

# Homework Helpers

# Grade 6 Module 2

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

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  $\frac{1}{8}$ .

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

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

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

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

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  $3 \text{ fourths} \div 3 = 1 \text{ fourth}$ .

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

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?

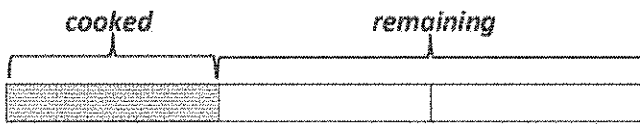
$\frac{5}{24}(48) = 10$ ; he will cook 10 pieces each day, so  $10 + 10 = 20$ . He will cook 20 pieces of chicken on Wednesday and Thursday.

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?

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

$\frac{1}{3}$  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.



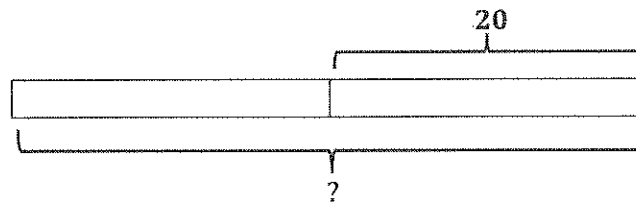
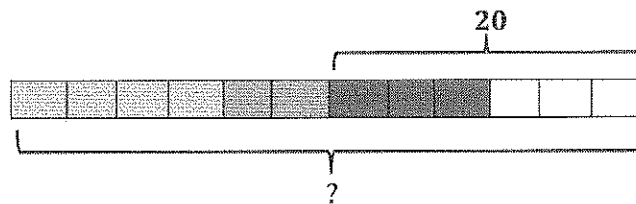
To find half of the remaining  $\frac{6}{12}$ , I need to divide by two.

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

- 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?



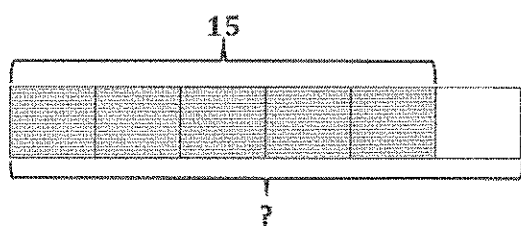
1 unit = 20

2 units =  $2 \times 20 = 40$

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.

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

$$5 \text{ units} = 15$$

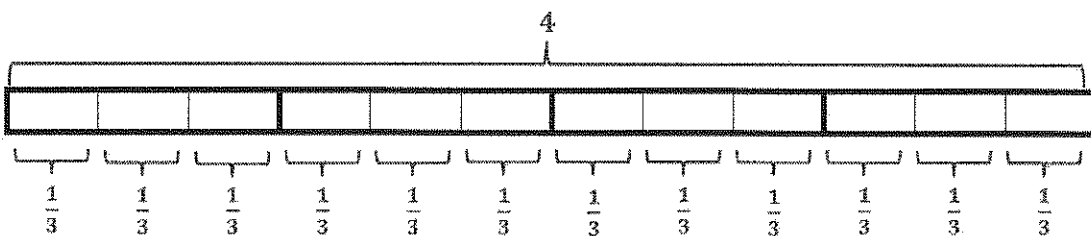
$$1 \text{ unit} = 15 \div 5 = 3$$

$$6 \text{ units} = 6 \times 3 = 18$$

*Ken started with 18 feet of wrapping paper.*

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.

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



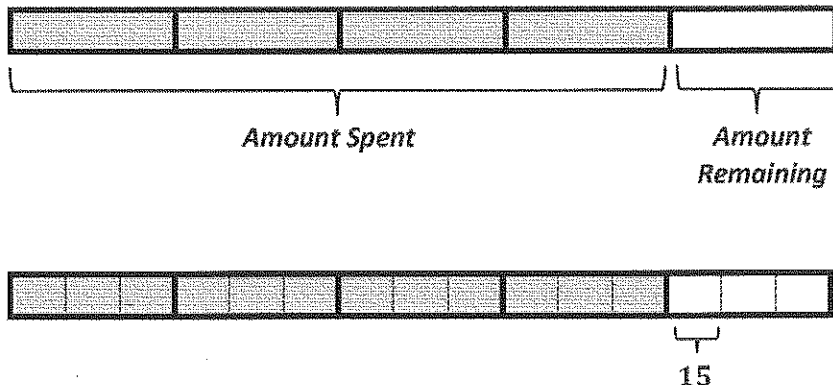
$$4 \div \frac{1}{3}$$

$$12 \text{ thirds} \div 1 \text{ third} = 12 \div 1 = 12$$

*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?



