# Kenmore-Town of Tonawanda UFSD

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

# Grade 5 Module 3

# Parent Handbook

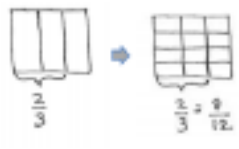
The materials contained within this packet have been taken from the Great Minds curriculum Eureka Math.

# Eureka Math Tips for Parents

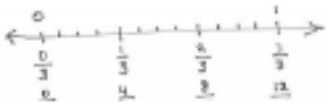
**Grade 5**
**Module 3**

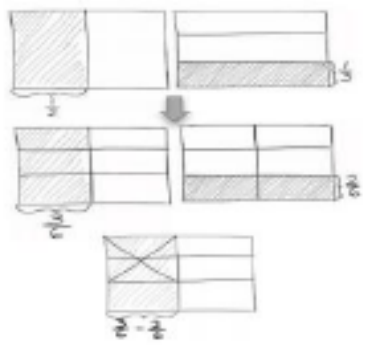
## *Addition and Subtraction of Fractions*

In this 16-lesson unit, students build on earlier work with equivalent fractions and decimals to add and subtract fractions with unlike denominators. They will move from concrete examples (paper strips and number lines) to abstract skills (writing their own math sentences). By the end of the module, students will fluently work through multi-step word problems that contextualize their learning.



Both the area model and number line show the equivalent fractions of $\frac{2}{3}$ and $\frac{8}{12}$.





Subtraction with unlike denominators:

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

***What Came Before this Module:*** We worked to build our knowledge of multiplication and division of whole numbers and decimals.

***What Comes After this Module:*** In Module 4, we will extend our understanding of fraction operations to multiplication and division of both fractions and decimal fractions.

## Key Words:

**Denominator** - shows the fractional unit, e.g. the fifths in 3 fifths

**Numerator** - shows how many fractional units there are, e.g. the 3 in 3 fifths

**Benchmark Fraction** - a very familiar fraction that can be referred to in comparison questions, e.g. $\frac{1}{2}$ is a benchmark fraction used when comparing $\frac{1}{3}$ and $\frac{3}{5}$

**Like Denominators** - fractions with the same denominator, e.g. $\frac{1}{8}$ and $\frac{3}{8}$

**Unlike Denominators** - fractions with different denominators, e.g. $\frac{1}{8}$ and $\frac{1}{7}$

**Equivalent Fraction** - fractions that have the same value, though they may look different, e.g. $\frac{3}{5}$ and $\frac{6}{10}$

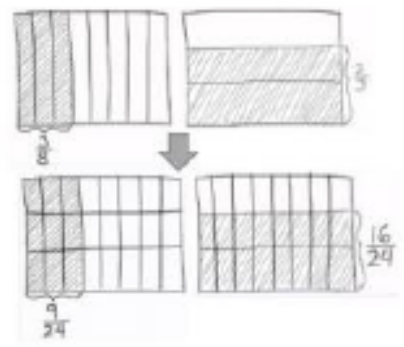
**Fraction Greater than or equal to 1** - e.g. $\frac{7}{3}$ or $2\frac{1}{3}$

## + How you can help at home:

- Look for opportunities in daily life to discuss fractional parts of a whole, e.g. pieces of pizza, parts of an hour, distances to familiar places
- Continue to practice and review multiplication and division math facts - this greatly supports work with fractions!

## Key Common Core Standards:

- Use equivalent fractions as a strategy to add and subtract fractions
  - Add and subtract fractions with unlike denominators
  - Solve word problems involving addition and subtraction of fractions

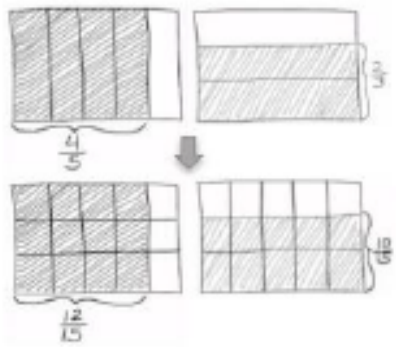


Above is an area model drawing of $\frac{3}{8}+\frac{2}{3}$. Note that the final answer would be found by doing the simple addition problem:

$$\frac{9}{24}+\frac{16}{24}=\frac{25}{24}=1\frac{1}{24}$$

Below is an area model drawing of $\frac{4}{5}-\frac{2}{3}$. Note that the final answer would be found by doing the simple subtraction problem:

$$\frac{12}{15}-\frac{10}{15}=\frac{2}{15}$$



**Spotlight on Math Models:**

## Area Models

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.

