Multiply Fractions in Word Problems
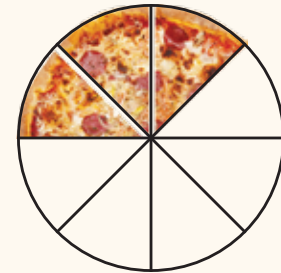
Dear Family,

This week your child is learning about multiplying fractions in word problems.

He or she might see a problem like this:

Michael found $\frac{3}{8}$ of a pizza in the refrigerator. He ate $\frac{2}{3}$ of it. How much of the original whole pizza did Michael eat?

- One way to understand this problem is to draw a picture. Your child could draw $\frac{3}{8}$ of a pizza.

  To show the part of the pizza that Michael ate, your child could shade 2 of the 3 pieces to show $\frac{2}{3}$.

  The shaded parts show how much of the original whole pizza Michael ate. Michael ate $\frac{2}{8}$, or $\frac{1}{4}$, of the original whole pizza.
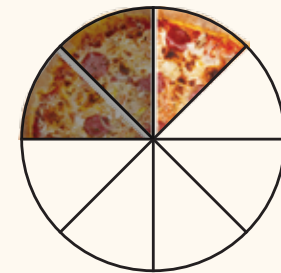
- Another way your child could solve the problem is to write a multiplication equation.

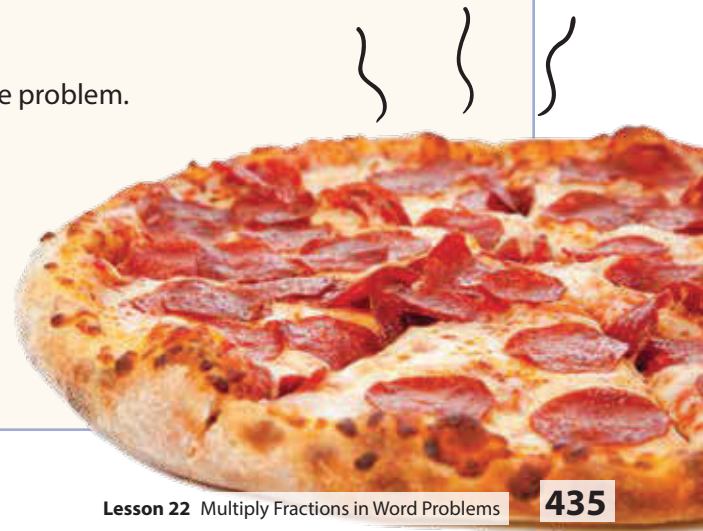 $\frac{2}{3}$ of $\frac{3}{8}$ means $\frac{2}{3} \times \frac{3}{8}$.

  $$\frac{2}{3} \times \frac{3}{8} = \frac{2 \times 3}{3 \times 8} = \frac{6}{24}$$

  So, $\frac{6}{24}$ is equivalent to $\frac{2}{8}$, or $\frac{1}{4}$.

The answer is the same using either way to solve the problem. Michael ate $\frac{1}{4}$ of the original whole pizza.

Invite your child to share what he or she knows about multiplying fractions and word problems by doing the following activity together.

ACTIVITY MULTIPLYING FRACTIONS IN WORD PROBLEMS

Do this activity with your child to multiply fractions in word problems.

Together with your child, make up and solve real-world problems about multiplying fractions or use the problems below.

Below are examples of problems you could solve.

1. Pete found $\frac{5}{6}$ of a party sandwich left in the refrigerator. He took $\frac{1}{2}$ of the $\frac{5}{6}$ of the sandwich to his neighbor. How much of the original sandwich did Pete take to his neighbor?

2. Shawn had $\frac{3}{5}$ of a gallon of paint left in the can. He used $\frac{2}{3}$ of it to paint a cabinet. How much of the gallon of paint did he use?
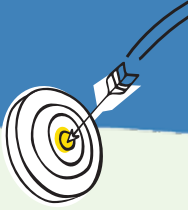
3. Renee made some money babysitting. She saved $\frac{3}{4}$ of the money. She spent $\frac{2}{5}$ of the money she saved to buy a shirt. What fraction of the money did Renee spend on the shirt?