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

1 unit = 15

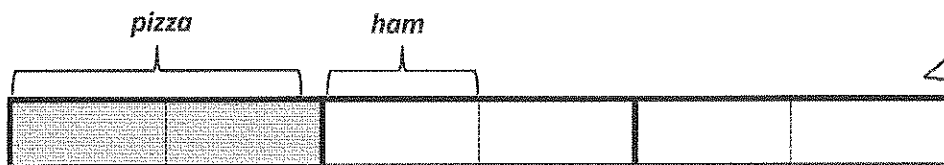
15 units =  $15 \times 15 = 225$

Savannah had \$225 at first.

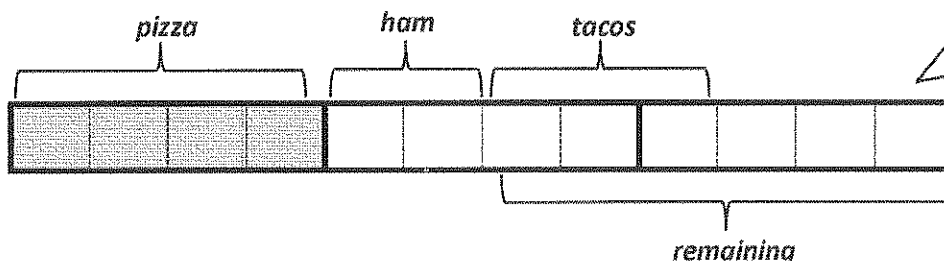
4. Isa's class was surveyed about their favorite foods.  $\frac{1}{3}$  of the students preferred pizza,  $\frac{1}{6}$  of the students preferred hamburgers, and  $\frac{1}{2}$  of the remaining students preferred tacos. If 9 students preferred tacos, how many students were surveyed?



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



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



I can divide each of the six units into two equal units to find half of the remainder.

$$3 \text{ units} = 9$$

$$1 \text{ unit} = 9 \div 3 = 3$$

$$12 \text{ units} = 12 \times 3 = 36$$

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?



$$3 \text{ units} = 60$$

$$1 \text{ unit} = 60 \div 3 = 20$$

$$8 \text{ units} = 8 \times 20 = 160$$

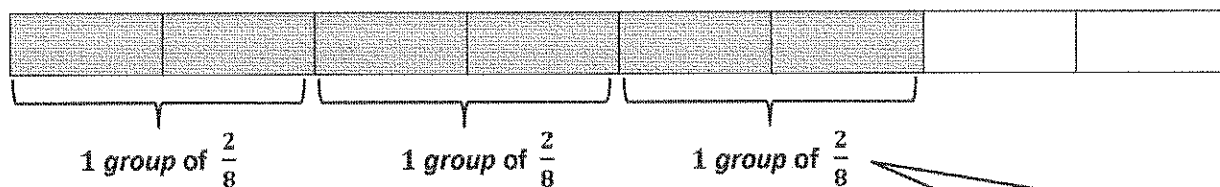
Caroline received \$160 in her pay.

## 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.  $\frac{6}{8} \div \frac{2}{8}$

$6 \text{ eighths} \div 2 \text{ eighths} = 3$



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

$7 \text{ sixths} \div 4 \text{ sixths} = 7 \div 4 = \frac{7}{4} = 1\frac{3}{4}$

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?

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

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.

- 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.*

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

- 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.*

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

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

Calculate the quotient. If needed, draw a model.

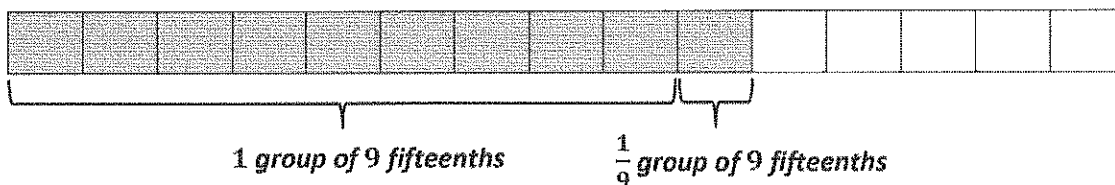
1.  $\frac{2}{5} \div \frac{2}{3}$

$$6 \text{ fifteenths} \div 10 \text{ fifteenths} = 6 \div 10 = \frac{6}{10} \text{ or } \frac{3}{5}$$

