

Divide Decimals



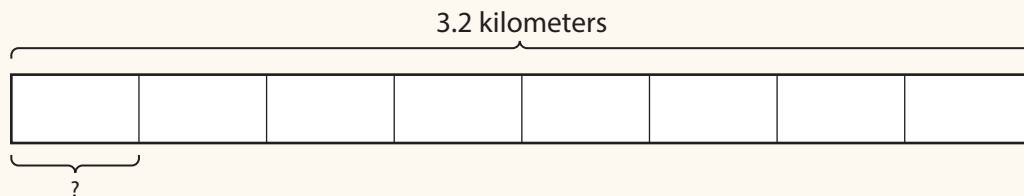
Dear Family,

This week your child is learning to divide with decimals.

Your child might see a problem like this:

Marty is running in a 3.2-kilometer race. Water stations are set up at 8 equal sections of the race. How far apart are the water stations?

One way to understand the relationship of the quantities in the problem is to use a bar model.



The whole bar represents the length of the race, 3.2 kilometers. The bar has 8 equal sections. Find the length of each section to find how far apart the water stations are.

Divide 3.2 by 8 to find the length of each shorter section.

One way your child is learning to divide decimals is to think about multiplying decimals. Division and multiplication are related operations.

To find $3.2 \div 8$, think $8 \times ? = 3.2$.

$$3.2 = 32 \text{ tenths}$$

$$8 \times ? = 32 \text{ tenths}$$

$$8 \times 4 \text{ tenths} = 32 \text{ tenths}$$

The answer, 4 tenths, is the length represented by each section of the bar model. The water stations are 0.4 kilometer apart.

Invite your child to share what he or she knows about dividing decimals by doing the following activity together.



ACTIVITY DIVIDING DECIMALS

Do this activity with your child to divide decimals.

Work with your child to solve a real-world problem involving dividing decimals.

- Think of something you spend money on for the whole family, such as the grocery bill, tickets to the movies, or a new board game.



- Divide the cost by the number of people in your family. This will describe the cost for each family member.

For example: A book of puzzles costs \$11.76. There are 4 people in the family.
To find the cost for each person, divide 11.76 by 4.

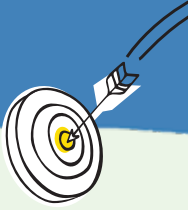
- Check that the answer is reasonable. In the example above, is 29.4 a reasonable answer for $11.76 \div 4$?

Be on the lookout for other real-world examples of dividing decimals that you can share with your child.



Answer: no

Explore Dividing Decimals



Now that you know how to multiply with decimals, you will learn how to divide with decimals. Use what you know to try to solve the problem below.

Mr. Kovich is preparing materials for a craft project. He needs to cut 2 meters of string into pieces that are 0.2 meter long. How many 0.2-meter pieces can he cut from 2 meters of string?



Learning Target



- Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.

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

TRY IT



Math Toolkit

- base-ten blocks
- decimal grids
- number lines 
- fraction bars
- fraction models 
- thousandths decimal place-value charts



DISCUSS IT

Ask your partner: Why did you choose that strategy?

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

CONNECT IT

1 LOOK BACK

Explain how you found how many 0.2-meter pieces are in 2 meters of string.

2 LOOK AHEAD

You can look for patterns in division to see how dividing with whole numbers and dividing with decimals is alike and different.

a. Complete the quotients in the table below to see patterns in division.

Expression	Expression in Words	Quotient
$2 \div 2$	How many groups of 2 are in 2?	
$2 \div 0.2$	How many groups of 0.2 are in 2?	
$2 \div 0.02$	How many groups of 0.02 are in 2?	

b. Use the division patterns in the table to complete the equations.

Dividend		Divisor		Quotient
2	\div	2	=	
2	\div	0.2	=	
2	\div	0.02	=	

c. How does the quotient compare to the dividend when the divisor is greater than 1? When the divisor is less than 1?