Answers:
1. $\frac{5}{12}$; **2.** $\frac{6}{15}$ or $\frac{2}{5}$; **3.** $\frac{6}{20}$ or $\frac{3}{10}$

Explore Multiplying Fractions in Word Problems

Now that you have learned how to multiply fractions, you will use what you know in problem situations. Use what you know to try to solve the problem below.

> Grayson lives $\frac{4}{5}$ mile from the park. He has already walked $\frac{3}{4}$ of the way to the park. How far has Grayson walked? Use a visual fraction model to show your thinking.

TRY IT

Math Toolkit
- fraction tiles or circles
- fraction bars
- fraction models
- grid paper
- number lines
- index cards
- multiplication models

DISCUSS IT

Ask your partner: Can you explain that again?

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

CONNECT IT

1 LOOK BACK

Explain how you can use a visual model to show how far Grayson has already walked.

2 LOOK AHEAD

You can use what you know about multiplying fractions to think through and solve word problems involving fractions. Consider this word problem:

Ehrin spills $\frac{1}{2}$ of a $\frac{3}{4}$-pound box of cereal. How many pounds did she spill?

a. Finding $\frac{1}{2}$ of a quantity is the same as multiplying by $\frac{1}{2}$. What equation could you write for the cereal problem? Use *p* for the unknown amount in the problem.

b. Estimate the product. Is the amount of cereal Ehrin spills on the floor more than $\frac{3}{4}$ pound or less than $\frac{3}{4}$ pound? Why?

c. Complete the area model to show the problem. How many pounds of cereal did Ehrin spill on

the floor? .... pound
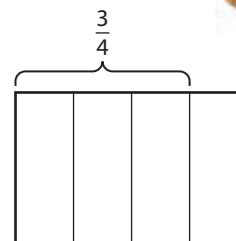
3 REFLECT

How does writing an equation, making an estimate, and drawing a model help you think through the problem?

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Prepare for Multiplying Fractions in Word Problems