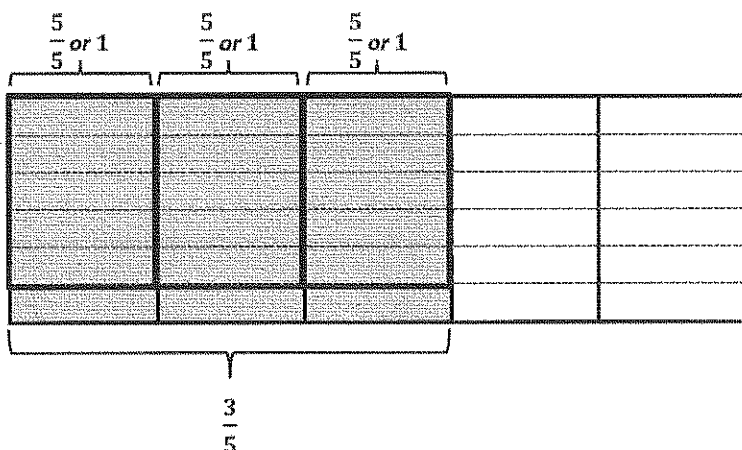
These fractions do not have the same denominator, or unit. I need to create like denominators to divide the numerators.

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

$$10 \text{ fifteenths} \div 9 \text{ fifteenths} = 10 \div 9 = \frac{10}{9} = 1\frac{1}{9}$$



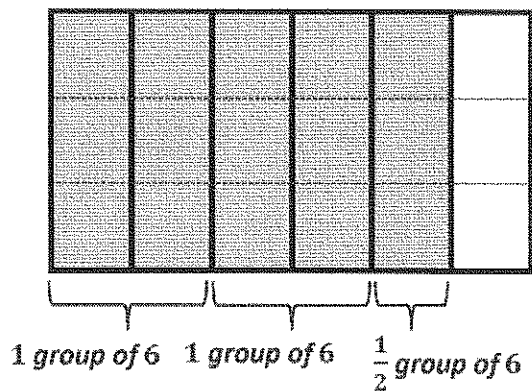
3.  $\frac{3}{5} \div \frac{1}{6}$



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

$$18 \text{ thirtieths} \div 5 \text{ thirtieths} = 18 \div 5 = \frac{18}{5} = 3\frac{3}{5}$$

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



I can shade 5 out of 6 columns to represent  $\frac{5}{6}$ . To find how many groups of  $\frac{1}{3}$  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  $2\frac{1}{2}$ .

$$15 \text{ eighths} \div 6 \text{ eighths} = 15 \div 6 = \frac{15}{6} = 2\frac{1}{2}$$

## 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?

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

$$5 \text{ sixths} \div 2 \text{ sixths} = 5 \div 2 = \frac{5}{2} = 2\frac{1}{2}$$

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

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

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

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

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?

$$4 \text{ units} = 8$$

$$1 \text{ unit} = 8 \div 4 = 2$$

$$5 \text{ units} = 5 \times 2 = 10$$

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?

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

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?

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

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

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

$$\frac{24}{24} - \frac{19}{24} = \frac{5}{24}$$

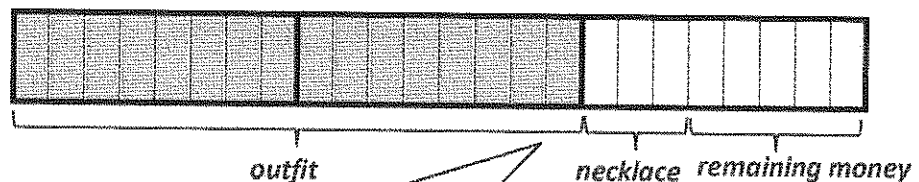
15 is  $\frac{5}{24}$  of what number?

$$5 \text{ units} = 15$$

$$1 \text{ unit} = 15 \div 5 = 3$$

$$16 \text{ units} = 16 \times 3 = 48$$

The outfit cost \$48.



$\frac{2}{3}$  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.

\$15  
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?

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

$$5 \text{ sixths} \div 2 \text{ sixths} = \frac{5}{2} = 2\frac{1}{2}$$

$\frac{5}{6}$  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?

