Kenmore-Town of Tonawanda UFSD

We educate, prepare, and inspire all students to achieve their highest potential

Grade 5 Module 4
Parent Handbook

The materials contained within this packet have been taken from the Great Minds curriculum Eureka Math.

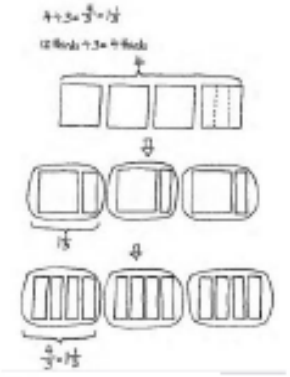
Eureka Math Tips for Parents

Grade 5 Module 4

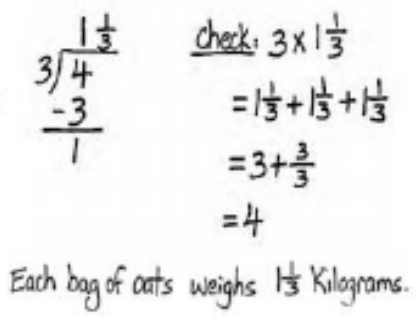
Multiplication and Division of Fractions and Decimal Fractions

In this 38-day module, students learn to multiply fractions and decimal fractions and start work with fraction division. Students will begin by measuring fractional parts on a number line as a concrete way of understanding fractional parts of a whole, and eventually move to more abstract fraction operations.

A diagram of 4 ÷ 3 showing fractional division:



4 ÷ 3, shown as a traditional algorithm division problem:



What Came Before this Module: We learned to add and subtract fractions with unlike denominators, moving from concrete to abstract examples.

What Comes After this Module: In Module 5, we will work with the area and volume of two- and three-dimensional figures.

New Terms in this Module:

Decimal divisor- the number that divides the whole and that has units of tenths, hundredths, thousandths, *e.g. 1/100*

Simplify - using the largest fractional unit possible to express an equivalent fraction, *e.g. 4/6 simplifies to 2/3, with the denominator 3 being a larger fractional unit than 6*

Familiar Terms with Some Definitions:

- *Denominator*
- *Decimal Fraction*
- *Equation*
- *Equivalent Fraction*
- *Factors* - numbers that are multiplied to obtain a product
- *Line Plot*
- *Mixed Number*
- *Numerator*
- *Tape Diagram*
- *Unit* - one segment of a partitioned tape diagram
- *Unknown* - the missing factor or quantity in multiplication or division
- *Whole Unit* - any unit that is partitioned into smaller, equally sized fractional units

+ How you can help at home:

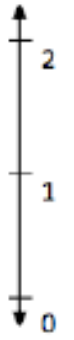
- Continue to practice and review multiplication and division math facts - this greatly supports work with fractions!
- Look for opportunities in daily life to discuss both fractional parts of a whole and of other fractions, e.g. What is ¼ of 20? ¼ of ½?

Key Common Core Standards:

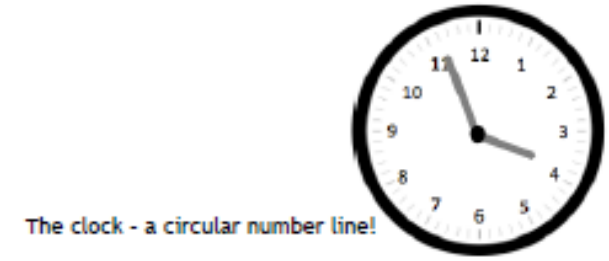
- *Write and interpret numerical expressions.*
- *Perform operations with multi-digit whole numbers and with decimals to hundredths.*
- *Apply and extend previous understandings of multiplication and division to multiply and divide fractions.*
- *Convert like measurement units within a given measurement system.*
- *Represent and interpret data.*

Prepared by Erin Schweng, Math Coach

Various types of number lines:



Vertical number line



The clock - a circular number line!

A ruler number line

Spotlight on Math Models:

Number Lines

You will often see this mathematical representation in *A Story of Units*.

A Story of Units has several key mathematical "models" that will be used throughout a student's elementary years.

The number line is a powerful, flexible model that students can use in many ways. In this particular module, students begin to understand the idea of fractions as division by marking a ruler or line plot with $\frac{1}{2}$, $\frac{1}{4}$, and $\frac{1}{8}$ increments.

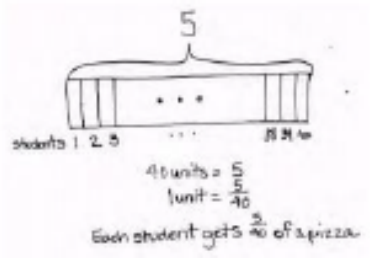
The number line is used beginning in Kindergarten in *A Story of Units*, and will continue to appear in various forms through 5th grade. It is used to develop a deeper understanding of whole number units, fraction units, measurement units, decimals, and negative numbers. Often, the mathematical concepts in an *ASOU* module move from concrete to more abstract, and the number line is an important concrete conceptual step for students of all ages.

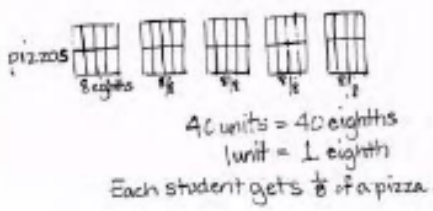
Sample Problem from Module 4:
(Example taken from Lesson 5)

Forty students shared 5 pizzas equally. How much pizza did each student receive?

What fraction of the pizza did each student receive?

Note the use of a tape diagram as well as the drawing showing division of a whole number into fractional parts:





Grade 5 • Module 4

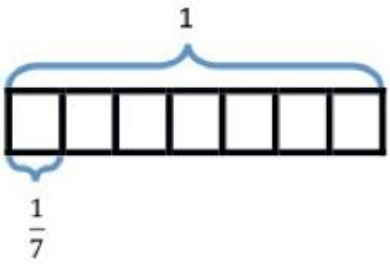
Multiplication and Division of Fractions and Decimal Fractions

OVERVIEW

In Module 4, students learn to multiply fractions and decimal fractions, and begin working with fraction division. Topic A opens the 38-day module with an exploration of fractional measurement. Students construct line plots by measuring the same objects using three different rulers accurate to $\frac{1}{2}$, $\frac{1}{4}$, and $\frac{1}{8}$ of an inch (**5.MD.2**).

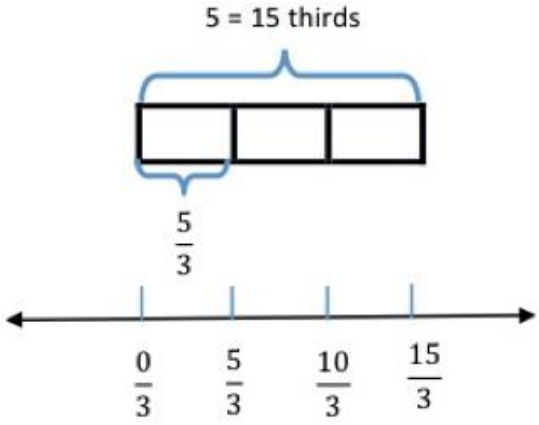
Students compare the line plots and explain how changing the accuracy of the unit of measure affects the distribution of points. This is foundational to the understanding that measurement is inherently imprecise because it is limited by the accuracy of the tool at hand. Students use their knowledge of fraction operations to explore questions that arise from the plotted data. The interpretation of a fraction as division is inherent in this exploration. For measuring to the quarter inch, one inch must be divided into four equal parts, or $1 \div 4$. This reminder of the meaning of a fraction as a point on a number line, coupled with the embedded, informal exploration of fractions as division, provides a bridge to Topic B's more formal treatment of fractions as division.

Topic B focuses on interpreting fractions as division. Equal sharing with area models (both concrete and pictorial) provides students with an opportunity to understand division of whole numbers with answers in the form of fractions or mixed numbers (e.g., seven brownies shared by three girls, three pizzas shared by four people). Discussion also includes an interpretation of remainders as a fraction (**5.NF.3**)**.** Tape diagrams provide a linear model of these problems. Moreover, students see that, by renaming larger units in terms of smaller units, division resulting in a fraction is similar to whole number division.



1 week ÷ 7 = 7 days ÷ 7 = 1 day

1 ÷ 7 = 7 sevenths ÷ 7 = 1 seventh



15 thirds ÷ 3 = 5 thirds

Topic B continues as students solve real world problems (**5.NF.3**) and generate story contexts for visual models. The topic concludes with students making connections between models and equations while reasoning about their results (e.g., between what two whole numbers does the answer lie?).

$$1 \div 7 = \frac{7}{7} \div 7 = \frac{7}{7} \qquad 5 \div 3 = \frac{5}{3}$$

In Topic C, students interpret finding a fraction of a set ($\frac{3}{4}$ *of 24*) as multiplication of a whole number by a fraction ($\frac{3}{4} \times 24$) and use tape diagrams to support their understandings (**5.NF.4a**). This, in turn, leads students to see division by a whole number as being equivalent to multiplication by its reciprocal. That is, division by 2, for example, is the same as multiplication by $\frac{1}{2}$. Students also use the commutative property to relate a fraction of a set to the Grade 4 repeated addition interpretation of multiplication by a fraction. This offers opportunities for students to reason about various strategies for multiplying fractions and whole numbers. Students apply their knowledge of a fraction of a set and previous conversion experiences (with scaffolding from a conversion chart, if necessary) to find a fraction of a measurement, thus converting a larger unit to an equivalent smaller unit (e.g., $\frac{1}{3}$ min = 20 seconds and $2\frac{1}{4}$ feet = 27 inches).

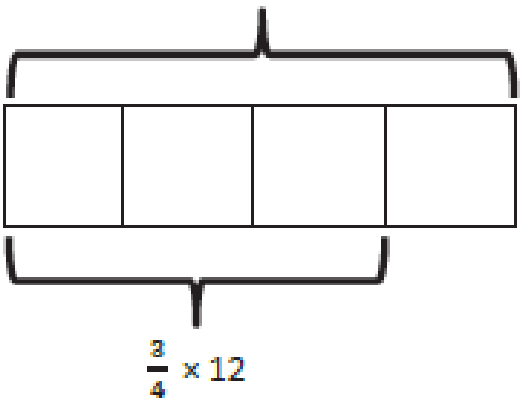
Interpreting numerical expressions opens Topic D as students learn to evaluate expressions with parentheses, such as $3 \times (\frac{2}{3} - \frac{1}{5})$ or $\frac{2}{3} \times (7 + 9)$ (**5.OA.1**). They then learn to interpret numerical expressions, such as 3 *times the difference between* $\frac{2}{3}$ *and* $\frac{1}{5}$ or *two-thirds the sum of 7 and 9* (**5.OA.2**). Students generate word problems that lead to the same calculation (**5.NF.4a**) such as, "Kelly combined 7 ounces of carrot juice and 5 ounces of orange juice in a

glass. Jack drank $\frac{2}{3}$ of the mixture. How much did Jack drink?" Solving word problems (**5.NF.6**) allows students to apply new knowledge of fraction multiplication in context, and tape diagrams are used to model multi-step problems requiring the use of addition, subtraction, and multiplication of fractions.

Topic E introduces students to multiplication of fractions by fractions—both in fraction and decimal form (**5.NF.4a**, **5.NBT.7**). The topic starts with multiplying a unit fraction by a unit fraction, and progresses to multiplying two non-unit fractions. Students use area models, rectangular arrays, and tape diagrams to model the multiplication. These familiar models help students draw parallels between whole number and fraction multiplication, as well as solve word problems. This intensive work with fractions positions students to extend their previous work with decimal-by-whole number multiplication to decimal-by-decimal multiplication. Just as students used unit form to multiply fractional units by wholes in Module 2 (e.g., 3.5 × 2 = 35 tenths × 2 ones = 70 tenths), they will connect fraction-by-fraction multiplication to multiply fractional units-by-fractional units (3.5 × 0.2 = 35 tenths × 2 tenths = 70 hundredths).

$\frac{3}{4}$ of a foot = $\frac{3}{4}$ × 12 inches

1 foot = 12 inches



Express $5\frac{3}{4}$ ft as inches.

$5\frac{3}{4}$ ft = (5 × 12) inches + ($\frac{3}{4}$ × 12) inches

= 60 + 9 inches

= 69 inches

Reasoning about decimal placement is an integral part of these lessons. Finding fractional parts of customary measurements and measurement conversion (**5.MD.1**) concludes Topic E. Students convert smaller units to fractions of a larger unit (e.g., 6 inches = $\frac{1}{2}$ ft). The inclusion of customary units provides a meaningful context for many common fractions ($\frac{1}{2}$ pint = 1 cup, $\frac{1}{3}$ yard = 1 foot, $\frac{1}{4}$ gallon = 1 quart, etc.). This topic, together with the fraction concepts and skills learned in Module 3, opens the door to a wide variety of application word problems (**5.NF.6**).