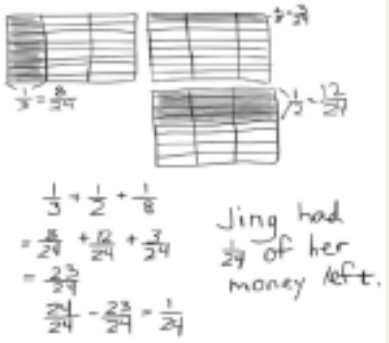
Students began in earlier grades to build arrays for various purposes, first showing simple multiplication. In 5th grade, we move beyond using the area model for multiplication of whole numbers and begin to use this powerful model to illustrate mathematical operations on fractions.

One of the goals in *A Story of Units* is to first give students concrete experiences with mathematical concepts, and then to build slowly toward more abstract representations of those concepts. The area model is a tool that helps students to make that important leap, and will support students' learning through algebra and beyond.

Sample Problem from Module 3:
*(Example taken from Lesson 7)*

Jing spent $\frac{1}{3}$ of her money on a pack of pens, $\frac{1}{2}$ of her money on a pack of markers, and $\frac{1}{8}$ of her money on a pack of pencils.

What fraction of her money is left?



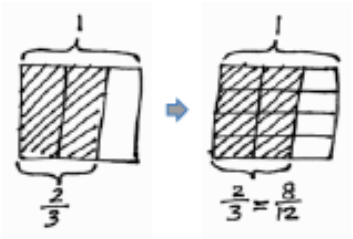

The student here has illustrated the equivalent fractions to $\frac{1}{3}$, $\frac{1}{2}$, and $\frac{1}{8}$, using the like denominator of twenty-fourths.

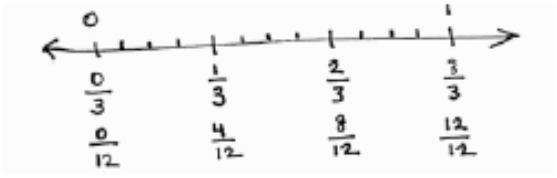
Then, in two steps, she adds those equivalent fractions, and subtracts that total from $\frac{24}{24}$ to find the solution.

# Addition and Subtraction of Fractions

## OVERVIEW

In Module 3, students' understanding of addition and subtraction of fractions extends from earlier work with fraction equivalence and decimals. This module marks a significant shift away from the elementary grades' centrality of base ten units to the study and use of the full set of fractional units from Grade 5 forward, especially as applied to algebra.
In Topic A, students revisit the foundational Grade 4 standards addressing equivalence. When equivalent, fractions represent the same amount of area of a rectangle and the same point on the number line. These equivalencies can also be represented symbolically.




$$\frac{2}{3} = \frac{2 \times 4}{3 \times 4} = \frac{8}{12}$$

Furthermore, equivalence is evidenced when adding fractions with the same denominator. The sum may be decomposed into parts (or recomposed into an equal sum). An example is shown as follows:

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

$$\frac{7}{8} = \frac{3}{8} + \frac{3}{8} + \frac{1}{8}$$

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

$$\frac{8}{5} = \frac{5}{5} + \frac{3}{5} = 1\frac{3}{5}$$

$$\frac{7}{3} = \frac{6}{3} + \frac{1}{3} = 2 \times \frac{3}{3} + \frac{1}{3} = 2 + \frac{1}{3} = 2\frac{1}{3}$$

This also carries forward work with decimal place value from Modules 1 and 2, confirming that like units can be composed and decomposed.

5 tenths + 7 tenths = 12 tenths = 1 and 2 tenths

5 eighths + 7 eighths = 12 eighths = 1 and 4 eighths

In Topic B, students move forward to see that fraction addition and subtraction are analogous to whole number addition and subtraction. Students add and subtract fractions with unlike denominators (**5.NF.1**) by replacing different fractional units with an equivalent fraction or like unit.

