

Kenmore-Town of Tonawanda UFSD

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

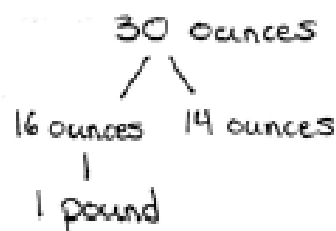


Grade 4 Module 7 Parent Packet

Exploring Measurement with Multiplication

In this final module of Grade 4, students build their competencies in measurement as they relate multiplication to the conversion of measurement units.

Throughout the module, students explore multiple strategies for solving measurement problems involving unit conversion.



A number bond decomposes 30 ounces to make a mixed unit of 1 pound 14 ounces

Pounds	Ounces
1	16
2	32
3	48
4	64
5	80
6	96
7	112
8	128
9	144
10	160

A pound-ounce conversion table like those students create and use in Module 7

What Came Before this Module:

Students explored decimal numbers and their relationship to decimal fractions. They learned to express a given quantity in both fraction and decimal forms and compared decimal numbers using the place value chart.

New Terms in this Module:

Customary system of measurement: measurement system used in the United States that includes such units as yards, pounds, and gallons

Customary unit: e.g., foot, ounce, quart

Cup (c): customary unit of measure for liquid volume

Gallon (gal): customary unit of measure for liquid volume

Metric system of measurement: base ten system of measurement used internationally that includes such units as meters, kilograms, and liters

Metric unit: e.g., kilometer, gram, milliliter

Ounce (oz): customary unit of measure for weight

Pint (pt): customary unit of measure for liquid volume

Pound (lb): customary unit of measure for weight

Quart (qt): customary unit of measure for liquid volume

+ How You Can Help at Home:

- As often as possible, notice and discuss customary units like ounces and pounds with your student (in the grocery store, at home, etc.).
- Review time by asking questions such as “How many more minutes until the next hour?” or “How many hours until the next day?”

Key Common Core Standards:

- Use the four operations with whole numbers to solve problems.**
 - Interpret a multiplication equation as a comparison, e.g., interpret $35 = 5 \times 7$ as a statement that 35 is 5 times as many as 7 and 7 times as many as 5.
 - Multiply or divide to solve word problems involving multiplicative comparison.
 - Solve multi-step word problems posed with whole numbers and having whole-number answers using the four operations.
- Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.**
 - Know relative sizes of measurement units within one system of units.
 - Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money.

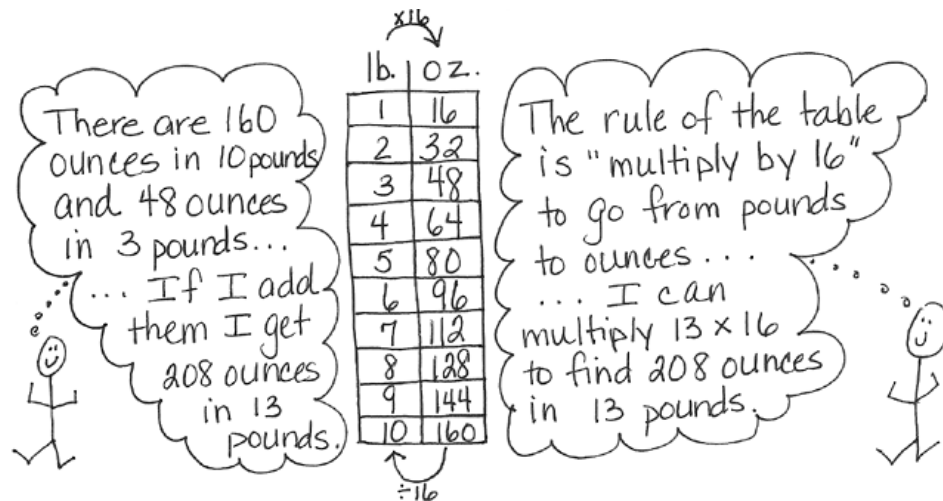
Grade 4 • Module 7

Exploring Measurement with Multiplication

OVERVIEW

In this module, students build their competencies in measurement as they relate multiplication to the conversion of measurement units. Throughout the module, students explore multiple strategies for solving measurement problems involving unit conversion.

In Topic A, students build on their work in Module 2 with measurement conversions. Working heavily in customary units, students use two-column conversion tables (**4.MD.1**) to practice conversion rates. For example, following a discovery activity where students learn that 16 ounces make 1 pound, students generate a two-column conversion table listing the number of ounces in 1 to 10 pounds. Tables for other measurement units are then generated in a similar fashion. Students then reason about why they do not need to complete the tables beyond 10 of the larger units. They use their multiplication skills from Module 3 to complete the tables and are able to see and explain connections such as $(13 \times 16) = (10 \times 16) + (3 \times 16)$. One student could reason, for example, that, “Since the table shows that there are 160 ounces in 10 pounds and 48 ounces in 3 pounds, I can add them together to tell that there are 208 ounces in 13 pounds.” Another student might reason that, “Since there are 16 ounces in each pound, I can use the rule of the table and multiply 13 pounds by 16 to find that there are 208 ounces in 13 pounds.”



As the topic progresses, students solve multiplicative comparison word problems. They are then challenged to create and solve their own word problems and to critique the reasoning of their peers (4.OA.1, 4.OA.2). They share their solution strategies and original problems within small groups, as well as share and critique the problem-solving strategies used by their peers. Through the use of guided questions, students discuss not only how the problems were solved, but also the advantages and disadvantages of using each strategy. They further discuss what makes one strategy more efficient than another. By the end of Topic A, students have started to internalize the conversion rates through fluency exercises and continued practice.