Students interpret multiplication in Grade 3 as equal groups, and in Grade 4 students begin understanding multiplication as comparison. Here, in Topic F, students once again extend their understanding of multiplication to include scaling (**5.NF.5**)**.** Students compare the product to the size of one factor, given the size of the other factor (**5.NF.5a**) without calculation (e.g., 486 × 1,327.45 is twice as large as 243 × 1,327.45 because 486 = 2 × 243). This reasoning, along with the other work of this module, sets the stage for students to reason about the size of products when quantities are multiplied by numbers larger than 1 and smaller than 1. Students relate their previous work with equivalent fractions to interpreting multiplication by $\frac{n}{n}$ as multiplication by 1 (**5.NF.5b)**. Students build on their new understanding of fraction equivalence as multiplication by $\frac{n}{n}$ to convert fractions to decimals and decimals to fractions. For example, $\frac{3}{25}$ is easily renamed in hundredths as $\frac{12}{100}$ using multiplication of $\frac{4}{4}$. The word form of *twelve hundredths* will then be used to notate this quantity as a decimal. Conversions between fractional forms will be limited to fractions whose denominators are factors of 10, 100, or 1,000. Students will apply the concepts of the topic to real world, multi-step problems (**5.NF.6**).

Topic G begins the work of division with both fractions and decimal fractions. Students use tape diagrams and number lines to reason about the division of a whole number by a unit fraction and a unit fraction by a whole number (**5.NF.7**). Using the same thinking developed in Module 2 to divide whole numbers, students reason about how many *fourths* are in 5 when considering such cases as $5 \div \frac{1}{4}$. They also reason about the size of the unit when $\frac{1}{4}$ is partitioned into 5 equal parts: $\frac{1}{4} \div 5$. Using this thinking as a backdrop, students are introduced to decimal fraction divisors and use equivalent fraction and place value thinking to reason about the size of quotients, calculate quotients, and sensibly place the decimal in quotients (**5.NBT.7**).

The module concludes with Topic H, in which numerical expressions involving fraction-by-fraction multiplication are interpreted and evaluated (**5.OA.1**, **5.OA.2**). Students create and solve word problems involving both multiplication and division of fractions and decimal fractions.

Terminology

New or Recently Introduced Terms

- Decimal divisor (the number that divides the whole and has units of tenths, hundredths, thousandths, etc.)
- Simplify (using the largest fractional unit possible to express an equivalent fraction)

Familiar Terms and Symbols

- Commutative property (e.g., $4 \times \frac{1}{2} = \frac{1}{2} \times 4$)
- Conversion factor
- Decimal fraction
- Denominator (denotes the fractional unit, e.g., fifths in 3 fifths, which is abbreviated to the 5 in $\frac{3}{5}$)
- Distribute (with reference to the distributive property, e.g., in $1\frac{2}{5} \times 15 = (1 \times 15) + (\frac{2}{5} \times 15)$)
- Divide, division (partitioning a total into equal groups to show how many units in a whole, e.g., $5 \div \frac{1}{5} = 25$)
- Equation (a statement that two expressions are equal, e.g., $3 \times 4 = 6 \times 2$)
- Equivalent fraction
- Expression
- Factors (numbers that are multiplied to obtain a product)
- Foot, mile, yard, inch, gallon, quart, pint, cup, pound, ounce, hour, minute, second
- Fraction greater than or equal to 1 (e.g., $\frac{7}{2}$, $3\frac{1}{2}$, an abbreviation for $3 + \frac{1}{2}$)
- Fraction written in the largest possible unit (e.g., $\frac{3}{6} = \frac{1\ x\ 3}{2\ x\ 3} = \frac{1}{2}$ or 1 three out of 2 threes = $\frac{1}{2}$)
- Fractional unit (e.g., the fifth unit in 3 fifths denoted by the denominator 5 in $\frac{3}{5}$)
- Hundredth ($\frac{1}{100}$ or 0.01)
- Line plot
- Mixed number ($3\ \frac{1}{2}$, an abbreviation for $3 + \frac{1}{2}$)
- Numerator (denotes the count of fractional units, e.g., 3 in 3 fifths or 3 in $\frac{3}{5}$)
- Parentheses (symbols ( ) used around a fact or numbers within an equation or expression)
- Quotient (the answer when one number is divided by another)
- Tape diagram (method for modeling problems)
- Tenth ($\frac{1}{10}$ or 0.1)
- Unit (one segment of a partitioned tape diagram)
- Unknown (the missing factor or quantity in multiplication or division)
- Whole unit (any unit partitioned into smaller, equally sized fractional units)

Suggested Tools and Representations

- Area models
- Number lines
- Tape diagrams

Grade 5 Module 4 Topic A

Line Plots of Fraction Measurements

Focus Standard:

5.MD.2 Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Use operations on fractions for this grade to solve problems involving information presented in line plots. *For example, given different measurements of liquid in identical beakers, find the amount of liquid each beaker would contain if the total amount in all the beakers were redistributed equally.*

Instructional Days Recommended: 1

Topic A begins the 38-day module with an exploration of fractional measurement. Students construct line plots by measuring the same objects using three different rulers accurate to $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$ and of an inch (**5.MD.2**). Students compare the line plots and explain how changing the accuracy of the unit of measure affects the distribution of points (see line plots at the end of this page). This is foundational to the understanding that measurement is inherently imprecise because it is limited by the accuracy of the tool at hand.

Students use their knowledge of fraction operations to explore questions that arise from the plotted data such as, "What is the total length of the five longest pencils in our class? Can the half inch line plot be reconstructed using only data from the quarter inch plot? Why or why not?" The interpretation of a fraction as division is inherent within this exploration. To measure to the quarter inch, one inch must be divided into 4 equal parts, or 1 ÷ 4. This reminder of the meaning of a fraction as a point on a number line, coupled with the embedded, informal exploration of fractions as division, provides a bridge to Topic B's more formal treatment of fractions as division.

Pencils measured to $\frac{1}{2}$ inch

Pencils measured to $\frac{1}{4}$ inch

**The sample homework responses contained in this manual are intended to provide insight into the skills expected of students and instructional strategies used in Eureka Math.*

Lesson 1

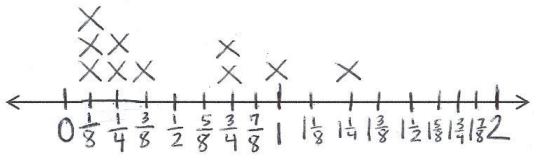
Objective: Measure and compare pencil lengths to the nearest $\frac{1}{2}$, $\frac{1}{4}$, and $\frac{1}{8}$ of an inch, and analyze the data through line plots.

Homework Key

1. Line plot drawn correctly.
   a. Location 6
   b. Locations 1, 7, and 10
   c. $\frac{1}{8}$ in
   d. 5 in

Homework Sample

A meteorologist set up rain gauges at various locations around a city and recorded the rainfall amounts in the table below. Use the data in the table to create a line plot using $\frac{1}{8}$ inches.



Location	Rainfall Amount (inches)
1	$\frac{1}{8}$
2	$\frac{3}{8}$
3	$\frac{3}{4}$
4	$\frac{3}{4}$
5	$\frac{1}{4}$
6	$1\frac{1}{4}$
7	$\frac{1}{8}$
8	$\frac{1}{4}$
9	1
10	$\frac{1}{8}$

a. Which location received the most rainfall?
Location 6 received the most rainfall.

b. Which location received the least rainfall?
Locations 1, 7 and 10 received the least rainfall.

c. Which rainfall measurement was the most frequent?
$\frac{1}{8}$ in was the most frequent measurement.

d. What is the total rainfall in inches?
$(3\times\frac{1}{8})+(2\times\frac{1}{4})+(1\times\frac{3}{8})+(2\times\frac{3}{4})+(1\times1)+(1\times\frac{1}{4})$
$=\frac{3}{8}+\frac{2}{4}+\frac{3}{8}+\frac{6}{4}+1+1\frac{1}{4}$
$=\frac{6}{8}+\frac{8}{4}+1+1\frac{1}{4}$
$=\frac{6}{8}+2+1+1\frac{1}{4}$
$=\frac{3}{4}+3+1\frac{1}{4}$
$=(\frac{3}{4}+1\frac{1}{4})+3=2+3=5$
The total rainfall was 5 inches

Grade 5 Module 4 Topic B

Fractions as Division

Focus Standard:

5.NF.3 Interpret a fraction as division of the numerator by the denominator (*a/b = a ÷ b).* Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers, e.g., by using visual fraction models or equations to represent the problem. *For example, interpret 3/4 as the result of dividing 3 by 4, noting that 3/4 multiplied by 4 equals 3, and that when 3 wholes are shared equally among 4 people each person has a share of size 3/4. If 9 people want to share a 50-pound sack of rice equally by weight, how many pounds of rice should each person get? Between what two whole numbers does your answer lie?*

Instructional Days Recommended: 4

Topic B focuses on interpreting fractions as division. Equal sharing with area models (both concrete and pictorial) provides students with an opportunity to understand the division of whole numbers with answers in the form of fractions or mixed numbers (e.g., seven brownies shared by three girls, three pizzas shared by four people). Discussion also includes an interpretation of remainders as a fraction (**5.NF.3**). Tape diagrams provide a linear model of these problems. Moreover, students see that, by renaming larger units in terms of smaller units, division resulting in a fraction is similar to whole number division.

Topic B continues as students solve real world problems (**5.NF.3**) and generate story contexts for visual models. The topic concludes with students making connections between models and equations while reasoning about their results (e.g., between what two whole numbers does the answer lie?).

**The sample homework responses contained in this manual are intended to provide insight into the skills expected of students and instructional strategies used in Eureka Math.*

Lesson 2 - 3

Objective: Interpret a fraction as division.

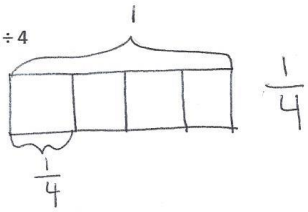
Homework Key (2)

1. a. $\frac{1}{4}$; picture representing 1 ÷ 4 drawn
   b. $\frac{3}{5}$; picture representing 3 ÷ 5 drawn
   c. $\frac{7}{4}$ or $1\frac{3}{4}$; picture representing 7 ÷ 4 drawn
2. $4 \div 6 = \frac{4}{6} = \frac{2}{3}$ or 24 sixths ÷ 6 = 4 sixths = $\frac{4}{6} = \frac{2}{3}$; picture representing 4 ÷ 6 drawn
3. a. 2, 7
   b. 39, 5
   c. 13, 3
   d. 9, 5
   e. 19, 28
   f. 8, 5

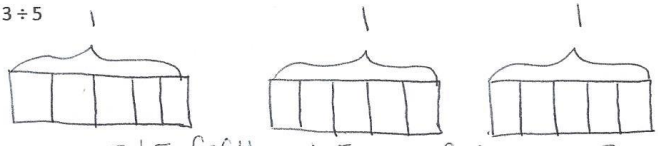
Homework Sample

1. Draw a picture to show the division. Express your answer as a fraction.

a. 1 ÷ 4

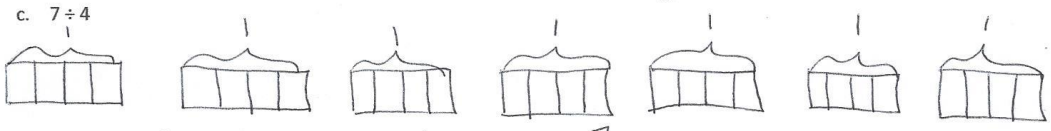


b. 3 ÷ 5



= 15 fifths ÷ 5 = 3 fifths = $\frac{3}{5}$

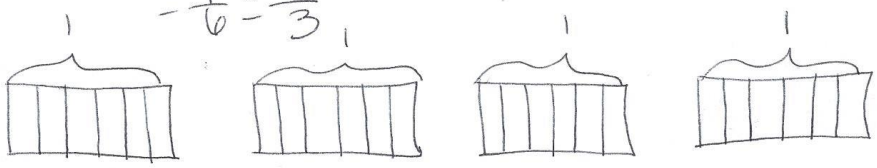
c. 7 ÷ 4



= 28 fourths ÷ 4 = 7 fourths = $\frac{7}{4}$

2. Using a picture, show how six people could share four sandwiches. Then, write an equation and solve.

$4 \div 6 = 24$ sixths $\div 6$
$= 4$ sixths
$= \frac{4}{6} = \frac{2}{3}$



Lesson 3

Homework Key

1. a. Answer provided
   b. 7, 5; 35, 7; $\frac{7}{5}$; algorithm completed correctly
   c. 7, 2; 14, 7; $\frac{7}{2}$; $3\frac{1}{2}$; algorithm completed correctly
   d. 28 fourths ÷ 4 = 7 fourths; $1\frac{3}{4}$; algorithm completed correctly
2. a. 3; explanations will vary.
   b. 7
3. a. 4; explanations will vary.
   b. $\frac{1}{2}$; 2

