Eureka Math™ Homework Helper

2015–2016

Grade 6
Module 2
Lessons 1–8

G6-M2-Lesson 1: Interpreting Division of a Fraction by a Whole Number (Visual Models)

Find the value of each in its simplest form.

1. $\frac{1}{2} \div 4$

1

To divide by four, I can create four rows. From the model, I can see that I am finding $\frac{1}{4}$ of $\frac{1}{2}$. I see that $\frac{1}{2} \div 4$ is the same as $\frac{1}{2} \times \frac{1}{4}$.

The diagram begins with one whole unit. I can divide it into two equal parts (columns) and shade one part to represent $\frac{1}{2}$.

The shared area (dark blue) is one out of eight total pieces, or $\frac{1}{8}$.

$\frac{1}{4}$

$\frac{1}{2}$

$$\frac{1}{2} \div 4 = \frac{1}{2} \times \frac{1}{4} = \frac{1}{8}$$

2. Three loads of sand weigh $\frac{3}{4}$ tons. Find the weight of 1 load of sand.

$\frac{3}{4} \div 3$

1

$\frac{3}{4}$

?

$\frac{1}{3}$

The shared area (dark blue) is three out of twelve total pieces, or $\frac{3}{12}$.

$\frac{3}{4}$

The diagram begins with three fourths. I need to find out how many one of those three fourths is. If three units represents three fourths, then one unit is 3 fourths ÷ 3 = 1 fourth.

$$\frac{3}{4} \div 3 = \frac{3}{4} \times \frac{1}{3} = \frac{3}{12} = \frac{1}{4}$$

3. Sammy cooked $\frac{1}{6}$ the amount of chicken he bought. He plans on cooking the rest equally over the next four days.

   a. What fraction of the chicken will Sammy cook each day?

   $$\frac{6}{6} - \frac{1}{6} = \frac{5}{6}$$

   > I begin with the whole amount of chicken, $\frac{6}{6}$, and then take away the $\frac{1}{6}$ he cooked.

   > I divide the remaining $\frac{5}{6}$ by 4 to find the fraction for each day.

   $$\frac{5}{6} \div 4 = \frac{5}{6} \times \frac{1}{4} = \frac{5}{24}$$

   b. If Sammy has 48 pieces of chicken, how many pieces will he cook on Wednesday and Thursday?

   $\frac{5}{24}(48) = 10$; *he will cook* 10 *pieces each day, so* $10 + 10 = 20$. *He will cook* 20 *pieces of chicken on Wednesday and Thursday.*

4. Sandra cooked $\frac{1}{3}$ of her sausages and put $\frac{1}{4}$ of the remaining sausages in the refrigerator to cook later. The rest of the sausages she divided equally into 2 portions and placed in the freezer.

   a. What fraction of sausage was in each container that went in the freezer?

   $$\frac{3}{3} - \frac{1}{3} = \frac{2}{3}$$

   cooked   **remaining**

   > $\frac{1}{3}$ is cooked, so there are $\frac{2}{3}$ remaining.
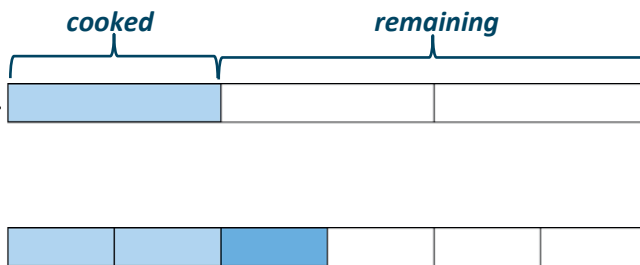
   > To find a fourth of the remaining, I need to divide the remaining $\frac{2}{3}$ into 4 equal pieces.

   $$\frac{2}{3} \div 4 = \frac{2}{3} \times \frac{1}{4} = \frac{2}{12} = \frac{1}{6}$$

