mrs. Stanton uses 28 floor tiles to cover her kitchen floor. If the floor tiles are in rows of 7 each, how many rows are there?

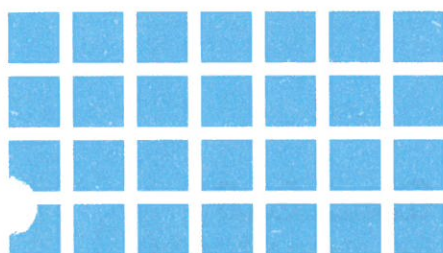
To find the unknown number of rows, find the number of groups of 7 in 28.

You can use an array to solve the problem.

Draw 28 squares to represent the tiles.

Put 7 squares in each row.

Count the number of rows.



You can also use division to find the unknown number of rows.

$$28 \div 7 = \blacksquare$$

$$28 \div 7 = 4$$

► The floor tiles are in 4 equal rows.

✏ Explain why the array can also represent this multiplication.

$$4 \times 7 = 28$$

Guided Instruction

Connect: What you know about representing and solving problems

Ms. Hardy's class has 27 students. Each time the students prepare to leave the classroom, they form 3 equal lines. How many students are in each line?

Step 1

Determine what is known and unknown.

Known: 27 students in all

Known: 3 equal lines of students

Unknown: number of students in each line

Step 2

Make an array to represent the problem.

Show 3 rows for the 3 lines.

Show a total of 27 symbols for the 27 students.



Remember!

Each row must have the same number of symbols.

Step 3

Count the symbols in each row.

There are ____ symbols in each row.

You can also use division to represent and solve the problem.

$$27 \div 3 = \underline{\quad}$$

➡ There are ____ students in each line.

✏️ What multiplication is represented by the array? Explain your thinking.

Guided Practice

Solve the problem. Use the array to help.

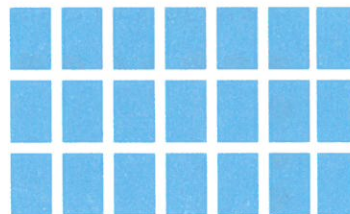
- Jarrold has a collection of 21 sports cards. He wants to share them equally among his 3 brothers. How many sports cards will each brother receive?

You can use division and an array to represent the problem.

$$21 \div 3 = \blacksquare$$

$$21 \div 3 = \underline{\quad}$$

Each brother will receive $\underline{\quad}$ sports cards.



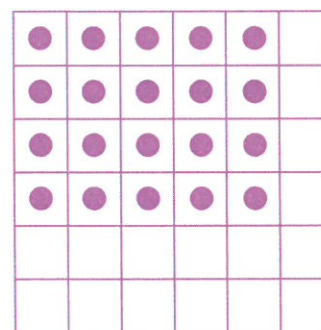
- Kayla has a collection of electronic games. She stores them in her game carrier in rows of 5 games each. If Kayla makes 4 rows, how many games are in her collection?

You can use multiplication and an array to represent the problem.

$$4 \times 5 = \blacksquare$$

$$4 \times 5 = \underline{\quad}$$

There are $\underline{\quad}$ games in her collection.



Think • Pair • Share

- MP4** 3. Draw an array to represent 6×8 . Then write a word problem that can be solved by finding 6×8 .

Independent Practice

Use an array to represent the problem. Then solve.

- MP4** 1. You are setting up 56 chairs for the class play. If you arrange the chairs in 7 rows, how many chairs will be in each row?

$$56 \div 7 = \square$$

Draw dots to complete an array that represents the problem.



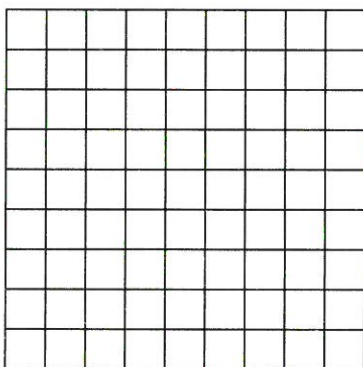
$$56 \div 7 = \underline{\quad}$$

Answer $\underline{\quad}$ chairs will be in each row.

- MP1** 2. The Ross High School band marches in 6 rows. There are 7 students in each row. How many students are in the band?

$$6 \times 7 = \square$$

Draw dots in this grid to make an array that represents the problem.



$$6 \times 7 = \underline{\quad}$$

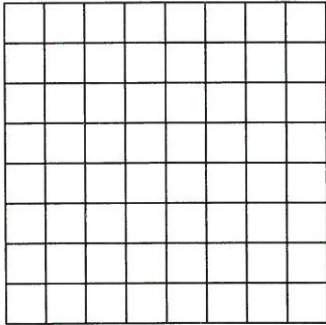
Answer There are $\underline{\quad}$ students in the band.

Independent Practice

- MP7** 3. Lauren has 24 trading cards. She is putting them in an album with the same number of cards on each page. She uses 6 pages for the cards. How many cards are on each page?

$$24 \div 6 = \square$$

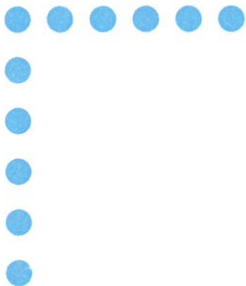
Use dots in this grid to show the array for this problem.



$$24 \div 6 = \underline{\quad}$$

Answer Each page of the album has cards.

- +** 4. The school cafeteria buys eggs in cartons. If a carton has 6 rows of 6 eggs, how many eggs are in a carton?



$$6 \times 6 = \square$$

Answer There are eggs in a carton.

