

Divide Unit Fractions in Word Problems



Dear Family,

This week your child is learning about dividing with unit fractions in word problems.

He or she might see a word problem like the one below.

Molly used $\frac{1}{4}$ square yard of fabric to decorate 4 flags. She used an equal amount of fabric for each flag. How much fabric did she use for each flag?

This problem can be solved by finding $\frac{1}{4} \div 4$.

One way to understand this problem is to use a model.

The square shown at the right represents 1 whole square yard of fabric. The shaded rectangle represents the $\frac{1}{4}$ square yard that Molly used to decorate the 4 flags.

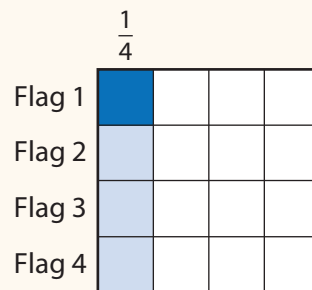
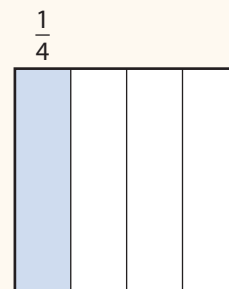
You can divide the shaded rectangle into 4 equal parts to represent the 4 flags Molly decorated.

The part shaded dark blue shows the amount used for one flag. 1 out of 16 parts of the whole square yard is used for 1 flag. Molly used $\frac{1}{16}$ square yard of fabric for each flag.

Your child can also write a division equation to solve the problem.

$$\frac{1}{4} \div 4 = \frac{1}{16}$$

Invite your child to share what he or she knows about dividing with unit fractions in word problems by doing the following activity together.



ACTIVITY DIVIDING BY UNIT FRACTIONS

Do this activity with your child to divide by unit fractions in word problems.

Materials yardstick, tape measure, or ruler

- Together with your child, solve the problem below about dividing by a unit fraction.

How many square tiles are needed to make a border along a wall? Each tile measures $\frac{1}{3}$ foot on each side, and the wall is 6 feet long.

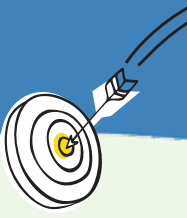


- Now suppose you are going to use the tiles to make a border along a wall in your own house. First, measure to find the length of the wall in feet. Then round your measurement to the nearest foot. Last, divide that number by $\frac{1}{3}$ to find the number of tiles you would need.



Answer: $6 \div \frac{1}{3} = 18$ tiles

Explore Dividing Unit Fractions in Word Problems



Previously, you learned about what it means to divide with unit fractions. Use what you know to try to solve the problem below.

Micah is running a 6-mile race.
There are water stops every $\frac{1}{2}$ mile and at the 6-mile finish line.
How many water stops are there in all? Use a visual model to show your solution.



Learning Target


- Solve real world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions, e.g., by using visual fraction models and equations to represent the problem.

SMP 1, 2, 3, 4, 5, 6, 8

TRY IT



Math Toolkit

- fraction bars
- fraction models 
- number lines
- grid paper
- index cards
- sticky notes



DISCUSS IT

Ask your partner: Why did you choose that strategy?

Tell your partner: A model I used was . . . It helped me . . .

CONNECT IT

1 LOOK BACK

How many water stops are there in all? Explain how you can use a number line to support your answer.

2 LOOK AHEAD

On the previous page, you used a visual model to solve a word problem involving dividing a whole number by a unit fraction. You can also use equations to represent and solve these types of problems. Consider this word problem.

Micah now runs in a 5-mile race. There are water stops every $\frac{1}{3}$ mile and at the 5-mile finish line in this new race. How many water stops are there in all?

a. Complete the division equation below.

$$\boxed{\text{miles in race}} \div \boxed{\text{fraction of a mile for each water stop}} = w \quad \boxed{\text{number of water stops}}$$

b. Complete the multiplication equation below.

$$\boxed{\text{miles in race}} \times \boxed{\text{number of water stops in each mile}} = w \quad \boxed{\text{number of water stops}}$$

c. How many water stops are in this race? Explain how you know.