Topic B builds upon the conversion work from Topic A to add and subtract mixed units of capacity, length, weight, and time. Working with metric and customary units, students add like units, making comparisons to adding like fractional units, further establishing the importance of deeply understanding the unit. Just as $2 \text{ fourths} + 3 \text{ fourths} = 5 \text{ fourths}$, so does $2 \text{ quarts} + 3 \text{ quarts} = 5 \text{ quarts}$. 5 fourths can be decomposed into 1 one 1 fourth, and therefore, 5 quarts can be decomposed into 1 gallon 1 quart. Students realize the same situation occurs in subtraction. Just as $1 - 34$ must be renamed to $44 - 34$ so that the units are alike, students must also rename units of measurements to make like units ($1 \text{ quart} - 3 \text{ cups} = 4 \text{ cups} - 3 \text{ cups}$). Students go on to add and subtract mixed units of measurements, finding multiple solution strategies

similar to the mixed number work in fractions. With a focus on measurement units of capacity, length, weight, and time, students apply this work to solve multi-step word problems.

$$\begin{array}{r}
 8\text{qt } 1\text{c} - 6\text{qt } 3\text{c} = 7\text{qt } 5\text{c} - 6\text{qt } 3\text{c} = 1\text{qt } 2\text{c} \\
 \wedge \\
 7\text{qt } 4\text{c}
 \end{array}$$

In Topic C, students reason how to convert larger units of measurements with fractional parts into smaller units by using hands-on measurements. For example, students convert 314 feet to inches by first finding the number of inches in 14 foot. They partition a length of 1 foot into 4 equal parts and find that 14 foot = 3 inches. They then convert 3 feet to 36 inches and add 3 inches to find that 314 feet = 39 inches. This work is directly analogous to earlier work with fraction equivalence using the tape diagram, area model, and number line in Topics A, B, and D of Module 5. Students partitioned a whole into 4 equal parts, decomposed 1 part into 3 smaller units, and found 1 fourth to be equal to 3 twelfths. The foot ruler is partitioned with precisely the same reasoning. Students close the topic by using measurements to solve multi-step word problems that require converting larger units into smaller units.

The End-of-Module Assessment follows Topic C.

Students review their year in Topic D by practicing the skills they have learned throughout the modules. Additionally, they create a take-home summer folder. The cover of the folder is transformed into the student's own miniature personal board, and a collection of activities from the lessons within this Topic are placed inside the folder to be practiced throughout the summer. Students practice major skills and concepts learned throughout the year in these final four lessons, including measuring angles and drawing lines, multiplication and division, and addition and subtraction through guided group work, fluency activities, and vocabulary games.

Terminology

New or Recently Introduced Terms

- Cup (c) (customary unit of measure for liquid volume)
- Customary system of measurement (measurement system commonly used in the United States that includes such units as yards, pounds, and gallons)
- Customary unit (e.g., foot, ounce, quart)
- Gallon (gal) (customary unit of measure for liquid volume)
- Metric system of measurement (base ten system of measurement used internationally that includes such units as meters, kilograms, and liters)
- Metric unit (e.g., kilometer, gram, milliliter)
- Ounce (oz) (customary unit of measure for weight)
- Pint (pt) (customary unit of measure for liquid volume)
- Pound (lb) (customary unit of measure for weight)
- Quart (qt) (customary unit of measure for liquid volume)

Familiar Terms and Symbols

- Capacity (the maximum amount that a container can hold)
- Convert (to express a measurement in a different unit)
- Distance (the length of the line segment joining two points)
- Equivalent (the same)
- Foot (ft) (customary unit of measure for length)
- Gram (g), kilogram (kg) (metric units of measure for mass, not distinguished from weight at this time)
- Hour (hr) (unit of measure for time)
- Inch (customary unit of measure for length, 12 inches = 1 foot)
- Interval (time passed or a segment on the number line)
- Length (the measurement of something from end to end)
- Liter (L), milliliter (mL) (metric units of measure for liquid volume)
- Measurement (dimensions, quantity, or capacity as determined by comparison with a standard)
- Meter (m), centimeter (cm), kilometer (km), (metric units of measure for length)
- Minute (min) (unit of measure for time)
- Mixed units (e.g., 3 m 43 cm)
- Second (sec) (unit of measure for time)
- Table (used to represent data)
- Weight (the measurement of how heavy something is)
- Yard (yd) (customary unit of measure for length)

Suggested Tools and Representations

- Analog clock (with second hand)
- Balance scale with mass weights
- Beaker (marked for mL and L)
- Composite figure
- Digital scale (metric and customary units)
- Gallon, quart, pint, and cup containers
- Meter stick, yard stick, 12-inch ruler, centimeter ruler
- Number bond
- Number line
- Protractor
- Stopwatch
- Tape diagram
- Two-column table

Grade 4 Module 7 Topic A

Measurement Conversion Tables

Focus Standards:

- 4.OA.1 Interpret a multiplication equation as a comparison, e.g., interpret $35 = 5 \times 7$ as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations.
- 4.OA.2 Multiply or divide to solve word problems involving multiplicative comparison, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem, distinguishing multiplicative comparison from additive comparison. (See CCSS Glossary, Table 2.)
- 4.MD.1 Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table. *For example, know that 1 ft is 12 times as long as 1 in. Express the length of a 4 ft snake as 48. Generate a conversion table for feet and inches listing the number pairs (1, 12), (2, 24), (3, 36),...*

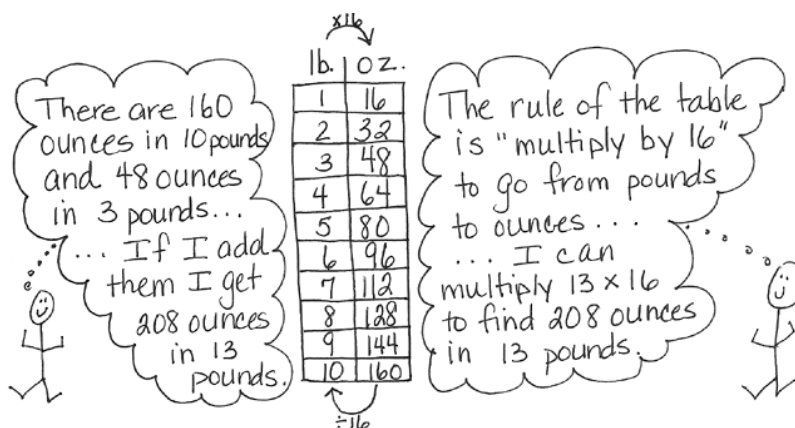
Recommended Instructional Days: 5

In Topic A, students build on the work they did in Module 2 with measurement conversions. In this module, however, they have the opportunity to work more extensively with tools while creating two-column tables that are then used to solve a variety of measurement problems.

In Lesson 1, students use two-column conversion tables (**4.MD.1**) to practice conversion rates. Students convert from pounds to ounces, yards to feet, and feet to inches. Students begin Lesson 1 by using a balance scale, a 1-pound weight, and individual 1-ounce weights (like fishing sinkers). With the 1-pound weight on one side of the balance, they add 1 ounce at a time to the other side until it balances to discover that there are 16 ounces in 1 pound. Students then generate a two-column conversion table listing the number of ounces in 2, 3, and up to 10 pounds. Students use their

multiplication skills from Module 3 to complete the table and reason about why they do not need to complete the table beyond 10 pounds.