- MP2** 5. Which multiplication or division is NOT shown by this array?



a. $3 \times 7 = 21$

b. $7 \times 3 = 21$

c. $21 \div 7 = 3$

d. $21 \times 3 = 7$

Independent Practice

Use an array and multiplication or division to solve problems 6–8.

- MP4** 6. Chad's mother made a quilt that is shaped like a rectangle. The quilt has 6 squares across and 3 squares down. How many squares are in the quilt?

 **Show your work.**

Answer _____

- MP1** 7. The neighborhood garden has 56 plants. If there are 7 plants in each row, how many rows of plants are there?

 **Show your work.**

Answer _____

- MP5** 8. There are 28 students in the choir. If they stand in 4 equal rows, how many students are in each row?

 **Show your work.**

Answer _____

Independent Practice

- MP5 9. Write a problem that can be solved by using this array.



- MP4 10. Draw as many arrays as you can to represent the product 16.
How many different arrays can you draw?

- MP2 11. Stella drew this array to represent 6 groups of 2 students.
What is wrong with Stella's array? Correct it.



Find Unknown Numbers in Multiplication and Division Equations

Essential Question:
How can you use multiplication and division equations to find an unknown number?

3.OA.4

Guided Instruction

In this lesson, you will learn how to find the value of an unknown number in a multiplication or division equation.

Understand: Finding unknown numbers in multiplication equations

How can you find an unknown number in a multiplication equation?

The numbers in a multiplication equation are related. You can rewrite a multiplication equation as a division equation.

$$\text{factor} \times \text{factor} = \text{product} \quad \text{product} \div \text{factor} = \text{factor}$$

When you find the value of the unknown number, you make the equation true because both sides are equal. There are two ways to find an unknown number in a multiplication equation.

Find an unknown first factor. $\square \times 4 = 12$

1. Use a multiplication you know.

What number times 4 equals 12?

$$\square \times 4 = 12$$

$$3 \times 4 = 12$$

$$\square = 3$$

2. Divide the product by the known factor.

$$12 \div 4 = \square$$

$$12 \div 4 = 3$$

$$\square = 3$$

Find an unknown second factor. $3 \times \square = 12$

1. Use a multiplication you know.

3 times what number equals 12?

$$3 \times \square = 12$$

$$3 \times 4 = 12$$

$$\square = 4$$

2. Divide the product by the known factor.

$$12 \div 3 = \square$$

$$12 \div 3 = 4$$

$$\square = 4$$

Find an unknown product. $3 \times 4 = \square$

1. Multiply the factors.

$$3 \times 4 = \square$$

$$3 \times 4 = 12$$

$$\square = 12$$

2. Use a division you know.

$$\square \div 4 = 3$$

$$12 \div 4 = 3$$

$$\square = 12$$

► You can use multiplication or division to find an unknown number in a multiplication equation.

Guided Instruction

Understand: Finding unknown numbers in division equations

How can you find the value of an unknown number in a division equation?

A division equation relates a dividend, a divisor, and a quotient. You can rewrite a division equation as a multiplication equation.

$$\text{dividend} \div \text{divisor} = \text{quotient}$$

$$\text{quotient} \times \text{divisor} = \text{product}$$

There are two ways to find an unknown number in a division equation. You can use a letter instead of a \blacksquare to represent an unknown number.

Find an unknown dividend. $n \div 4 = 3$

1. Use a division you know.

What number divided by 4 equals 3?

$$n \div 4 = 3$$

$$12 \div 4 = 3$$

$$n = 12$$

2. Multiply the quotient by the divisor.

$$3 \times 4 = n$$

$$3 \times 4 = 12$$

$$n = 12$$

Find an unknown divisor. $12 \div n = 3$

1. Use a division you know.

12 divided by what number equals 3?

$$12 \div n = 3$$

$$12 \div 4 = 3$$

$$n = 4$$

2. Use a multiplication you know.

$$3 \times n = 12$$

$$3 \times 4 = 12$$

$$n = 4$$

Find an unknown quotient. $12 \div 3 = n$

1. Divide.

$$12 \div 3 = n$$

$$12 \div 3 = 4$$

$$n = 4$$

2. Use a multiplication you know.

$$n \times 3 = 12$$

$$4 \times 3 = 12$$

$$n = 4$$

► You can use multiplication or division to find an unknown number in a division equation.

► Explain what it means to find the value of an unknown number in a division equation.

Guided Instruction

Connect: What you know about multiplication and division equations to solve word problems

At the craft fair, a large basket costs \$28. This is 4 times as much as a small basket costs.

How much does a small basket cost?

To solve the problem, find the number that 28 is 4 times as much as.


Step 1

Write an equation to represent the problem.

4 times the cost of a small basket equals \$28

$$4 \times s = 28$$

Remember!

You can use a  or a letter to represent an unknown number.

Step 2

Find the factor that makes the equation true. You can use multiplication or division.

Use a multiplication that you know.

$$4 \times s = 28$$

$$4 \times \underline{\quad} = 28$$

Or, divide.

$$s = 28 \div 4$$

$$\underline{\quad} = 28 \div 4$$

► A small basket costs \$7.

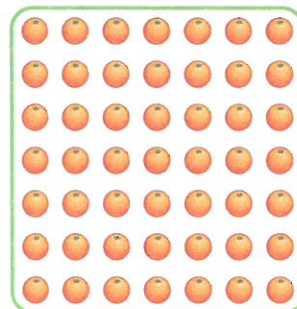
 $a \times 5 = 40$

Describe two ways to find the unknown number.