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

Examples

Examples

Examples

fraction of a fraction

Examples

Examples

Examples
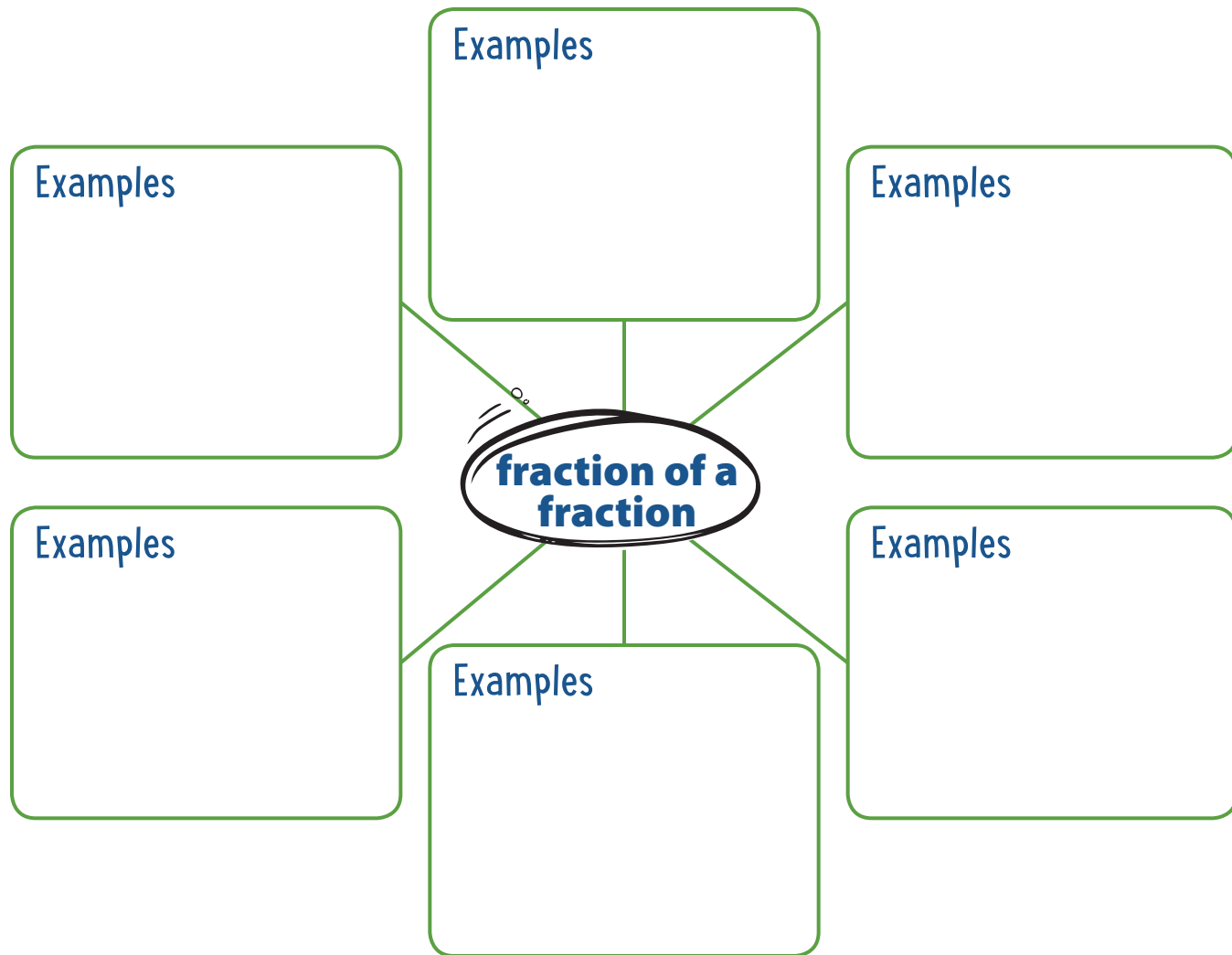
2 Write a multiplication expression that can be used to find $\frac{1}{5}$ of $\frac{3}{8}$.

Why is the product less than $\frac{3}{8}$?

3   Solve the problem. Show your work.

Lola lives $\frac{3}{4}$ mile from the basketball court. She has already walked $\frac{2}{3}$ of the way to the basketball court. How far has Lola walked? Use a visual fraction model to show your thinking.

Solution ....

4   Check your answer. Show your work.

Develop Multiplying Fractions in Word Problems

Read and try to solve the problem below.

> **Brandon's mother left $\frac{3}{4}$ of a pizza on the counter. If Brandon eats $\frac{2}{3}$ of the leftover pizza, how much of the whole pizza did Brandon eat?**

TRY IT

🧰 Math Toolkit
- fraction tiles or circles
- fraction bars
- fraction models 🖱
- grid paper
- number lines 🖱
- index cards
- multiplication models 🖱

DISCUSS IT

Ask your partner: How did you get started?

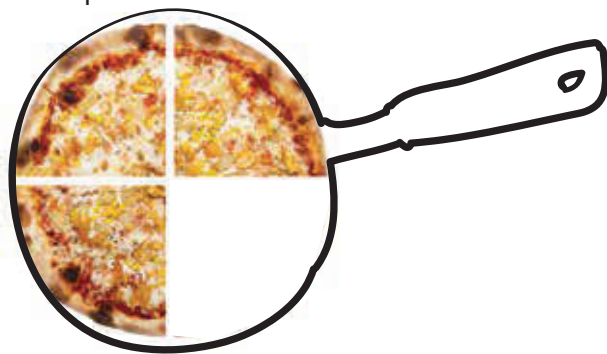**Tell your partner:** I am not sure how to find the answer because . . .

Explore different ways to understand strategies for solving word problems that involve finding a fraction of a fraction.

> **Brandon's mother left $\frac{3}{4}$ of a pizza on the counter. If Brandon eats $\frac{2}{3}$ of the leftover pizza, how much of the whole pizza did Brandon eat?**

PICTURE IT

You can draw a picture to help you understand the problem.

Show $\frac{3}{4}$ of a pizza.