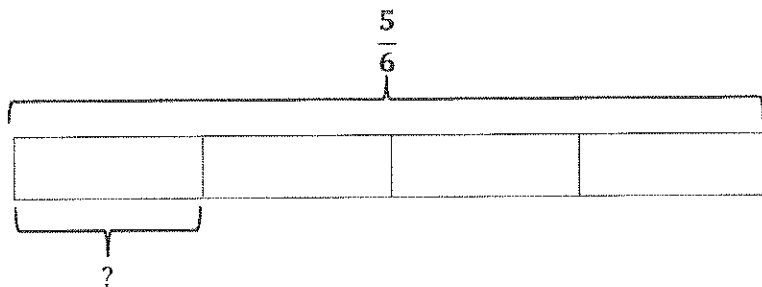
3. Fill in the blanks to complete the equation. Then, find the quotient, and draw a model to support your solution.

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

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

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.



$$4 \text{ units} \rightarrow \frac{5}{6}$$

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

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

### Models and Equations

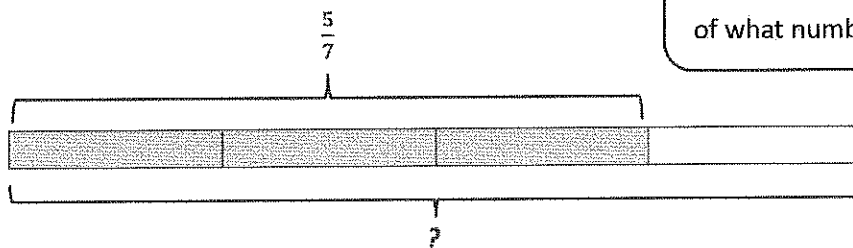
Invert and multiply to divide.

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

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

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.

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

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

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

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

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

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

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



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  $\frac{3}{2}$ ?

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

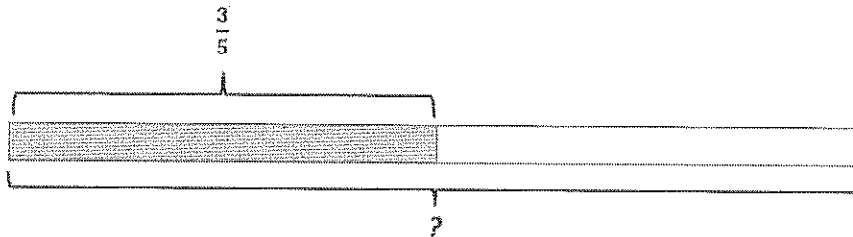
$$\frac{14}{6} = \frac{7}{3} = 2\frac{1}{3}$$

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

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?"



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

## 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.

## G6-M2-Lesson 9: Sums and Differences of Decimals

Find each sum or difference.

1.  $426\frac{2}{10} - 215\frac{68}{100}$

$426.2 - 215.68$

$426.20 - 215.68$

It would be difficult to subtract the mixed numbers, so I can represent the numbers with decimals. From there, I can use the subtraction algorithm to find the difference.

$$\begin{array}{r}
 \phantom{4} 5 \phantom{0} \phantom{0} \phantom{0} \phantom{0} \\
 \phantom{4} 2 \phantom{6} \phantom{0} \phantom{0} \phantom{0} \\
 - \phantom{4} 2 \phantom{6} \phantom{0} \phantom{0} \phantom{0} \\
 \hline
 \phantom{4} 2 \phantom{6} \phantom{0} \phantom{0} \phantom{0}
 \end{array}$$

2.  $627\frac{17}{25} + 18\frac{7}{10}$

$627.68 + 18.7$

$627.68 + 18.70$

It would be difficult to add the mixed numbers, so I can represent the numbers with decimals. From there, I can use the addition algorithm to find the sum.

$$\begin{array}{r}
 \phantom{6} 2 \phantom{7} \phantom{0} \phantom{0} \\
 + \phantom{6} 1 \phantom{8} \phantom{0} \phantom{0} \\
 \hline
 \phantom{6} 4 \phantom{6} \phantom{0} \phantom{0}
 \end{array}$$

## G6-M2-Lesson 10: The Distributive Property and the Products of Decimals

Calculate the product using partial products.