Guided Practice

1. Each box of oranges at the supermarket has 7 rows of oranges with 7 oranges in each row. How many oranges are there altogether?

Write an equation to represent the problem. Then solve to find the unknown number of oranges.



How many oranges are in 7 rows of 7 oranges each?

$$o = \underline{\quad} \times \underline{\quad}$$

$$o = \underline{\quad}$$

There are $\underline{\quad}$ oranges altogether.

2. One bag has 36 dog treats. If the treats are shared equally among 9 dogs at the park, how many treats will each dog get?

How many treats times 9 dogs equals 36?

Write an equation to represent the problem. Find the unknown number that makes the equation true.

$$t \times \underline{\quad} = \underline{\quad}$$

$$\underline{\quad} \times \underline{\quad} = \underline{\quad}$$

Each dog will get $\underline{\quad}$ treats.

Use the same numbers to write a division equation that is true.

$$\underline{\quad} \div \underline{\quad} = \underline{\quad}$$

Think•Pair•Share

- MP2 3. What number makes the equation true?

$$18 \div 6 = \underline{\quad}$$

What multiplication could you use to check? Explain why you can use multiplication to check division?

Independent Practice

Write the unknown number to complete the equation.

1. $3 \times 5 = \underline{\quad}$

2. $6 \times 9 = \underline{\quad}$

3. $5 \times \underline{\quad} = 25$

4. $4 \times \underline{\quad} = 28$

5. $\underline{\quad} \times 3 = 9$

6. $\underline{\quad} \times 4 = 32$

Write a related division equation to find the unknown number.
Then complete the division equation.

7. $2 \times \blacksquare = 12$



$12 \div \underline{\quad} = \blacksquare$

$12 \div \underline{\quad} = \underline{\quad}$

8. $7 \times \blacksquare = 70$



$\underline{\quad} \div \underline{\quad} = \blacksquare$

$\underline{\quad} \div \underline{\quad} = \underline{\quad}$

9. $\blacksquare \times 8 = 48$



$\underline{\quad} \div 8 = \blacksquare$

$\underline{\quad} \div 8 = \underline{\quad}$

10. $\blacksquare \times 4 = 24$



$\underline{\quad} \div \underline{\quad} = \blacksquare$

$\underline{\quad} \div \underline{\quad} = \underline{\quad}$

11. $5 \times t = 30$



$\underline{\quad} \div \underline{\quad} = t$

$\underline{\quad} \div \underline{\quad} = \underline{\quad}$

12. $c \times 9 = 81$



$\underline{\quad} \div \underline{\quad} = c$

$\underline{\quad} \div \underline{\quad} = \underline{\quad}$

Independent Practice

13. Which multiplication equation could you use to find the unknown number?

$$8 \times \square = 56$$

a. $7 \times 7 = 49$

b. $8 \times 7 = 56$

c. $8 \times 8 = 64$

d. $8 \times 9 = 72$

14. Which division equation could you use to find the unknown number?

$$3 \times n = 18$$

a. $18 \div 2 = 9$

b. $18 \div 9 = 2$

c. $18 \div 1 = 18$

d. $18 \div 3 = 6$

15. Which division equation could you use to find the unknown number?

$$63 = y \times 7$$

a. $70 \div 7 = 10$

b. $64 \div 8 = 8$

c. $63 \div 7 = 9$

d. $60 \div 6 = 10$

Find the unknown number.

16. $4 \times \square = 12$

 Show your work.

$$\square = \underline{\quad}$$

17. $36 = \square \times 6$

 Show your work.

$$\square = \underline{\quad}$$

Independent Practice

- MP6 18.** Tell how you would find the unknown number that makes the equation true. Then solve.

$$r \times 6 = 54$$

$$\underline{\hspace{1cm}} \times 6 = 54$$

- MP6 19.** Tell how you would find the unknown number that makes the equation true. Then find the unknown number.

$$72 \div \blacksquare = 8$$

$$72 \div \underline{\hspace{1cm}} = 8$$

Solve the problems.

- MP4 20.** Thirty-five nickels are shared equally among 5 friends. How many nickels does each friend get?

 **Show your work.**

Answer _____

- MP1 21.** At the toy store, a small plush animal costs \$8. A large plush animal costs 2 times as much as a small one. How much does a large plush animal cost?

 **Show your work.**

Answer _____

Independent Practice

- MP5 22.** At the school concert, 64 singers stand in equal rows of 8. How many rows of singers are there? What equation can help you solve the problem?

 **Show your work.**

Answer _____

- MP2 23.** Wei-Yin says that for the equation $30 = \square \times 3$, the unknown factor is 9. Is he correct?

Answer _____

 **Justify your answer using words, drawings, or numbers.**

- MP3 24.** Maura says that for the equation $6 \times a = 48$, $a = 8$. Is she correct?

Answer _____

 **Justify your answer using words, drawings, or numbers.**

Apply Commutative and Associative Properties to Multiply

Essential Question:

How can you use properties of multiplication?

3.OA.5

Words to Know:

property
Commutative Property of Multiplication
parentheses
Associative Property of Multiplication

Guided Instruction

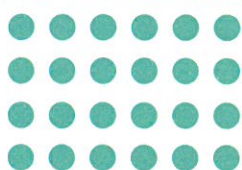
In this lesson you will learn how to use two properties of multiplication.

Understand: Two numbers can be multiplied in any order

The students in Ms. Ward's class sit in 4 rows of 6. The students in Mr. Rao's class sit in 6 rows of 4. Which class has more students?

To find which class has more students, multiply to find the number of students in each class. Then compare.