Homework Sample

1. Fill in the chart. The first one is done for you.

Division Expression	Unit Forms	Improper Fractions	Mixed Numbers	Standard Algorithm (Write your answer in whole numbers and fractional units. Then check.)
a. $4 \div 3$	12 thirds ÷ 3 = 4 thirds	$\frac{4}{3}$	$1\frac{1}{3}$	$3\overline{)4}$ quotient $1\frac{1}{3}$, -3, remainder 1 Check: $3 \times 1\frac{1}{3} = 1\frac{1}{3} + 1\frac{1}{3} + 1\frac{1}{3}$ $= 3 + \frac{3}{3}$ $= 3 + 1$ $= 4$
b. 7 ÷ 5	35 fifths ÷ 5 = 7 fifths	$\frac{7}{5}$	$1\frac{2}{5}$	$5\overline{)7}$ quotient $1\frac{2}{5}$, -5, remainder 2 Check $5 \times 1\frac{2}{5} =$ $1\frac{2}{5} + 1\frac{2}{5} + 1\frac{2}{5} + 1\frac{2}{5} + 1\frac{2}{5}$ $= 5\frac{10}{5} = 5 + 2$ $= 7$
c. 7 ÷ 2	14 halves ÷ 2 = 7 halves	$\frac{7}{2}$	$3\frac{1}{2}$	$2\overline{)7}$ quotient $3\frac{1}{2}$, -6, remainder 1 Check $2 \times 3\frac{1}{2} =$ $3\frac{1}{2} + 3\frac{1}{2}$ $= 6\frac{2}{2} = 7$
d. 7 ÷ 4	28 fourths ÷ 4 = 7 fourths	$\frac{7}{4}$	$1\frac{3}{4}$	$4\overline{)7}$ quotient $1\frac{3}{4}$, -4, remainder 3 Check $4 \times 1\frac{3}{4}$ $= 1\frac{3}{4} + 1\frac{3}{4} + 1\frac{3}{4} + 1\frac{3}{4}$ $= 4\frac{12}{4} = 4 + 3$ $= 7$

Lesson 4

Objective: Use tape diagrams to model fractions as division.

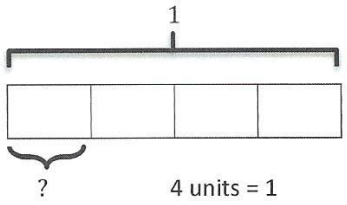
Homework Key

1. a. Answer provided
   b. $\frac{4}{5}$; tape diagram drawn correctly
   c. $\frac{8}{5}$; tape diagram drawn correctly
   d. $\frac{14}{3}$; tape diagram drawn correctly
2. a. Answer provided
   b. 3, 4; algorithm completed correctly
   c. 7, 2; 3 and 4; althorithm completed correctly
   d. 81, 90; 0 and 1; algorithm completed correctly
3. a. $\frac{2}{5}$ yd; tape diagram drawn correctly
   b. $1\frac{1}{5}$ ft; tape diagram drawn correctly
4. $4\frac{2}{3}$ lb
5. $\frac{2}{3}$ lb; tape diagram drawn correctly

Homework Sample

1. Draw a tape diagram to solve. Express your answer as a fraction. Show the addition sentence to support your answer. The first one is done for you.

a. $1 \div 4 = \frac{1}{4}$



4 units = 1

1 unit = $1 \div 4$

$= \frac{1}{4}$

$$4 \overline{)1} \quad 0\ \tfrac{1}{4}, \quad -0, \quad 1$$

Check:

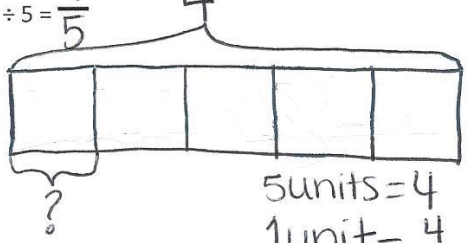
$$4 \times \frac{1}{4}$$

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

$$= \frac{4}{4}$$

$$= 1$$

b. $4 \div 5 = \frac{4}{5}$



5units = 4

1unit = $\frac{4}{5}$

$$5 \overline{)4} \quad 0\tfrac{4}{5}, \quad -0, \quad 4$$

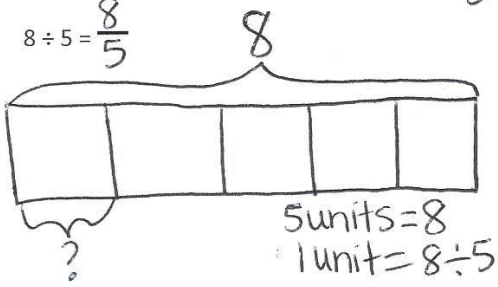
Check

$$5 \times \frac{4}{5}$$

$$= \frac{4}{5} + \frac{4}{5} + \frac{4}{5} + \frac{4}{5} + \frac{4}{5}$$

$$= \frac{20}{5} = 4$$

c. $8 \div 5 = \frac{8}{5}$



5units = 8

1unit = $8 \div 5 = \frac{8}{5} = 1\frac{3}{5}$

$$5 \overline{)8} \quad 1\tfrac{3}{5}, \quad -5, \quad 3$$

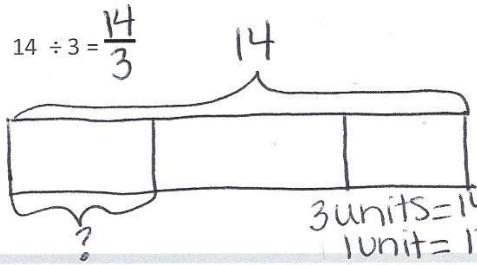
Check

$$5 \times 1\tfrac{3}{5}$$

$$= 1\tfrac{3}{5} + 1\tfrac{3}{5} + 1\tfrac{3}{5} + 1\tfrac{3}{5} + 1\tfrac{3}{5}$$

$$= 5 + \tfrac{15}{5} = 5 + 3 = 8$$

d. $14 \div 3 = \frac{14}{3}$



3units = 14

1unit = $14 \div 3 = \frac{14}{3} = 4\frac{2}{3}$

$$3 \overline{)14} \quad 4\tfrac{2}{3}, \quad -12, \quad 2$$

Check

$$3 \times 4\tfrac{2}{3}$$

$$= 4\tfrac{2}{3} + 4\tfrac{2}{3} + 4\tfrac{2}{3}$$

$$= 12 + \tfrac{6}{3} = 12 + 2 = 14$$

Lesson 5

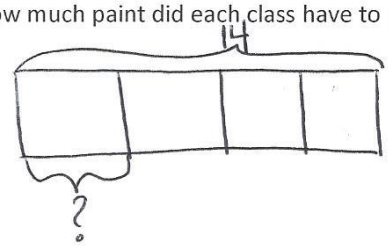
Objective: Solve word problems involving the division of whole numbers with answers in the form of fractions or whole numbers.

Homework Key

1. a. $3\frac{2}{4}$ or $3\frac{1}{2}$ gal
   b. $10\frac{1}{2}$ gal; explanations will vary.
   c. $7\frac{2}{4}$ or $7\frac{1}{2}$ sq. ft
   d. $\frac{1}{4}$
2. a. $\frac{1}{4}$; models will vary.
   b. $\frac{3}{4}$ ft
   c. 9 in
3. $7.50

Homework Sample

1. When someone donated 14 gallons of paint to Rosendale Elementary School, the fifth-grade decided to use it to paint murals. They split the gallons equally among the four classes.
   a. How much paint did each class have to paint their mural?



$14 \div 4 = \frac{14}{4} = 3\frac{2}{4} = 3\frac{1}{2}$

Each class will get $3\frac{1}{2}$ gallons of paint.

   b. How much paint will three classes use? Show your thinking using words, numbers, or pictures.

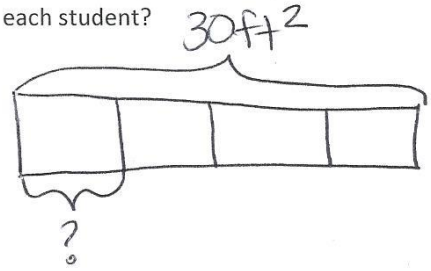
$3 \times 3\frac{1}{2}$

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

$= 9 + \frac{3}{2} = 9 + 1\frac{1}{2} = 10\frac{1}{2}$

The three classes will use $10\frac{1}{2}$ gallons of paint.

   c. If 4 students share a 30 square foot wall equally, how many square feet of the wall will be painted by each student?



$30 \div 4 = \frac{30}{4} = 7\frac{2}{4} = 7\frac{1}{2}$

Each student will paint $7\frac{1}{2}$ square feet of the wall.

   d. What fraction of the wall will each student paint?

Each student will paint $\frac{1}{4}$ of the wall.

Grade 5 Module 4 Topic C

Multiplication of a Whole Number by a Fraction

Focus Standard:

5.NF.4a Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction.

a. Interpret the product of *(a/b) × q* as *a* parts of a partition of *q* into *b* equal parts; equivalently, as the result of a sequence of operations *a × q ÷ b. For example, use a visual fraction model to show (2/3 × 4 = 8/3, and create a story context for this equation. Do the same with (2/3) × (4/5) = 8/15. (In general, (a/b) × (c/d) = ac/bd.)*

5.MD.1 Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems.

Instructional Days Recommended: 4

In Topic C, students interpret finding a fraction of a set ($\frac{3}{4}$ *of* 24) as multiplication of a whole number by a fraction ($\frac{3}{4} \times 24$) and use tape diagrams to support their understandings (**5.NF.4a**). This, in turn, leads students to see division by a whole number as being equivalent to multiplication by its reciprocal. That is, division by 2, for example, is the same as multiplication by $\frac{1}{2}$.

Students also use the commutative property to relate fraction of a set to the Grade 4 repeated addition interpretation of multiplication by a fraction. This offers opportunities for students to reason about various strategies for multiplying fractions and whole numbers. Students apply their knowledge of fraction of a set and previous conversion experiences (with scaffolding from a conversion chart, if necessary) to find a fraction of a measurement, thus converting a larger unit to an equivalent smaller unit (e.g., $\frac{1}{3}$ min = 20 seconds and $2\frac{1}{4}$ feet = 27 inches).

**The sample homework responses contained in this manual are intended to provide insight into the skills expected of students and instructional strategies used in Eureka Math.*

Lesson 6

Objective: Relate fractions as division to fraction of a set.

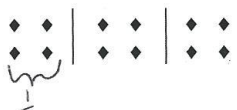
Homework Key

1. a. 4; 8; 12
   b. 5; 10; 15; 20
   c. 7; 14; 21; 28; 35; 42
2. 12; drawings will vary.
3. Explanations and pictures will vary.
4. 8
5. a. 2 dozen; 24 eggs
   b. $45

Homework Sample

1. Find the value of each of the following.

a.

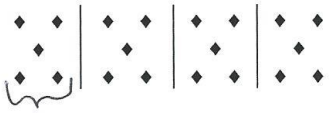


$\frac{1}{3}$ of 12 = 4

$\frac{2}{3}$ of 12 = 8

$\frac{3}{3}$ of 12 = 12

b.



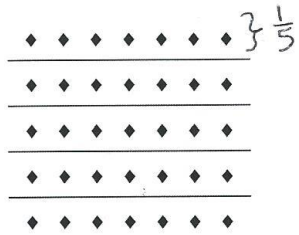
$\frac{1}{4}$ of 20 = 5

$\frac{2}{4}$ of 20 = 10

$\frac{3}{4}$ of 20 = 15

$\frac{4}{4}$ of 20 = 20

c.



$\frac{1}{5}$ of 35 = 7

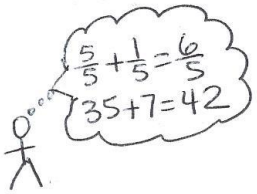
$\frac{2}{5}$ of 35 = 14

$\frac{3}{5}$ of 35 = 21

$\frac{4}{5}$ of 35 = 28

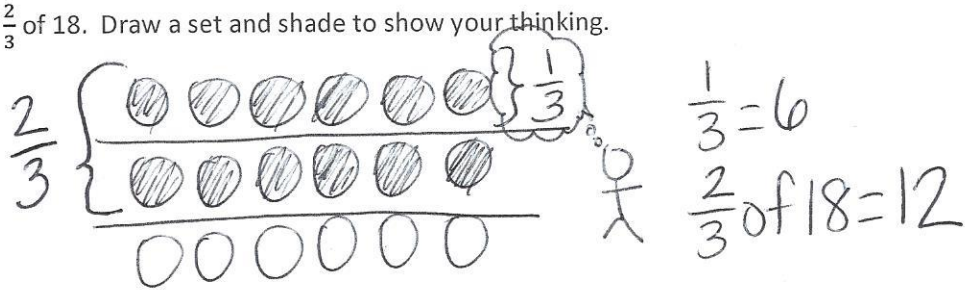
$\frac{5}{5}$ of 35 = 35

$\frac{6}{5}$ of 35 = 42



Lesson 6 (continued)

2. Find $\frac{2}{3}$ of 18. Draw a set and shade to show your thinking.



Lesson 7

Objective: Multiply any whole number by a fraction using tape diagrams.