3 REFLECT

Explain what it means to divide 5 by $\frac{1}{3}$, or $5 \div \frac{1}{3}$.

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Prepare for Dividing Unit Fractions in Word Problems

- 1 Think about what you know about fraction models. Fill in each box. Use words, numbers, and pictures. Show as many ideas as you can.

| | | |
|---|----------------------|----------|
| What Is It? | What I Know About It | |
|  fraction model | | |
| Examples | Examples | Examples |

- 2 Draw a fraction model to show the expression $4 \div \frac{1}{2}$.

- 3 Solve the problem. Show your work.

Adela has a ribbon that is 2 yards long. She cuts the ribbon into pieces that are $\frac{1}{4}$ yard long. How many pieces of ribbon are there in all? Use a visual model to show your solution.



Solution

- 4 Check your answer. Show your work.

Develop Dividing a Unit Fraction by a Whole Number

Read and try to solve the problem below.


Piper uses $\frac{1}{6}$ yard of ribbon to make a border around an equilateral triangle. How long is the piece of ribbon that Piper uses for each side?



TRY IT



Math Toolkit

- fraction bars
- fraction models 
- number lines
- grid paper
- ribbon or yarn
- index cards



DISCUSS IT

Ask your partner: How did you get started?

Tell your partner: I knew . . . so I . . .

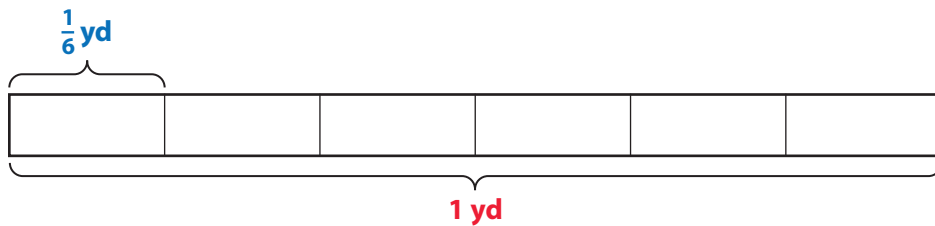
Explore different ways to understand dividing a unit fraction by a whole number to solve word problems.

Piper uses $\frac{1}{6}$ yard of ribbon to make a border around an equilateral triangle. How long is the piece of ribbon that Piper uses for each side?

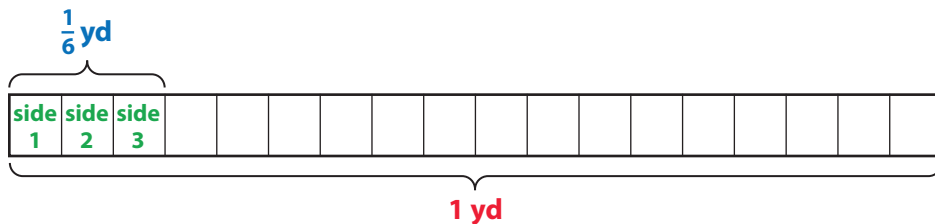
PICTURE IT

You can draw a picture to help understand the problem.

Draw a **1-yard** length of ribbon and then draw and label a $\frac{1}{6}$ -yard length.



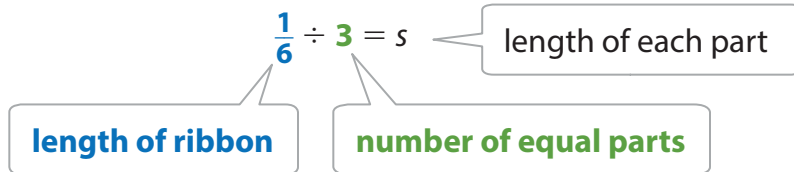
Divide the $\frac{1}{6}$ -yard length into **3 equal parts**, one for each side of the equilateral triangle.