Ms. Ward's Class



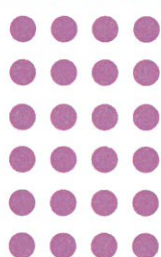
4 rows of 6

$$4 \times 6$$

$$4 \times 6 = 24$$

factors product

Mr. Rao's Class



6 rows of 4

$$6 \times 4$$

$$6 \times 4 = 24$$

factors product

Notice that both products are the same. If you know $4 \times 6 = 24$, then you also know $6 \times 4 = 24$.

➡ There are 24 students in each class.

When you multiply, the order of the factors does not matter.

The product is the same. This is a **property**, or rule, of multiplication.

It is called the **Commutative Property of Multiplication**. Some people call it the Order Property.

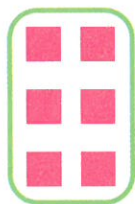
✏️ • How does the Commutative Property explain why 2×3 and 3×2 have the same product?

Guided Instruction

Understand: Three factors can be grouped in different ways

At a shirt factory, 2 shirts are put in each package. Three packages are put in each box. Two boxes of packages of shirts are delivered to Ms. Roman's store. How many shirts are in the delivery to Ms. Roman's store?

To find the number of shirts in all, multiply $2 \times 3 \times 2$. Use an array to show 2 groups of 3 rows of 2.



← The array shows 2 groups of 3 rows of 2.

You can group three factors in two different ways to find the product. Put parentheses around the two factors you group together. This shows that you multiply them first.

$$\begin{array}{l} 2 \times 3 \times 2 = \blacksquare \\ (2 \times 3) \times 2 = \blacksquare \\ \downarrow \\ 6 \times 2 = \blacksquare \\ 6 \times 2 = 12 \end{array}$$

$$\begin{array}{l} 2 \times 3 \times 2 = \blacksquare \\ 2 \times (3 \times 2) = \blacksquare \\ \downarrow \\ 2 \times 6 = \blacksquare \\ 2 \times 6 = 12 \end{array}$$

When you multiply three factors, you can group them in two different ways. The product is the same.

This is the Associative Property of Multiplication. Some people call it the Grouping Property.

► There are 12 shirts in the delivery to Ms. Roman's store.

When you use the Associative Property, you may not change the order of the factors. To do that, you must use the Commutative Property.

• Show how to group the factors $2 \times 1 \times 5$ in two different ways to find their product.

You can use a property of multiplication to rewrite a multiplication. Tell what the property means and what it lets you do.

The product is _____.

$$3 \times 2 \times 1 = (\underline{\quad} \times 2) \times 1 \quad \underline{\hspace{2cm}}$$

Guided Practice

Draw lines to match the multiplications with the same product.

1. 3×4

a. 9×2

2. $5 \times 6 \times 7$

b. $2 + 4 \times 8$

3. $2 \times 4 \times 8$

c. 4×3

4. 2×9

d. $(2 \times 4) \times 8$

e. $5 \times (6 \times 7)$

5. Use the Associative Property. Show two ways to find the product.

$$3 \times 3 \times 2 = \square$$

$$(3 \times 3) \times 2 = \square$$

$$\begin{array}{c} \downarrow \quad \downarrow \\ \square \times 2 = \square \end{array}$$

$$\square \times 2 = \square$$

$$3 \times 3 \times 2 = \square$$

$$3 \times (3 \times 2) = \square$$

$$\begin{array}{c} \downarrow \quad \downarrow \\ 3 \times \square = \square \end{array}$$

$$3 \times \square = \square$$

Answer The product is ____.

Think-Pair-Share

- MP3** 6. Max said he used only the Associative Property to group $3 \times 5 \times 2$ in the three ways shown at the right. Is Max's work correct? Explain your answer.

$$\begin{array}{l} (3 \times 5) \times 2 \\ 3 \times (5 \times 2) \\ (3 \times 2) \times 5 \end{array}$$

Independent Practice

Complete the equations. Circle the name of the property you used.

1. $5 \times 1 \times 9 = 5 \times (1 \times \underline{\quad})$

Commutative Property

Associative Property

2. $9 \times 6 = \underline{\quad} \times 9$

Commutative Property

Associative Property

For exercises 3–6, find each product.

3. $2 \times (2 \times 4) =$

$2 \times \underline{\quad} = \underline{\quad}$

4. $(3 \times 2) \times 5 =$

$\underline{\quad} \times 5 = \underline{\quad}$

5. $6 \times (2 \times 3) =$

$6 \times \underline{\quad} = \underline{\quad}$

6. $(2 \times 2) \times 7 =$

$\underline{\quad} \times 7 = \underline{\quad}$

For exercises 7 and 8, use the Commutative Property. Find each unknown product.

7. $1 \times 7 = 7$

$7 \times 1 = \underline{\quad}$

8. $8 \times 5 = 40$

$5 \times 8 = \underline{\quad}$

- MP3** 9. Stacy says that $(3 \times 5) \times 4 = 3 \times (5 \times 4)$. Is Stacy correct? What property helps you decide?

 **Show your work.**

Independent Practice

Find the product. You can use the Associative Property to group the factors.