Students use various strategies to determine how many smaller units would make up a larger unit not listed in the table. A student could reason, for example, that since the table shows that there are 160 ounces in 10 pounds and 48 ounces in 3 pounds, he can add them together to tell that there are 208 ounces in 13 pounds. Another student might reason that since there are 16 ounces in each pound, she can use the rule of the table and multiply 13 pounds by 16 to find that there are 208 ounces in 13 pounds.



Similar to Lesson 1, in Lesson 2 students complete conversion tables, this time focusing on capacity and converting gallons to quarts, quarts to pints, and pints to cups. Adding to the complexity of the conversions, students explore two-step conversions, solving, for example, to find how many cups are equal to 1 gallon.

In Lesson 3, students investigate the relationships between units of time. They discover a similarity in converting from hours to minutes and minutes to seconds. Students are able to reason that, for both sets of conversions, the values in the two tables will be the same because there are 60 seconds in a minute and 60 minutes in an hour. Students also convert from days to hours. The clock and the number line are used as tools to develop the conversion tables.

In Lesson 4, students use the conversions that they discovered in Lessons 1–3 to solve multiplicative comparison word problems. Working in small groups, students have the opportunity to share and discuss their solution strategies (**4.OA.1**, **4.OA.2**).

After being given tape diagrams, students are challenged to create word problems to match the information displayed within the tape diagrams in Lesson 5. The given information requires students to use the customary or metric units practiced during this topic. After first solving the problems that they create, students share and critique the problem-solving strategies used by their peers. In the Debrief, by way of answering guided questions, students discuss not only how the problems were solved but also the advantages and disadvantages of using each strategy. They further discuss what makes one strategy more efficient than another.

**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 - 2

Objective: Create conversion tables for length, weight, and capacity units using measurement tools, and use the tables to solve problems.

Homework Key (1)

1.
 - a. 3, 6, 9, 15, 30
 - b. 12, 24, 60, 120, 180
 - c. 36, 108, 216, 360, 432
2.
 - a. 74
 - b. 334
 - c. 14
 - d. 40
 - e. 206
 - f. 34
 - g. 47
 - h. 204
3. 240 inches
4. 16, 32, 64, 160, 192
5. 114 ounces
6.
 - a. True
 - b. False; $10 \text{ yd} < 361 \text{ in}$
 - c. False; $10 \text{ liters} = 10,000 \text{ mL}$

Homework Sample (Lesson 1)

1. Complete the tables.

a.

Yards	Feet
1	3
2	6
3	9
5	15
10	30

b.

Feet	Inches
1	12
2	24
5	60
10	120
15	180

c.

Yards	Inches
1	36
3	108
6	216
10	360
12	432

2. Solve.

a. 2 yards 2 inches = _____ inches

b. 9 yards 10 inches = _____ inches

c. 4 yards 2 feet = _____ feet

d. 13 yards 1 foot = _____ feet

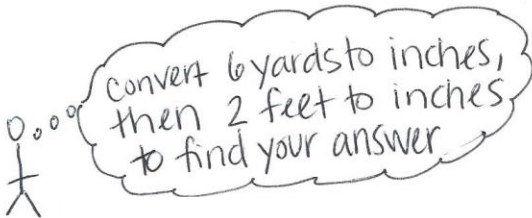
e. 17 feet 2 inches = _____ inches

f. 11 yards 1 foot = _____ feet

g. 15 yards 2 feet = _____ feet

h. 5 yards 2 feet = _____ inches

3. Ally has a piece of string that is 6 yards 2 feet long. How many inches of string does she have?

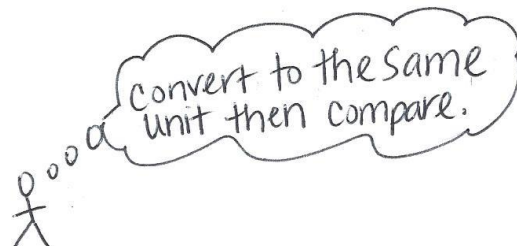


6. Answer *true* or *false* for the following statements. If the statement is false, change the right side of the comparison to make it true.

a. 4 kilograms < 4,100 grams _____

b. 10 yards < 360 inches _____

c. 10 liters = 100,000 milliliters _____



Lesson 2

Homework Key

- 48 cups
- 6 quarts (or equivalent)
- 1,720 mL (or equivalent)
- 4, 8, 16, 48, 60
 - 2, 4, 12, 20, 32
- 27
 - 50
 - 11
 - 58
 - 140
 - 444
- Answers will vary.
- False; 2 quarts > 3 pints
 - True
 - True
- 6 pints; answers will vary.
- 12 cups

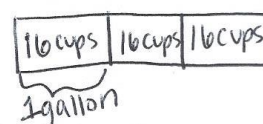
Homework Sample

Use the RDW process to solve Problems 1–3.

- Dawn needs to pour 3 gallons of water into her fish tank. She only has a 1-cup measuring cup. How many cups of water should she put in the tank?

$$\begin{aligned} 3 \text{ gallons} &= ? \text{ cups} \\ 1 \text{ gallon} &= 16 \text{ cups} \end{aligned}$$

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



Dawn needs 48 cups of water to fill the fish tank.

- Answer *true* or *false* for the following statements. If your answer is false, make the statement true by correcting the right side of the comparison.

- 2 quarts > 10 pints false
2 quarts > 3 pints

1 quart = 2 pints

Lesson 3

Objective: Create conversion tables for units of time, and use the tables to solve problems.

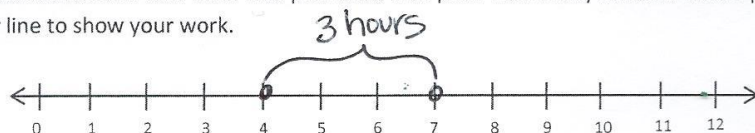
Homework Key

- 180 minutes
- 300 minutes
- 60, 120, 300, 540, 720; multiply the number of hours times 60
 - 24, 72, 144, 192, 480; multiply the number of days times 24
- 630
 - 375
 - 116
 - 225
 - 573
 - 1,025
- Explanations will vary.
- 516 seconds
- 264 hours

Homework Sample

Use RDW to solve Problems 1–2.

- Jeffrey practiced his drums from 4:00 p.m. until 7:00 p.m. How many minutes did he practice? Use the number line to show your work.



1 hr = 60 minutes
2 hr = 120 minutes
3 hr = 180 minutes

Jeffrey practiced his drums for 180 minutes.

- Solve.

a. 10 hours 30 minutes = 630 minutes

b. 6 minutes 15 seconds = _____ seconds

1 hour = 60 minutes,
so 10 hours = 600 minutes

Lesson 4

Objective: Solve multiplicative comparison word problems using measurement conversion tables.