1.  $500 \times 54.1$

$$500(50) + 500(4) + 500(0.1)$$

$$25,000 + 2,000 + 50$$

$$27,050$$

I can decompose 54.1 into an addition expression. 54.1 is equal to the sum  $50 + 4 + 0.1$ . I can now distribute 500 to each addend in the expression:  
 $500(50) + 500(4) + 500(0.1)$ .

2.  $13.5 \times 200$

$$200(10) + 200(3) + 200(0.5)$$

$$2,000 + 600 + 100$$

$$2,700$$

The commutative property allows me to switch the factors in the problem.  $200 \times 13.5$

I can decompose 13.5 into an addition expression. 13.5 is equal to the sum  $10 + 3 + 0.5$ . I can now distribute 200 to each addend in the expression:  
 $200(10) + 200(3) + 200(0.5)$ .

## G6-M2-Lesson 11: Fraction Multiplication and the Products of Decimals

Solve each problem. Remember to round to the nearest penny when necessary.

1. Calculate the product.  $64.13 \times 19.39$

$$64.13 \times 19.39 = 1,243.4807$$

I know decimal multiplication is similar to whole number multiplication, but I have to determine where the decimal point is placed in the product. I can estimate the factors and determine the estimated product.  $60 \times 20 = 1,200$ . In the actual answer, the decimal point must be in a place where the product is close to 1,200. I can multiply using the algorithm and then place the decimal point after the ones place. 1,243.4807 is close to 1,200, so I know my answer is reasonable, and I correctly placed the decimal point.

I can also count the decimal digits in the first factor (2) and the decimal digits in the second factor (2) and add them together.  $2 + 2 = 4$ , so the product will have four decimal digits.

2. Every weekend, Talia visits the farmer's market and buys 5 grapefruits for \$0.61 each and a loaf of banana bread for \$6.99. How much does Talia spend at the farmer's market every weekend?

$$\$6.99 + (5 \times \$0.61) = \$10.04$$

$5 \times \$0.60$  is \$3.00, so Talia spends about \$3.00 each weekend on grapefruit. I can add the cost of the bread, which is about \$7, so Talia spends about \$10 every weekend at the farmer's market. This estimated product could help me determine the correct placement of the decimal point. I can find the value of the expression in the parentheses first.  $5 \times \$0.61 = \$3.05$ . Now I can add both parts of the number sentence.  $\$3.05 + \$6.99 = \$10.04$ . This answer is close to the estimated answer of \$10, so I know my answer is reasonable and the decimal point is in the correct place.

## G6-M2-Lesson 12: Estimating Digits in a Quotient

Round to estimate the quotient. Then, compute the quotient using a calculator, and compare the estimate to the quotient.

1.  $891 \div 11 =$

**Estimate:**  $900 \div 10 = 90$

**Quotient:**  $891 \div 11 = 81$

**Comparison:** *Since the divisor is very close to a multiple of 10, the quotient is very close to the estimate.*

I can round 11 to 10. I can round 891 to 900 since 900 is a multiple of 10. I can also choose to round 891 to 890 since it's a multiple of 10, and it would be easy to divide 890 by 10 also.

2.  $13,616 \div 16 =$

**Estimate:**  $14,000 \div 20 = 700$

**Quotient:**  $13,616 \div 16 = 851$

**Comparison:** *The divisor is not close to a multiple of 10, so the quotient is not nearly as close to the estimate as when divisors are closer to a multiple of 10.*

I can round the divisor to 20 because it's easier to divide by a divisor that is a multiple of 10, and 16 is closer to 20 than 10. I can round the dividend, 13,616, to 14,000 since it is closer to 14,000 than 13,000.

Divisors with digits 4, 5, and 6 in the ones place have less accurate estimates. Because the divisor in the problem is not very close to a multiple of 10, the estimate is not very close to the quotient.

# G6-M2-Lesson 13: Dividing Multi-Digit Numbers Using the Algorithm

Divide using the division algorithm.

$$1,332 \div 18$$

The quotient is 74.