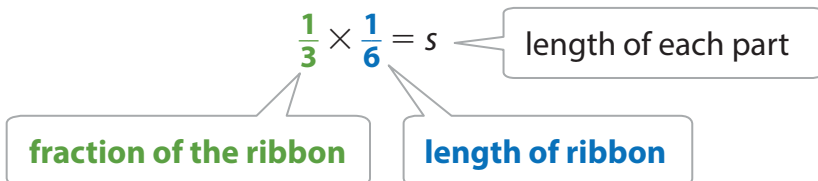
MODEL IT

You can use equations to model the problem.

Write a division equation.



Write a multiplication equation.



CONNECT IT

Now you will use the problem from the previous page to help you understand how to divide a unit fraction by a whole number.

- 1 Look at **Picture It**. What does the first diagram show? What whole is being divided?

Why does the second diagram show each $\frac{1}{6}$ -yard section divided into 3 equal parts?

- 2 Look at **Model It**. How does each equation relate to the second diagram in **Picture It**?

- 3 How long is the piece of ribbon Piper uses for each side of the triangle?

- 4 What is $\frac{1}{6} \div 3$? How can you use a multiplication equation different from the one shown in **Model It** to check that your answer is correct?

5 REFLECT

Look back at your **Try It**, strategies by classmates, and **Picture It** and **Model It**. Which models or strategies do you like best for dividing a unit fraction by a whole number to solve word problems? Explain.

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APPLY IT

Use what you just learned to solve these problems.

- 6 Felipe has $\frac{1}{4}$ of a pizza. He wants to share it equally with a friend. How much of the original whole pizza will each of them get? Show your work.



Solution

- 7 Angela uses $\frac{1}{3}$ of her rectangular flower garden for roses. She plants equal rectangular areas of red, white, pink, and orange roses in this part of the garden. What fraction of the whole garden has red roses? Draw a model and write a division equation to represent and solve the problem.

Solution

- 8 Look at problem 7. Which multiplication expressions can be used to represent the situation or check the division equation?

Ⓐ $\frac{1}{4} \times \frac{1}{3}$

Ⓑ $4 \times \frac{1}{3}$

Ⓒ $\frac{1}{12} \times 4$

Ⓓ 3×4

Ⓔ $3 \times \frac{1}{4}$

Practice Dividing a Unit Fraction by a Whole Number

Study the Example showing one way to solve a word problem involving dividing a fraction by a whole number. Then solve problems 1–5.

EXAMPLE

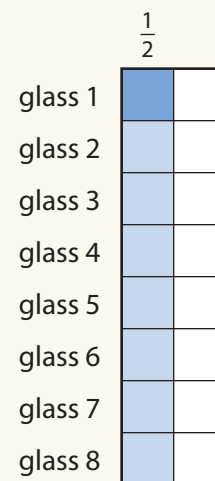
Felicia makes $\frac{1}{2}$ gallon of fruit punch. She pours an equal amount into 8 glasses. What fraction of a gallon of fruit punch is in each glass?

Find $\frac{1}{2} \div 8$.

The model shows a rectangle divided into halves and then divided into 8 equal parts. There are a total of 16 parts, and one part is the amount of fruit punch in 1 glass.