3 REFLECT

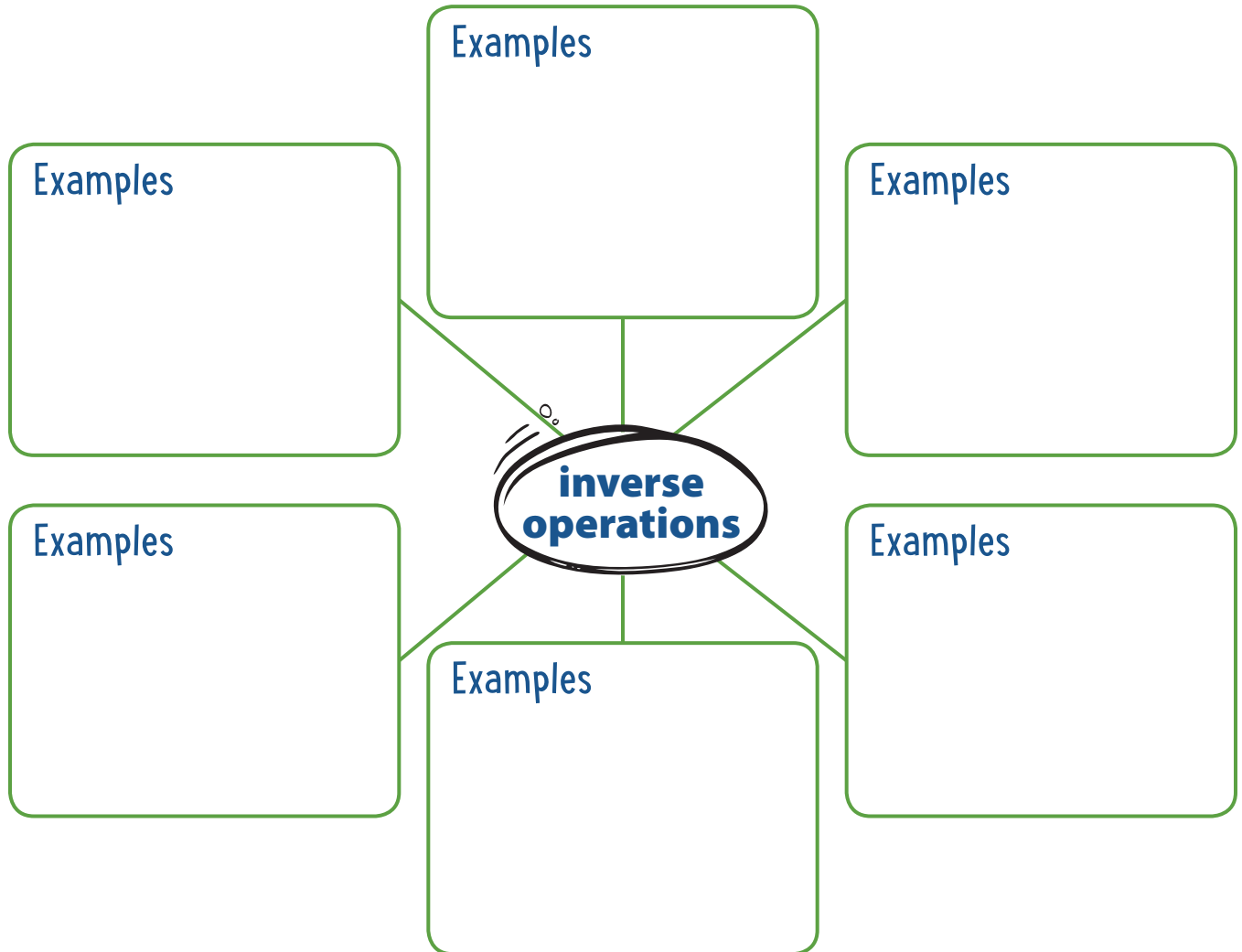
Think about 2 meters \div 0.2 meter. Why is the quotient greater than the dividend when dividing by a decimal less than 1?

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Prepare for Dividing Decimals

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



- 2 Write a related multiplication equation for the division equation $5 \div 0.2 = n$.

- 3 Solve the problem. Show your work.

Mrs. Carter is preparing materials for a craft project. She needs to cut 5 meters of ribbon into pieces that are 0.5 meter long. How many 0.5-meter pieces can she cut from 5 meters of ribbon?

Solution

- 4 Check your answer. Show your work.



Develop Dividing a Decimal by a Whole Number



Read and try to solve the problem below.

Coach Ann is setting up a 2.7-kilometer race. She uses flags to mark off 9 equal sections of the race. How far apart should she space the flags to mark off the sections?

TRY IT



Math Toolkit

- base-ten blocks
- counters
- base-ten grid paper
- number lines 
- fraction bars
- fraction models 



DISCUSS IT

Ask your partner: Do you agree with me? Why or why not?