1 fourth + 2 thirds = 3 twelfths + 8 twelfths = 11 twelfths

$$\frac{1}{4}+\frac{2}{3}=\frac{3}{12}+\frac{8}{12}=\frac{11}{12}$$

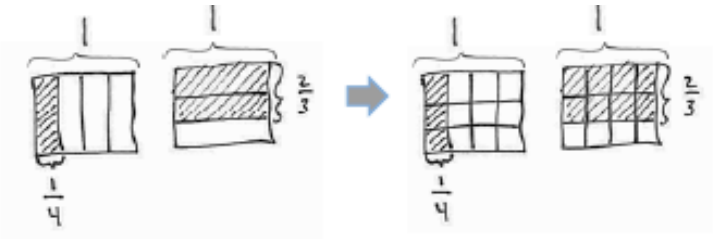
This is not a new concept, but certainly a new level of complexity. Students have added equivalent or like units since kindergarten, adding frogs to frogs, ones to ones, tens to tens, etc.

1 boy + 2 girls = 1 child + 2 children = 3 children

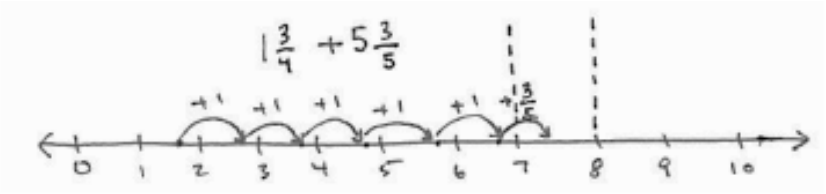
1 liter – 375 mL = 1,000 mL – 375 mL = 625 mL

Throughout the module, a concrete to pictorial to abstract approach is used to convey this simple concept. Topic A uses paper strips and number line diagrams to clearly show equivalence. After a brief concrete experience with folding paper, Topic B primarily uses the rectangular fractional model because it is useful for creating smaller like units by means of partitioning (e.g., thirds and fourths are changed to twelfths to create equivalent fractions as in the diagram below.) In Topic C, students move away from the pictorial altogether as they are empowered to write equations clarified by the model.

$$\frac{1}{4}+\frac{2}{3}=\left(\frac{1\times3}{4\times3}\right)+\left(\frac{2\times4}{3\times4}\right)=\frac{3}{12}+\frac{8}{12}=\frac{11}{12}$$



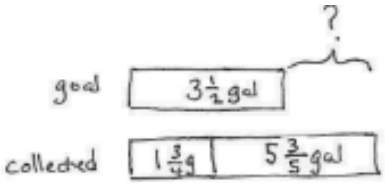
Topic C also uses the number line when adding and subtracting fractions greater than or equal to 1 so that students begin to see and manipulate fractions in relation to larger whole numbers and to each other. The number line allows the students to pictorially represent larger whole numbers. For example, "Between which two whole numbers does the sum of $1\frac{3}{4}$ and $5\frac{3}{5}$ lie?"




$\_\_\_\_ < 1\frac{3}{4} + 5\frac{3}{5} < \_\_\_\_$

This leads to an understanding of and skill with solving more complex problems, which are often embedded within multi-step word problems:

*Cristina and Matt's goal is to collect a total of* $3\frac{1}{2}$ *gallons of sap from the maple trees. Cristina collected* $1\frac{3}{4}$ *gallons. Matt collected* $5\frac{3}{5}$ *gallons. By how much did they beat their goal?*




$$1\frac{3}{4}\text{ gal} + 5\frac{3}{5}\text{ gal} - 3\frac{1}{2}\text{ gal} = 3 + \left(\frac{3 \times 5}{4 \times 5}\right) + \left(\frac{3 \times 4}{5 \times 4}\right) - \left(\frac{1 \times 10}{2 \times 10}\right)$$

$$= 3 + \frac{15}{20} + \frac{12}{20} - \frac{10}{20} = 3\frac{17}{20}\text{ gal.}$$

*Cristina and Matt beat their goal by* $3\frac{17}{20}$ *gallons.*

Word problems are a part of every lesson. Students are encouraged to draw tape diagrams, which encourage them to recognize part–whole relationships with fractions that they have seen with whole numbers since Grade 1.

In Topic D, students strategize to solve multi-term problems and more intensely assess the reasonableness of their solutions to equations and word problems with fractional units (**5.NF.2**).