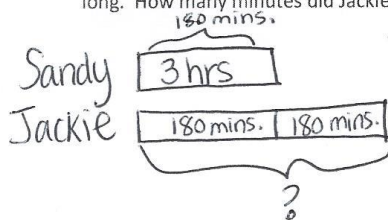
Homework Key

- 360 minutes
- 56 ounces
- 1,350 milliliters
- 12 feet
- 14 boxes
- a. 45 quarts (or equivalent)
b. No; answers will vary.

Homework Sample

Use RDW to solve the following problems.

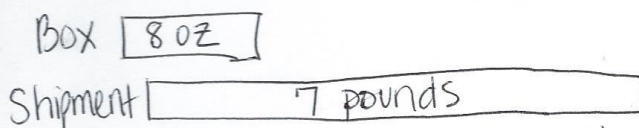
- Sandy took the train to New York City. The trip took 3 hours. Jackie took the bus, which took twice as long. How many minutes did Jackie's trip take?



$$3 \times 60 \text{ minutes} = 180 \text{ minutes}$$
$$2 \times 180 \text{ minutes} = 360 \text{ minutes}$$

Jackie's trip took 360 minutes.

- A box weighs 8 ounces. A shipment of boxes weighs 7 pounds. How many boxes are in the shipment?



$$1 \text{ pound} = 16 \text{ ounces}$$
$$7 \text{ pounds} = 112 \text{ ounces}$$

$$112 \text{ ounces} \div 8 = 14 \text{ boxes}$$

There are 14 boxes in the shipment.

Lesson 5

Objective: Share and critique peer strategies.

Homework Key

- 24 cups
- 36 minutes
- 12 ounces
- Tape diagram labeled; 19 feet 2 inches
 - Answers will vary.
- Answers will vary; 21 pounds 8 ounces

Homework Sample

Draw a tape diagram to solve the following problems.

- Timmy drank 2 quarts of water yesterday. He drank twice as much water today as he drank yesterday. How many cups of water did Timmy drink in the two days?

Yesterday $2 \text{ quarts} = 8 \text{ cups}$

Today $2 \text{ quarts} \quad 2 \text{ quarts}$
 $8 \text{ cups} \quad 8 \text{ cups}$

$1 \text{ quart} = 8 \text{ cups}$
 $2 \text{ quarts} = 8 \text{ cups}$

$8 \text{ cups} + 8 \text{ cups} + 8 \text{ cups} = 24 \text{ cups}$
 Timmy drank 24 cups of water in the two days.

- Label the rest of the tape diagram below. Solve for the unknown.

5 feet

A $\overbrace{\hspace{2cm}}$

B $\overbrace{5 \text{ feet} \quad 5 \text{ feet}}^{120 \text{ inches}}$

C $\overbrace{110 \text{ inches}}^{?}$

10 in.

$1 \text{ foot} = 12 \text{ inches}$
 $5 \text{ feet} = 60 \text{ inches}$
 $A = 60 \text{ inches}$
 $B = 5 \text{ ft} + 5 \text{ ft} = 10 \text{ ft} = 120 \text{ in.}$

$C: ? = (5 \text{ ft} \times 2) + (10 \text{ ft} - 10 \text{ in.})$
 $= 10 \text{ ft} + 110 \text{ in.}$
 $= 19 \text{ ft } 2 \text{ in.}$

- Write a problem of your own that could be solved using the diagram above.

Grade 4 Module 7 Topic B

Problem Solving with Measurement

Focus Standards:

- 4.OA.2 Multiply or divide to solve word problems involving multiplicative comparison, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem, distinguishing multiplicative comparison from additive comparison. (See CCSS-M Glossary, Table 2.)
- 4.OA.3 Solve multi-step word problems posed with whole numbers and having whole number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.
- 4.MD.1 Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table. *For example, know that 1 ft is 12 times as long as 1 in. Express the length of a 4 ft snake as 48 in. Generate a conversion table for feet and inches listing the number pairs (1, 12), (2, 24), (3, 36),...*
- 4.MD. Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.

Recommended Instructional Days: 6

Each lesson in Topic B builds upon the conversion work from Topic A to add and subtract mixed units of capacity, length, weight, and time. Unlike the mixed unit work in Module 2, now students work with the two systems of measurement, customary and metric, as well as being presented with fractional amounts of measurement, e.g., 234 feet or 438 pounds. As students add like units, they make comparisons to adding like fractional units, further establishing the importance of deeply understanding the unit. Just as $2 \text{ fourths} + 3 \text{ fourths} = 5 \text{ fourths}$, so does $2 \text{ quarts} + 3 \text{ quarts} = 5 \text{ quarts}$. 5 fourths can be decomposed into 1 one 1 fourth, and therefore 5 quarts can be decomposed into 1 gallon 1 quart. Students realize that this also applies to subtraction: Just as $1 - 34$ must be renamed to $44 - 34$ so the units are alike, the units of measurement must be renamed to make like units ($1 \text{ quart} - 3 \text{ cups} = 4 \text{ cups} - 3 \text{ cups}$). Students go on to add and subtract mixed units of measurements, finding multiple solution strategies, similar to the mixed number work in fractions.

I can rename 8 quarts so I have enough cups to subtract!

$$8 \text{qt } 1 \text{c} - 6 \text{qt } 3 \text{c} = 7 \text{qt } 5 \text{c} - 6 \text{qt } 3 \text{c} = 1 \text{qt } 2 \text{c}$$

6qt 3c $\xrightarrow{+1\text{c}}$ 7qt $\xrightarrow{+1\text{qt } 1\text{c}}$ 8qt 1c $\Rightarrow 1\text{c} + 1\text{qt } 1\text{c} = 1\text{qt } 2\text{c}$

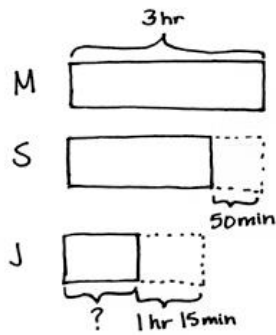
I can add up to 8qt 1c.

There are not enough cups in the total I can make this subtract on easier. Let's add 1 cup to each part.

$$8 \text{qt } 1 \text{c} - 6 \text{qt } 3 \text{c} = 8 \text{qt } 2 \text{c} - 6 \text{qt } 3 \text{c} = 1 \text{qt } 2 \text{c}$$

In Lessons 6 – 9, each lesson focuses on a specific type of measurement: capacity, length, weight, or time. Students go on to practice addition and subtraction of mixed units of measurements to solve multi-step word problems in Lessons 10 and 11.