Tell your partner: I agree with you about . . . because . . .

Explore different ways to understand dividing a decimal by a whole number.

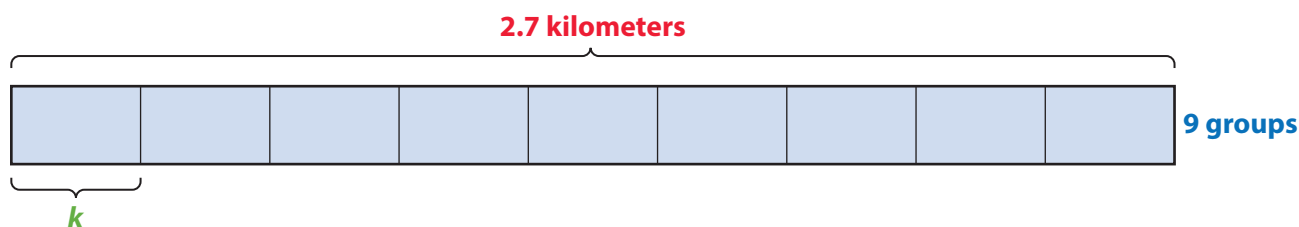
Coach Ann is setting up a 2.7-kilometer race. She uses flags to mark off 9 equal sections of the race. How far apart should she space the flags to mark off the sections?

PICTURE IT

You can draw a bar model to represent the problem.

You know the **number of kilometers to be divided** into equal groups.

You know the **number of equal groups**.



You do not know the **number of kilometers in each group**.

MODEL IT

You can use the relationship between multiplication and division to understand the problem.

To solve $2.7 \div 9 = k$, think $9 \times k = 2.7$.

Use place-value understanding to find the missing factor.

$$2.7 = 27 \text{ tenths}$$

$$9 \times ? \text{ tenths} = 27 \text{ tenths}$$

CONNECT IT

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

- 1 Look at **Picture It**. Why is the bar divided into 9 equal parts?

What do you need to find?

- 2 Look at **Model It**. How does the division expression $2.7 \div 9$ relate to the bar model?

- 3 Explain how you know that $2.7 = 27$ tenths.

- 4 How far apart should Coach Ann space the flags? tenths kilometer

Write the distance as a decimal. kilometer

- 5 Explain how you could divide a decimal by a whole number.

6 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 decimal by a whole number? Explain.

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APPLY IT

Use what you just learned to solve these problems.

- 7 How much will each person receive if \$20.35 is split equally among 5 people?
Show your work.

Solution

- 8 What is $0.99 \div 11$? Show your work.

Solution

- 9 What is $51.2 \div 4$?

- Ⓐ 1.28
- Ⓑ 12.08
- Ⓒ 12.8
- Ⓓ 120.8

Practice Dividing a Decimal by a Whole Number

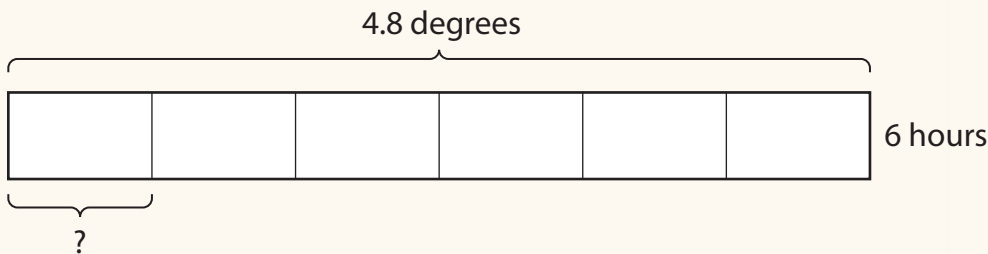
Study the Example showing one way to divide a decimal by a whole number. Then solve problems 1–5.



EXAMPLE

The temperature rises 4.8 degrees in 6 hours. If the temperature rises by an equal amount each hour, how many degrees did it rise each hour?