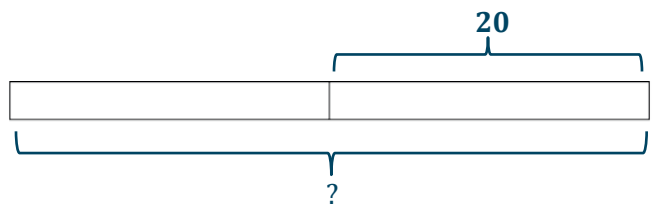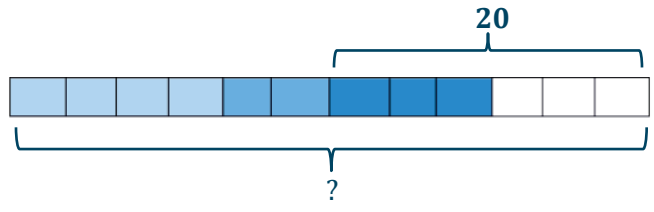   > The darkest shaded value is $\frac{1}{4}$ the amount of the tape diagram.

   > To find half of the remaining $\frac{6}{12}$, I need to divide by two.

   $$\frac{6}{12} \div 2 = \frac{6}{12} \times \frac{1}{2} = \frac{6}{24} = \frac{3}{12} = \frac{1}{4}$$

b.   If Sandra placed 20 sausages in the freezer, how many sausages did she start with?
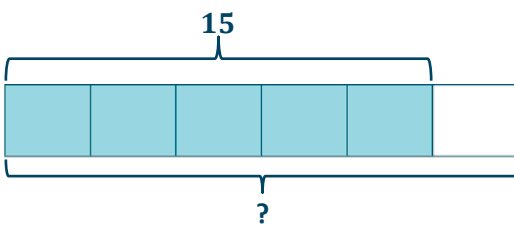
$$20 \div \frac{6}{12} \text{ or } 20 \div \frac{1}{2}$$

20 is $\frac{1}{2}$ of what size?

1 unit = 20

2 units = 2 × 20 = 40

Sandra started with 40 sausages.

G6-M2-Lesson 2: Interpreting Division of a Whole Number by a Fraction (Visual Models)

1. Ken used $\frac{5}{6}$ of his wrapping paper to wrap gifts. If he used 15 feet of wrapping paper, how much did he start with?

I can think of this as, "15 is $\frac{5}{6}$ of what number?" 5 out of the 6 units represents the amount of paper Ken used, which is 15 feet.

$15 \div \frac{5}{6}$

5 units = 15

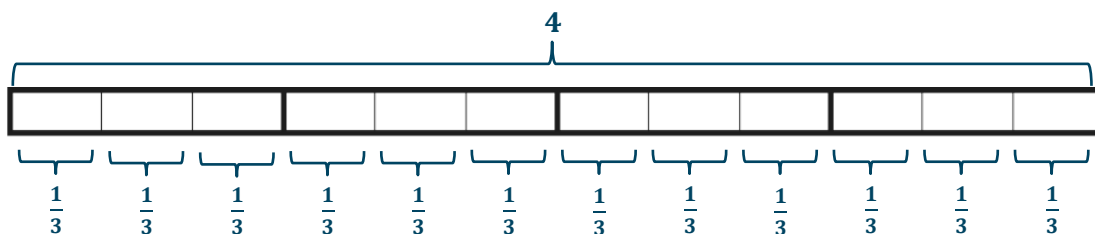**1 unit = 15 ÷ 5 = 3**

6 units = 6 × 3 = 18

I can divide 15 by 5 to determine the value of one unit. I need to find the value of one unit to determine the value of all six units.

*Ken started with **18** feet of wrapping paper.*

2. Robbie has 4 meters of ribbon. He cuts the ribbon into pieces $\frac{1}{3}$ meters long. How many pieces will he make?

$4 \div \frac{1}{3}$
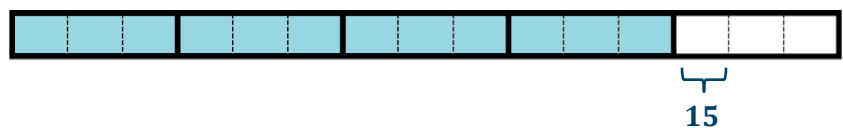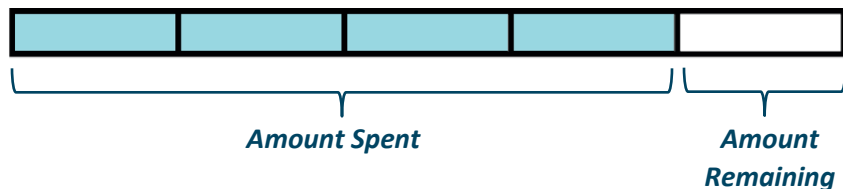
12 thirds ÷ 1 third = 12 ÷ 1 = 12

Robbie will make 12 pieces of ribbon.