Since Brandon eats $\frac{2}{3}$ of what is left, outline 2 of the 3 pieces that are left. You can see from the outlined parts how much of the whole pizza Brandon ate.
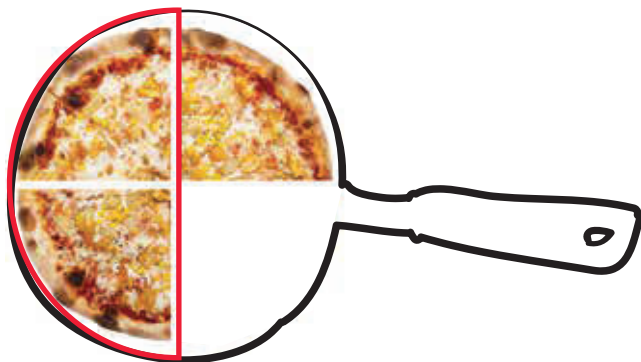
MODEL IT

You can write an equation to help you understand the problem.

You need to find a fraction of a fraction: $\frac{2}{3}$ of $\frac{3}{4}$ of a pizza.

$\frac{2}{3}$ of $\frac{3}{4}$ means $\frac{2}{3} \times \frac{3}{4}$.

$$\frac{2}{3} \times \frac{3}{4} = \frac{2 \times 3}{3 \times 4}$$

CONNECT IT

Now you will use the problem from the previous page to help you understand strategies for solving word problems that involve finding a fraction of a fraction.

1 Look at **Picture It**. Why do you outline 2 of the 3 parts of the pizza?

2 How much of the whole pizza did Brandon eat? Explain your reasoning.

3 Look at **Model It**. How do you know that you should multiply $\frac{2}{3} \times \frac{3}{4}$?

4 What is $\frac{2 \times 3}{3 \times 4}$? ....

Is this product the same as your answer to problem 2? Explain.

5 What strategies can you use to solve a word problem that involves finding a fraction of a fraction?

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 solving word problems that involve finding a fraction of a fraction? Explain.

....

....

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APPLY IT

Use what you just learned to solve these problems.

7 Lewis walked $\frac{8}{10}$ of a mile. Todd walked $\frac{3}{4}$ of the way with Lewis. How many miles did Todd walk with Lewis? Show your work.

Solution ....

8 Stan has a recipe for vegetable lasagna that calls for $\frac{9}{16}$ pound of eggplant. He wants to make a batch of lasagna that is $\frac{2}{3}$ of the amount of the recipe. How much eggplant will Stan need? Show your work.

Solution ....

9 Jamie worked $\frac{5}{6}$ hour filing papers for her mother. She listened to music for $\frac{4}{5}$ of the time she spent filing. How much time did Jamie spend listening to music? Show your work.

Solution ....

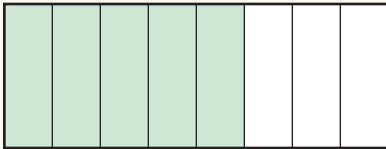# Practice Multiplying Fractions in Word Problems

**Study the Example showing one way to solve a word problem with fractions.
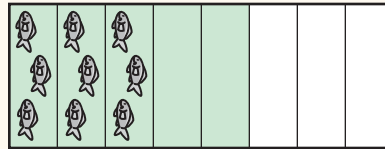Then solve problems 1–5.**

EXAMPLE

Vicky's favorite beach towel is green and white and has a fish design. The green part covers $\frac{5}{8}$ of the towel. A fish design is drawn on $\frac{3}{5}$ of that part. What part of the towel has a fish design?

You can draw a picture.

Show a towel with $\frac{5}{8}$ shaded green.   Draw fish on $\frac{3}{5}$ of the green part.

Because 3 of the 8 parts of the towel have fish drawn on them, $\frac{3}{8}$ of the towel has a fish design.

1   You can also write an equation to solve the Example. Write the numbers to complete the equation showing what part of the towel has the fish design.