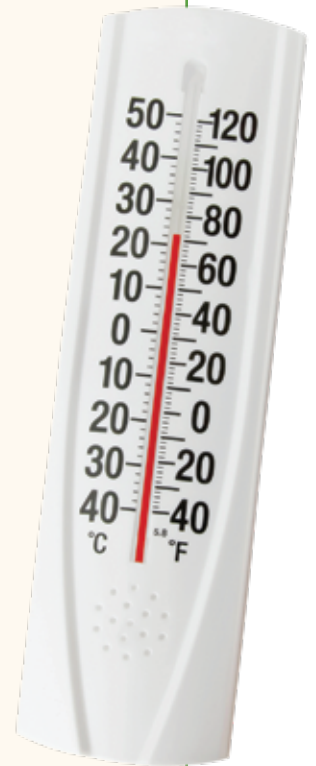
You can represent this with a bar model.



To find $4.8 \div 6$, think $6 \times ? = 4.8$.

$$\begin{aligned} 4.8 &= 48 \text{ tenths} & 6 \times 8 \text{ tenths} &= 48 \text{ tenths} \\ & & 6 \times 0.8 &= 4.8 \\ & & 4.8 \div 6 &= 0.8 \end{aligned}$$

The temperature rose 0.8 degree each hour.



- 1 Look at the Example. Suppose the temperature rises 5.4 degrees in 6 hours. Complete the steps to find $5.4 \div 6$.

- a. $5.4 \div 6$ Think: $\dots \times ? = \dots$
- b. $5.4 = \dots$ tenths $\dots \times ? = \dots$ tenths
- c. $6 \times \dots$ tenths = \dots tenths
- d. $5.4 \div 6 = \dots$

- 2 Use numbers from the box. Write the number of tenths and hundredths in each decimal.

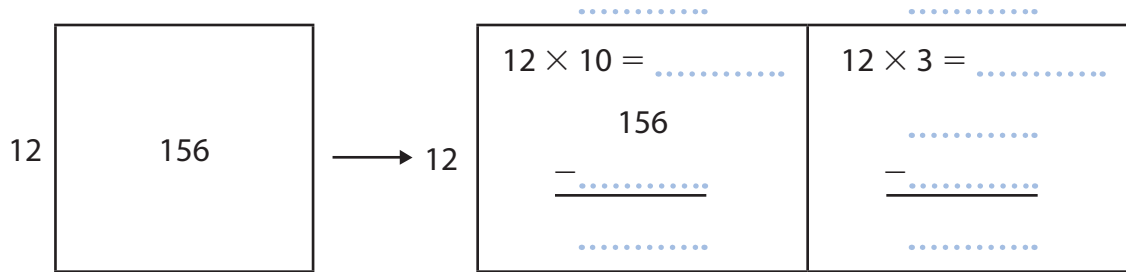
$$\begin{aligned} 3.5 &= \dots \text{ tenths} & 3.5 &= \dots \text{ hundredths} \\ 0.79 &= \dots \text{ tenths} & 0.79 &= \dots \text{ hundredths} \end{aligned}$$

3.5	0.79	0.35
350		35
7.9	79	790

3 Complete the steps for using an area model to solve $1.56 \div 12$.

$1.56 \div 12$ is the same as $\times ? =$

$1.56 =$ hundredths



$156 \text{ hundredths} \div 12 =$ hundredths

$1.56 \div 12 =$

4 Conor earns \$9 an hour for yard work. He raked leaves one afternoon and earned \$29.25. How many hours did he rake leaves? Show your work.

Solution

5 Look at problem 4. How much does Conor earn for each minute he does yard work? (1 hour = 60 minutes) Show your work.

Solution

Develop Dividing by Tenths

Read and try solve the problem below.



Grant has 3.6 pounds of pretzels. He puts the pretzels into bags that each hold 0.3 pound. How many bags does Grant use to hold the pretzels?



TRY IT



Math Toolkit

- base-ten blocks
- counters
- base-ten grid paper
- number lines 
- fraction bars
- fraction models 



DISCUSS IT

Ask your partner: How did you get started?

Tell your partner: I started by ...