Homework Key

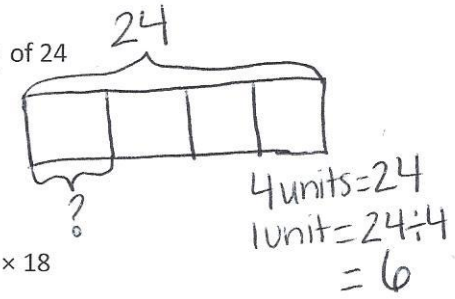
1. Tape diagram drawn accurately
   a. 6
   b. 12
   c. 12
   d. 6
   e. 21
   f. 36
   g. $10\frac{1}{3}$
   h. 8
   i. $6\frac{1}{4}$
   j. $18\frac{3}{4}$
   k. 36
   l. 35

2. Tape diagram drawn accurately
   a. 22
   b. 150 degrees
   c. $4\frac{2}{8}$ or $4\frac{1}{4}$ ounces
   d. 84

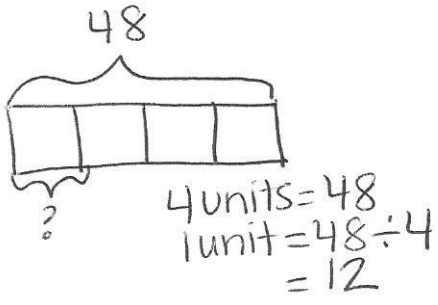
Homework Sample

1. Solve using a tape diagram.

a. $\frac{1}{4}$ of 24



b. $\frac{1}{4}$ of 48



c. $\frac{2}{3} \times 18$

d. $\frac{2}{6} \times 18$

Lesson 8

Objective: Relate a fraction of a set to the repeated addition interpretation of fraction multiplication.

Homework Key

1. Solution strategies will vary.
   a. $\frac{15}{3}$ or 5
   b. $\frac{26}{5}$
   c. $\frac{27}{4}$
2. Solution strategies will vary.
   a. 12
   b. 16
   c. 44
   d. 42
   e. 15
   f. $7\frac{1}{2}$
   g. $23\frac{1}{3}$
3. a. 20
   b. 48
   c. 700
   d. 60

Homework Sample

1. Rewrite the following expressions as shown in the example.

   Example: $\frac{2}{3}+\frac{2}{3}+\frac{2}{3}+\frac{2}{3}=\frac{4\times 2}{3}=\frac{8}{3}$

   a. $\frac{5}{3}+\frac{5}{3}+\frac{5}{3}=\frac{3\times 5}{3}=\frac{15}{3}$ b. $\frac{13}{5}+\frac{13}{5}=\frac{2\times 13}{5}=\frac{26}{5}$ c. $\frac{9}{4}+\frac{9}{4}+\frac{9}{4}=\frac{3\times 9}{4}=\frac{27}{4}$

2. Solve each problem in two different ways as modeled in the example.

   Example: $\frac{2}{3}\times 6=\frac{2\times 6}{3}=\frac{12}{3}=4$ $\frac{2}{3}\times 6=\frac{2\times \cancel{6}^{2}}{\cancel{3}_{1}}=4$

   a. $\frac{3}{4}\times 16=\frac{3\times 16}{4}=\frac{48}{4}=12$ $\frac{3}{4}\times 16=\frac{3\times \cancel{16}^{4}}{\cancel{4}}=12$

Lesson 9

Objective: Find a fraction of a measurement, and solve word problems.

Homework Key

1. Explanations will vary.
   a. Answer provided
   b. 2
   c. 9
   d. 60
   e. 25
   f. 24
2. 9 in
3. a. 12 oz
   b. 10 oz
   c. 2 oz
   d. Mr. Phillips; 6 oz
4. $6\frac{1}{4}$ lb; $3\frac{3}{4}$ lb

Homework Sample

1. Convert. Show your work using a tape diagram or an equation. The first one is done for you.

a. $\frac{1}{4}$ yard = 9 inches

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

$= \frac{1}{4} \times 36$ inches

$= \frac{36}{4}$ inches

$= 9$ inches

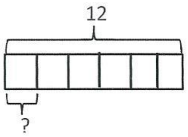
b. $\frac{1}{6}$ foot = 2 inches

$\frac{1}{6}$ foot = $\frac{1}{6} \times 1$ foot

$= \frac{1}{6} \times 12$ inches

$= \frac{12}{6}$ inches

$= 2$ inches



c. $\frac{3}{4}$ year = 9 months

$\frac{3}{4}$ year $= \frac{3}{4} \times 1$ year

$\frac{3}{4} \times 12$ months

$= \frac{3 \times 12}{4} = \frac{36}{4}$

$= 9$ months

d. $\frac{3}{5}$ meter = 60 centimeters

$\frac{3}{5}$ meter $= \frac{3}{5} \times 1$ meter

$= \frac{3}{5} \times 100$ cm

$= \frac{300}{5}$ cm

$= 60$ cm

e. $\frac{5}{12}$ hour = _____ minutes

f. $\frac{2}{3}$ yard = _____ inches

2. Michelle measured the length of her forearm. It was $\frac{3}{4}$ of a foot. How long is her forearm in inches?

$\frac{3}{4}$ foot $= \frac{3}{4} \times 1$ foot

$= \frac{3}{4} \times 12$ inches

$= \frac{3 \times 12}{4} = \frac{36}{4} = 9$

Michelle's forearm is 9 inches long.

Grade 5 Module 4 Topic D

Fraction Expressions and Word Problems

Focus Standards:

5.OA.1 Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols.

5.OA.2 Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them. *For example, express the calculation "add 8 and 7, then multiply by 2" as 2 × (8 +7). Recognize that 3 × (18932 + 921) is three times as large as 18932 + 921, without having to calculate the indicated sum or product.*

5.NF.4a Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction.

a. Interpret the product of *(a/b) × q* as *a* parts of a partition of *q* into *b* equal parts; equivalently, as the result of a sequence of operations *a × q ÷ b. For example, use a visual fraction model to show (2/3 × 4 = 8/3, and create a story context for this equation. Do the same with (2/3) × (4/5) = 8/15. (In general, (a/b) × (c/d) = ac/bd.)*

5.NF.6 Solve real world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem.

Instructional Days Recommended: 3

Interpreting numerical expressions opens Topic D as students learn to evaluate expressions with parentheses, such as $3 \times (\frac{2}{3} - \frac{1}{5})$ or $\frac{2}{3}$— × (7 + 9) (**5.OA.1**). They then learn to interpret numerical expressions, such as *3 times the difference between* $\frac{2}{3}$ *and* $\frac{1}{5}$ or *two thirds the sum of 7 and 9* (**5.OA.2**). Students generate word problems that lead to the same calculation (**5.NF.4a**) such as, "Kelly combined 7 ounces of carrot juice and 5 ounces of orange juice in a glass. Jack drank $\frac{2}{3}$—of the mixture. How much did Jack drink?" Solving word problems (**5.NF.6**) allows students to apply new knowledge of fraction multiplication in context, and tape diagrams are used to model multi-step problems requiring the use of addition, subtraction, and multiplication of fractions.

**The sample homework responses contained in this manual are intended to provide insight into the skills expected of students and instructional strategies used in Eureka Math.*

Lesson 10

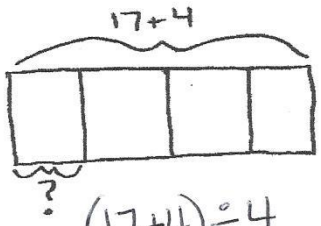
Objective: Compare and evaluate expressions with parentheses.

Homework Key

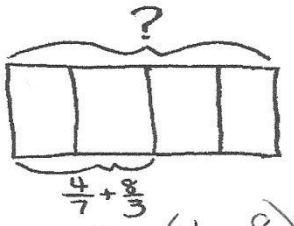
1. $5\frac{1}{4}$; expressions will vary.
   $6\frac{10}{21}$; expressions will vary.
2. $(6 \times 3) \div 8$ and $\frac{3}{8} \times 6$ circled;
   explanations will vary.
3. a. 5; expressions will vary.
   b. 3; expressions will vary.
   c. $7\frac{14}{15}$; expressions will vary.
   d. 4; expressions will vary.
   e. $39\frac{1}{5}$; expressions will vary.
   f. 36; expressions will vary.
4. a. >; explanations will vary.
   b. >; explanations will vary.
   c. >; explanations will vary.
5. a. $2\frac{1}{4}$; expressions will vary.
   b. $1\frac{3}{4}$; expressions will vary.
   c. $3\frac{1}{4}$; expressions will vary.
   d. Line plot accurately drawn
   e. $19\frac{3}{8}$; expressions will vary.

Homework Sample

1. Write expressions to match the diagrams. Then, evaluate.



$(17+4) \div 4$
$= 21 \div 4 = 5\frac{1}{4}$



$2 \times \left(\frac{4}{7}+\frac{8}{3}\right)$
$= 2 \times \left(\frac{12}{21}+\frac{56}{21}\right)$
$= 2 \times \left(\frac{68}{21}\right)$
$= \frac{2 \times 68}{21}$
$= \frac{136}{21} = 6\frac{10}{21}$

2. Circle the expression(s) that give the same product as $6 \times \frac{3}{8}$. Explain how you know.

Lesson 11 - 12

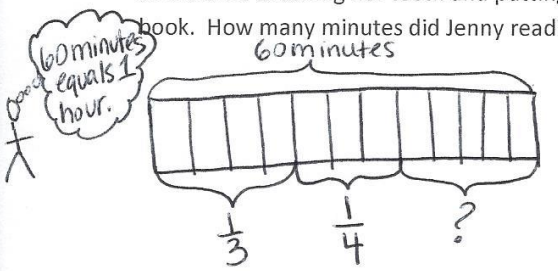
Objective: Solve and create fraction word problems involving addition, subtraction, and multiplication.

Homework Key (11)

1. 25 min
2. $4\frac{3}{4}$
3. $12\frac{1}{4}$
4. $3\frac{1}{2}$
5. Answers will vary

Homework Sample

1. Jenny's mom says she has an hour before it's bedtime. Jenny spends $\frac{1}{3}$ of the hour texting a friend and $\frac{1}{4}$ of the time brushing her teeth and putting on her pajamas. She spends the rest of the time reading her book. How many minutes did Jenny read?



$\frac{1}{3}+\frac{1}{4}=\frac{4}{12}+\frac{3}{12}=\frac{7}{12}$

$1-\frac{7}{12}=\frac{5}{12}$

$\frac{5}{12}$ of 60 minutes

$\frac{5\times 60^{5}}{\cancel{12}}=25$ minutes

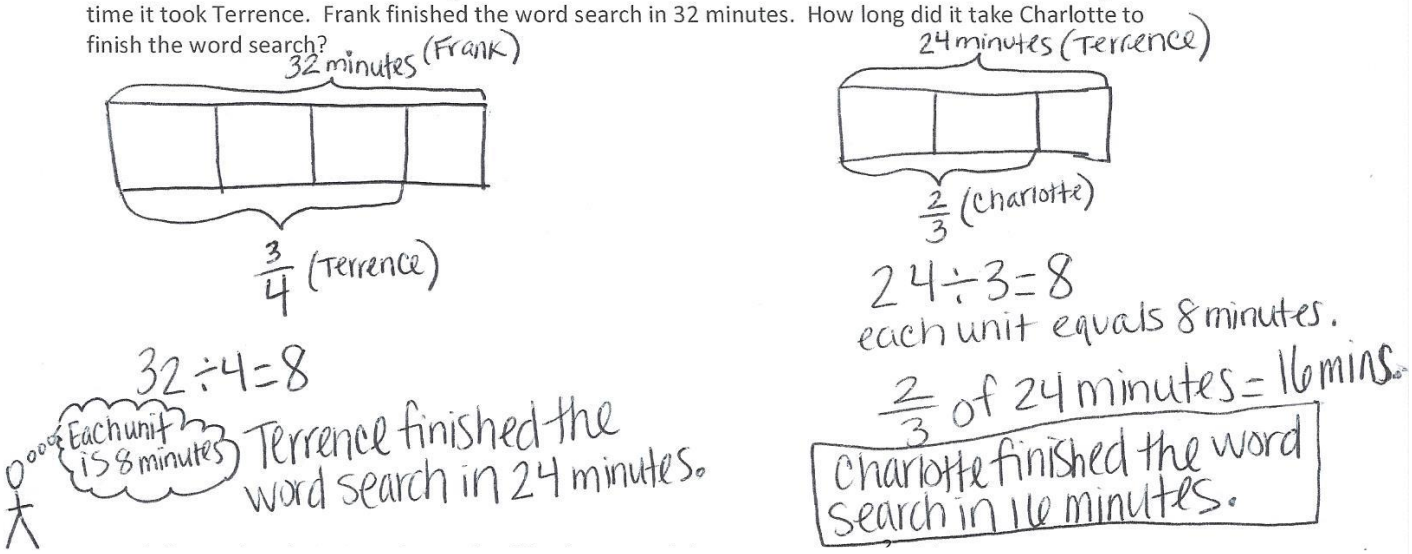
Lesson 12

Homework Key

1. 16 minutes
2. $\frac{21}{56}$ or $\frac{3}{8}$
3. 12
4. Jacob; bonus: $\frac{1}{6}$ minute
5. 4; story problems will vary.
6. 4; story problems will vary.