I can think of this as, "How many groups of $\frac{1}{3}$ are in 4?"

3. Savannah spent $\frac{4}{5}$ of her money on clothes before spending $\frac{1}{3}$ of the remaining money on accessories. If the accessories cost \$15, how much money did she have to begin with?

Amount Spent   **Amount Remaining**

> I can divide each unit into three equal units to find a third of the remaining money. Each of these units represents \$15.

15

1 *unit* = **15**

15 *units* = **15** × **15** = **225**

Savannah had \$**225** *at first.*

4. Isa's class was surveyed about their favorite foods. $\frac{1}{3}$ of the students preferred pizza, $\frac{1}{6}$ of the students preferred hamburgers, and $\frac{1}{2}$ of the remaining students preferred tacos. If 9 students preferred tacos, how many students were surveyed?

pizza

> One third of the total amount of students preferred pizza. I can represent this with a tape diagram.

pizza   *ham*
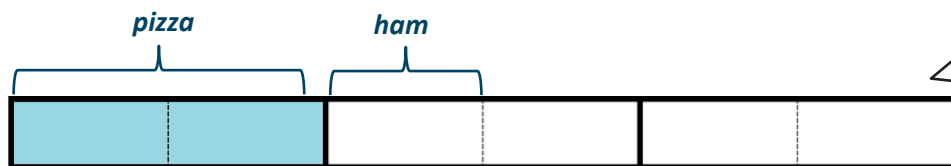
> I can divide each of the three units into two equal units to find one sixth.

pizza   *ham*   *tacos*
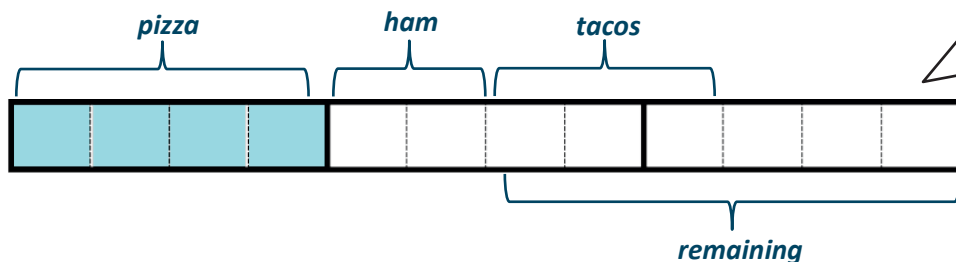
> I can divide each of the six units into two equal units to find half of the remainder.

remaining

3 *units* = 9

1 *unit* = 9 ÷ 3 = 3

12 *units* = 12 × 3 = 36

There were* 36 *students surveyed.

5. Caroline received her pay for the week. She spent $\frac{1}{4}$ of her pay on bills and deposited the remainder of the money equally into 2 bank accounts.

   a. What fraction of her pay did each bank account receive?

$$1 - \frac{1}{4} = \frac{3}{4}$$

$$\frac{3}{4} \div 2 = \frac{3}{4} \times \frac{1}{2} = \frac{3}{8}$$

> I need to start with the total amount of her pay, which I can represent with 1 whole.

   b. If Caroline deposited $60 into each bank account, how much did she receive in her pay?

60
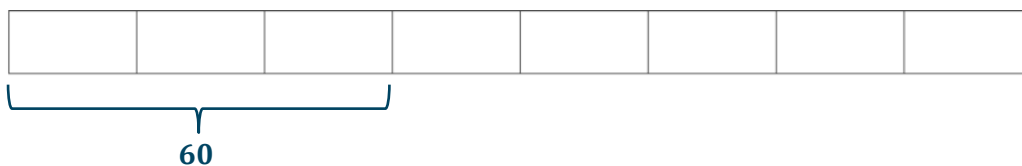
3 *units* = 60

1 *unit* = 60 ÷ 3 = 20

8 *units* = 8 × 20 = 160

Caroline received* $160 *in her pay.