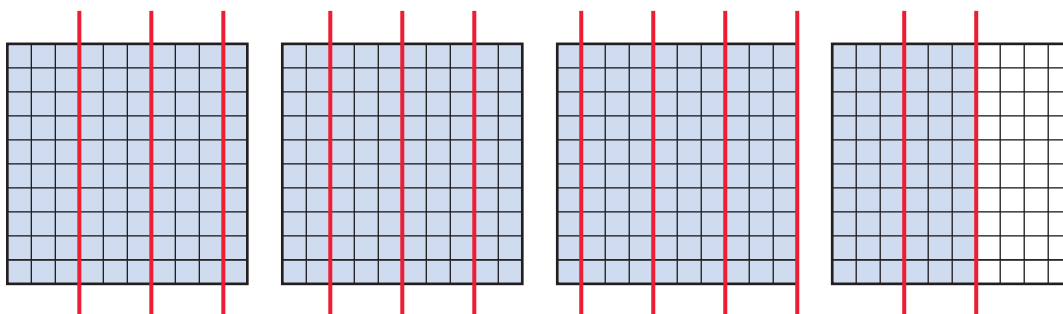
Explore different ways to understand how to divide with tenths.

Grant has 3.6 pounds of pretzels. He puts the pretzels into bags that each hold 0.3 pound. How many bags does Grant use to hold the pretzels?

PICTURE IT

You can picture dividing by tenths with decimal grids.

Each large square represents 1 pound of pretzels.



You know the amount to be shared in equal groups and the size of each group.

MODEL IT

You can use the relationship between multiplication and division to understand the problem.

To solve $3.6 \div 0.3 = n$, think $n \times 0.3 = 3.6$.

Use place-value understanding to find the missing factor.

$$3.6 = 36 \text{ tenths}$$

$$0.3 = 3 \text{ tenths}$$

$$n \times 3 \text{ tenths} = 36 \text{ tenths}$$



CONNECT IT

Now you will use the problem from the previous page to help you understand how to divide with tenths.

- 1 Look at **Picture It**. How do you decide what to shade?

- 2 Why are the grids separated into groups of 3 columns?

- 3 Look at **Model It**. How do you know this is a division problem?

- 4 Explain why $3.6 = 36$ tenths.

- 5 Both **Picture It** and **Model It** tell you that Grant uses bags of pretzels.
- 6 Explain how to divide tenths by tenths.

7 REFLECT

Look back at your **Try It**, strategies by classmates, and **Picture It** and **Model It** on the previous page. Which models or strategies do you like best for dividing tenths by tenths? Explain.

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APPLY IT

Use what you just learned to solve these problems.

- 8 How many dimes are there in a jar of dimes worth \$2.70? Show your work.

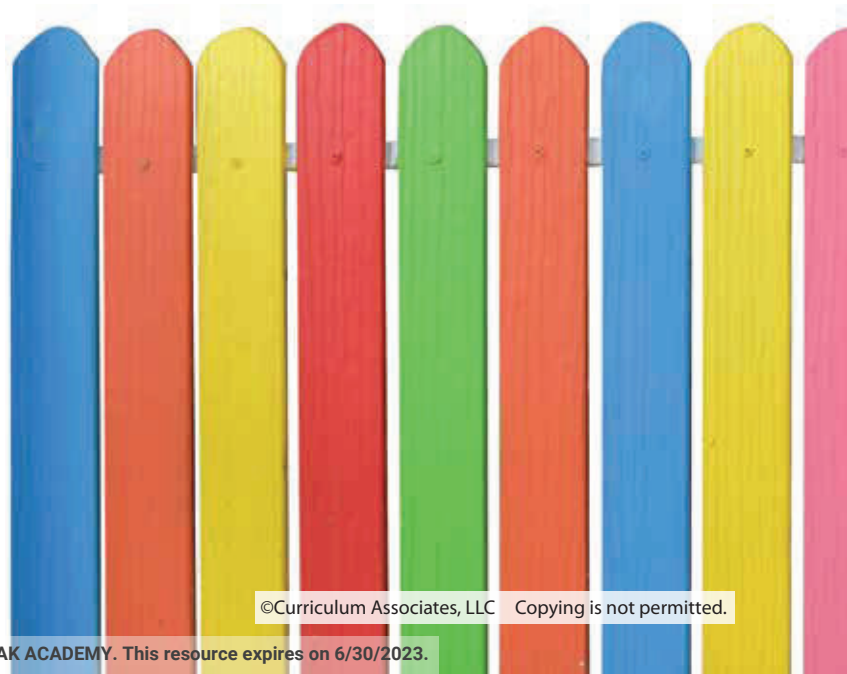
Solution

- 9 A fence is 52.5 meters in length. Posts divide the fence into sections that are each 3.5 meters in length. How many sections are in the fence? Show your work.

Solution

- 10 What is $42 \div 0.7$?