$\frac{3}{5}$ of $\frac{5}{8}$ means $\frac{3}{5} \times \frac{5}{8}$.

$$\frac{3}{5} \times \frac{\square}{\square} = \frac{\square \times 5}{\square \times 8} = \frac{\square}{\square}$$

2   Is your answer to problem 1 the same as the answer of $\frac{3}{8}$ shown in the Example? Explain.

3 Suppose that the green part of Vicky's towel covers $\frac{4}{5}$ of the towel and the fish design is drawn on $\frac{3}{4}$ of that part. Draw a picture to find the part of the towel that has the fish design. Then write the answer.

Solution

4 Write an equation to show the answer to problem 3.

Solution

5 Write a word problem that can be solved by finding the product $\frac{1}{6} \times \frac{3}{8}$. Then solve your problem.

Problem

Show your work.

Solution

446   **Lesson 22** Multiply Fractions in Word Problems

Develop Multiplying with Mixed Numbers in Word Problems

Read and try to solve the problem below.

> Janie has a rectangular garden that is $2\frac{3}{4}$ yards in length and 1 yard in width. She grows roses in $\frac{1}{2}$ of her garden.
>
> How many square yards in Janie's garden has roses?

TRY IT

🧰 Math Toolkit
- fraction tiles or circles
- fraction bars
- fraction models 🖰
- grid paper
- number lines 🖰
- index cards
- multiplication models 🖰

DISCUSS IT

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

Tell your partner: At first, I thought . . .

Explore different ways to understand multiplying fractions and mixed numbers.

> **Janie has a rectangular garden that is $2\frac{3}{4}$ yards in length and 1 yard in width. She grows roses in $\frac{1}{2}$ of her garden. How many square yards in Janie's garden has roses?**

PICTURE IT

You can use an area model to help you understand the problem.

The purple shaded region of the area model shows **half** of $2\frac{3}{4}$.
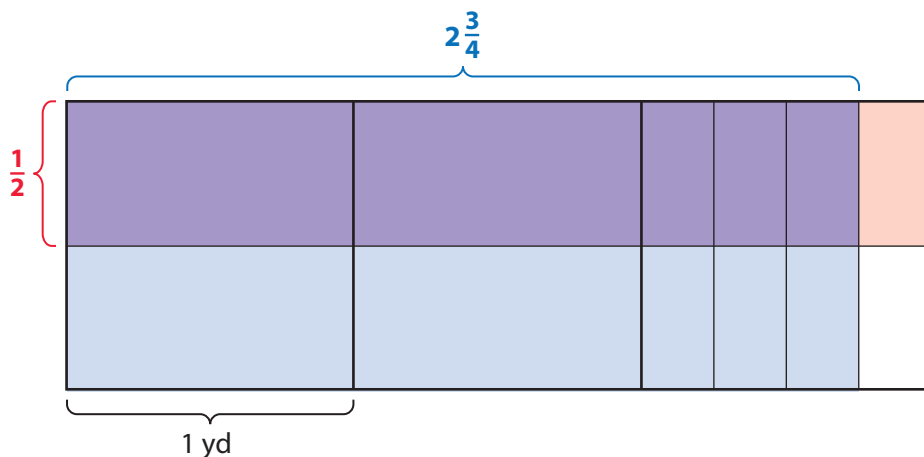
MODEL IT

You can write equations to model the problem.

You can write $2\frac{3}{4}$ as a fraction.

$$2\frac{3}{4} = 2 + \frac{3}{4}$$
$$= \frac{8}{4} + \frac{3}{4}$$
$$= \frac{11}{4}$$

You need to find a fraction of a fraction: $\frac{1}{2}$ of $\frac{11}{4}$ square yards.

$\frac{1}{2}$ of $\frac{11}{4}$ means $\frac{1}{2} \times \frac{11}{4}$.

$$\frac{1}{2} \times \frac{11}{4} = \frac{1 \times 11}{2 \times 4}$$

CONNECT IT

Now you will use the problem from the previous page to understand how to multiply fractions and mixed numbers.

1 Use the last equation in **Model It** to find the area of Janie's garden that has roses.

Janie's garden has .... square yards of roses.

Explain how you can use the area model in **Picture It** to find the area of Janie's garden that has roses.