*"I know my answer makes sense because the total amount of sap they collected is about 7 and a half gallons. Then, when we subtract 3 gallons, that is about 4 and a half. Then, 1 half less than that is about 4.* $3\frac{17}{20}$ *is just a little less than 4."*

## Terminology

**New or Recently Introduced Terms**

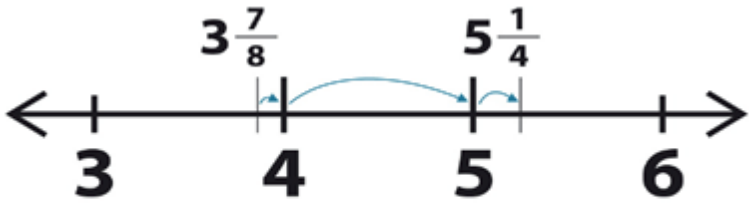
- Benchmark fraction (e.g., $\frac{1}{2}$ is a benchmark fraction when comparing $\frac{1}{3}$ and $\frac{3}{5}$)
- Like denominators (e.g., $\frac{1}{8}$ and $\frac{5}{8}$)
- Unlike denominators (e.g., $\frac{1}{8}$ and $\frac{1}{7}$)

**Familiar Terms and Symbols**

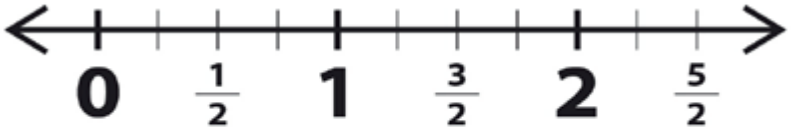
- Between (e.g., $\frac{1}{2}$ is between $\frac{1}{3}$ and $\frac{3}{5}$)
- Denominator (denotes the fractional unit: fifths in 3 fifths, which is abbreviated as the 5 in $\frac{3}{5}$)
- Equivalent fraction (e.g., $\frac{3}{5} = \frac{6}{10}$)
- Fraction (e.g., 3 fifths or $\frac{3}{5}$)
- Fraction greater than or equal to 1 (e.g., $\frac{7}{3}$, $3\frac{1}{2}$, an abbreviation for $3 + \frac{1}{2}$)
- Fraction written in the largest possible unit (e.g., $\frac{3}{6} = \frac{1x3}{2x3} = \frac{1}{2}$ 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)
- Kilometer, meter, centimeter, liter, milliliter, kilogram, gram, mile, yard, foot, inch, gallon, quart, pint, cup, pound, ounce, hour, minute, second
- *More than halfway* and *less than halfway*
- Number sentence (e.g., “Three plus seven equals ten.” Usually written as “3 + 7 = 10.”)
- Numerator (denotes the count of fractional units: 3 in 3 fifths or 3 in $\frac{3}{5}$)
- *One tenth of* (e.g., $\frac{1}{10} \times 250$)
- Tenth ($\frac{1}{10}$ or 0.1)
- Whole unit (e.g., any unit that is partitioned into smaller, equally sized fractional units)
- < , > , =

## Suggested Tools and Representations

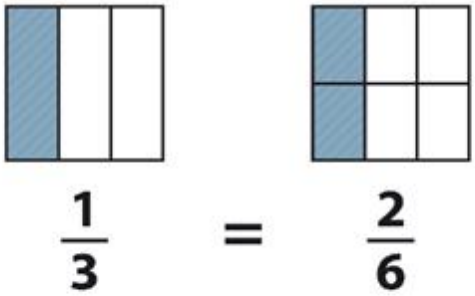
- Fraction strips
- Number line (a variety of templates)
- Paper strips (for modeling equivalence)
- Rectangular fraction model
- Tape diagrams




Example of an "empty" number line




Example of a number line




Example of a rectangular fraction model

# Grade 5 Module 3 Topic A

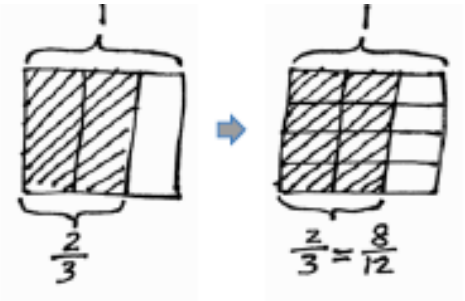
# Equivalent Fractions

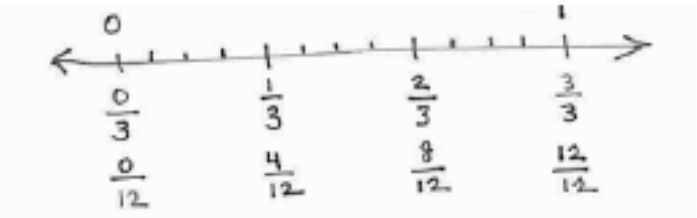
## Focus Standard:

4.NF.1 Explain why a fraction a/b is equivalent to a fraction *(n x a)/(n x b)* by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.