10. $5 \times 2 \times 3 = \blacksquare$

11. $3 \times 2 \times 3 = \blacksquare$

$5 \times 2 \times 3 = \underline{\quad}$

$3 \times 2 \times 3 = \underline{\quad}$

12. $6 \times 1 \times 2 = \blacksquare$

13. $2 \times 2 \times 3 = \blacksquare$

$6 \times 1 \times 2 = \underline{\quad}$

$2 \times 2 \times 3 = \underline{\quad}$

14. Which of the following is the same as 3×7 ?

a. 3×3

b. 3×6

c. 7×3

d. $7 \times 2 \times 3$

15. Which of the following is the same as $(4 \times 9) \times 3$?

a. $4 \times (9 \times 3)$

b. $4 \times (9 \times 2)$

c. $(4 \times 8) \times 3$

d. $(3 \times 9) \times 3$

Independent Practice

- MP6 16.** Explain why you can use the multiplication fact $7 \times 9 = 63$ to find the product of 9×7 . Then find the product.

$$9 \times 7 = \underline{\hspace{2cm}}$$

- MP6 17.** Explain how you could group $3 \times 2 \times 5$ to multiply. Then find the product.

$$3 \times 2 \times 5 = \underline{\hspace{2cm}}$$

Solve the problems.

- MP1 18.** Six groups of 8 students are visiting the science museum. How many students are at the museum?

 **Show your work.**

Answer _____

Independent Practice

- MP4 19. a.** There are 5 shelves on a bookshelf. Each shelf holds 9 books. How many books are there in all?

Answer _____

- b.** There are 9 shelves on a bookshelf. Each shelf holds 5 books. How many books are there in all?

Answer _____

- c.** Compare the answers to parts a and b. Explain your results.

Answer _____

- MP8 20.** Mr. Smith buys 3 cartons of eggs for his café. Each carton has 2 rows. There are 4 eggs in each row. How many eggs does Mr. Smith buy? Explain your thinking.

 **Show your work.**

Answer _____

- MP7 21.** Jillian packs 6 gift mugs in each of 8 small boxes. Aaron packs 8 gift mugs in each of 6 large boxes. Compare the number of mugs they pack.

Answer _____

 **Justify your answer using words, drawings, or numbers.**

Apply the Distributive Property to Multiply

Essential Question:
How can you break apart numbers to rewrite multiplication problems?

3.OA.5

Words to Know:
Distributive Property

Guided Instruction

In this lesson you will learn about another property of multiplication.

Understand: Breaking apart numbers to multiply

Bart has 7 packages of pencils. Each package has 6 pencils.
How many pencils does Bart have?

To find the total number of pencils, multiply 7×6 .

One way to show 7 packages of 6 pencils each is to use an array.

The meaning of multiplication tells you that the number of groups times the number in each group is equal to the number in all.

Draw 7 groups of 6.

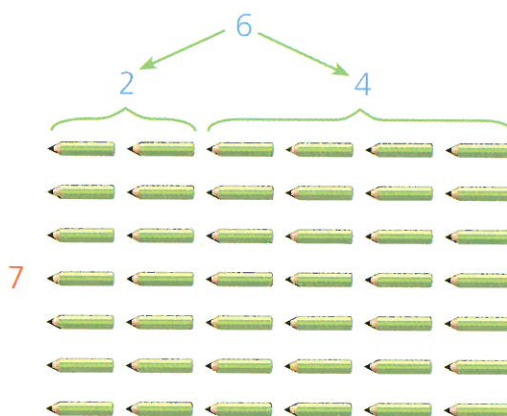
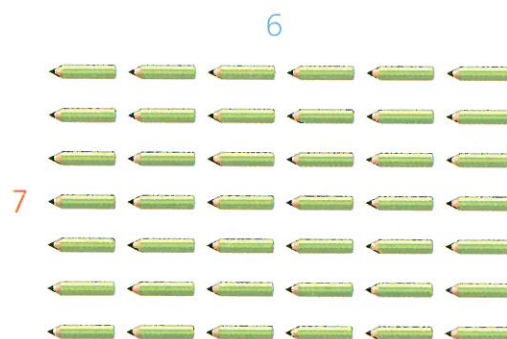
If you do not remember the product for 7×6 , you can add $6 + 6 + 6 + 6 + 6 + 6 + 6$.

Another way to find the product is to use multiplication facts you know. You can show one of the factors as a sum. Break apart the factor 6 into $2 + 4$. Change the array to show 7 groups of 2 and 7 groups of 4.

Multiply 7×2 and 7×4 and then add the products.

$$\begin{array}{rcl} 7 \times 2 = 14 & 7 \times 4 = 28 & \\ & \swarrow \quad \searrow & \\ & 14 + 28 = 42 & \end{array}$$

➡ Bart has 42 pencils in all.



Guided Instruction

Understand: Using parentheses with the Distributive Property

Roger has 7 boxes of apples. Each box holds 9 apples.
How many apples does Roger have in all?

To solve, find 7×9 .

To find the product of 7×9 , break apart the factor 9 into the sum of the addends $5 + 4$.
Use parentheses to show the sum of the addends.
Parentheses show numbers that belong together.

$$7 \times 9 = 7 \times (5 + 4)$$

Multiply each addend by 7 and then add the products. Now you use parentheses to show the factors that you will multiply.

$$\begin{aligned} 7 \times 9 &= 7 \times (5 + 4) \\ &= (7 \times 5) + (7 \times 4) \\ &\quad \downarrow \quad \quad \downarrow \\ &\quad 35 \quad + \quad 28 \\ &\quad \quad \quad \downarrow \\ &\quad \quad \quad 63 \end{aligned}$$

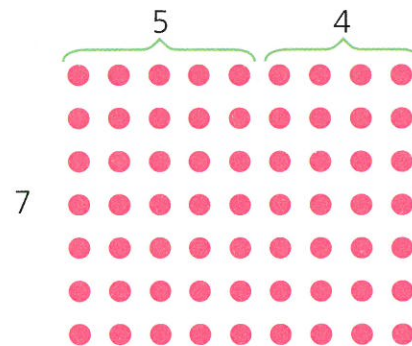
When you multiply a factor by a sum of two addends, you multiply the factor by each of the addends.

$$7 \times 9 = 63$$

➡ Roger has 63 apples in all.