2015-16

G6-M2-Lesson 3: Interpreting and Computing Division of a Fraction by a Fraction—More Models

Rewrite the expression in unit form. Find the quotient. Draw a model to support your answer.
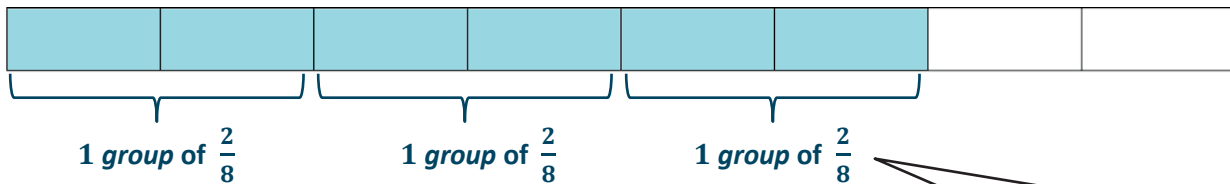
1. $\frac{6}{8} \div \frac{2}{8}$

   6 *eighths* ÷ 2 *eighths* = 3

1 *group* of $\frac{2}{8}$ **1 *group* of $\frac{2}{8}$**   **1 *group* of $\frac{2}{8}$**

> I can look at this as, "How many groups of $\frac{2}{8}$ can fit in $\frac{6}{8}$?"

Rewrite the expression in unit form. Find the quotient.

2. $\frac{7}{6} \div \frac{4}{6}$

   7 *sixths* ÷ 4 *sixths* = 7 ÷ 4 = $\frac{7}{4}$ = $1\frac{3}{4}$

> The units are the same in the dividend and divisor. I can easily divide the numerators.

Represent the division expression in unit form. Find the quotient.

3. A biker is $\frac{6}{7}$ miles from the finish line. If he can travel $\frac{5}{7}$ miles in one minute, how long until he reaches the finish line?

   $\frac{6}{7} \div \frac{5}{7} =$ **6 *sevenths* ÷ 5 *sevenths* = 6 ÷ 5 = $\frac{6}{5}$ = $1\frac{1}{5}$**

   It will take him $1\frac{1}{5}$ minutes, or 1 minute and 12 seconds, to reach the finish line.

4. A seamstress has 5.2 feet of ribbon.

> Since this is a mixed number, she can only cut 8 whole strips.

a. How many $\frac{6}{10}$ feet strips of ribbon can she cut?

$5.2 = 52 \text{ tenths}; \frac{6}{10} = 6 \text{ tenths}; 52 \text{ tenths} \div 6 \text{ tenths} = 52 \div 6 = 8\frac{4}{6} \text{ or } 8\frac{2}{3}$

She can cut eight $\frac{6}{10}$ feet of ribbon.

> I can determine eight strips of $\frac{6}{10}$ feet of ribbon by multiplying $\frac{6}{10}$ by 8.
> 6 tenths × 8 = 48 tenths.

b. How much ribbon is left over?

$52 \text{ tenths} - 48 \text{ tenths} = 4 \text{ tenths}$

She will have $\frac{4}{10}$ feet of ribbon left over.

G6-M2-Lesson 4: Interpreting and Computing Division of a Fraction by a Fraction—More Models