$$\begin{array}{r}
 \phantom{1} 8 \overline{) 1,332} \\
 \phantom{1} \phantom{8} \phantom{)} \phantom{1,} 332 \\
 \phantom{1} \phantom{8} \phantom{)} \phantom{1,} \phantom{3} 5 \\
 \phantom{1} \phantom{8} \phantom{)} \phantom{1,} \phantom{3} \phantom{5} 26 \\
 \phantom{1} \phantom{8} \phantom{)} \phantom{1,} \phantom{3} \phantom{5} \phantom{2} 72 \\
 \phantom{1} \phantom{8} \phantom{)} \phantom{1,} \phantom{3} \phantom{5} \phantom{2} \phantom{7} 3 \\
 \phantom{1} \phantom{8} \phantom{)} \phantom{1,} \phantom{3} \phantom{5} \phantom{2} \phantom{7} \phantom{3} 2 \\
 \phantom{1} \phantom{8} \phantom{)} \phantom{1,} \phantom{3} \phantom{5} \phantom{2} \phantom{7} \phantom{3} \phantom{2} 0
 \end{array}$$

Multiples of 18	
$1 \times 18 = 18$	
$2 \times 18 = 36$	
$3 \times 18 = 54$	
$4 \times 18 = 72$	
$5 \times 18 = 90$	
$6 \times 18 = 108$	
$7 \times 18 = 126$	
$8 \times 18 = 144$	
$9 \times 18 = 162$	

I can use the tables of multiples to see that I can divide 133 tens into about 70 groups of 18.

Now I can regroup and determine how many times 18 divides into 72. I see from my table of multiples that  $18 \times 4 = 72$ . I multiply 4 ones  $\times$  8 ones and get 3 tens and 2 ones. I record the 3 in the tens place and the 2 in the ones place. 4 ones  $\times$  10 ones is 4 tens, plus the 3 tens in the tens place is 7 tens. So the quotient is 74.

I can round the dividend to 140 tens and the divisor to 2 tens.  $1,400 \div 20 = 70$ . Using this estimation and the table of multiples, 18 divides into 133 around 7 times, so I record 7 in the tens place.  $7 \times 8$  ones is 5 tens and 6 ones, so I record the 5 in the tens place and the 6 in the ones place.  $7 \times 10$  is 70; but when I add the 5 tens (or 50), I get 120, so I record the 1 in the hundreds place and the 2 in the tens place. I remember to cross out the 5.  $133 - 126 = 7$ .

## G6-M2-Lesson 14: The Division Algorithm—Converting Decimal Division into Whole Number Division Using Fractions

1. Convert decimal division expressions to fractional division expressions to create whole number divisors.

$$624.12 \div 0.8$$

$$\frac{624.12}{0.8} \times \frac{10}{10} = \frac{6,241.2}{8}$$

To convert the divisor, 0.8, to a whole number, I can multiply by 10. I must also multiply the dividend by 10 for equality.

2. Estimate quotients. Convert decimal division expressions to fractional division expressions to create whole number divisors. Compute the quotients using the division algorithm. Check your work with a calculator and your estimates.

Nicky purchased several notepads for \$3.70 each. She spent a total of \$29.60. How many notepads did she buy?

$$\frac{29.60}{3.7} \times \frac{10}{10} = \frac{296}{37}$$

$$\begin{array}{r} 37 \overline{) 296} \\ \underline{296} \\ 0 \end{array}$$

I can convert the divisor to a whole number.

I can use the division algorithm to find the quotient.

*Estimate:*  $32 \div 4 = 8$

*Nicky purchased 8 notebooks, so the quotient is the same as the estimate.*



## G6-M2-Lesson 15: The Division Algorithm—Converting Decimal Division into Whole Number Division Using Mental Math

1. Use mental math, estimation, and the division algorithm to evaluate the expressions.

$$405 \div 4.5$$

*Mental Math:*  $810 \div 9 = 90$

I can multiply the dividend and the divisor by 2 to get a whole number divisor. This also creates a whole number that easily divides into the dividend that has been doubled.

*Estimate:*  $400 \div 4 = 100$

*Algorithm:*

$$\begin{array}{r} 90 \\ 45 \overline{) 4050} \\ \underline{40} \phantom{50} \\ 50 \\ \underline{45} \\ 50 \\ \underline{45} \\ 0 \end{array}$$

Since  $45 \times 10 = 450$  and 450 is larger than 405, I can try  $45 \times 9$ . I multiplied 9 tens by 5 ones and got 4 hundreds and 5 tens. I multiplied 9 tens by 4 tens and got 3 thousands 6 hundreds. I added the 4 hundreds to the 6 hundreds, and that is another thousand, so the total is 4 thousands, 5 tens. Now I can subtract, and the difference is 0. The quotient is 90.