Homework Sample

1. Terrence finished a word search in $\frac{3}{4}$ the time it took Frank. Charlotte finished the word search in $\frac{2}{3}$ the time it took Terrence. Frank finished the word search in 32 minutes. How long did it take Charlotte to finish the word search?



Grade 5 Module 4 Topic E

Multiplication of a Fraction by a Fraction

Focus Standards:

5.NBT.7	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.
5.NF.4a	Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction. a. Interpret the product of *(a/b) × q* as *a* parts of a partition of *q* into *b* equal parts; equivalently, as the result of a sequence of operations *a × q ÷ b. For example, use a visual fraction model to show (2/3 × 4 = 8/3, and create a story context for this equation. Do the same with (2/3) × (4/5) = 8/15. (In general, (a/b) × (c/d) = ac/bd.)*
5.NF.6	Solve real world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem.
5.MD.1	Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems.

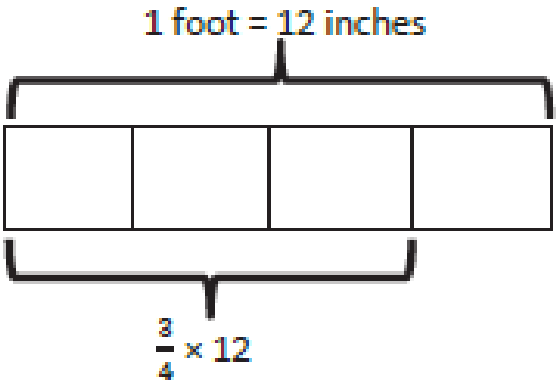
Instructional Days Recommended: 8

Topic E introduces students to multiplication of fractions by fractions—both in fraction and decimal form (**5.NF.4a**, **5.NBT.7**). The topic starts with multiplying a unit fraction by a unit fraction, and progresses to multiplying two non-unit fractions. Students use area models, rectangular arrays, and tape diagrams to model the multiplication. These familiar models help students draw parallels between whole number and fraction multiplication, as well as solve word problems. This intensive work with fractions positions students to extend their previous work with decimal-by-whole number multiplication to decimal-by-decimal multiplication. Just as students used unit form to multiply fractional units by wholes in Module 2 (e.g., 3.5 × 2 = 35 tenths × 2 ones = 70 tenths), they will connect fraction-by-fraction multiplication to multiply fractional units-by-fractional units (3.5 × 0.2 = 35 tenths × 2 tenths = 70 hundredths).

$\frac{3}{4}$ of a foot = $\frac{3}{4}$ × (1 foot)

= $\frac{3}{4}$ × (12 inches)

= 9 inches



Express $5\frac{3}{4}$ feet as inches.

$5\frac{3}{4}$ feet = (5 × 12) inches + ($\frac{3}{4}$ × 12) inches

= 60 + 9 inches

= 69 inches

Reasoning about decimal placement is an integral part of these lessons. Finding fractional parts of customary measurements and measurement conversion (5.MD.1) concludes Topic E. Students convert smaller units to fractions of a larger unit (e.g., 6 inches = $\frac{1}{2}$ feet). The inclusion of customary units provides a meaningful context for many common fractions ($\frac{1}{2}$ pint = 1 cup, $\frac{1}{3}$ yard, = 1 foot, $\frac{1}{4}$ gallon = 1 quart, etc.). This topic, together with the fraction concepts and skills learned in Module 3 opens the door to a wide variety of application word problems (5.NF.6).

**The sample homework responses contained in this manual are intended to provide insight into the skills expected of students and instructional strategies used in Eureka Math.*

Lesson 13

Objective: Multiply unit fractions by unit fractions.

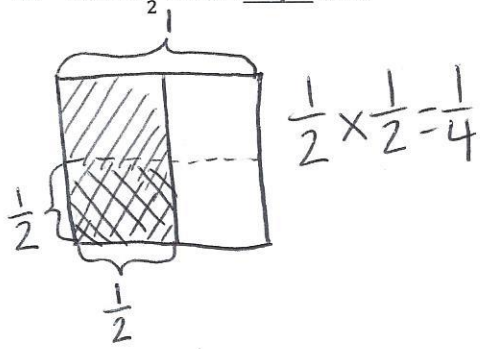
Homework Key

1. Accurate area models drawn
   a. $\frac{1}{4}$
   b. $\frac{1}{6}$
   c. $\frac{1}{8}$
   d. $\frac{1}{10}$
   e. $\frac{1}{9}$
   f. $\frac{1}{12}$
2. $\frac{1}{10}$; accurate picture drawn
3. $\frac{1}{6}$; accurate picture drawn
4. $\frac{1}{20}$; accurate area model drawn

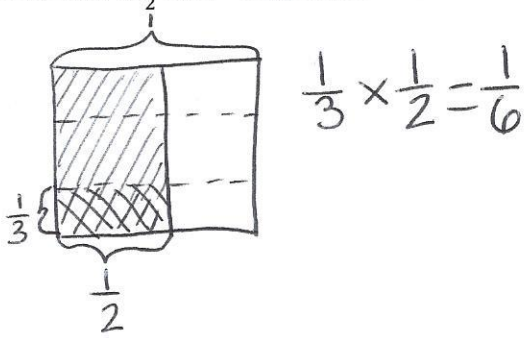
Homework Sample

1. Solve. Draw a rectangular fraction model to show your thinking.

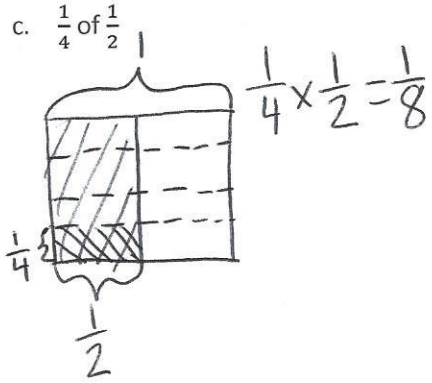
a. Half of $\frac{1}{2}$ cake = $\frac{1}{4}$ cake



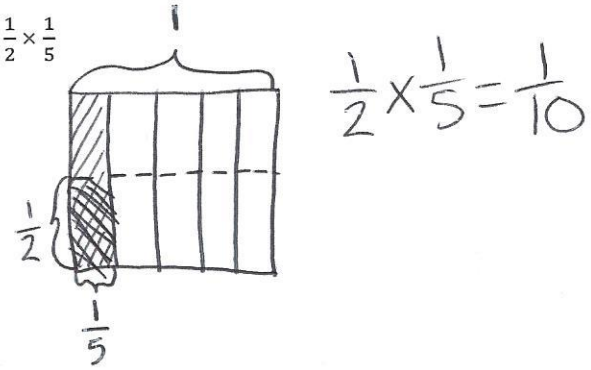
b. One-third of $\frac{1}{2}$ cake = $\frac{1}{6}$ cake



c. $\frac{1}{4}$ of $\frac{1}{2}$



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



Lesson 14

Objective: Multiply unit fractions by non-unit fractions.

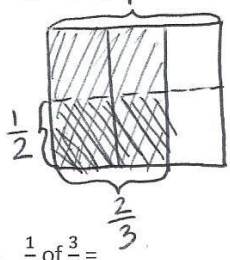
Homework Key

1. Accurate models drawn and number sentences provided
   a. 2; 1
   b. 4; 2
   c. $\frac{1}{5}$
   d. $\frac{3}{8}$
   e. $\frac{4}{15}$
   f. $\frac{4}{15}$
2. $\frac{1}{7}$; accurate model drawn
3. a. $\frac{1}{5}$
   b. $\frac{1}{15}$
4. a. All grandchildren received the same amount; explanations may vary; accurate picture drawn
   b. $\frac{1}{5}$

Homework Sample

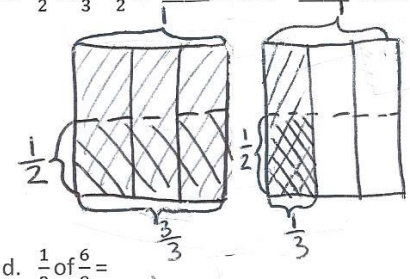
1. Solve. Draw a rectangular fraction model to explain your thinking.

a. $\frac{1}{2}$ of $\frac{2}{3} = \frac{1}{2}$ of 2 thirds = 1 thirds



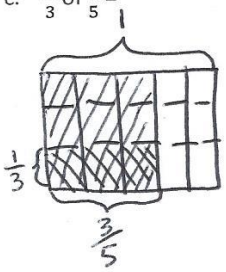
$\frac{1}{2} \times \frac{2}{3} = \frac{2}{6} = \frac{1}{3}$

b. $\frac{1}{2}$ of $\frac{4}{3} = \frac{1}{2}$ of 4 thirds = 2 thirds



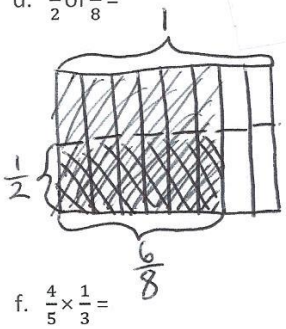
$\frac{1}{2} \times \frac{4}{3} = \frac{4}{6} = \frac{2}{3}$

c. $\frac{1}{3}$ of $\frac{3}{5} =$



$\frac{1}{3} \times \frac{3}{5} = \frac{3}{15} = \frac{1}{5}$

d. $\frac{1}{2}$ of $\frac{6}{8} =$



$\frac{1}{2} \times \frac{6}{8} = \frac{6}{16} = \frac{3}{8}$

e. $\frac{1}{3} \times \frac{4}{5} =$

f. $\frac{4}{5} \times \frac{1}{3} =$

Lesson 15

Objective: Multiply non-unit fractions by non-unit fractions.

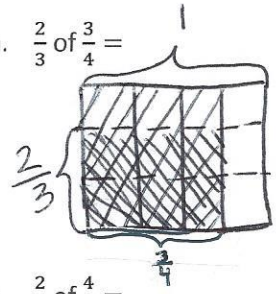
Homework Key

1. a. $\frac{1}{2}$; accurate model drawn and multiplication sentence provided
   b. $\frac{3}{10}$; accurate model drawn and multiplication sentence provided
   c. $\frac{8}{25}$; accurate model drawn and multiplication sentence provided
   d. $\frac{3}{5}$; accurate model drawn and multiplication sentence provided
2. a. $\frac{1}{4}$
   b. $\frac{3}{5}$
   c. $\frac{25}{48}$
   d. $\frac{5}{16}$
   e. $\frac{16}{27}$
   f. $\frac{2}{21}$
3. a. $\frac{1}{2}$
   b. 250 mL
4. $\frac{1}{2}$
5. a. $\frac{1}{10}$
   b. $\frac{1}{2}$ lb

Homework Sample

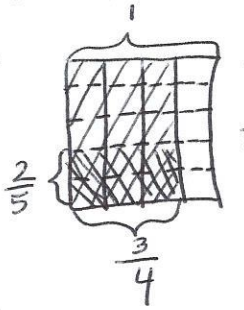
1. Solve. Draw a rectangular fraction model to explain your thinking. Then, write a multiplication sentence.

a. $\frac{2}{3}$ of $\frac{3}{4}$ =



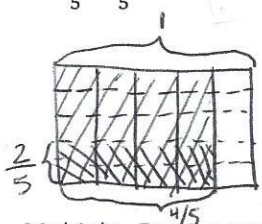
$\frac{2}{3} \times \frac{3}{4} = \frac{6}{12} = \frac{1}{2}$

b. $\frac{2}{5}$ of $\frac{3}{4}$ =



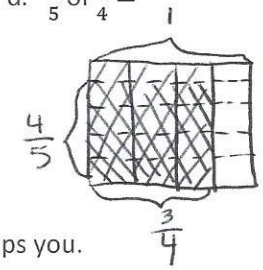
$\frac{2}{5} \times \frac{3}{4}$
$= \frac{6}{20}$
$= \frac{3}{10}$

c. $\frac{2}{5}$ of $\frac{4}{5}$ =



$\frac{2}{5} \times \frac{4}{5}$
$= \frac{8}{25}$

d. $\frac{4}{5}$ of $\frac{3}{4}$ =



$\frac{4}{5} \times \frac{3}{4}$
$= \frac{12}{20}$
$= \frac{3}{5}$

2. Multiply. Draw a rectangular fraction model if it helps you.

Lesson 16

Objective: Solve word problems using tape diagrams and fraction–by–fraction multiplication.