2 Look at the first equation in **Model It**. Why is the mixed number rewritten as a fraction?

3 How can you multiply $\frac{1}{2} \times 2\frac{3}{4}$ without changing $2\frac{3}{4}$ to a fraction?

What is $\frac{1}{2} \times 2$? .... 　　　　　 What is $\frac{1}{2} \times \frac{3}{4}$? ....

Add the two products. .... + ... = ...

Is this result the same as your answer to problem 1? ....

4 How can you multiply a mixed number by a fraction?

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 multiplying fractions and mixed numbers? Explain.

....

....

....

APPLY IT

Use what you just learned to solve these problems.

6   Izzy has $3\frac{1}{2}$ yards of rope. She uses $\frac{3}{5}$ of the rope to attach a tire swing to a tree in her yard. How many yards of rope does Izzy use for the tire swing? Show your work.

Solution

7   Colin has a chain that is $\frac{5}{6}$ foot long. He adds links to his chain so that it is $4\frac{1}{2}$ times as long as the original chain. How many feet long is his chain now? Show your work.

Solution

8   George has $1\frac{5}{9}$ yards of fabric. He plans to use $\frac{3}{4}$ of the fabric to make a pillow. How many yards of fabric will George use for the pillow?

Ⓐ $1\frac{6}{36}$

Ⓑ $1\frac{8}{13}$

Ⓒ $1\frac{17}{36}$

Ⓓ $1\frac{5}{12}$

Practice Multiplying with Mixed Numbers

Study the Example showing one way to solve a word problem with a mixed number. Then solve problems 1–5.

EXAMPLE

Mr. Urrego is painting his deck for the summer. He has painted a rectangular area that is $3\frac{1}{4}$ yards long and $\frac{2}{3}$ yard wide. How many square yards of deck are painted?
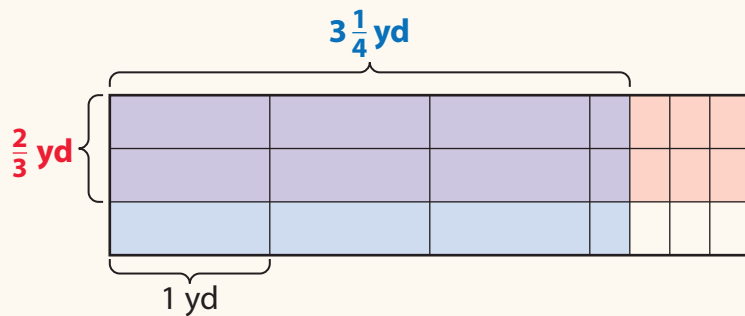
You can use an area model.

The larger sections of the area model are $\frac{1}{3} \times 1 = \frac{1}{3}$ square yard.

The smaller sections of the area model are $\frac{1}{3} \times \frac{1}{4} = \frac{1}{12}$ square yard.

The model shows the number of square yards painted is:

$$\frac{2}{3} + \frac{2}{3} + \frac{2}{3} + \frac{2}{12} = \frac{6}{3} + \frac{2}{12} = 2 + \frac{2}{12} = 2\frac{2}{12}$$

1 Write the missing numbers to complete the multiplication equation showing how much of the deck is painted.

Multiply the length and width of the painted area:

$$3\frac{1}{4} \times \frac{\square}{\square} = \left(\square \times \frac{2}{3} \right) + \left(\frac{\square}{\square} \times \frac{2}{3} \right) = \frac{\square}{3} + \frac{2}{\square} = \square \frac{2}{12}$$

.... square yards

2 To multiply by a mixed number, you can also write the mixed number as a fraction and then multiply. Use this method to find the product $3\frac{1}{4} \times \frac{2}{3}$ in order to find how many square yards of the deck are painted. Show your work.

Solution ....

3 On Saturday, Kira ran $\frac{3}{4}$ mile. On Sunday, she ran $2\frac{1}{2}$ times as far as on Saturday. Use a multiplication equation to find how far Kira ran on Sunday. Show your work.

Solution ....