2. Place the decimal point in the correct place to make the number sentence true.

$$65.5872 \div 6.1 = 10752$$

$$65.5872 \div 6.1 = 10.752$$

I can round the dividend to 66 and the divisor to 6. The quotient is 11. The decimal point in the quotient is placed after the ones place. The decimal point is in the correct place because 10.752 is close to 11, my estimated quotient.

## G6-M2-Lesson 16: Even and Odd Numbers

### Lesson Notes

Adding:

- The sum of two even numbers is even.
- The sum of two odd numbers is even.
- The sum of an even number and an odd number is odd.

Multiplying:

- The product of two even numbers is even.
- The product of two odd numbers is odd.
- The product of an even number and an odd number is even.

1. When solving, tell whether the sum is even or odd. Explain your reasoning.

$$951 + 244$$

When I add these two numbers, the odd number will have a dot remaining after I circle pairs of dots. The even number will not have any dots remaining after I circle the pairs of dots, so the one remaining dot from the odd number will not be able to join with another dot to make a pair. The sum is odd.

*The sum is odd because the sum of an odd number and an even number is odd.*

2. When solving, tell whether the product is even or odd. Explain your reasoning.

$$2,422 \times 346$$

In this problem, I have 2,422 groups of 346, so I have an even number of groups of 346. When I add the addends (346) two at a time, the sum is always even because there are no dots remaining after I circle all the pairs.

*The product is even because the product of two even numbers is even.*

## G6-M2-Lesson 17: Divisibility Tests for 3 and 9

1. Is 5,641 divisible by both 3 and 9? Why or why not?

*The number 5,641 is not divisible by 3 and 9 because the sum of the digits is 16, which is not divisible by 3 or 9.*

I can find the sum of the digits by adding  $5 + 6 + 4 + 1$ . The sum is 16.

If the sum of the digits is 15, the number would be divisible by 3 but not 9 since 15 is divisible by 3 but not 9. If the sum of the digits is 27, the number would be divisible by 3 and 9 since 27 is a multiple of 3 and 9.

2. Circle all the factors of 71,820 from the list below.

2   3   4   5   8   9   10

71,820 is an even number, so it is divisible by 2. When I added  $7 + 1 + 8 + 2 + 0$ , the sum is 18, which is divisible by 3 and 9, so the entire number is divisible by 3 and 9. The last 2 digits, 20, are divisible by 4, so the entire number is divisible by 4. The number ends in a 0, so the entire number is also divisible by 5 and 10.

3. Write a 3-digit number that is divisible by both 3 and 4. Explain how you know this number is divisible by 3 and 4.

*324 is a 3-digit number that is divisible by 3 and 4 because the sum of the digits is divisible by 3, and the last two digits are divisible by 4.*

I know the number has to have three digits, and since it is divisible by 4, the last 2 digits have to be divisible by 4. So, I can write a number that ends in 24 since 24 is divisible by 4. Since  $2 + 4$  is 6, and I need to make a 3-digit number, 3 more is 9, which is divisible by 3. So my number is 324.

## G6-M2-Lesson 18: Least Common Multiple and Greatest Common Factor

### Factors and GCF

1. The Knitting Club members are preparing identical welcome kits for new members. The Knitting Club has 45 spools of yarn and 75 knitting needles. Find the greatest number of identical kits they can prepare using all of the yarn and knitting needles. How many spools of yarn and knitting needles would each welcome kit have?

Factors of 45:

1, 3, 5, 9, 15, 45

Common Factors:

1, 3, 5, 15

***GCF (45, 75) is 15. There would be 15 identical kits. Each kit will have 3 spools of yarn and 5 knitting needles.***

Since there are 15 kits and a total of 45 spools of yarn,  $45 \div 15 = 3$ , so each kit will have 3 spools of yarn.

Since there are 15 kits and a total of 75 knitting needles,  $75 \div 15 = 5$ , so each kit will have 5 knitting needles.

Factors of 75:

1, 3, 5, 15, 25, 75

GCF:

15

I can find the GCF of 45 and 75 by listing the factors of each number and the common factors and by identifying the greatest factor both numbers have in common (the GCF).

### Multiples and LCM

2. Madison has two plants. She waters the spider plant every 4 days and the cactus every 6 days. She watered both plants on November 30. What is the next day that she will water both plants?