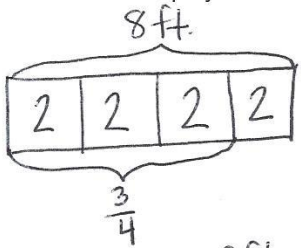
Homework Key

1. 8; accurate tape diagram drawn
2. Accurate tape diagrams drawn for each
   a. 180
   b. 60
   c. 313
   d. Less than half
   e. 126

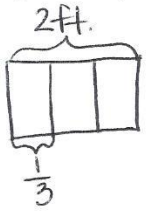
Homework Sample

Solve and show your thinking with a tape diagram.

1. Anthony bought an 8-foot board. He cut off $\frac{3}{4}$ of the board to build a shelf, and gave $\frac{1}{3}$ of the rest to his brother for an art project. How many inches long was the piece Anthony gave to his brother?



4 units = 8 ft.
1 unit = 2 ft.



$\frac{1}{3}$ of 2 ft.
$= \frac{1}{3} \times 2$
$= \frac{1 \times 2}{3}$
$= \frac{2}{3}$ ft.

$= \frac{2}{3} \times 1$ ft.
$= \frac{2}{3} \times 12$ inches
$= \frac{2 \times 12}{3}$
$= \frac{24}{3} = 8$ inches

The piece Anthony gave his brother was $\frac{2}{3}$ ft. or 8 in. long.

2. Riverside Elementary School is holding a school-wide election to choose a school color. Five-eighths of the votes were for blue, $\frac{5}{9}$ of the remaining votes were for green, and the remaining 48 votes were for

Lesson 17 - 18

Objective: Relate decimal and fraction multiplication.

Homework Key (17)

1. a. Answer provided
   b. $0.6 \times 0.2 = 0.12$; accurate area model
   c. $0.1 \times 1.6 = 0.16$; accurate area model
   d. $0.6 \times 1.9 = 1.14$; accurate area model
2. a. 2.4
   b. 0.24; $\frac{24}{100}$; 0.24
   c. 0.024; 4, 6; $\frac{24}{1000}$; 0.024
   d. 2.1
   e. 0.21
   f. 0.021
   g. 6.5
   h. 0.65
   i. 0.065
3. 0.51 L
4. a. 1.44 mi
   b. 3.46 mi

Homework Sample

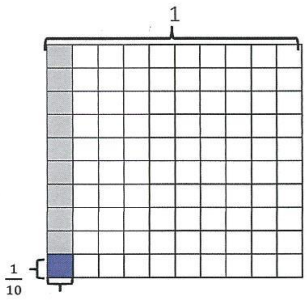
1. Multiply and model. Rewrite each expression as a number sentence with decimal factors. The first one is done for you.

a. $\frac{1}{10} \times \frac{1}{10}$

$= \frac{1 \times 1}{10 \times 10}$

$= \frac{1}{100}$

$0.1 \times 0.1 = 0.01$

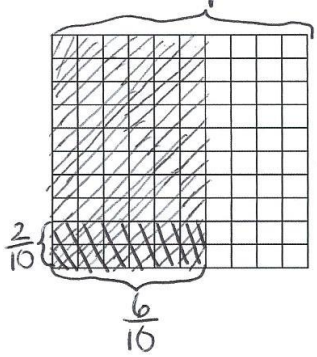


b. $\frac{6}{10} \times \frac{2}{10}$

$= \frac{6 \times 2}{10 \times 10}$

$= \frac{12}{100}$

$0.6 \times 0.2 = 0.12$



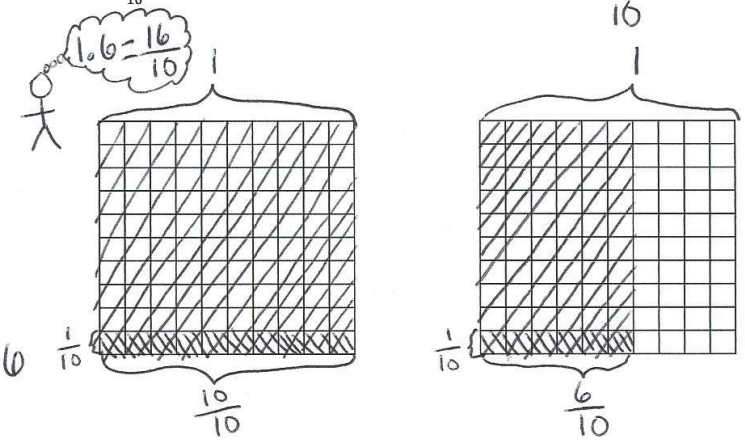
c. $\frac{1}{10} \times 1.6$

$= \frac{1}{10} \times \frac{16}{10}$

$= \frac{1 \times 16}{10 \times 10}$

$= \frac{16}{100}$

$0.1 \times 1.6 = 0.16$



Lesson 18

Homework Key

1. a. Answer provided
   b. 2.64; 264 hundredths
   c. 14.08; 1,408 hundredths
   d. 3.52; 352 hundredths
2. a. 4,704 thousandths
   b. 2.345; 2,345 thousandths
   c. 12.928; 12,928 thousandths
   d. 0.704; 704 thousandths
3. a. Answer provided
   b. 4.83; 483 hundredths
   c. 25.194; 25,194 thousandths
   d. 29.25; 2,925 hundredths *or* 29.250; 29,250 thousandths
4. $19.25
5. a. 70.2 sq. m
   b. 175.5 sq. m

Homework Sample

1. Multiply using fraction form and unit form. Check your answer by counting the decimal places. The first one is done for you.

   a. $3.3 \times 1.6 = \frac{33}{10} \times \frac{16}{10}$

   $= \frac{33 \times 16}{100}$

   $= \frac{528}{100}$

   $= 5.28$

   3 3 tenths
   × 1 6 tenths
   1 9 8
   + 3 3 0
   5 2 8 hundredths

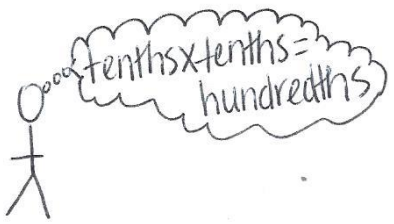
   b. $3.3 \times 0.8 = \frac{33}{10} \times \frac{8}{10}$

   $= \frac{33 \times 8}{10 \times 10}$

   $= \frac{264}{100}$

   $= 2.64$

   2 3 3 tenths
   × 8 tenths
   264 hundredths

   c. $4.4 \times 3.2 =$

   d. $2.2 \times 1.6 =$

Lesson 19

Objective: Covert measures involving whole numbers, and solve multi-step word problems.

Homework Key

1. a. Answer provided
   b. $2; \frac{1}{3}; \frac{6}{3}$
   c. $\frac{5}{12}$
   d. $1\frac{2}{12}$ or $1\frac{1}{6}$
   e. $\frac{7}{16}$
   f. $1\frac{4}{16}$ or $1\frac{1}{4}$
   g. $\frac{1}{2}$
   h. 2
2. a. $\frac{12}{16}$ or $\frac{3}{4}$ lb
   b. $3
3. $1\frac{5}{16}$ lb
4. 3 gal

Homework Sample

1. Convert. Express your answer as a mixed number, if possible.

a. 2 ft = $\frac{2}{3}$ yd

2 ft = 2 × 1 ft

= 2 × $\frac{1}{3}$ yd

= $\frac{2}{3}$ yd

b. 6 ft = 2 yd

6 ft = 6 × 1 ft

= 6 × $\frac{1}{3}$ yd

= $\frac{6 \times 1}{3}$ yd

= $\frac{6}{3}$ = 2 yd.

c. 5 in = $\frac{5}{12}$ ft

5 in = 5 × 1 in.

= 5 × $\frac{1}{12}$ ft.

= $\frac{5}{12}$ ft.

d. 14 in = $1\frac{1}{6}$ ft

14 in = 14 × 1 in.

= 14 × $\frac{1}{12}$ ft.

= $\frac{14}{12}$ ft.

= $1\frac{2}{12} = 1\frac{1}{6}$ ft.

e. 7 oz = $\frac{7}{16}$ lb

7 oz = 7 × 1 oz

= 7 × $\frac{1}{16}$ lb.

= $\frac{7}{16}$ lb.

f. 20 oz = $1\frac{1}{4}$ lb

20 oz = 20 × 1 oz

= 20 × $\frac{1}{16}$ lb.

= $\frac{20}{16}$

= $1\frac{4}{16} = 1\frac{1}{4}$ lb.

g. 1 pt = $\frac{1}{2}$ qt

1 pt = 1 × 1 pt

= 1 × $\frac{1}{2}$ qt

= $\frac{1}{2}$ qt.

h. 4 pt = 2 qt

4 pt = 4 × 1 pt.

= 4 × $\frac{1}{2}$ qt.

= $\frac{4}{2}$ qt.

= 2 qt.

Lesson 20

Objective: Convert mixed unit measurements, and solve multi-step word problems.

Homework Key

1. a. Answer provided
   b. $\frac{5}{12}$
   c. 46
   d. $3\frac{3}{4}$
   e. 258
   f. $2\frac{3}{4}$
2. $2\frac{3}{4}$ min
3. $\frac{1}{4}$ lb
4. Yes, because the package weighs 15 lb

Homework Sample

1. Convert. Show your work. Express your answer as a mixed number. The first one is done for you.

a. $2\frac{2}{3}$ yd = 8 ft

$2\frac{2}{3}$ yd $= 2\frac{2}{3} \times 1$ yd
$= 2\frac{2}{3} \times 3$ ft
$= \frac{8}{3} \times 3$ ft
$= \frac{24}{3}$ ft
$= 8$ ft

b. $1\frac{1}{4}$ ft = $\frac{5}{12}$ yd

$1\frac{1}{4}$ ft $= 1\frac{1}{4} \times 1$ ft
$= 1\frac{1}{4} \times \frac{1}{3}$ yd
$= \frac{5}{4} \times \frac{1}{3}$ yd
$= \frac{5}{12}$ yd.

c. $3\frac{5}{6}$ ft = 46 in

$= 3\frac{5}{6} \times 1$ ft.
$= 3\frac{5}{6} \times 12$ in.
$= \frac{23}{6} \times \frac{12^{2}}{1}$ in.
$= 46$ inches

d. $7\frac{1}{2}$ pt = $3\frac{3}{4}$ qt

$= 7\frac{1}{2} \times 1$ pt.
$= 7\frac{1}{2} \times \frac{1}{2}$ qt.
$= \frac{15}{2} \times \frac{1}{2}$ qt.
$= \frac{15}{4}$ qt. $= 3\frac{3}{4}$ qt.

e. $4\frac{3}{10}$ hr = 258. min

$= 4\frac{3}{10} \times 1$ hr.
$= 4\frac{3}{10} \times 60$ min.
$= \frac{43}{10} \times \frac{60^{6}}{1}$ min.
$= 258$ mins.

43 × 6 = 258

f. 33 months = $2\frac{3}{4}$ years

$= 33 \times 1$ month
$= 33 \times \frac{1}{12}$ year
$= \frac{33 \times 1}{12}$ year
$= \frac{33}{12}$ year
$= 2\frac{9}{12}$ year $= 2\frac{3}{4}$ year

Grade 5 Module 4 Topic F

Multiplication with Fractions and Decimals as Scaling and Word Problems

Focus Standards:

5.NF.5 Interpret multiplication as scaling (resizing), by:
a. Comparing the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication.
b. Explaining why multiplying a given number by a fraction greater than 1 results in a product greater than the given number (recognizing multiplication by whole numbers greater than 1 as a familiar case); explaining why multiplying a given number by a fraction less than 1 results in a product smaller than the given number; and relating the principle of fraction equivalence *a/b = (n×a)/(n×b)* to the effect of multiplying *a/b* by 1.

5.NF.6 Solve real world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem.

Instructional Days Recommended: 4

Students interpret multiplication in Grade 3 as equal groups, and in Grade 4, students begin understanding multiplication as comparison. Here, in Topic F, students once again extend their understanding of multiplication to include scaling (**5.NF.5**)**.** Students compare the product to the size of one factor, given the size of the other factor (**5.NF.5a**) without calculation (e.g., 486 × 1,327.45 is twice as large as 243 × 1,327.45 because 486 = 2 × 243). This reasoning, along with the other work of this module, sets the stage for students to reason about the size of products when quantities are multiplied by 1, by numbers larger than 1, and numbers smaller than 1. Students relate their previous work with equivalent fractions to interpreting multiplication by $\frac{n}{n}$as multiplication by 1 (**5.NF.5b**).

Students build on their new understanding of fraction equivalence as multiplication by $\frac{n}{n}$to convert fractions to decimals and decimals to fractions. For example, $\frac{3}{25}$ is easily renamed in

hundredths as $\frac{12}{100}$ using multiplication of $\frac{4}{4}$. The word form of *twelve hundredths* will then be used to notate this quantity as a decimal. Conversions between fractional forms will be limited to fractions whose denominators are factors of 10, 100, or 1,000. Students will apply the concepts of the topic to real world, multi-step problems (**5.NF.6**).

Lesson 21

Objective: Explain the size of the product, and relate fraction and decimal equivalence to multiplying a fraction by 1.