4 Use a visual model to show another way to find the distance Kira ran on Sunday.

5 The multipurpose room at the Cortez School is being set up for the annual book sale. Graphic novels will be displayed in a rectangular area $1\frac{1}{4}$ yards long and $\frac{3}{4}$ yard wide. Will the graphic novels be displayed in an area greater than or less than 1 square yard? Show your work.

Solution ....

Refine Multiplying Fractions in Word Problems

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

EXAMPLE

Chris uses $4\frac{1}{4}$ tubes of paint. Nico uses $1\frac{1}{2}$ times as much paint as Chris. How much paint did Nico use?

Look at how you can solve this problem using equations.

$$4\frac{1}{4} \times 1 = 4\frac{1}{4}$$

$$4\frac{1}{4} \times \frac{1}{2} = \left(4 \times \frac{1}{2}\right) + \left(\frac{1}{4} \times \frac{1}{2}\right) = 2 + \frac{1}{8}$$

$$4\frac{1}{4} + 2 + \frac{1}{8} = 6\frac{1}{4} + \frac{1}{8} = 6\frac{2}{8} + \frac{1}{8} = 6\frac{3}{8}$$

Solution ....

> Breaking apart a mixed number happens twice in this problem.

PAIR/SHARE
How does the product compare to $4\frac{1}{4}$?

APPLY IT

1 Josh exercises at the gym $3\frac{3}{4}$ hours a week. He spends $\frac{2}{5}$ of his time at the gym lifting weights. How many hours a week does Josh spend lifting weights at the gym? Show your work.

> How do I know what operation to use to solve this problem?

PAIR/SHARE
What is a reasonable estimate for the number of hours Josh lifts weights each week?

Solution ....

Lesson 22 Multiply Fractions in Word Problems **453**

2 A field is in the shape of a rectangle $\frac{5}{6}$ mile long and $\frac{3}{4}$ mile wide. What is the area of the field? Show your work.

> What model can I use to help understand this problem?

Solution ....

3 Ari had $\frac{3}{4}$ of a bag of popcorn. His friends ate $\frac{1}{2}$ of his popcorn. What fraction of the whole bag of popcorn did Ari's friends eat?

> **PAIR/SHARE**
> Can you solve this problem in another way?

> What equation can I write to solve this problem?

Ⓐ $\frac{1}{4}$

Ⓑ $\frac{3}{8}$

Ⓒ $\frac{5}{4}$

Ⓓ $\frac{3}{2}$

Kayla chose Ⓐ as the correct answer. How did she get that answer?

> **PAIR/SHARE**
> Does Kayla's answer make sense?

4 On Sunday, Kristen bought a carton of 24 bottles of water.

- On Monday, Kristen drank $\frac{1}{6}$ of the bottles in the carton.
- On Tuesday, Kristen drank $\frac{1}{4}$ of the bottles that remained in the carton after Monday.
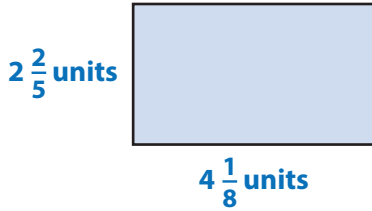
Which picture represents the number of bottles of water remaining in the carton after Kristen drank her water on Tuesday?

Ⓐ

Ⓑ

Ⓒ

Ⓓ

5 Milo's pancake recipe makes 9 servings. It calls for $\frac{3}{4}$ cup milk. Milo wants to make 6 servings. How much milk will he need?

.... cup

6 Jillian draws a rectangle with the dimensions shown below. What is the area of Jillian's rectangle?

$2\frac{2}{5}$ units

$4\frac{1}{8}$ units

Solution ....

7 Lily paints 3 trees for a wall mural. The middle tree is $2\frac{1}{2}$ ft tall. The tree on the left is $\frac{3}{4}$ as tall as the middle tree. The tree on the right is $1\frac{3}{4}$ times as tall as the middle tree. How tall is each tree? Show your work.

Solution ....

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8 MATH JOURNAL

Write a word problem for the expression $3\frac{1}{2} \times \frac{1}{2}$. Use a visual model or an equation to show how to solve your problem.

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