When you break apart a factor so that you can add two simpler multiplications to find a product, you are using the **Distributive Property**.

✏️ How could you use what you just learned about breaking apart one factor to find the product of 7×9 another way?



Guided Instruction

Connect: Using the Distributive Property to find a product

Katya has 9 playlists on her phone. Each playlist has 4 country songs. How many country songs does Katya have in all?

To find the number of country songs Katya has, multiply 9×4 . You can use the Distributive Property to rewrite 9×4 as two simpler multiplications. To do this, break apart the factor 9 or the factor 4.

One way to break apart the factor 4 is into $2 + 2$.

$$\begin{aligned}
 9 \times 4 &= 9 \times (2 + 2) \\
 &= (9 \times 2) + (9 \times 2) \\
 &\quad \downarrow \qquad \downarrow \\
 &\quad 18 \quad + \quad 18 \\
 &\quad \swarrow \quad \searrow \\
 &\quad \quad \quad \text{---}
 \end{aligned}$$

One way to break apart the factor 9 is into 3 and 6.


$$\begin{aligned}
 9 \times 4 &= (3 + 6) \times 4 \\
 &= (3 \times 4) + (6 \times 4) \\
 &\quad \downarrow \qquad \downarrow \\
 &\quad 12 \quad + \quad 24 \\
 &\quad \swarrow \quad \searrow \\
 &\quad \quad \quad \text{---}
 \end{aligned}$$

Whichever factor you break apart, the final product is the same.

$$9 \times 4 = 36$$

➡ Katya has 36 country songs in all.

You can use the Distributive Property to rewrite a multiplication as two simpler multiplications.

 You can break apart the factors of 9×4 in other ways. Use the Distributive Property to show two or more other ways.

Guided Practice

1. Use the array to find the product of 4×7 . Break apart the factor 7.

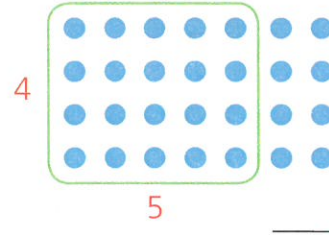
$$4 \times 7 = 4 \times (5 + \square)$$

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

$$4 \times 5 = \underline{\quad} \quad 4 \times 2 = \underline{\quad}$$

$$\underline{\quad} + \underline{\quad} = \underline{\quad}$$

$$4 \times 7 = \underline{\quad}$$



2. Use the Distributive Property to find the product of 7×5 .
The array may help.

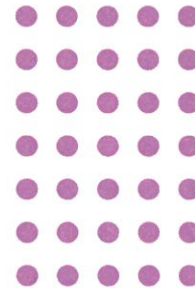
$$7 \times 5 = (\square + 4) \times 5$$

$$(3 + 4) \times 5 = (3 \times 5) + (4 \times 5)$$

$$3 \times 5 = \underline{\quad} \quad 4 \times 5 = \underline{\quad}$$

$$\underline{\quad} + \underline{\quad} = \underline{\quad}$$

$$7 \times 5 = \underline{\quad}$$



3. Use the Distributive Property to find 8×6 . Draw an array if it helps.

$$8 \times 6 = (\underline{\quad} + \underline{\quad}) \times 6$$

$$8 \times 6 = (\underline{\quad} \times 6) + (\underline{\quad} \times 6)$$

$$8 \times 6 = \underline{\quad} + \underline{\quad}$$

$$8 \times 6 = \underline{\quad}$$

Think•Pair•Share

- MP7 4. Show two ways you could use the Distributive Property to find 5×9 .
Explain why the products are the same for each way.

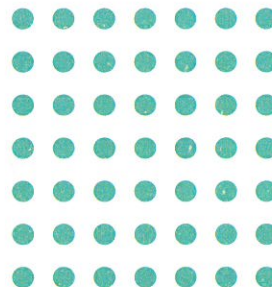
Independent Practice

In exercises 1 and 2, break apart the array. Then show how to use the Distributive Property to find the product.

1. $6 \times 9 = \blacksquare$



2. $7 \times 7 = \blacksquare$



$6 \times 9 = \underline{\hspace{2cm}}$

$7 \times 7 = \underline{\hspace{2cm}}$

3. Which of the following is the same as 12×6 ?
- a. $(9 \times 4) + (3 \times 2)$ b. $(8 \times 6) + (4 \times 6)$
 c. $(3 \times 4) + (3 \times 2)$ d. $6 \times (3 + 4)$
4. Choose all of the following that are the same as $(4 \times 3) + (4 \times 5)$.
- a. 8×8 b. $4 \times (3 + 5)$
 c. 4×8 d. $4 \times (3 \times 5)$
5. Choose all of the following that have the same total as $(3 \times 5) + (3 \times 6)$.
- a. $3 \times (7 + 4)$ b. 6×11
 c. $3 \times (10 + 1)$ d. 3×11

Independent Practice

Draw lines to match.

6. 6×9

a. $(5 \times 8) + (2 \times 8)$

7. 7×8

b. $(7 \times 4) + (2 \times 4)$

8. 5×7

c. $(5 \times 4) + (1 \times 4)$

9. 9×4

d. $6 \times (6 + 3)$

10. 6×4

e. $(6 \times 2) + (3 \times 2)$

f. $5 \times (5 + 2)$

Find each product.