- Ⓐ 0.06
- Ⓑ 0.6
- Ⓒ 6
- Ⓓ 60



Practice Dividing by Tenths

Study the Example showing one way to divide a decimal by a decimal. Then solve problems 1–7.

EXAMPLE

What is $2.1 \div 0.7$?

You can represent this problem with decimal grids.

Each large square represents 1 whole.

To find $2.1 \div 0.7$, think $0.7 \times ? = 2.1$.

The lines separate groups of 0.7.

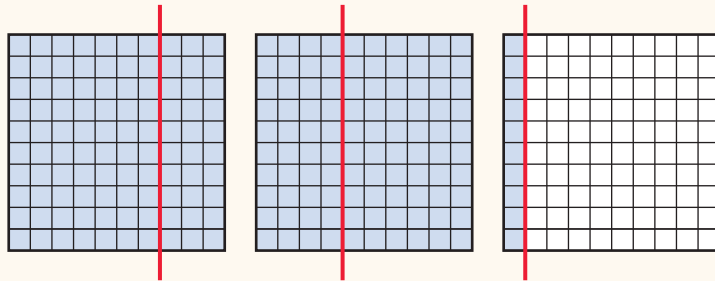
$$2.1 = 21 \text{ tenths}$$

$$0.7 = 7 \text{ tenths}$$

$$7 \text{ tenths} \times ? = 21 \text{ tenths}$$

$$7 \text{ tenths} \times 3 = 21 \text{ tenths}$$

$$2.1 \div 0.7 = 3$$



- Look at the Example. How is the quotient, 3, represented by the grids?
- Which of these expressions are represented by the decimal grids in the Example?

(A) 0.7×3	(B) 3×0.7
(C) $0.7 \div 3$	(D) $2.1 \div 3$
(E) $21 \div 0.7$	(F) $0.7 \div 2.1$
- How many grids would you need to represent the problem $4.5 \div 0.5$? Explain.

- 4 Complete the steps to solve $4.5 \div 0.5$.
- a. $4.5 \div 0.5$ Think: $\times ? =$
 - b. $4.5 =$ tenths and $0.5 =$ tenths
 - c. 5 tenths \times = 45 tenths
 - d. $4.5 \div 0.5 =$

5 Rewrite each division problem as a multiplication problem and solve.

- a. $6.3 \div 0.9 = ?$ $\times ? =$ $6.3 \div 0.9 =$
- b. $3.2 \div 0.4 = ?$ $\times ? =$ $3.2 \div 0.4 =$
- c. $1.8 \div 0.3 = ?$ $\times ? =$ $1.8 \div 0.3 =$
- d. $2.4 \div 1.2 = ?$ $\times ? =$ $2.4 \div 1.2 =$

6 The Razdan family drinks 0.5 gallon of milk a day. Will 2.5 gallons of milk last them more than 1 week? Explain. Show your work.

Solution

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7 Mrs. Lang is hanging pictures for the school art show across a wall that is 2.8 meters wide. She determines that each picture, along with the space needed on the sides of the picture, will take up 0.4 meter across the wall. How many pictures can she hang in one row across the wall? Show your work.

Solution

Develop Dividing by Hundredths

Read and try to solve the problem below.



Fiona has \$1.20 with which to buy some ribbon.
The ribbon is on sale for \$0.08 per foot.
How many feet of ribbon
can Fiona buy?



TRY IT



Math Toolkit

- base-ten blocks
- play money
- base-ten grid paper
- number lines 
- fraction bars
- fraction models 



DISCUSS IT

Ask your partner: Can you explain that again?

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

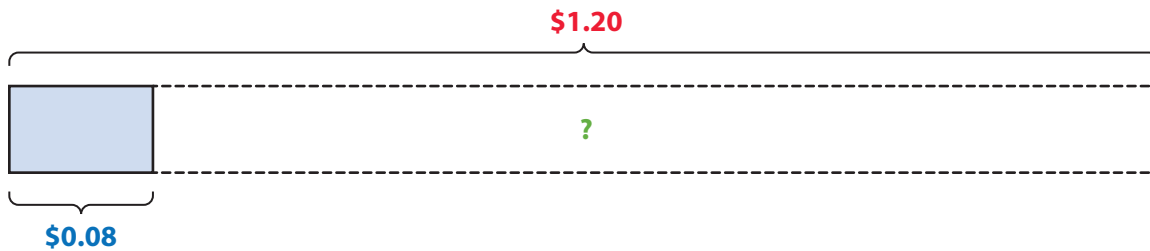
Explore different ways to understand how to divide by hundredths.