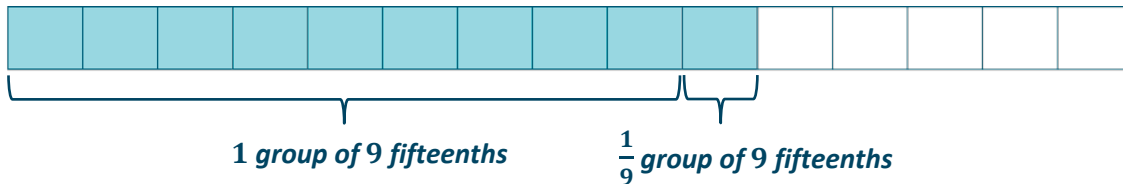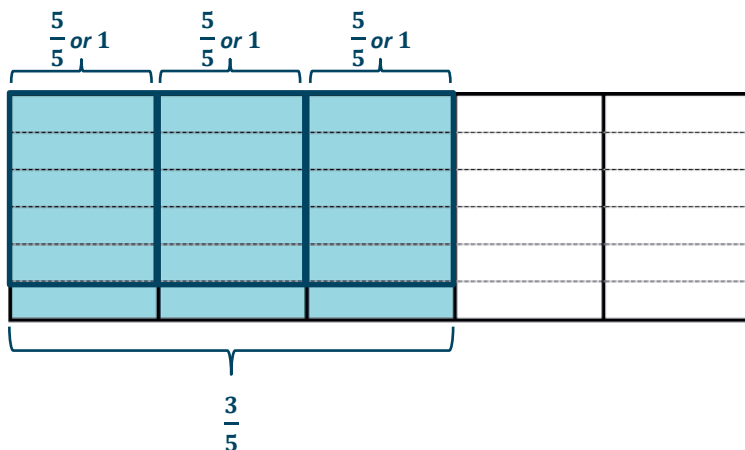Calculate the quotient. If needed, draw a model.

1. $\frac{2}{5} \div \frac{2}{3}$

> These fractions do not have the same denominator, or unit. I need to create like denominators to divide the numerators.

6 fifteenths ÷ 10 fifteenths = 6 ÷ 10 = $\frac{6}{10}$, or $\frac{3}{5}$

2. $\frac{2}{3} \div \frac{3}{5}$

10 fifteenths ÷ 9 fifteenths = 10 ÷ 9 = $\frac{10}{9}$ = $1\frac{1}{9}$

1 group of 9 fifteenths   **$\frac{1}{9}$ group of 9 fifteenths**

3. $\frac{3}{5} \div \frac{1}{6}$

$\frac{5}{5}$ or 1   **$\frac{5}{5}$ or 1**   **$\frac{5}{5}$ or 1**

> I can shade 3 out of 5 columns to represent $\frac{3}{5}$. To find how many groups of $\frac{1}{6}$ are in that amount, I can divide each column into 6 rows. There are 18 fifths. I can represent this as 3 wholes and 3 fifths, or $3\frac{3}{5}$.

$\frac{3}{5}$

18 thirtieths ÷ 5 thirtieths = 18 ÷ 5 = $\frac{18}{5}$ = $3\frac{3}{5}$
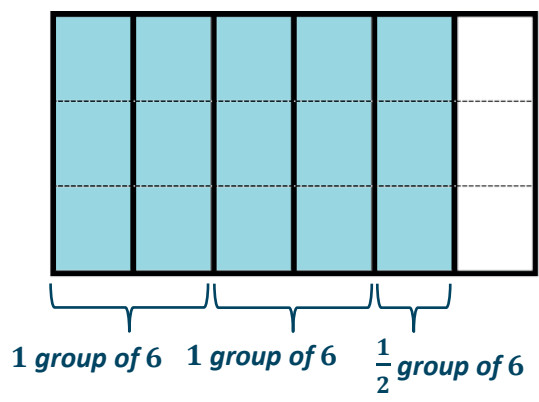
4. $\dfrac{5}{6} \div \dfrac{1}{3}$

I can shade 5 out of 6 columns to represent $\dfrac{5}{6}$. To find how many groups of $\dfrac{1}{3}$ are in that amount, I can divide each column into 3 rows. There are 15 sixths. I can represent this as 2 wholes and 3 sixths, or $2\dfrac{1}{2}$.

1 *group of* 6   1 *group of* 6 $\dfrac{1}{2}$ *group of* 6

$$15 \; eighteenths \div 6 \; eighteenths = 15 \div 6 = \dfrac{15}{6} = 2\dfrac{1}{2}$$

G6-M2-Lesson 5: Creating Division Stories

1. How many $\frac{1}{3}$ teaspoons of honey are in a recipe calling for $\frac{5}{6}$ teaspoons of honey?

   $\frac{5}{6} \div \frac{1}{3} = \frac{5}{6} \div \frac{2}{6}$

   5 sixths ÷ 2 sixths = 5 ÷ 2 = $\frac{5}{2}$ = $2\frac{1}{2}$

   There are $2\frac{1}{2}$ one-third teaspoons of honey in $\frac{5}{6}$ teaspoons.

