3 Did You Get the Part?

Multiplying Fractions

WARM UP

Plot each value on the number line shown.

1. 2
2. $\frac{1}{4}$
3. $4\frac{1}{3}$
4. $\frac{7}{2}$

LEARNING GOALS

- Connect an area model to the standard algorithm for multiplying two fractions.
- Multiply two fractions using the standard algorithm.
- Calculate the products of fractions in real-world and mathematical problems.

KEY TERM

- algorithm

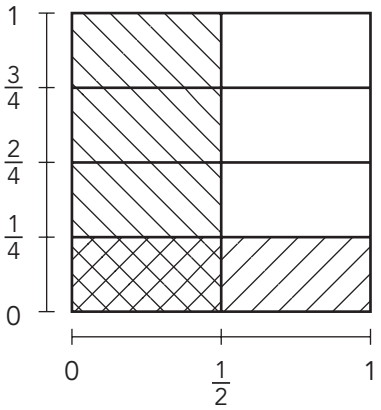
You have used area models to represent products of whole numbers. How can you use area models to represent products of fractions?

A Part of a Part

Previously, you used an area model to represent products, determine factors, and list multiples of given numbers. In the same way that area models represent whole number multiplication, area models can represent fraction multiplication.

Consider the expression $\frac{1}{4} \times \frac{1}{2}$ represented in the area model shown.

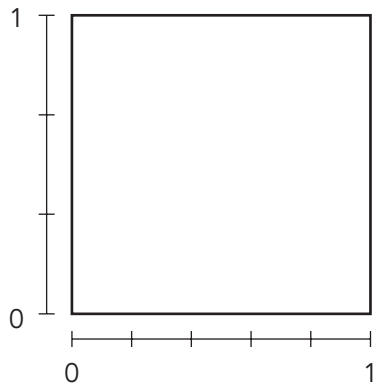
1. How are the factors $\frac{1}{4} \times \frac{1}{2}$ represented in the model?



2. What is the product of $\frac{1}{4} \times \frac{1}{2}$? Describe how the product is represented in the model.

Consider the expression $\frac{2}{3} \times \frac{3}{5}$.

3. Model the expression and determine the product.



4. Show how the *algorithm* for multiplying two fractions less than 1 gives the same product as the model.

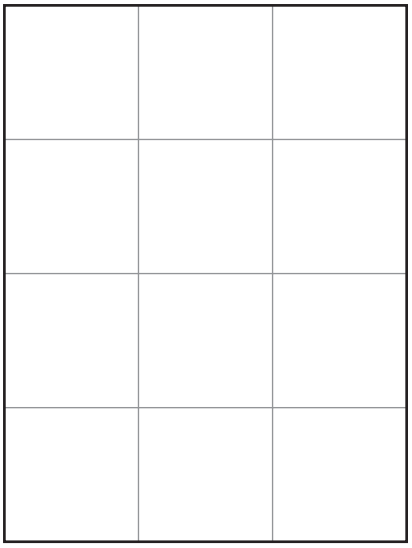
An **algorithm** is a process or description of steps you can follow to complete a mathematical calculation.

ACTIVITY
3.1 Using Area Models to Multiply Mixed Numbers

Bree is tiling the top of a table that measures $3\frac{1}{2}$ feet by $2\frac{1}{2}$ feet. She has 12 ceramic tiles that each measure 1 foot by 1 foot.

Consider the 4×3 area model that represents the 12 tiles Bree will use.

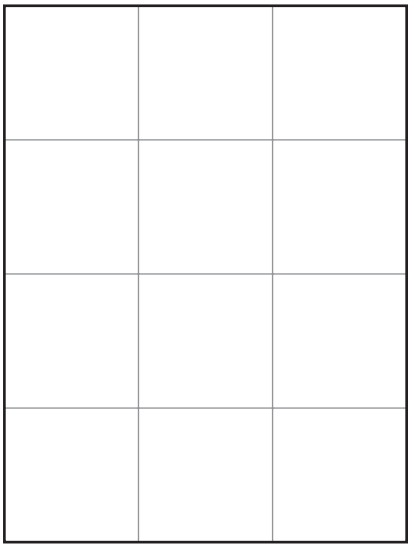
1. Create a model to represent the dimensions of the table.



2. What portion of the tiles will Bree use to cover the tabletop?

Suppose Bree doesn't want to cut the 1 ft × 1 ft tiles. Instead, she wants to buy smaller sized square tiles that she can use to cover the entire tabletop.

3. Continue to divide the model into equal-sized tiles. Describe your model.



4. What size tiles should she buy?

5. How many tiles of that size does she need?

6. Show that the area represented in the model is the same as the product of the side lengths.

ACTIVITY
3.2 Multiplying Mixed Numbers

You can use the standard algorithm to multiply a whole number and a mixed number, a mixed number and a fraction less than one, or two mixed numbers when solving real-world and mathematical problems.

RECIPE

Hawaiian Trail Mix Extravaganza

- $3\frac{3}{8}$ cups of macadamia nuts
- $2\frac{1}{3}$ cups of almonds
- $2\frac{1}{4}$ cups of pumpkin seeds
- $1\frac{1}{3}$ cups of sunflower seeds
- $3\frac{3}{8}$ cups of dried cherries
- $2\frac{5}{6}$ cups of honey
- $4\frac{5}{8}$ cups of popped pop corn
- $4\frac{1}{2}$ cups of raisins
- $\frac{3}{4}$ cups of corn syrup
- $2\frac{3}{4}$ cups of granola

Feeds 12 People

The teachers at Riverside Middle School decide to make trail mix for an upcoming field trip. Ms. Hadley shares her Hawaiian Trail Mix Extravaganza recipe with the other teachers. The recipe shown is for 1 batch.

1. Megan and CJ determined the number of cups of almonds it will take to make 3 batches. How is CJ's strategy different than Megan's?

Megan

$3 \times 2\frac{1}{3}$

$\frac{3}{1} \times \frac{7}{3} = \frac{21}{3}$

$= 7$

7 cups

CJ

$3 \times 2\frac{1}{3}$

$\frac{\cancel{3}}{1} \times \frac{7}{\cancel{3}} = 7$

7 cups

2. Determine the number of cups of each ingredient it will take to make $4\frac{1}{2}$ batches. Show your work.

a. corn syrup

b. sunflower seeds

c. pumpkin seeds

3. Calculate each product. Write your answer as a mixed number. Show your work.

a. $2\frac{1}{2} \times 3\frac{2}{5}$

b. $2\frac{2}{3} \times 4\frac{1}{4}$

c. $1\frac{3}{4} \times \frac{2}{5}$

d. $1\frac{1}{2} \times \frac{5}{6}$

e. $3\frac{3}{4} \times 2$

f. $2\frac{5}{8} \times 3$

NOTES

TALK the TALK

Going in a General Direction

Look back at the factors and products in this lesson. What generalizations can you make about the multiplication of fractions?

1. **Determine whether each statement is *always, sometimes,* or *never* true. Provide examples.**

   a. **If a fraction between 0 and 1 is multiplied by another fraction between 0 and 1, the product will be less than 1.**

   b. **If a fraction between 0 and 1 is multiplied by a mixed number, the product will be greater than 1.**

2. **Describe the algorithm for multiplying any two fractions or mixed numbers.**