Judy spent 1 hour and 15 minutes less than Sandy exercising last week. Sandy spent 50 minutes less than Mary, who spent 3 hours at the gym. How long did Judy exercise?



$$3 \text{ hr} - 50 \text{ min} = 2 \text{ hr } 10 \text{ min}$$

^
2 hr 60 min

$$2 \text{ hr } 10 \text{ min} - 1 \text{ hr } 15 \text{ min} = 55 \text{ min}$$

^
1 hr 60 min

Judy spent 55 min exercising last week.

**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: Solve problems involving mixed units of capacity.

Homework Key

- | | | | |
|----|---------|----|--------------------------------|
| 1. | a. 2 | 2. | a. 5, 1 |
| | b. 2 | | b. 18, 1 |
| | c. 1 | | c. 6, 7 |
| | d. 2, 2 | | d. 6, 5 |
| | e. 1 | | e. 14, 3 |
| | f. 4 | | f. 14, 2 |
| | g. 1 | 3. | 1 gallon 2 quarts, or 6 quarts |
| | h. 3, 1 | 4. | a. 49 cups (or equivalent) |
| | | | b. 15 cups |

Homework Sample

1. Determine the following sums and differences. Show your work.

- a. $5 \text{ qt} + 3 \text{ qt} = \underline{2} \text{ gal}$
 \checkmark
 8 qt.
 (Handwritten: 4 quarts = 1 gallon)
- b. $1 \text{ gal } 2 \text{ qt} + 2 \text{ qt} = \underline{2} \text{ gal}$
 \checkmark
 6 qt
- c. $1 \text{ gal} - 3 \text{ qt} = \underline{1} \text{ qt}$
 \checkmark
 $4 \text{ qt} - 3 \text{ qt}$
- d. $3 \text{ gal} - 2 \text{ qt} = \underline{2} \text{ gal } \underline{2} \text{ qt}$
 \checkmark
 12
 (Handwritten: 3 gallons = 12 quarts)
- e. $1 \text{ c} + 3 \text{ c} = \underline{1} \text{ qt}$
 \checkmark
 4 c
 (Handwritten: 1 quart = 4 cups)
- f. $2 \text{ qt } 3 \text{ c} + 5 \text{ c} = \underline{4} \text{ qt}$
 \checkmark
 $8 \text{ c} + 3 \text{ c} + 5 \text{ c}$
 16 cups
- g. $1 \text{ qt} - 1 \text{ pt} = \underline{1} \text{ pt}$
 \checkmark
 (Handwritten: 1 quart = 2 pints)
- h. $6 \text{ qt} - 5 \text{ pt} = \underline{3} \text{ qt } \underline{1} \text{ pt}$
 \checkmark
 12 pt
 7 pts.

Lesson 7

Objective: Solve problems involving mixed units of length.

Homework Key

- 3
 - 1, 2
 - 1, 1
 - 4, 2
 - 1
 - 1, 2
 - 10
 - 1, 6
- 5, 1
 - 8, 0
 - 4, 2
 - 1, 2
 - 8, 1
 - 12, 2
 - 31, 8
 - 4, 3
- 15 ft 9 in, or 189 in
- 8 ft 9 in, or 105 in
- 12 ft 6 in, 150 in
 - Length is equal to width

Homework Sample

1. Determine the following sums and differences. Show your work.

a. $2 \text{ yd } 2 \text{ ft } + 1 \text{ ft} = \underline{3} \text{ yd}$
1 yd

c. $2 \text{ ft } + 2 \text{ ft} = \underline{1} \text{ yd } \underline{1} \text{ ft}$
1 yd

e. $7 \text{ in } + 5 \text{ in} = \underline{1} \text{ ft}$
12 in

g. $1 \text{ ft } - 2 \text{ in} = \underline{10} \text{ in}$
12 in - 2 in

b. $2 \text{ yd } - 1 \text{ ft} = \underline{1} \text{ yd } \underline{2} \text{ ft}$
1 yd 3 ft - 1 ft

d. $5 \text{ yd } - 1 \text{ ft} = \underline{4} \text{ yd } \underline{2} \text{ ft}$
4 yd 3 ft - 1 ft

f. $7 \text{ in } + 7 \text{ in} = \underline{1} \text{ ft } \underline{2} \text{ in}$
5 in 2 in

h. $2 \text{ ft } - 6 \text{ in} = \underline{1} \text{ ft } \underline{6} \text{ in}$
1 ft 12 in - 6 in

Lesson 8

Objective: Solve problems involving mixed units of weight.

Homework Key

- | | |
|-----------|--|
| 1. a. 1 | 2. 4 pounds 11 ounces, or 75 ounces |
| b. 2 | 3. 3 ounces |
| c. 5 | 4. a. 6 pounds 9 ounces, or 105 ounces |
| d. 11, 8 | b. 17 pounds 5 ounces, or 277 ounces |
| e. 6, 1 | c. 6 pounds 11 ounces, or 107 ounces |
| f. 28, 1 | |
| g. 22, 2 | |
| h. 72, 14 | |

Homework Sample

1. Determine the following sums and differences. Show your work.

a. $11 \text{ oz} + 5 \text{ oz} = \underline{1} \text{ lb}$
 $\swarrow \searrow$
 16 oz

b. $1 \text{ lb } 7 \text{ oz} + 9 \text{ oz} = \underline{2} \text{ lb}$
 $\swarrow \searrow$
 16 oz

c. $1 \text{ lb} - 11 \text{ oz} = \underline{5} \text{ oz}$
 $16 \text{ oz} - 11 \text{ oz}$

d. $12 \text{ lb} - 8 \text{ oz} = \underline{11} \text{ lb } \underline{8} \text{ oz}$
 $\swarrow \searrow$
 $11 \text{ lb}, 16 \text{ oz} - 8 \text{ oz}$

e. $5 \text{ lb } 8 \text{ oz} + 9 \text{ oz} = \underline{6} \text{ lb } \underline{1} \text{ oz}$

f. $21 \text{ lb } 8 \text{ oz} + 6 \text{ lb } 9 \text{ oz} = \underline{28} \text{ lb } \underline{1} \text{ oz}$

g. $23 \text{ lb } 1 \text{ oz} - 15 \text{ oz} = \underline{22} \text{ lb } \underline{2} \text{ oz}$
 $\swarrow \searrow$
 $22 \text{ lb}, 17 \text{ oz} - 15 \text{ oz}$

h. $89 \text{ lb } 2 \text{ oz} - 16 \text{ lb } 4 \text{ oz} = \underline{72} \text{ lb } \underline{14} \text{ oz}$
 $\swarrow \searrow$
 $88 \text{ lb } 18 \text{ oz} - 16 \text{ lb } 4 \text{ oz}$

2. When David took his dog, Rocky, to the vet in December, Rocky weighed 29 pounds 9 ounces. When he took Rocky back to the vet in March, Rocky weighed 34 pounds 4 ounces. How much weight did Rocky gain?