2. Write a measurement story problem for $5 \div \frac{3}{5}$.

   > I know that measurement interpretation means that I have to find out how many groups of $\frac{3}{5}$ are in 5.

   How many $\frac{3}{5}$ cups of milk are in a recipe calling for 5 cups?

3. Fill in the blanks to complete the equation. Then, find the quotient, and draw a model to support your solution.

   $$\frac{1}{3} \div 7 = \frac{1}{\square} \text{ of } \frac{1}{3}$$

   $$\frac{1}{3} \div 7 = \frac{1}{7} \text{ of } \frac{1}{3}$$

   > When I divide by 7, I know that is the same as taking a seventh, or multiplying by $\frac{1}{7}$. The word "of" tells me to multiply in this case.

4. Pam used 8 loads of soil to cover $\frac{4}{5}$ of her garden. How many loads of soil will she need to cover the entire garden?

   4 units = 8

   1 unit = 8 ÷ 4 = 2

   5 units = 5 × 2 = 10

   > I can use the partitive interpretation of division here since I know both parts and need to determine the total amount.

   Pam needs 10 loads of soil to cover the entire garden.

5. Becky plans to run 3 miles on the track. Each lap is $\frac{1}{4}$ miles. How many laps will Becky run?

   $3 \div \frac{1}{4} = 12\ \textbf{\textit{fourths}} \div 1\ \textbf{\textit{fourth}} = 12 \div 1 = \frac{12}{1} = 12.$ **Becky will run 12 laps.**

6. Kaliah spent $\frac{2}{3}$ of her money on an outfit. She spent $\frac{3}{8}$ of the remaining money on a necklace. If she has $15 left, how much did the outfit cost?

   $\frac{3}{3} - \frac{2}{3} = \frac{1}{3}$

   $\frac{1}{3} \times \frac{3}{8} = \frac{1}{8}$

   $\frac{2}{3} + \frac{1}{8} = \frac{16}{24} + \frac{3}{24} = \frac{19}{24}$

   $\frac{24}{24} - \frac{19}{24} = \frac{5}{24}$
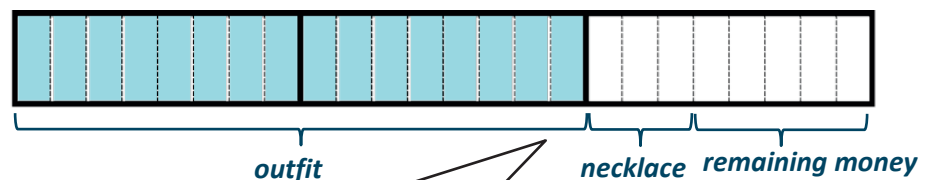
   15 is $\frac{5}{24}$ of what number?

   5 units = 15

   1 unit = 15 ÷ 5 = 3

   16 units = 16 × 3 = 48

   The outfit cost $48.

   outfit   necklace   remaining money

   $15

   $\frac{2}{3}$ is shaded in my diagram. What is left over is $\frac{1}{3}$. Three eighths of that is spent on the necklace. The leftover is $\frac{5}{8}$. If I split the remaining third into eight equal parts, I need to split each of the other two thirds into eight equal parts. The entire amount is now in 24 parts.

   5 units out of 24 represents the $15 left over. I can use unit form to determine what one unit represents.

G6-M2-Lesson 6: Creating Division Stories

1. $\frac{5}{6}$ teaspoons is $\frac{1}{3}$ group of what size?

   $$\frac{5}{6} \div \frac{1}{3}$$

   5 sixths ÷ 2 sixths $= \frac{5}{2} = 2\frac{1}{2}$

   $\frac{5}{6}$ teaspoons is $\frac{1}{3}$ group of $2\frac{1}{2}$ teaspoons.