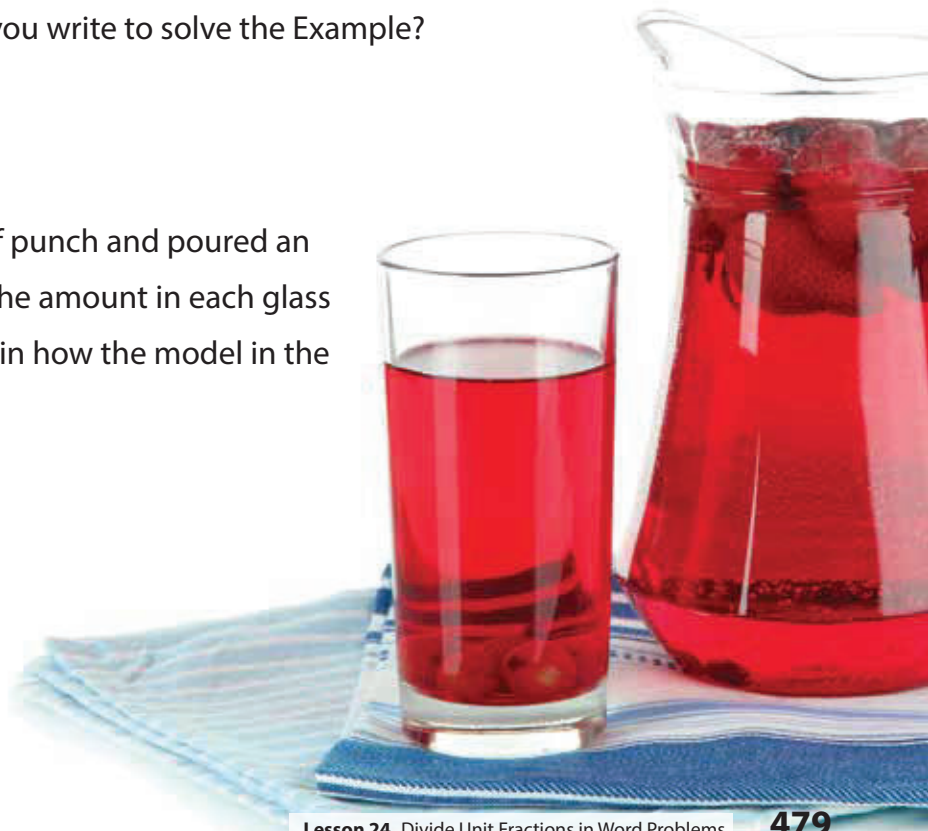
$$\frac{1}{2} \div 8 = \frac{1}{16}$$

The amount in 1 glass is $\frac{1}{16}$ gallon.



1 What multiplication equation could you write to solve the Example?

2 Suppose Felicia had made $\frac{1}{4}$ gallon of punch and poured an equal amount into 8 glasses. Would the amount in each glass be more or less than $\frac{1}{16}$ gallon? Explain how the model in the Example would change to show this.



- 3 Donal buys a $\frac{1}{4}$ -pound package of cheese. There are 8 slices of cheese in the package. Each slice has the same weight. What fraction of a pound is each slice? Draw a model and write a division equation to represent and solve the problem.

**Solution**

- 4 Student volunteers are getting ready to hand out programs at a talent show. Leah and Tomas are each given $\frac{1}{2}$ of a stack of programs to hand out. Leah divides her $\frac{1}{2}$ equally among herself and 2 friends. What fraction of the original stack of programs do Leah and her 2 friends each have? Show your work.

Solution

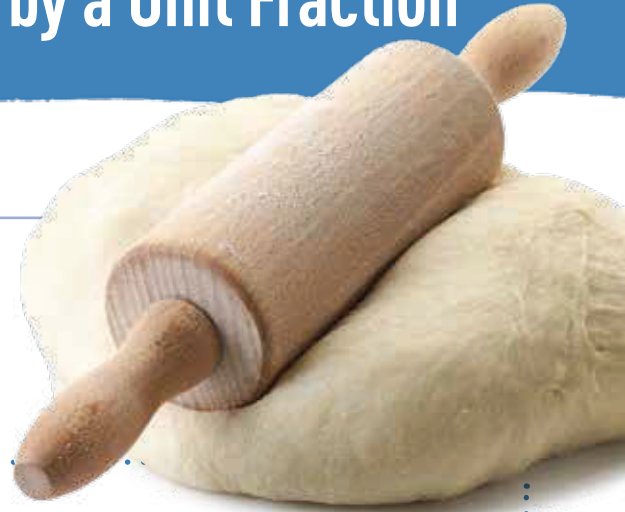
- 5 Look at problem 4. If Tomas divides his stack of programs between himself and his 3 friends, what fraction of the original stack will each of his friends have? Write a division equation to represent and solve the problem.