$34 \text{ lb } 4 \text{ oz} - 29 \text{ lb } 9 \text{ oz}$
 $\swarrow \searrow$
 $33 \text{ lb } 16 \text{ oz} + 4 \text{ oz}$
 $33 \text{ lb } 20 \text{ oz} - 29 \text{ lb } 9 \text{ oz} = 4 \text{ lb } 11 \text{ oz}$
 Rocky gained 4 lb, 11 oz.

Lesson 9

Objective: Solve problems involving mixed units of time.

Homework Key

- 1
 - 3
 - 27
 - 2, 27
 - 1
 - 4, 45
- 6, 5
 - 9, 10
 - 3, 26
 - 2, 38
 - 4, 9
 - 16, 39
- 5 minutes 7 seconds, or 307 seconds
- No; explanations will vary.
 - 4 hours 28 minutes, or 268 minutes;
2 hours 32 minutes, or 152 minutes

Homework Sample

1. Determine the following sums and differences. Show your work.

a. $41 \text{ min} + 19 \text{ min} = \underline{1} \text{ hr}$

$$\begin{array}{r} 41 \\ + 19 \\ \hline 60 \text{ min} = 1 \text{ hr} \end{array}$$

b. $2 \text{ hr } 21 \text{ min} + 39 \text{ min} = \underline{3} \text{ hr}$

$$\begin{array}{r} 21 \\ + 39 \\ \hline 60 \text{ min} = 1 \text{ hr} \end{array}$$

c. $1 \text{ hr} - 33 \text{ min} = \underline{27} \text{ min}$

$$\begin{array}{r} \overset{5}{\cancel{60}} \text{ min} \\ - 33 \text{ min} \\ \hline 27 \end{array}$$

d. $3 \text{ hr} - 33 \text{ min} = \underline{2} \text{ hr } \underline{27} \text{ min}$

$$\begin{array}{r} \overset{2}{\cancel{3}} \text{ hr } \overset{5}{\cancel{60}} \text{ min} \\ - 33 \\ \hline 27 \end{array}$$

e. $31 \text{ sec} + 29 \text{ sec} = \underline{1} \text{ min}$

$$\begin{array}{r} 31 \\ + 29 \\ \hline 60 \text{ sec} = 1 \text{ min} \end{array}$$

f. $5 \text{ min} - 15 \text{ sec} = \underline{4} \text{ min } \underline{45} \text{ sec}$

$$\begin{array}{r} \overset{4}{\cancel{5}} \text{ min } \overset{5}{\cancel{60}} \text{ sec} - 15 \text{ sec} \\ \hline 45 \end{array}$$

Lesson 10 - 11

Objective: Solve multi-step measurement word problems.

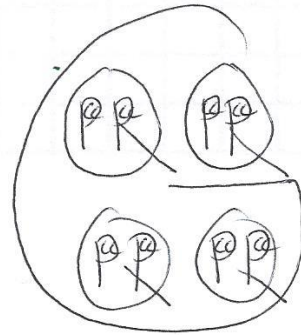
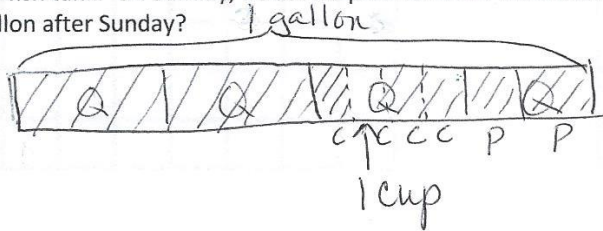
Homework Key (10)

1. 1 cup
2. 5 quarts 1 cup, or 21 cups
3. 5 hours 25 minutes, or 325 minutes
4. 2 feet 6 inches
5. 155 pounds 12 ounces

Homework Sample

Use RDW to solve the following problems.

1. On Saturday, Jeff used 2 quarts 1 cup of water from a full gallon to replace some water that leaked from his fish tank. On Sunday, he used 3 pints of water from the same gallon. How much water was left in the gallon after Sunday?



Jeff had 1 cup of water left from the gallon.

Lesson 11

Homework Key

1. 3 hours 43 minutes, or 223 minutes
2. 25 feet 3 inches, or 303 inches
3. 80
4. 1 hour 31 minutes, or 91 minutes
5. Yes

Homework Sample

Use RDW to solve the following problems.

1. Ashley ran a marathon and finished 1 hour 40 minutes after P.J., who had a time of 2 hours 15 minutes. Kerry finished 12 minutes before Ashley. How long did it take Kerry to run the marathon?

PJ 2 hr 15 min

Ashley 1 hr 40 min

Kerry 12 min

↓
12 min

It took Kerry 3 hr 43 minutes to run the marathon.

$$\begin{array}{r} 2 \text{ hr } 15 \text{ min} \\ + 1 \text{ hr } 40 \text{ min} \\ \hline 3 \text{ hr } 55 \text{ min} \\ - 12 \text{ min} \\ \hline 3 \text{ hr } 43 \text{ min} \end{array}$$

Grade 4 Module 7 Topic C

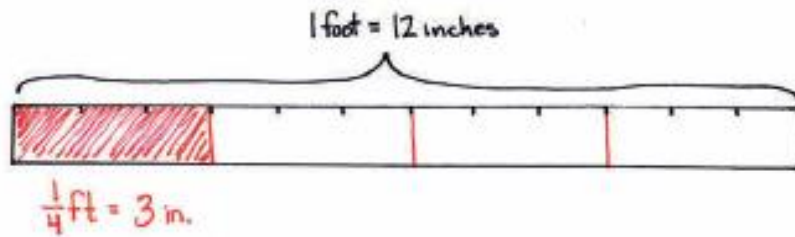
Investigation of Measurements Expressed as Mixed Numbers

Focus Standards:

- 4.OA.3 Solve multi-step word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.
- 4.MD.1 Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table. *For example, know that 1 ft is 12 times as long as 1 in. Express the length of a 4 ft snake as 48 in. Generate a conversion table for feet and inches listing the number pairs (1, 12), (2, 24), (3, 36), ...*
- 4.MD.2 Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.