11. $7 \times 5 = 7 \times (3 + 2)$

$= (7 \times 3) + (7 \times \underline{\quad})$

$\underline{\quad} + \underline{\quad} = \underline{\quad}$

$7 \times 5 = \underline{\quad}$

12. $6 \times 6 = (6 \times 3) + (6 \times \underline{\quad})$

$\underline{\quad} + \underline{\quad} = \underline{\quad}$

$6 \times 6 = \underline{\quad}$

13. $8 \times 3 = (2 \times 3) + (\underline{\quad} \times 3)$

$\underline{\quad} + \underline{\quad} = \underline{\quad}$

$8 \times 3 = \underline{\quad}$

14. $9 \times 8 = (9 \times 5) + (9 \times \underline{\quad})$

$\underline{\quad} + \underline{\quad} = \underline{\quad}$

$9 \times 8 = \underline{\quad}$

Independent Practice

- 15.** Write two ways to find the product of 5×8 .
Use the Distributive Property.

$$5 \times 8 = \underline{\hspace{2cm}}$$

Solve the problems.

- MP4 16.** Vera bought 8 cans of tennis balls.
Each can has 3 tennis balls.
How many tennis balls did Vera buy?

 **Draw an array to justify your answer.**

Answer _____

- MP4 17.** Bill planted 3 rows of pepper plants in his vegetable garden. He planted 7 plants in each row. How many pepper plants did Bill plant?
Draw an array to model the pepper plants in Bill's garden.

 **Show your work.**

Answer _____

- MP6 18.** Jason buys 8 cartons of oranges. Each carton has 6 oranges in it.
How many oranges does Jason buy altogether?

 **Show your work.**

Answer _____

Independent Practice

- MP7 19.** Evan thinks that 9×8 is the same as $(9 \times 4) + (9 \times 4)$.
Is he correct?

Answer _____

 **Justify your answer using words, drawings, or numbers.**

- MP3 20.** Show how to use the Distributive Property to find 6×11 .

- MP7 21.** Lauren says that $(4 \times 3) + (2 \times 3)$ is the same as 6×6 .
Is she correct?

Answer _____

 **Justify your answer using words, drawings, or numbers.**

Divide by Finding an Unknown Factor

Essential Question:
How can you use what you know about how multiplication and division are related to divide?

3.OA.6

Words to Know:
fact family

Guided Instruction

In this lesson you will divide using a related multiplication to find an unknown factor.

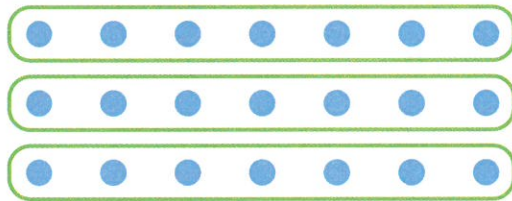
Understand: Multiplication and division fact families

Three students are making a large poster. Ms. Peters gives them 21 markers to share equally. How many markers does each student get?

To find how many markers each student gets, divide $21 \div 3$.

One way to find $21 \div 3$ is to use an array.

Draw 21 dots in 3 equal rows.



Count to see that there are 7 dots in each row.

Another way to find $21 \div 3$ is to find the value of an unknown factor.

You can use a fact family to find the value of an unknown factor. A fact family shows related multiplication and division facts.

3 times **what number** is equal to 21? Think of a multiplication fact with 21 and 3.

$3 \times \square = 21$ \square is an unknown factor.

$3 \times 7 = 21$ 7 is the unknown factor.

$21 \div 3 = 7$ Use the unknown factor to divide.

Each student gets 7 markers.

Fact Family for 3, 7, and 21:

$3 \times 7 = 21$ $7 \times 3 = 21$

$21 \div 3 = 7$ $21 \div 7 = 3$

What fact family can you use to find an unknown factor to divide $72 \div 8$?

Guided Instruction

Understand: Using a fact family to find an unknown factor

Sixteen students are on a field trip. The teacher groups them into pairs. How many pairs of students are there?

To find how many pairs, you can divide 16 by 2.

You can use related multiplication facts to solve division problems.

Remember!

A pair is equal to 2.

$$\begin{array}{ccccccc} 16 & \div & 2 & = & \square \\ \uparrow & & \uparrow & & \uparrow \\ \text{number} & & \text{number} & & \text{number} \\ \text{in all} & & \text{in} & & \text{of groups} \\ & & \text{each group} & & \end{array}$$

Think: What number times 2 makes 16?

$$\begin{array}{ccccccc} \square & \times & 2 & = & 16 \\ \uparrow & & \uparrow & & \uparrow \\ \text{number} & & \text{number} & & \text{number} \\ \text{of groups} & & \text{in} & & \text{in all} \\ & & \text{each group} & & \end{array}$$

You can use the fact family for 2, 8, and 16 to help solve the problem.

$$\begin{array}{ll} 2 \times 8 = 16 & 8 \times 2 = 16 \\ 16 \div 2 = 8 & 16 \div 8 = 2 \end{array}$$

Find the unknown factor in the multiplication.

$$\square \times 2 = 16$$

Use the unknown factor to complete the related division.

$$16 \div 2 = 8$$

➡ There are 8 pairs of students.

✏ Why does finding an unknown factor help you divide?

Guided Instruction

Connect: Division equations and finding an unknown factor

Lana wants to store 36 trading cards in plastic sleeves. Each plastic sleeve can hold 4 trading cards. How many plastic sleeves will Lana need?