Solution

Develop Dividing a Whole Number by a Unit Fraction

Read and try to solve the problem below.


Alex makes 2 pounds of bread dough. He splits the dough into $\frac{1}{4}$ -pound loaves before baking them in the oven. How many loaves does he make?



TRY IT



Math Toolkit

- fraction tiles
- fraction bars
- fraction models 
- number lines
- grid paper
- index cards



DISCUSS IT

Ask your partner: Can you explain that again?

Tell your partner: The strategy I used to find the answer was . . .

Explore different ways to understand how to divide a whole number by a unit fraction in order to solve word problems.

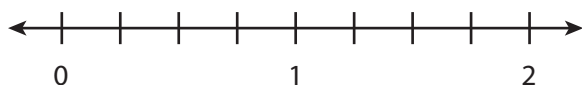
Alex makes 2 pounds of bread dough. He splits the dough into $\frac{1}{4}$ -pound loaves before baking them in the oven. How many loaves does he make?

MODEL IT

You can use a number line to help understand the problem.

Draw a number line and label it to show the 2 pounds of bread dough.

Mark the number line to divide each whole into fourths.



MODEL IT

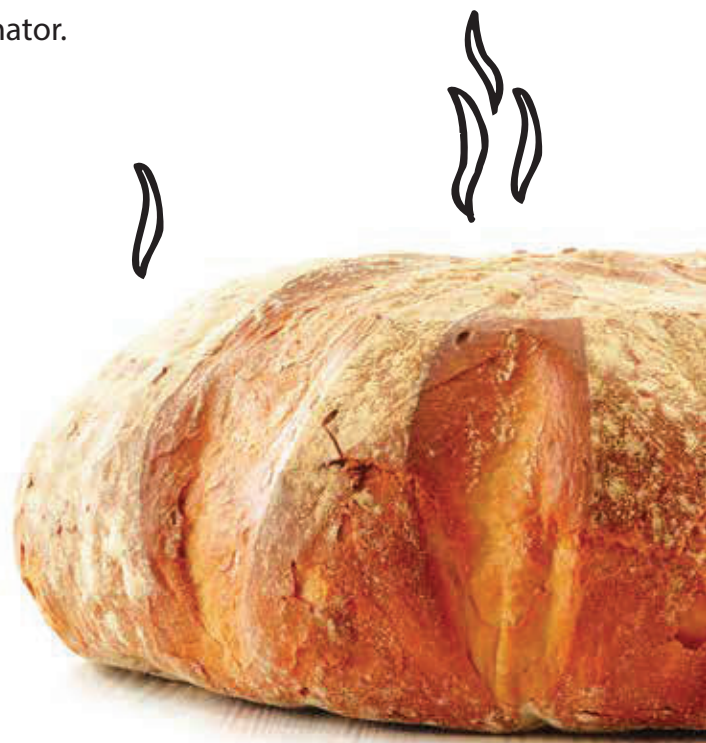
You can use what you know about equations, equivalent fractions, and common denominators to solve the problem.

The equation $2 \div \frac{1}{4} = n$ models the problem with n being the number of loaves Alex makes.

Write the numbers in the equation with a common denominator.

$$\frac{8}{4} \div \frac{1}{4} = n$$

Now you can divide $\frac{8}{4}$ into equal groups of $\frac{1}{4}$.



CONNECT IT

Now you will use the problem from the previous page to help you understand how to divide a whole number by a unit fraction.