   > In partitive division, I know the parts and need to find the total amount. I can choose the unit of feet and create a story.

2. Write a partitive division story problem for $\frac{7}{10} \div \frac{1}{5}$.
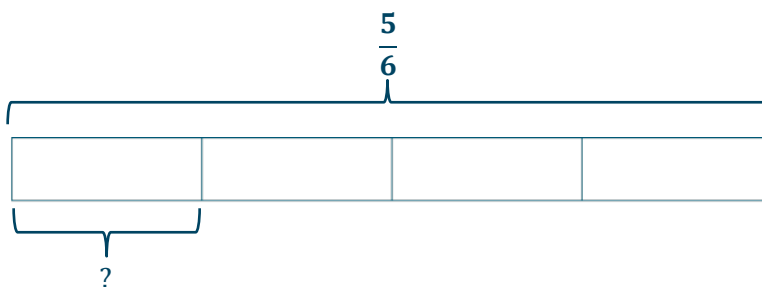
   Brendan had $\frac{7}{10}$ foot of rope. This is $\frac{1}{5}$ the amount he needs. How much rope does he need in all?

3. Fill in the blanks to complete the equation. Then, find the quotient, and draw a model to support your solution.

   $$\frac{5}{6} \div 4 = \frac{\square}{4} \text{ of } \frac{5}{6}$$

   $$\frac{5}{6} \div 4 = \frac{1}{4} \text{ of } \frac{5}{6}$$

   > I can think of this as what is $\frac{1}{4}$ of $\frac{5}{6}$? $\frac{5}{6}$ is the total. I am looking for the part.

   $$\frac{5}{6}$$

   ?

   4 units → $\frac{5}{6}$

   1 unit → $\frac{5}{6} \div 4 = \frac{5}{6} \times \frac{1}{4} = \frac{5}{24}$

4. Karrie cleaned $\frac{1}{5}$ of her house in 45 minutes. How long will it take her to clean the entire house?

$$45 \text{ min} \times \frac{1 \text{ hr}}{60 \text{ min}} = \frac{45}{60} \text{ hr} = \frac{3}{4} \text{ hr.}$$

$$\frac{3}{4} \div \frac{1}{5} = 15 \text{ twentieths} \div 4 \text{ twentieths} = \frac{15}{4} = 3\frac{3}{4}$$

It will take Karrie $3\frac{3}{4}$ hours to clean the entire house.

> I can use conversions to determine the fraction of an hour that is represented by 45 minutes.

> I can look at this as partitive division. I know it takes $\frac{3}{4}$ hours to clean $\frac{1}{5}$ of the house. I'm looking to find the total amount of hours needed to clean the whole house.

# G6-M2-Lesson 7: The Relationship Between Visual Fraction Models and Equations

Invert and multiply to divide.

1. $\frac{6}{7} \div \frac{2}{3}$

    $\frac{6}{7} \div \frac{2}{3} = \frac{6}{7} \times \frac{3}{2} = \frac{18}{14} = \frac{9}{7}$

> I know that $\frac{6}{7}$ is $\frac{2}{3}$ of a number. Two units is represented by $\frac{6}{7}$, so one unit is half of $\frac{6}{7}$. $\frac{6}{7} \times \frac{1}{2} = \frac{6}{14}$. Three units is $3 \times \frac{6}{14} = \frac{18}{14}$. I multiplied $\frac{6}{7}$ by 3 and by $\frac{1}{2}$. I know this is the same as multiplying $\frac{6}{7}$ by $\frac{3}{2}$.

2. Cody used $\frac{3}{4}$ of his gas. If he used $\frac{5}{7}$ of a tank, how much gas did he start with?
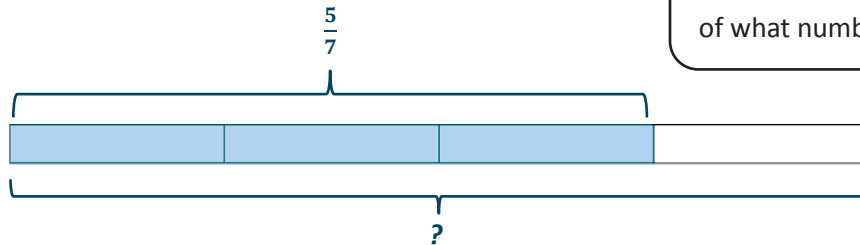
> I know that this problem is asking me to determine $\frac{5}{7}$ is $\frac{3}{4}$ of what number.

$$\frac{5}{7}$$

?