Fiona has \$1.20 with which to buy some ribbon. The ribbon is on sale for \$0.08 per foot. How many feet of ribbon can Fiona buy?

PICTURE IT

You can picture the division problem using a bar model.

You know the **total amount of money** and the **size of one group**.



You do not know the **number of groups**.

MODEL IT

You can use place-value reasoning to relate dividing with decimals to dividing with whole numbers.

$$1.20 \div 0.08 = ? \leftarrow \text{How many groups of size } 0.08 \text{ are in } 1.20?$$

$$120 \text{ hundredths} \div 8 \text{ hundredths} = ?$$

$$120 \div 8 = ? \leftarrow \text{How many groups of size } 8 \text{ are in } 120?$$

Then you can divide the hundredths as you might divide with whole numbers, such as using partial quotients.

$$\begin{array}{r}
 ? \\
 \underline{5} \\
 10 \\
 8 \overline{)120} \\
 \underline{-80} \\
 40 \\
 \underline{-40} \\
 0
 \end{array}$$

CONNECT IT

Now you will use the problem from the previous page to help you understand how to divide by hundredths.

- 1 Look at **Picture It**. What are you trying to find in this problem?
- 2 What operation will solve this problem? How do you know?
- 3 Look at **Model It**. Explain why $1.20 = 120$ hundredths.
- 4 How many feet of ribbon can Fiona buy? Explain how you know.
- 5 Check your answer using the decimals in a multiplication equation.
 feet of ribbon \times \$ = \$
- 6 Explain how to divide by a decimal in the hundredths.

7 REFLECT

Look back at your **Try It**, strategies by classmates, and **Picture It** and **Model It** on the previous page. Which models or strategies do you like best for dividing by hundredths? Explain.

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APPLY IT

Use what you just learned to solve these problems.

- 8 How many quarters are in a jar of quarters worth \$9.75? Show your work.



Solution

- 9 What is $16 \div 0.16$? Show your work.

Solution

- 10 Which division expression can be used to find the quotient $17.6 \div 0.04$?
- (A) $1.76 \div 4$
 - (B) $176 \div 4$
 - (C) $176 \div 40$
 - (D) $1760 \div 4$

Practice Dividing by Hundredths

Study the Example showing one way to divide by hundredths.
Then solve problems 1–6.

EXAMPLE

Find $1.8 \div 0.04$.

Find the least place. Write each decimal to the least place.

$$0.04 = 4 \text{ hundredths}$$

$$1.8 = 180 \text{ hundredths}$$

Divide as you would with whole numbers, using partial quotients or another method.

$$180 \text{ hundredths} \div 4 \text{ hundredths} = 45$$

$$1.8 \div 0.04 = 45$$

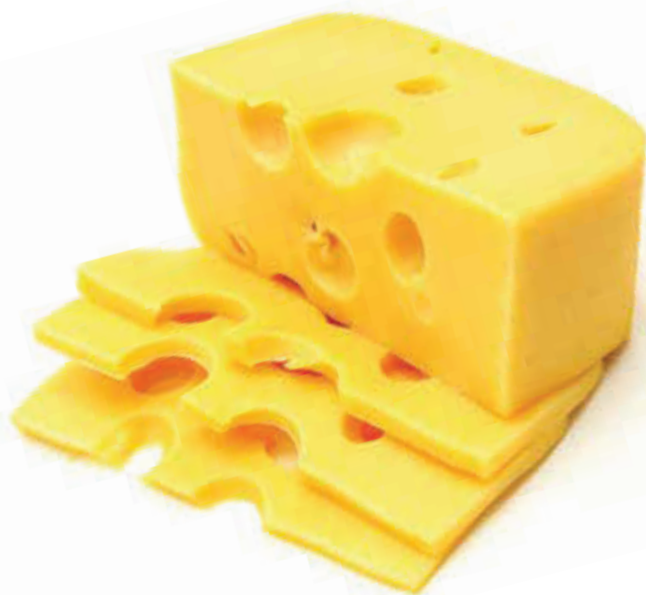
$$\begin{array}{r} 45 \\ \underline{5} \\ 40 \\ 4 \overline{)180} \\ \underline{-160} \\ 20 \\ \underline{-20} \\ 0 \end{array}$$