Homework Key

1. a. 3
   b. $\frac{7}{7}$
   c. $\frac{5}{5}$; 10
   d. Answers will vary.
2. a. 75; 0.75
   b. $\frac{25}{100} = 0.25$
   c. $\frac{2}{5} \times \frac{2}{2} = \frac{4}{10} = 0.4$
   d. $\frac{3}{5} \times \frac{2}{2} = \frac{6}{10} = 0.6$
   e. $\frac{3}{20} \times \frac{5}{5} = \frac{15}{100} = 0.15$
   f. $\frac{25}{20} \times \frac{5}{5} = \frac{125}{100} = 1.25$
   g. $\frac{23}{25} \times \frac{4}{4} = \frac{92}{100} = 0.92$
   h. $\frac{89}{50} \times \frac{2}{2} = \frac{178}{100} = 1.78$
   i. $3\frac{11}{25} \times \frac{4}{4} = 3\frac{44}{100} = 3.44$
   j. $5\frac{41}{50} \times \frac{2}{2} = 5\frac{82}{100} = 5.82$
3. $\frac{6}{8} = \frac{3}{4} \times \frac{25}{25} = \frac{75}{100} = 0.75$
4. Answers will vary.
5. \$0.31 or 31 cents

Lesson 21 (continued)

Homework Sample

1. Fill in the blanks.

   a. $\frac{1}{3} \times 1 = \frac{1}{3} \times \frac{3}{3} = \frac{3}{9}$

   b. $\frac{2}{3} \times 1 = \frac{2}{3} \times \frac{7}{7} = \frac{14}{21}$

   c. $\frac{5}{2} \times 1 = \frac{5}{2} \times \frac{5}{5} = \frac{25}{10}$

   d. Compare the first factor to the value of the product.

   Each time, the first factor, was multiplied by a fraction equivalent to 1. The value of the product is equivalent to the first factor. Example: $\frac{1}{3} = \frac{3}{9}$.

2. Express each fraction as an equivalent decimal. The first one is partially done for you.

   a. $\frac{3}{4} \times \frac{25}{25} = \frac{3 \times 25}{4 \times 25} = \frac{\quad}{100} =$

   b. $\frac{1}{4} \times \frac{25}{25} =$

Lesson 22 -23

Objective: Compare the size of the product to the size of the factors.

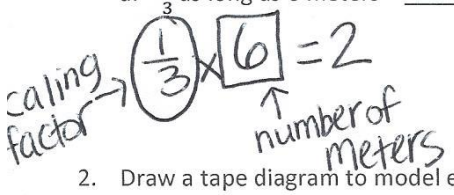
Homework Key (22)

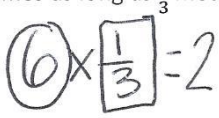
1. a. $\frac{1}{3} \times 6 = 2$; $\frac{1}{3}$ circled, 6 boxed; 2
   b. $6 \times \frac{1}{3} = 2$; 6 circled, $\frac{1}{3}$ boxed; 2
2. a. Accurate tape diagram shown
   b. Accurate tape diagram shown
3. a. Any number greater than 3; answers will vary.
   b. Any number greater than 6; answers will vary.
   c. 5
4. a. Any fraction greater than 1; answers will vary
   b. Any fraction less than 1; answers will vary.
5. a. Any number less than $\frac{1}{3}$
   b. Explanations will vary
6. 17 yd
7. $\frac{1}{6}$ ft by $\frac{1}{4}$ ft; $\frac{1}{2}$ ft by $\frac{1}{3}$ ft

Homework Sample

1. Solve for the unknown. Rewrite each phrase as a multiplication sentence. Circle the scaling factor and put a box around the number of meters.

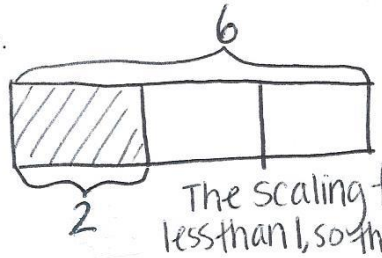
   a. $\frac{1}{3}$ as long as 6 meters = 2 meters b. 6 times as long as $\frac{1}{3}$ meter = 2 meters





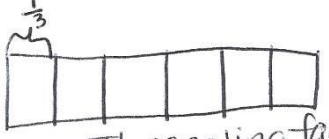
2. Draw a tape diagram to model each situation in Problem 1, and describe what happened to the number of meters when it was multiplied by the scaling factor.

   a.



The scaling factor ($\frac{1}{3}$) is less than 1, so the number of meters decreased.

   b.



The scaling factor, 6, is greater than 1, so the number of meters increased.

Lesson 23

Homework Key

1. a. Less: 828×0.921, 0.05×0.1
   Greater: 12.5×1.989, 321.46×1.26, 0.007×1.02, 2.16×1.11
   b. Explanations will vary.
2. a. Is slightly less than; explanations will vary.
   b. Is slightly more than; explanations will vary.
   c. Is a lot less than; explanations will vary.
   d. Is slightly more than; explanations will vary.
   e. Is slightly less than; explanations will vary.
3. Kayla, Jonathan, Rachel; explanations will vary.
4. a. Greater than 1; examples will vary.
   b. Less than 1; examples will vary.

Homework Sample

1.

a. Sort the following expressions by rewriting them in the table.

The product is less than the boxed number:	The product is greater than the boxed number:
828×0.921 0.05×0.1	12.5×1.989 0.007×1.02 2.16×1.11 321.46×1.26

$\boxed{12.5} \times 1.989$ $\quad \boxed{828} \times 0.921$ $\quad \boxed{321.46} \times 1.26$

$\boxed{0.007} \times 1.02$ $\quad \boxed{2.16} \times 1.11$ $\quad \boxed{0.05} \times 0.1$

b. What do the expressions in each column have in common?

In the first column, the boxed number is multiplied by a scaling factor less than 1, so the products will be less than the boxed number. In the second column, the boxed number is multiplied by a scaling factor greater than 1, so the product will be more than the boxed number.

2. Write a statement using one of the following phrases to compare the value of the expressions. Then, explain how you know.

Lesson 24

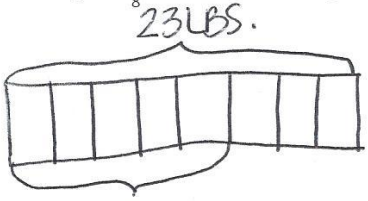
Objective: Solve word problems using fraction ad decimal multiplication.

Homework Key

1.	14.375 lb	4.	$215,942.65
2.	0.225 cm	5.	108
3.	38 mi	6.	$142.60

Homework Sample

1. Jesse takes his dog and cat for their annual vet visit. Jesse's dog weighs 23 pounds. The vet tells him his cat's weight is $\frac{5}{8}$ as much as his dog's weight. How much does his cat weigh?



$\frac{5}{8}$ of 23 LBS

$5 \times \frac{23}{8}$

2.875

8 | 23.000

-16

70

-64

60

-56

40

-40

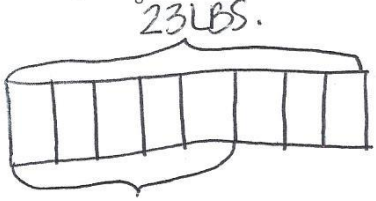
0

$5 \times 2.875 = 14.375$

The cat weighs 14.375 pounds.

or

1. Jesse takes his dog and cat for their annual vet visit. Jesse's dog weighs 23 pounds. The vet tells him his cat's weight is $\frac{5}{8}$ as much as his dog's weight. How much does his cat weigh?



$\frac{5}{8}$ of 23 LBS

$= \frac{5}{8} \times 23$

$= \frac{5 \times 23}{8}$

$= \frac{115}{8} = 14\frac{3}{8}$ LBS.

The cat weighs 14.375 pounds.

Grade 5 Module 4 Topic G

Division of Fractions and Decimal Fractions

Focus Standards:

5.OA.1 Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols.

5.NBT.7 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.

5.NF.7 Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. (Students capable of multiplying fractions can generally develop strategies to divide fractions by reasoning about the relationship between multiplication and division. However, division of a fraction by a fraction is not a requirement at this grade level.)

a. Interpret division of a unit fraction by a non-zero whole number, and compute such quotients. *For example, create a story context for (1/3) ÷ 4, and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that (1/3) ÷ 4 = 1/12 because (1/12) × 4 = 1/3.*

b. Interpret division of a whole number by a unit fraction, and compute such quotients. *For example, create a story context for 4 ÷ (1/5), and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that 4 ÷ (1/5) = 20 because 20 × (1/5) = 4.*

c. Solve real world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions, e.g., by using visual fraction models and equations to represent the problem. *For example, how much chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How many 1/3-cup servings are in 2 cups of raisins?*

Instructional Days Recommended: 7

Topic G begins the work of division with fractions—both fractions and decimal fractions. Students use tape diagrams and number lines to reason about the division of a whole number by a unit fraction and a unit fraction by a whole number (**5.NF.7**). Using the same thinking developed in Module 2 to divide whole numbers, students reason about how many *fourths* are in 5 when considering cases such as $5 \div \frac{1}{4}$. They also reason about the size of the unit when $\frac{1}{4}$ is partitioned into 5 equal parts: $\frac{1}{4} \div 5$. Using this thinking as a backdrop, students are introduced to decimal fraction divisors and use equivalent fraction and place value thinking to reason about the size of quotients, calculate quotients, and sensibly place the decimal in quotients (**5.NBT.7**).

**The sample homework responses contained in this manual are intended to provide insight into the skills expected of students and instructional strategies used in Eureka Math.*

Lesson 25

Objective: Divide a whole number by a unit fraction.

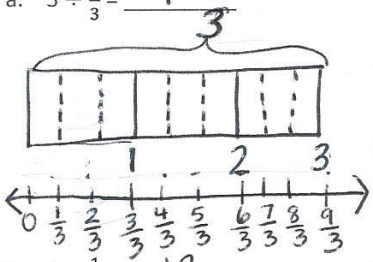
Homework Key

1. a. 9; 3; 9, 9; accurate tape diagram drawn
   b. 12; 4; 12, 3; 12; accurate tape diagram drawn
   c. 12; 3; 12, 4; 12; accurate tape diagram drawn
   d. 20; 4; 20, 5; 20; accurate tape diagram drawn
2. Accurate check shown for each
   a. 8
   b. 12
   c. 20
   d. 40
   e. 18
   f. 18
   g. 30
   h. 60
3. 24
4. 24 bags of nuts, 20 bags of cherries, and 24 bags of dried fruit

Homework Sample

1. Draw a tape diagram and a number line to solve. Fill in the blanks that follow.

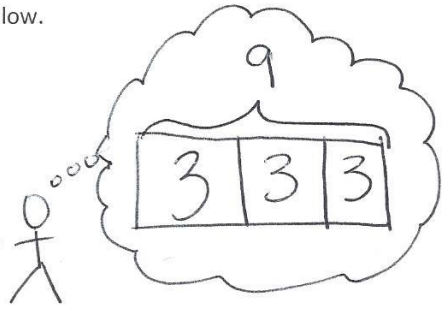
a. $3 \div \frac{1}{3} =$ 9



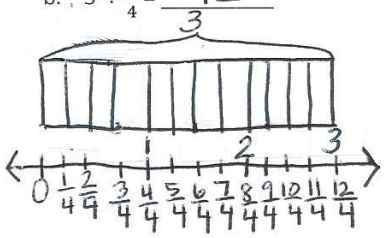
There are 3 thirds in 1 whole.

There are 9 thirds in 3 wholes.

If 3 is $\frac{1}{3}$, what is the whole? 9



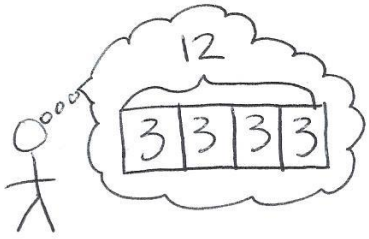
b. $3 \div \frac{1}{4} =$ 12



There are 4 fourths in 1 whole.

There are 12 fourths in 3 wholes.

If 3 is $\frac{1}{4}$, what is the whole? 12



Lesson 26

Objective: Divide a unit fraction by a whole number.