## Instructional Days Recommended: 2

In Topic A, students revisit the foundational Grade 4 standards addressing equivalence. When equivalent, fractions can be represented by the same amount of area of a rectangle, as well as the same point on a number line. Students subdivide areas and divide number line lengths to model this equivalence. On the number line below, there are 3 × 4 parts of equal length. Both the area model and number line show that 2 thirds is equivalent to 8 twelfths.




This equivalence can also be represented symbolically as follows:

$$\frac{2}{3} = \frac{2 \times 4}{3 \times 4} = \frac{8}{12}$$

Furthermore, equivalence is evidenced when adding fractions with the same denominator. The sum may be decomposed into parts (or recomposed into an equal sum). An example is shown as follows:

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

$$\frac{7}{8} = \frac{3}{8} + \frac{3}{8} + \frac{1}{8}$$

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

$$\frac{8}{5} = \frac{5}{5} + \frac{3}{5} = 1\frac{3}{5}$$

$$\frac{7}{3} = \frac{6}{3} + \frac{1}{3} = 2 \times \frac{3}{3} + \frac{1}{3} = 2 + \frac{1}{3} = 2\frac{1}{3}$$

In Lesson 1, students analyze how and when units must change, particularly when making an equivalent fraction by decomposing larger units into smaller units. This hones their ability to look for and make use of structure (MP.7). They study the area model to make generalizations, and then apply those generalizations to work with the number line as they see the same process occurring there within the lengths.

**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

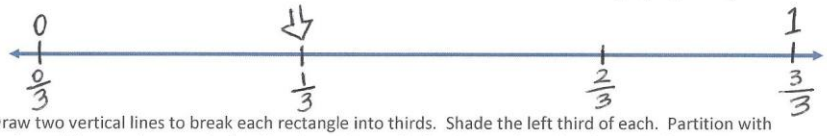
Objective: Make equivalent fractions with the number line, the area model, and numbers.

### Homework Key

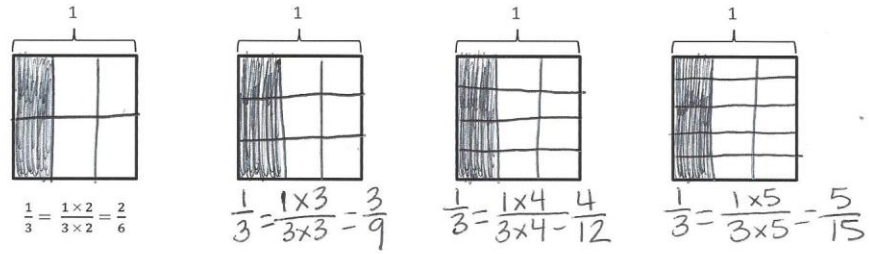
1. Number line marked 0 and 1 on top and $\frac{0}{3}, \frac{1}{3}, \frac{2}{3}, \frac{3}{3}$ on the bottom; $\frac{2}{6}$ shaded; $\frac{3}{9}$ shaded, $\frac{1}{3} = \frac{1 \times 3}{3 \times 3} = \frac{3}{9}, \frac{4}{12}$ shaded, $\frac{1}{3} = \frac{1 \times 4}{3 \times 4} = \frac{4}{12}, \frac{5}{15}$ shaded, $\frac{1}{3} = \frac{1 \times 5}{3 \times 5} = \frac{5}{15}$
2. Number line marked 0 and 1 on top and $\frac{0}{4}, \frac{1}{4}, \frac{2}{4}, \frac{3}{4}, \frac{4}{4}$ on the bottom; $\frac{2}{8}$ shaded, $\frac{1}{4} = \frac{1 \times 2}{4 \times 2} = \frac{2}{8}, \frac{3}{12}$ shaded, $\frac{1}{4} = \frac{1 \times 3}{4 \times 3} = \frac{3}{12}, \frac{4}{16}$ shaded, $\frac{1}{4} = \frac{1 \times 4}{4 \times 4} = \frac{4}{16}, \frac{5}{20}$ shaded, $\frac{1}{4} = \frac{1 \times 5}{4 \times 5} = \frac{5}{20}$
3. Number line marked 0 and 1 on top and $\frac{0}{5}, \frac{1}{5}, \frac{2}{5}, \frac{3}{5}, \frac{4}{5}, \frac{5}{5}$, on the bottom; $\frac{8}{10}$ shaded, $\frac{4}{5} = \frac{4 \times 2}{5 \times 2} = \frac{8}{10}, \frac{12}{15}$ shaded, $\frac{4}{5} = \frac{4 \times 3}{5 \times 3} = \frac{12}{15}, \frac{16}{20}$ shaded, $\frac{4}{5} = \frac{4 \times 4}{5 \times 4} = \frac{16}{20}, \frac{20}{25}$ shaded, $\frac{4}{5} = \frac{4 \times 5}{5 \times 5} = \frac{20}{25}$
4. Number line marked 0 and 1 on top and $\frac{0}{8}, \frac{1}{8}, \frac{2}{8}, \frac{3}{8}, \frac{4}{8}, \frac{5}{8}, \frac{6}{8}, \frac{7}{8}, \frac{8}{8}, \frac{9}{8}$ on the bottom; examples may vary.