- 1 Complete the steps to solve $1.02 \div 0.06$.
 - a. $1.02 = \dots\dots\dots$ hundredths
 $0.06 = \dots\dots\dots$ hundredths
 - b. $102 \div 6 = \dots\dots\dots$
 - c. $1.02 \div 0.06 = \dots\dots\dots$
- 2 Did you use partial quotients or another method to divide 102 by 6 in problem 1? Explain.
- 3 Check your answer to problem 1 by writing the decimals in a multiplication equation.
 $\dots\dots\dots \times \dots\dots\dots = \dots\dots\dots$

4 Is each equation *True* or *False*?

	True	False
$1.23 = 123$ hundredths	(A)	(B)
$0.5 = 50$ hundredths	(C)	(D)
74 hundredths $= 7.4$	(E)	(F)
$1,088$ hundredths $= 10.88$	(G)	(H)

5 Jaden buys 1.15 pounds of cheese at the deli counter. If each slice is 0.05 pound, how many slices of cheese does she buy? Show your work.



Solution

6 Alejandro feeds his dog 0.12 kilogram of dry dog food each day. He wants to buy the smallest bag that has enough food to feed his dog for one month. Should he buy the bag that has 1.8 kilograms, 2.4 kilograms, or 4.2 kilograms of dog food? Show your work.

Solution

Refine Dividing Decimals

Complete the Example below. Then solve problems 1–8.

EXAMPLE

Nancy ran a total of 35 miles to train for a race. She ran 2.5 miles each day. How many days did Nancy run to train for the race?

Look at how you could show your work using equations.

Let d = number of days.

$$2.5 \times d = 35$$

$$2.5 = 25 \text{ tenths}, 35 = 350 \text{ tenths}$$

$$25 \times d = 350$$

$$350 \div 25 = 14$$

Solution

The student wrote a related multiplication equation to solve the problem.



PAIR/SHARE

Can you solve the problem in another way?

APPLY IT

- 1 What number multiplied by 8 will give a product of 9.6?
Write an equation and solve. Show your work.

Solution

What is a good estimate for your answer?

PAIR/SHARE

How could you model this problem with a number line?

- 2 The length of a screw is 0.75 centimeter. How many screws can be placed end to end to make a row that is 18 centimeters long? Show your work.

Will the answer be greater than or less than 18?



Solution

- 3 What is $6.5 \div 0.5$?
- (A) 3.25
 - (B) 6
 - (C) 7
 - (D) 13

Gwen chose (A) as the correct answer. How did she get that answer?

PAIR/SHARE

Explain how you decided what operation to use to solve the problem.

I could draw a model to represent this problem.

PAIR/SHARE

Does Gwen's answer make sense?

- 4 Jordan has \$3.80 to spend at the used book store. Each book costs \$0.95. What is the greatest number of books Jordan can buy?
- (A) 3
- (B) 4
- (C) 5
- (D) 6
- 5 Keith bought 3.4 pounds of peanuts on Monday, 2.5 pounds on Tuesday, and 4 pounds on Wednesday. He is going to divide the peanuts equally between himself and two friends. How many pounds of peanuts will each friend get?

0	0	0	0	0	0
1	1	1	1	1	1
2	2	2	2	2	2
3	3	3	3	3	3
4	4	4	4	4	4
5	5	5	5	5	5
6	6	6	6	6	6
7	7	7	7	7	7
8	8	8	8	8	8
9	9	9	9	9	9

- 6 If you put 0.7 in the box for each equation, is the equation true?

	Yes	No
$\square \times 5.2 = 36.4$	(A)	(B)
$49 \div \square = 70$	(C)	(D)
$\square \div 3.5 = 0.02$	(E)	(F)
$9.1 \times \square = 6.37$	(G)	(H)

- 7 Jamie has 5 jars to fill with beads for a carnival game. She has 7.5 bags of multi-colored beads. Jamie wants to put an equal amount of beads in each jar. How many bags of beads can she put into each jar?

Part A Use decimal grids to solve the problem. Explain your solution.

Part B Use multiplication to check your answer.



8 MATH JOURNAL

A sticker is 1.2 centimeters wide. How many stickers will fit edge to edge on a strip of paper that is 108 centimeters long? Explain your thinking.

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