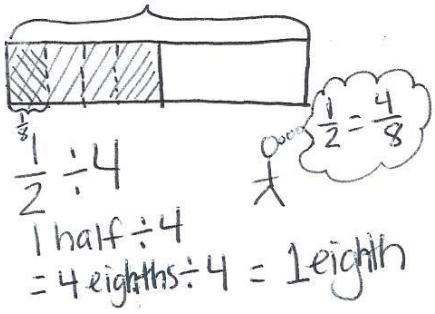
Homework Key

1. Model or tape diagram drawn for each
   a. $\frac{1}{8}$
   b. $\frac{1}{18}$
   c. $\frac{1}{12}$
   d. $\frac{1}{10}$
2. Accurate check shown for each
   a. $\frac{1}{20}$
   b. $\frac{1}{40}$
   c. $\frac{1}{15}$
   d. $\frac{1}{15}$
   e. $\frac{1}{32}$
   f. $\frac{1}{21}$
   g. $\frac{1}{50}$
   h. $\frac{1}{100}$
3. $\frac{1}{16}$ mile
4. a. $\frac{2}{15}$
   b. 105 pages

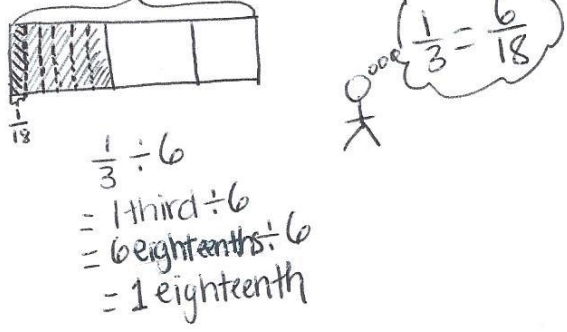
Homework Sample

1. Solve and support your answer with a model or tape diagram. Write your quotient in the blank.

a. $\frac{1}{2} \div 4 = \frac{1}{8}$



b. $\frac{1}{3} \div 6 = \frac{1}{18}$



c. $\frac{1}{4} \div 3 =$ _____

d. $\frac{1}{5} \div 2 =$ _____

Lesson 27

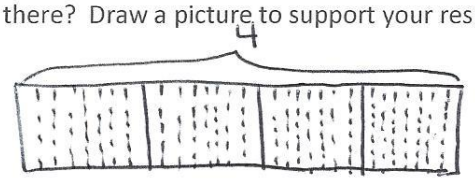
Objective: Solve problems involving fraction division.

Homework Key

1. 32; accurate model shown
2. $\frac{1}{24}$; accurate model shown
3. a. $\frac{1}{20}$ L; accurate model shown
   b. 50 mL
4. a. 20 fifths
   b. 20 cm
5. a. $\frac{1}{12}$
   b. 72 oz
   c. 3 lb

Homework Sample

1. Kelvin ordered four pizzas for a birthday party. The pizzas were cut in eighths. How many slices were there? Draw a picture to support your response.



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

8 slices in 1 pizza
= 32 slices in 4 pizzas.

There were 32 slices in 4 pizzas.

Lesson 28

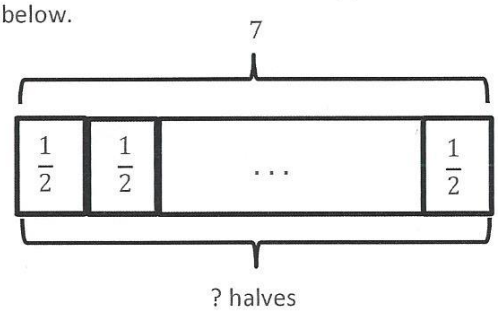
Objective: Write equations and word problems corresponding to tape and number line diagrams.

Homework Key

1. Answers will vary; 14
2. Answers will vary; $\frac{1}{9}$ lb
3. a. Answers will vary; 8
   b. Answers will vary; $\frac{1}{8}$
   c. Answers will vary; $\frac{1}{15}$
   d. Answers will vary; 30

Homework Sample

1. Create and solve a division story problem about 7 feet of rope that is modeled by the tape diagram below.



Sally had 7 feet of rope. She cut the rope into $\frac{1}{2}$ ft. pieces. How many $\frac{1}{2}$ pieces will Sally have after cutting all the rope?

$7 \div \frac{1}{2} = 14$ halves

Sally will have 14 $\frac{1}{2}$ ft. pieces of rope.

Lesson 29

Objective: Connect division by a unit fraction to division by 1 tenth and 1 hundredth.

Homework Key

1. a. $9 \div \frac{1}{10} = 90; 10; 90$
   b. $6 \div \frac{1}{10} = 60; 10; 60$
   c. $3.6 \div \frac{1}{10} = 36; 30; 6; 36$
   d. $12.8 \div \frac{1}{10} = 128; 120; 8; 128$
   e. $3 \div \frac{1}{100} = 300; 100; 300$
   f. $7 \div \frac{1}{100} = 700; 100; 700$
   g. $4.7 \div \frac{1}{100} = 470; 400; 70; 470$
   h. $11.3 \div \frac{1}{100} = 1{,}130; 1{,}100; 30; 1{,}130$

2. a. 20
   b. 230
   c. 500
   d. 72
   e. 5,100
   f. 310
   g. 2,310
   h. 437
   i. 2,450
3. 1,260
4. Geraldine; answers will vary.
5. $132.64

Homework Sample

1. Divide. Rewrite each expression as a division sentence with a fraction divisor, and fill in the blanks. The first one is done for you.

Example: $4 \div 0.1 = 4 \div \frac{1}{10} = 40$

There are 10 tenths in 1 whole.

There are 40 tenths in 4 wholes.

a. $9 \div 0.1 = 9 \div \frac{1}{10} = 90$

There are 10 tenths in 1 whole.

There are 90 tenths in 9 wholes.

b. $6 \div 0.1 = 6 \div \frac{1}{10} = 60$

There are 10 tenths in 1 whole.

There are 60 tenths in 6 wholes.

Lesson 30 - 31

Objective: Divide decimal dividends by non-unit decimal divisors.

Homework Key (30)

1. a. 3
   b. 30
   c. $\frac{4.8}{0.6}$; 8
   d. $\frac{0.48}{0.06}$; 8
   e. $\frac{8.4}{0.7}$; 12
   f. $\frac{0.84}{0.07}$; 12
   g. $\frac{4.5}{0.15}$; 3
   h. $\frac{0.45}{0.15}$; 3
   i. $\frac{14.4}{1.2}$; 12
   j. $\frac{1.44}{0.12}$; 12

2. Leann is incorrect; answers will vary
3. a. 8
   b. 16
4. 15

Homework Sample

1. Rewrite the division expression as a fraction and divide. The first two have been started for you.

a. $2.4 \div 0.8 = \frac{2.4}{0.8}$ $= \frac{2.4 \times 10}{0.8 \times 10}$ $= \frac{24}{8}$ $= 3$	b. $2.4 \div 0.08 = \frac{2.4}{0.08}$ $= \frac{2.4 \times 100}{0.08 \times 100}$ $= \frac{240}{8}$ $= 30$
c. $4.8 \div 0.6 = \frac{4.8}{0.6}$ $= \frac{4.8 \times 10}{0.6 \times 10}$ $= \frac{48}{6}$ $= 8$	d. $0.48 \div 0.06$ $\frac{0.48}{0.06}$ $= \frac{0.48 \times 100}{0.06 \times 100}$ $= \frac{48}{6}$ $= 8$

Lesson 31

Homework Key

1. a. $61.6 \div 0.8 \approx \frac{640}{8} = 80;\ 77$

   b. $5.74 \div 0.7 \approx \frac{56}{7} = 8;\ 8.2$

2. a. $4.74 \div 0.06 \approx \frac{480}{6} = 80;\ 79$

   b. $19.44 \div 0.54 \approx \frac{2000}{50} = 40;\ 36$

3. a. 64

   b. $\frac{752}{8}$; 94

   c. $\frac{124.5}{5}$; 24.9

   d. $\frac{560}{16}$; 35

4. 54 green; 36 purple

5. 14

Homework Sample

1. Estimate and then divide. An example has been done for you.

$78.4 \div 0.7 \approx 770 \div 7 = 110$

$= \frac{78.4}{0.7}$

$= \frac{78.4 \times 10}{0.7 \times 10}$

$= \frac{784}{7}$

$= 112$

$$\begin{array}{r} 1\,1\,2 \\ 7\overline{)\,7\,8\,4} \\ -7 \\ \hline 8 \\ -7 \\ \hline 1\,4 \\ -1\,4 \\ \hline 0 \end{array}$$

a. $61.6 \div 0.8 \approx 640 \div 8 = 80$

$= \frac{61.6}{0.8}$

$= \frac{61.6 \times 10}{0.8 \times 10}$

$= \frac{616}{8}$

$= 77$

$$\begin{array}{r} 77 \\ 8\overline{)\,616} \\ -56 \\ \hline 56 \end{array}$$

b. $5.74 \div 0.7 \approx 56 \div 7 = 8$

$= \frac{5.74}{0.7}$

$= \frac{5.74 \times 10}{0.7 \times 10}$

$= \frac{57.4}{7}$

$= 8.2$

$$\begin{array}{r} 8.2 \\ 7\overline{)\,57.4} \\ -56 \\ \hline 14 \end{array}$$

2. Estimate and then divide. An example has been done for you.

$7.32 \div 0.06 \approx 720 \div 6 = 120$

$= \frac{7.32}{0.06}$

$= \frac{7.32 \times 100}{0.06 \times 100}$

$= \frac{732}{6}$

$= 122$

$$\begin{array}{r} 1\,2\,2 \\ 6\overline{)\,7\,3\,2} \\ -6 \\ \hline 1\,3 \\ -1\,2 \\ \hline 1\,2 \\ -1\,2 \\ \hline 0 \end{array}$$

Grade 5 Module 4 Topic H

Interpretation of Numerical Expressions

Focus Standards:

5.OA.1 Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols.

5.OA.2 Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them. *For example, express the calculation "add 8 and 7, then multiply by 2" as 2 × (8 +7). Recognize that 3 × (18932 + 921) is three times as large as 18932 + 921, without having to calculate the indicated sum or product.*

Instructional Days Recommended: 2

The module concludes with Topic H, in which numerical expressions involving fraction-by-fraction multiplication are interpreted and evaluated (**5.OA.1**, **5.OA.2**). Students create and solve word problems involving both multiplication and division of fractions and decimal fractions.

**The sample homework responses contained in this manual are intended to provide insight into the skills expected of students and instructional strategies used in Eureka Math.*

Lesson 32

Objective: Interpret and evaluate numerical expressions including the language of scaling and fraction division.

Homework Key

1. $(7-4)\div\frac{1}{5}$ circled.
2. $42\div(\frac{2}{3}+\frac{3}{4})$ and $\frac{42}{\frac{2}{3}+\frac{3}{4}}$ circled.
3. Answers will vary.
4. 3(a); explanations will vary.
5. a. 30
   b. $1\frac{1}{5}$
   c. $\frac{1}{100}$
   d. $\frac{2}{5}$
   e. 400
6. a. Answers will vary.
   b. $32-5-\frac{1}{3}(32-5)$ circled.

Homework Sample

1. Circle the expression equivalent to *the difference between 7 and 4, divided by a fifth*.

   $7+(4\div\frac{1}{5})$ $\quad\frac{7-4}{5}$ $\quad$ **(circled)** $(7-4)\div\frac{1}{5}$ $\quad\frac{1}{5}\div(7-4)$

2. Circle the expression(s) equivalent to *42 divided by the sum of* $\frac{2}{3}$ *and* $\frac{3}{4}$.

   $(\frac{2}{3}+\frac{3}{4})\div 42$ $\quad(42\div\frac{2}{3})+\frac{3}{4}$ $\quad$ **(circled)** $42\div(\frac{2}{3}+\frac{3}{4})$ $\quad\frac{42}{\frac{2}{3}+\frac{3}{4}}$

3. Fill in the chart by writing the equivalent numerical expression or expression in word form.

	Expression in word form	Numerical expression
a.	A fourth as much as the sum of $3\frac{1}{8}$ and 4.5	$\frac{1}{4}\times(3\frac{1}{8}+4.5)$
b.	The sum of $3\frac{1}{8}$ and 4.5, divided by 5.	$(3\frac{1}{8}+4.5)\div 5$
c.	Multiply $\frac{3}{5}$ by 5.8; then halve the product	$(\frac{3}{5}\times 5.8)\div 2$
d.	$\frac{1}{6}$ as much as the difference of 4.8 and $\frac{1}{2}$.	$\frac{1}{6}\times(4.8-\frac{1}{2})$
e.	The quotient of $\frac{1}{2}\div 9$ subtracted from 8.	$8-(\frac{1}{2}\div 9)$

Lesson 33

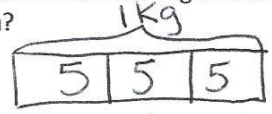
Objective: Create story contexts for numerical expressions and tape diagrams, and solve word problems.

Homework Key

1. a. $\frac{1}{15}$ kg
   b. $1\frac{1}{3}$ kg
2. a. 19
   b. 38
3. a. 13
   b. 6
4. a. Answers will vary.
   b. Answers will vary.
5. Answers will vary.

Homework Sample

1. Chase volunteers at an animal shelter after school, feeding and playing with the cats.
   a. If he can make 5 servings of cat food from a third of a kilogram of food, how much does one serving weigh?



Each serving is $\frac{1}{15}$ kg.

   b. If Chase wants to give this same serving size to each of 20 cats, how many kilograms of food will he need?

$\frac{1}{15} \times 20$

$= \frac{1 \times 20}{15}$

$= 1\frac{5}{15} = 1\frac{1}{3}$ kg

Chase would need $1\frac{1}{3}$ kg of food.