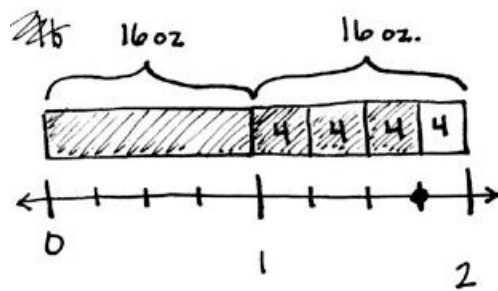
Recommended Instructional Days: 3

In Topic C, students convert larger mixed measurement units to smaller units. Students partition a measurement scale in Lesson 12 to help them convert larger units of measurements with fractional parts into smaller units. For example, students use a ruler to draw a number line 1 foot in length. Then, students partition the number line into 12 equal parts. Combining fractions and conversions, students see that 1 twelfth foot is the same as 1 inch. Repeating the same activity—but with different partitions—students will find how many inches are in $\frac{1}{2}$ foot, $\frac{1}{3}$ foot, and $\frac{1}{4}$ foot.



The same hands-on activity can be repeated for the capacity of part of a gallon represented as quarts. That hands-on experience leads students to make abstract connections in Lesson 13 for weight, identifying that $\frac{1}{16}$ pound is equal to 1 ounce, and with respect to time, finding that $\frac{1}{60}$ hour is equal to 1 minute, through the modeling of tape diagrams and number lines. Moving forward, students use their knowledge of conversion tables with this new understanding to convert mixed number units into smaller units, such as $3\frac{1}{4}$ foot equals 39 inches, by applying mixed number units to solve multi-step problems in Lesson 14.

Erin has 134 pounds of apples. A recipe for apple tarts requires 4 ounces of apples. How many apple tarts can Erin make?



$$1 \text{ tart} = 4 \text{ oz.}$$

$$7 \text{ tarts} = 28 \text{ oz.}$$

$$\begin{aligned} 1\frac{3}{4} \text{ lb} &= 1 \text{ lb} + \frac{3}{4} \text{ lb} \\ &= 16 \text{ oz} + 12 \text{ oz} \\ &= 28 \text{ oz} \end{aligned}$$

$$28 \div 4 = 7$$

Erin can make 7 apple tarts.

**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 12 - 13

Objective: Use measurement tools to convert mixed number measurements to smaller units.

Homework Key (12)

- | | |
|---|---------|
| 1. Tape diagram drawn to show equivalence | 5. a. 8 |
| 2. Tape diagram drawn to show equivalence | b. 10 |
| 3. Tape diagram drawn to show equivalence | c. 14 |
| 4. a. 6 | d. 21 |
| b. 3, 3 | e. 75 |
| c. 2, 2 | f. 88 |
| d. 4, 4 | g. 30 |
| e. 8, 8 | h. 69 |
| f. 10, 10 | i. 116 |
| | j. 94 |

Homework Sample

1. Draw a tape diagram to show $1\frac{1}{3}$ yards = 4 feet.



$1\text{ yd} = 3\text{ ft.}$ $1\text{ yd} + \frac{1}{3}\text{ yd} = 4\text{ feet}$

Lesson 13

Homework Key

- 1
 - 8, 8
 - 4, 4
 - 12, 12
 - 2, 2
 - 10, 10
 - Tape diagram drawn to show equivalence
 - 1
 - 30, 30
 - 15, 15
 - 20, 20
 - Tape diagram drawn to show equivalence
- 36
 - 78
 - 108
 - 66
 - 105
 - 270
 - 225
 - 320
 - 14
 - 19
 - 17
 - 11
 - 75
 - 118

Homework Sample

1. Solve.

a. $\frac{1}{16}$ pound = 1 ounce

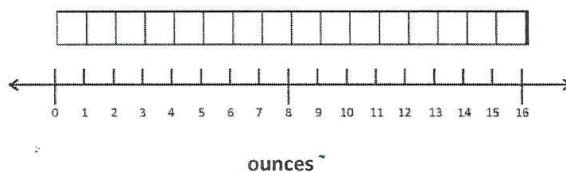
b. $\frac{8}{16}$ pound = $\frac{1}{2}$ pound = 8 ounces

c. $\frac{4}{16}$ pound = $\frac{1}{4}$ pound = 4 ounces

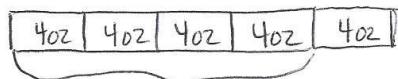
d. $\frac{12}{16}$ pound = $\frac{3}{4}$ pound = 12 ounces

e. $\frac{2}{16}$ pound = $\frac{1}{8}$ pound = 2 ounces

f. $\frac{10}{16}$ pound = $\frac{5}{8}$ pound = 10 ounces



2. Draw a tape diagram to show $1\frac{1}{4}$ pounds = 20 ounces.



3. Solve.

$1\text{ lb} = 16\text{oz} + 4\text{oz} = 20\text{oz}$

Lesson 14

Objective: Solve multi-step word problems involving converting mixed number measurements to a single unit.

Homework Key

- 175 minutes
- 8 feet 11 inches, or 107 inches
- 6 gallons 3 quarts, or 27 quarts
- 34
- a. 60 ounces
b. 6

Homework Sample

Use RDW to solve the following problems.

- Molly baked a pie for 1 hour and 45 minutes. Then, she baked banana bread for 35 minutes less than the pie. How many minutes did it take to bake the pie and the bread?

1 hr	45 min
1 hr	10 min

35 min

} ?

$$\begin{array}{r} 1 \text{ hr } 45 \text{ min} \\ + 1 \text{ hr } 10 \text{ min} \\ \hline 2 \text{ hr } 55 \text{ min} \end{array}$$

Grade 4 Module 7 Topic D

Year in Review

Recommended Instructional Days: 4

In Topic D, students review math concepts they learned throughout the year and create a summer folder.

In Lesson 15, students review their work with the area formula, as well as their multiplication skills, by solving for the area of composite figures. Initially introduced in Grade 3, these problems now require a deeper understanding of measurement and the area formula. Lesson 16 is a continuation of Lesson 15, asking students to draw composite figures and to solve for a determined area. To review major fluency work completed in Grade 4, students work in small groups in Lesson 17, taking turns being the teacher and delivering fluency drills to their peers. Finally, Lesson 18 reviews major vocabulary terms learned throughout Grade 4 as students play various games to further internalize these terms.

A summer folder is developed across the four lessons within this final topic. In Lesson 15, students create a take-home version of a personal white board that they can use during the lessons and at home during the summer. Each page of the Homework of these lessons includes a top half and a bottom half that have identical problems. The top half is completed for homework, ultimately becoming an answer key for the bottom half. The bottom half is placed into the student mini-personal white boards and is completed over the summer. Having already completed the top half, students can check their work by referring back to the top-half answer key. Other games, templates, and activities used in the final lessons are also included within the folder so that, on the final day of school, students go home with a folder full of activities to practice over the summer to keep their Grade 4 math skills sharp.