- 1 In the first **Model It** number line, how are the 2 pounds of bread dough represented?
- 2 How are the $\frac{1}{4}$ -pound loaves represented on the number line?
- 3 How many fourths are in one whole? In two wholes?
- 4 Look at the second **Model It**. How was the equation $2 \div \frac{1}{4} = n$ changed to an equation involving fractions with common denominators?
- 5 How many groups of $\frac{1}{4}$ are in $\frac{8}{4}$? What is $\frac{8}{4} \div \frac{1}{4}$? Explain.
- 6 How many loaves does Alex make? How are the first **Model It** and second **Model It** alike in showing how to find the solution?
- 7 What multiplication equation can you write to check your answer to $2 \div \frac{1}{4}$? Explain.

8 REFLECT

Look back at your **Try It**, strategies by classmates, and **Model Its**. Which models or strategies do you like best for dividing a whole number by a unit fraction? Explain.

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APPLY IT

Use what you just learned to solve these problems.

- 9 Stacy has 4 sheets of paper to make cards. Each card requires $\frac{1}{2}$ sheet of paper. How many cards can Stacy make? Draw a model and write a division equation to represent and solve the problem.

Solution

- 10 Look at problem 9 above. Which multiplication expressions can be used to represent the situation or check the division equation?

(A) 8×2

(B) $4 \times \frac{1}{2}$

(C) $16 \times \frac{1}{2}$

(D) $8 \times \frac{1}{2}$

(E) 4×2

- 11 Dylan makes 3 submarine sandwiches. He cuts each sandwich into sixths to share. He stacks all the sandwich pieces on a plate. How many sandwich pieces does Dylan stack on the plate? Show your work.

Solution



Practice Dividing a Whole Number by a Unit Fraction

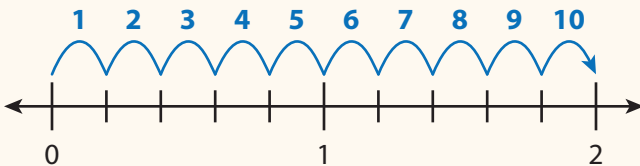
Study the Example showing one way to solve a word problem involving dividing a whole number by a fraction. Then solve problems 1–6.

EXAMPLE

Darius walks dogs at an animal shelter. He walks each dog for $\frac{1}{5}$ hour. He walks the dogs one at a time. How many dogs can Darius walk in 2 hours?

Find $2 \div \frac{1}{5}$.

The number line shows two hours. Each hour is divided into fifths.



There are 10 fifths in 2.

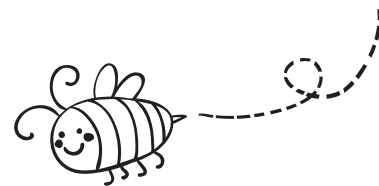
$$2 \div \frac{1}{5} = 10$$

Darius can walk 10 dogs in 2 hours.

- 1 What multiplication equation could you write to solve the Example?
- 2 Use the information from the Example. In one month, Darius spends 9 hours walking dogs. How many times does he walk a dog in one month?
- 3 Explain how you got your answer to problem 2.



- 4 Mrs. Wing will tape up posters made by her students on the wall. She cuts tape into $\frac{1}{4}$ -foot pieces. How many $\frac{1}{4}$ -foot pieces can she cut from 5 feet of tape? Show your work.



Solution

- 5 Taylor is helping decorate tables with flowers for a graduation celebration. She has 7 bunches of tulips. She will put $\frac{1}{2}$ of each bunch in a vase. How many vases does she need? Draw a model and write a division equation to represent and solve the problem.



Solution

- 6 Look at how you solved problem 5. Use a different way to solve the problem and show how a multiplication equation can be used to check the answer.