$\frac{5}{7}$ *is* $\frac{3}{4}$ *of what number?*

$\frac{5}{7} \div \frac{3}{4}$

3 units $= \frac{5}{7}$

1 unit $= \frac{5}{7} \div 3 = \frac{5}{7} \times \frac{1}{3} = \frac{5}{21}$

> This shows why I can invert and multiply the second factor.

4 units $= \frac{5}{21} \times 4 = \frac{20}{21}$

$\frac{5}{7}$ *is* $\frac{3}{4}$ *of* $\frac{20}{21}$.

3. Claire has 7 half-pound packages of trail mix. She wants to make packages that contain $1\frac{1}{2}$ pounds. How many packages can she make?

$1\frac{1}{2} = \frac{2}{2} + \frac{1}{2} = \frac{3}{2}$

$\frac{7}{2}$ *is how many* $\frac{3}{2}$*?*

> I need to represent this mixed number with a fraction and then invert and multiply.

$\frac{7}{2} \div \frac{3}{2} = \frac{7}{2} \times \frac{2}{3} = \frac{14}{6}$

$\frac{14}{6} = \frac{7}{3} = 2\frac{1}{3}$

Claire can make two whole packages with enough left over for $\frac{1}{3}$ *package.*

4. Draw a model that shows $\frac{3}{5} \div \frac{1}{2}$. Find the quotient.

> I can think of this as, "$\frac{3}{5}$ is $\frac{1}{2}$ of what number?"

$\frac{3}{5}$

?
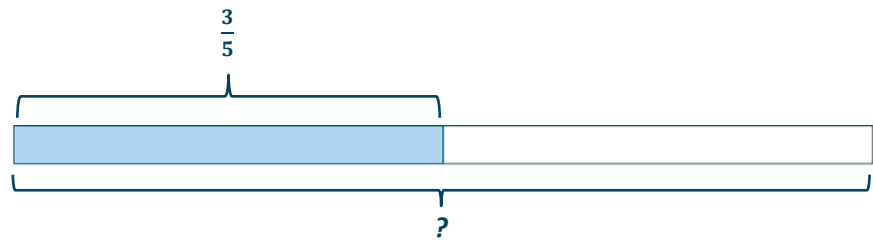
$\frac{3}{5} \div \frac{1}{2} = \frac{3}{5} \times \frac{2}{1} = \frac{6}{5} = 1\frac{1}{5}$

G6-M2-Lesson 8: Dividing Fractions and Mixed Numbers

Calculate each quotient.

1. $\frac{3}{7} \div 4\frac{1}{5}$

$$4\frac{1}{5} = \left(4 \times \frac{5}{5}\right) + \frac{1}{5}$$

$$\frac{20}{5} + \frac{1}{5} = \frac{21}{5}$$

$$\frac{3}{7} \div \frac{21}{5} = \frac{3}{7} \times \frac{5}{21} = \frac{15}{147} = \frac{5}{49}$$

> Before I divide, I need to change $4\frac{1}{5}$ into a fraction. I know that 4 can be represented as $\frac{20}{5}$. I can add that to $\frac{1}{5}$ to determine the equivalent fraction.

2. $5\frac{1}{3} \div \frac{5}{8}$

$$5\frac{1}{3} = \left(5 \times \frac{3}{3}\right) + \frac{1}{3}$$

$$\frac{15}{3} + \frac{1}{3} = \frac{16}{3}$$

$$\frac{16}{3} \div \frac{5}{8} = \frac{16}{3} \times \frac{8}{5} = \frac{128}{15} = 8\frac{8}{15}$$

> Before I divide, I need to change $5\frac{1}{3}$ into a fraction. I know that 5 can be represented as $\frac{15}{3}$. I can add that to $\frac{1}{3}$ to determine the equivalent fraction.