**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 15 - 16

Objective: Create and determine the area of composite figures.

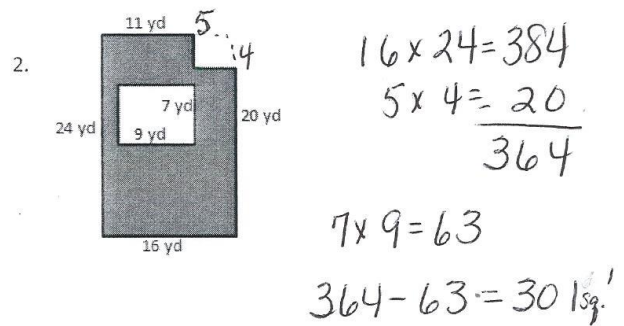
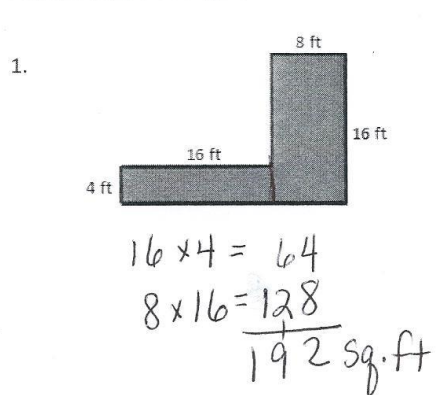
Homework Key (15)

1. 192 square feet
2. 301 square yards
3. 96 square feet

Homework Sample

For homework, complete the top portion of each page. This will become an answer key for you to refer to when completing the bottom portion as a mini-personal white board activity during the summer.

Find the area of the figure that is shaded.



Lesson 16

Homework Key

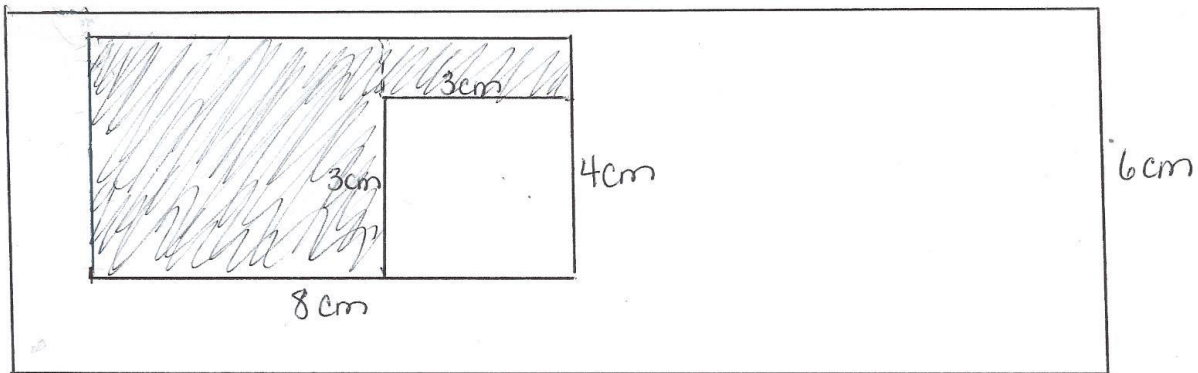
1. 85 square centimeters
2. 948 square inches

Homework Sample

For homework, complete the top portion of each page. This will become an answer key for you to refer to when completing the bottom portion as a mini-personal white board activity during the summer.

Use a ruler and protractor to create and shade a figure according to the directions. Then, find the area of the unshaded part of the figure.

1. Draw a rectangle that is 18 cm long and 6 cm wide. Inside the rectangle, draw a smaller rectangle that is 8 cm long and 4 cm wide. Inside the smaller rectangle, draw a square that has a side length of 3 cm. Shade in the smaller rectangle, but leave the square unshaded. Find the area of the unshaded space.



18 cm .

$$6 \times 18 = 108 \text{ cm}^2$$

$$8 \times 4 = 32 \text{ cm}^2$$

$$\begin{array}{r} 108 \\ + 32 \\ \hline 140 \end{array} \text{ cm}^2$$

$$+ 9 \text{ cm}^2$$

$$\text{Area} = \begin{array}{r} 140 \\ + 9 \\ \hline 149 \end{array} \text{ cm}^2$$

Lesson 17

Objective: Practice and solidify Grade 4 fluency.

Homework Key

- Point accurately plotted on number line; 2.9 ; $2\frac{9}{10}$, $\frac{1}{10}$ or 0.1
 - Point accurately plotted on number line; 4 ones and 4 tenths; $4\frac{4}{10}$, $\frac{6}{10}$ or 0.6
 - Answers will vary.
- Answer provided.

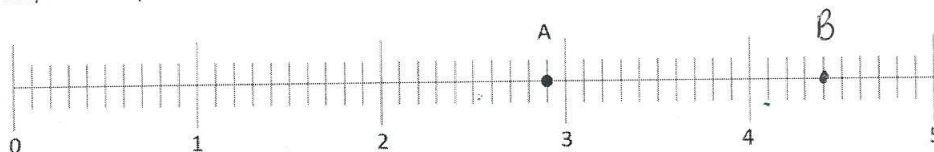
$8\frac{6}{10}$, 86 tenths or $\frac{86}{10}$; 860 hundredths or $\frac{860}{100}$

$11\frac{7}{10}$, 117 tenths or $\frac{117}{10}$, 1170 hundredths or $\frac{1170}{100}$

$4\frac{8}{10}$, 48 tenths or $\frac{48}{10}$; 480 hundredths or $\frac{480}{100}$

Homework Sample

- Decimal Fraction Review: Plot and label each point on the number line below and complete the chart. Only solve the portion above the dotted line.



Point	Unit Form	Decimal Form	Mixed Number (ones and fraction form)	How much more to get to the next whole number?
A	2 ones and 9 tenths	2.9	$2\frac{9}{10}$	$\frac{1}{10}$, 0.1
B	4 ones and 4 tenths	4.4	$4\frac{4}{10}$	$\frac{6}{10}$, 0.6
C	1 one and 8 tenths	1.8	$1\frac{8}{10}$	$\frac{2}{10}$ or 0.2

answers may vary

Lesson 18

Objective: Practice and solidify Grade 4 vocabulary.

Reflection

1. Answers will vary.
2. Answers will vary.