***The LCM of 4 and 6 is 12, so she will water both plants on December 12.***

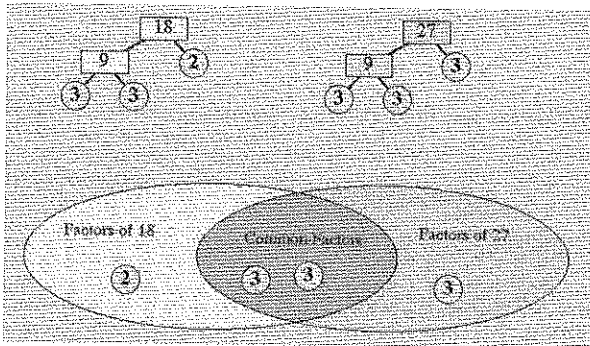
I can also list the multiples of each number until I find one that both have in common. I will list the first five multiples of each number although I can stop whenever I identify a common multiple.

Multiples of 4: 4, 8, 12, 16, 20

Multiples of 6: 6, 12, 18, 24, 30

**Using Prime Factors to Determine GCF**

3. Use prime factors to find the greatest common factor of the following pairs of numbers.  
 GCF (18, 27)



I can find the prime factors of 18 and 27 by decomposing each number using the factor tree.

I can multiply the shared factors to find the greatest common factor (GCF).  
 $3 \times 3 = 9$ .

I can use the Venn diagram to compare and organize the factors. I can put the common factors in the middle section of the Venn diagram and the unique factors in the left and right parts.

$GCF(18, 27) = 9$

**Applying Factors to the Distributive Property**

4. Find the GCF from the two numbers, and rewrite the sum using the distributive property.  
 $16 + 40 =$   
 $GCF(16, 40) = 8$   
 $16 + 40 = 8(2) + 8(5) = 8(2 + 5) = 8(7) = 56$

I can determine the GCF of 16 and 40, which is 8. I can rewrite 16 and 40 by factoring out the GCF.  $8 \times 2 = 16$ , and  $8 \times 5 = 40$ .

## G6-M2-Lesson 19: The Euclidean Algorithm as an Application of the Long Division Algorithm

1. Use Euclid's algorithm to find the greatest common factor of the following pairs of numbers.

GCF (16, 158)

$$\text{GCF}(16, 158) = 2$$

$$\begin{array}{r}
 9 \\
 16 \overline{) 158} \\
 \underline{16} \phantom{0} \\
 5 \phantom{0} \\
 \underline{16} \phantom{0} \\
 14 \phantom{0} \\
 \underline{14} \\
 0
 \end{array}
 \rightarrow
 \begin{array}{r}
 1 \\
 16 \overline{) 158} \\
 \underline{16} \phantom{0} \\
 14 \phantom{0} \\
 \underline{14} \\
 2
 \end{array}
 \rightarrow
 \begin{array}{r}
 7 \\
 2 \overline{) 14} \\
 \underline{14} \\
 0
 \end{array}$$

I can divide 158 by 16 since 158 is the larger of the two numbers. There is a remainder of 14, so I can divide the divisor, 16, by the remainder, 14. There is another remainder of 2, so I can divide the divisor, 14, by the remainder again.  $14 \div 2 = 7$ , and there is no remainder. Since 2 is the final divisor, 2 is the GCF of the original pair of numbers, 16 and 158.

2. Kristen and Alen are planning a party for their son's birthday. They order a rectangular cake that measures 12 inches by 18 inches.
- a. All pieces of the cake must be square with none left over. What is the side length of the largest square pieces into which Kristen and Alen can cut the cake?

$$\text{GCF}(12, 18) = 6$$

*They can cut the cake into 6 inch by 6 inch squares.*

$$\begin{array}{r}
 1 \\
 12 \overline{) 18} \\
 \underline{12} \\
 6
 \end{array}
 \rightarrow
 \begin{array}{r}
 2 \\
 6 \overline{) 12} \\
 \underline{12} \\
 0
 \end{array}$$

I can use Euclid's algorithm to find the greatest common factors of 12 and 18.

- b. How many pieces of this size can be cut?

$$2 \times 3 = 6$$

*Kristen and Alen can cut 6 pieces of cake.*

I can visualize the whole cake, which is 12 inches by 18 inches. Since the GCF is 6, I can cut the 12-inch side in half since  $12 \div 6 = 2$ . I can cut the 18-inch side into thirds since  $18 \div 6 = 3$ . Now I can multiply.  $2 \times 3 = 6$ , so Kristen and Alen can cut 6 pieces of cake.