Solution

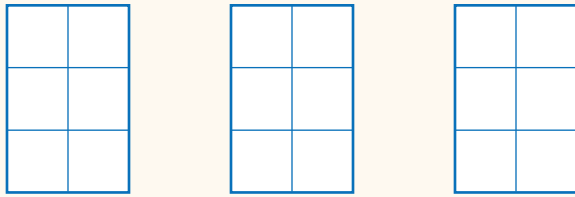
Refine Dividing Unit Fractions in Word Problems

Complete the Example below. Then solve problems 1–9.

EXAMPLE

Sierra has a photo album with 3 empty pages. Each photo uses $\frac{1}{6}$ of an album page. How many photos can Sierra put on the empty pages?

Look at how you could show your work using rectangles.



6 photos will fit on each of the 3 pages.

Solution

The student used a model to visualize the problem.



PAIR/SHARE

What related equations can you write to represent the problem?

APPLY IT

- Corrine picked $\frac{1}{4}$ gallon of blackberries. She poured equal amounts of berries into 4 containers. What fraction of a gallon is in each container? Show your work.

Can you draw a model to help understand the problem?

Solution

PAIR/SHARE

How will the answer compare to $\frac{1}{4}$ gallon?

- 2 Cooper's USB drive is $\frac{1}{2}$ full with 5 video files. Each video file is the same size. What fraction of the USB drive does 1 video file use? Show your work.

How could I represent this problem using an equation?



Solution

- 3 Devonte is studying for a history test. He uses $\frac{1}{8}$ of a side of one sheet of paper to write notes for each historical event. He fills 2 full sides of one sheet of paper. Which expression could be used to find how many events Devonte makes notes for?

- (A) $2 \times \frac{1}{8}$
- (B) $2 \div \frac{1}{8}$
- (C) $\frac{1}{8} \times 2$
- (D) $\frac{1}{8} \div 2$

Barry chose (D) as the correct answer. How did he get that answer?

PAIR/SHARE

How can you check your answer?

Is this problem like one you have seen before?

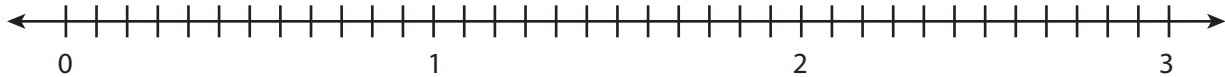
PAIR/SHARE

Does Barry's answer make sense?

- 4 Elise picks 6 pounds of apples. She uses $\frac{1}{2}$ pound of apples to make 1 container of applesauce. How many containers of applesauce can Elise make with all the apples?
- (A) 12 containers
 (B) $6\frac{1}{2}$ containers
 (C) $5\frac{1}{2}$ containers
 (D) 3 containers
- 5 Students are running in a relay race. Each team will run a total of 3 miles. Each member of a team will run $\frac{1}{3}$ mile. How many students will a team need to complete the race? Circle the correct number below.

$\frac{1}{9}$ 3 9 12 36

You may use the number line to help find your answer.



- 6 Tanya has $\frac{1}{3}$ of a cake left over from a party. She cuts the leftover cake into 6 equal pieces to store in the freezer. What fraction of the original cake is each piece? Show your work.



Solution

- 7 Marina has a pattern to make bows that requires $\frac{1}{4}$ yard of ribbon for each bow. Fill in the table to show how many bows she can make from a given length of ribbon.

| Ribbon Length (yards) | Number of Bows |
|-----------------------|----------------|
| 1 | |
| 2 | |
| 3 | |
| 4 | |

- 8 **Part A** Ted serves $\frac{1}{6}$ gallon of ice cream. He puts an equal amount of ice cream in each of 4 bowls. How many gallons of ice cream does Ted put in each bowl? Use a visual model to support your answer.



Solution

Part B Write a division equation to represent this situation. Then write a multiplication equation you can use to check your answer.

Solution

9 **MATH JOURNAL**

Write a word problem represented by $\frac{1}{5} \div 4$. Explain or show how to find the answer.

 **SELF CHECK** Go back to the Unit 3 Opener and see what you can check off.