Step 1

Write a division equation to represent the problem.

$$36 \div 4 = a$$

Remember!

You can use a letter to represent an unknown number.

Step 2

Think: What number times 4 is equal to 36?

Write the related multiplication.

$$a \times 4 = 36$$

Step 3


Find the value of the unknown factor in the multiplication.

$$\underline{\quad} \times 4 = 36$$

Then complete the related division.

$$36 \div 4 = \underline{\quad}$$

➡ Lana needs 9 plastic sleeves.

 Choose a multiplication fact you know. Write the other related multiplication and divisions in the fact family. Explain why they are related.

Guided Practice

Complete each fact family.

1. $3 \times 7 = 21$ $21 \div 7 = \underline{\quad}$ 2. $\underline{\quad} \times 5 = 15$ $15 \div 5 = \underline{\quad}$
 $\underline{\quad} \times 3 = 21$ $21 \div 3 = \underline{\quad}$ $\underline{\quad} \times 3 = 15$ $15 \div 3 = \underline{\quad}$
3. $7 \times \underline{\quad} = 56$ $56 \div 8 = \underline{\quad}$ 4. $\underline{\quad} \times \underline{\quad} = 64$ $64 \div 8 = \underline{\quad}$
 $8 \times \underline{\quad} = 56$ $56 \div 7 = \underline{\quad}$

Solve the problem.

5. The soccer team orders two pizzas with a total of 20 slices. There are 10 players on the team. How many slices will each player get?



This division equation represents the problem.

$$20 \div 10 = s$$

Write a related multiplication equation.

$$\underline{\quad} \times s = \underline{\quad}$$

Find the unknown factor.

$$10 \times \underline{\quad} = 20$$

Then complete the related division. $20 \div 10 = \underline{\quad}$

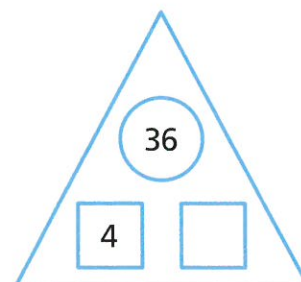
Complete the fact family for 2, 10, and 20.

$$\begin{array}{ll} \underline{\quad} \times 10 = 20 & 20 \div 10 = \underline{\quad} \\ \underline{\quad} \times 2 = 20 & 20 \div 2 = \underline{\quad} \end{array}$$

Answer Each player will get $\underline{\quad}$ slices.

Think-Pair-Share

- MP7 6. Amy makes triangles to show multiplication and division fact families. Complete the fact family triangle for 4, 9, and 36. How can you use the triangle to help you multiply and divide?



Independent Practice

Complete each fact family.

1. $\underline{\quad} \times \underline{\quad} = 42$

$\underline{\quad} \times \underline{\quad} = 42$

$42 \div 7 = \underline{\quad}$

$42 \div 6 = \underline{\quad}$

2. $\underline{\quad} \times \underline{\quad} = 27$

$\underline{\quad} \times \underline{\quad} = 27$

$27 \div 9 = \underline{\quad}$

$27 \div 3 = \underline{\quad}$

3. $\underline{\quad} \times \underline{\quad} = 40$

$\underline{\quad} \times \underline{\quad} = 40$

$40 \div 8 = \underline{\quad}$

$40 \div 5 = \underline{\quad}$

4. $\underline{\quad} \times \underline{\quad} = 63$

$\underline{\quad} \times \underline{\quad} = 63$

$63 \div 9 = \underline{\quad}$

$63 \div 7 = \underline{\quad}$

To divide, find the unknown factor.

5. $42 \div 7 = \blacksquare$



What number times 7 equals 42?

$\underline{\quad} \times 7 = 42$

$42 \div 7 = \underline{\quad}$

6. $64 \div 8 = \blacksquare$



What number times 8 equals 64?

$\underline{\quad} \times 8 = 64$

$64 \div 8 = \underline{\quad}$

7. $63 \div 7 = \blacksquare$



What number times 7 equals 63?

$\underline{\quad} \times 7 = 63$

$63 \div 7 = \underline{\quad}$

8. $50 \div 10 = \blacksquare$



What number times 10 equals 50?

$\underline{\quad} \times 10 = 50$

$50 \div 10 = \underline{\quad}$

Independent Practice

9. Which multiplication fact could you use to find the unknown number?

$$36 \div 9 = \blacksquare$$

a. $4 \times 8 = 32$

b. $5 \times 7 = 35$

c. $4 \times 9 = 36$

d. $5 \times 9 = 45$

10. Which multiplication fact could you use to find n ?

$$24 \div 3 = n$$

a. $7 \times 3 = 21$

b. $8 \times 3 = 24$

c. $9 \times 3 = 27$

d. $10 \times 3 = 30$

For exercises 11 and 12, find the unknown number.

11. $63 \div 7 = m$



Show your work.

Answer $63 \div 7 = \underline{\quad}$

12. $48 \div 8 = m$



Show your work.

Answer $48 \div 8 = \underline{\quad}$

Independent Practice

- MP6 13.** Tell how you would find a . Then solve.

$$a = 49 \div 7$$

Answer ____ $= 49 \div 7$

- MP8 14.** Ethan knows that $6 \times 9 = 54$. How can he use that fact to solve the following equation?

$$54 \div 9 = d$$

Answer $54 \div 9 =$ ____

Solve the problems.

- MP2 15.** Zoey has flower plants to sell at the spring fair. She has 72 plants and 9 boxes. How many plants can she put in each box?

 **Show your work.**

Answer _____