### Homework Samples

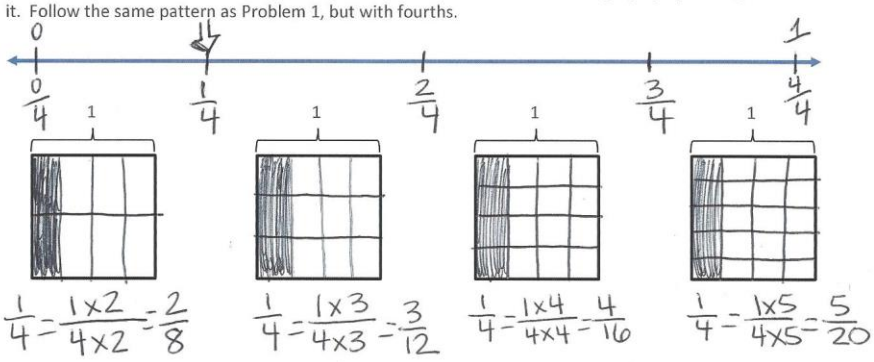
1. Use the folded paper strip to mark points 0 and 1 above the number line, and $\frac{0}{3}$, $\frac{1}{3}$, $\frac{2}{3}$, and $\frac{3}{3}$ below it.




Draw two vertical lines to break each rectangle into thirds. Shade the left third of each. Partition with horizontal lines to show equivalent fractions. Use multiplication to show the change in the units.




2. Use the folded paper strip to mark points 0 and 1 above the number line, and $\frac{0}{4}$, $\frac{1}{4}$, $\frac{2}{4}$, $\frac{3}{4}$, and $\frac{4}{4}$ below it. Follow the same pattern as Problem 1, but with fourths.



## Lesson 2

Objective: Make equivalent fractions with sums of fractions with like denominators.

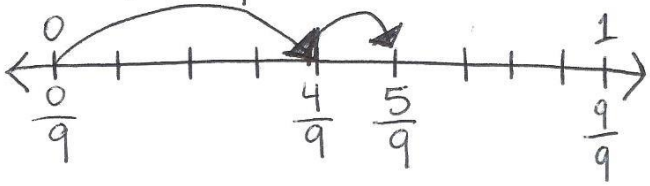
### Homework Key

1. a. $\frac{5}{9}$; number line drawn
   b. $\frac{4}{4}$; number line drawn
   c. $\frac{6}{7}$; number line drawn
   d. $\frac{8}{5}$; number line drawn
2. a. Answers will vary; number line drawn
   b. Answers will vary.
   c. Answers will vary.
   d. Answers will vary.
3. a. $1\frac{4}{5}$
   b. $3\frac{1}{2}$
   c. $3\frac{4}{7}$; number line drawn
   d. $2\frac{3}{9}$ or $2\frac{1}{3}$; number line drawn
4. $4\frac{5}{10}$ or $4\frac{1}{2}$; number line drawn

### Homework Samples

1. Show each expression on a number line. Solve.

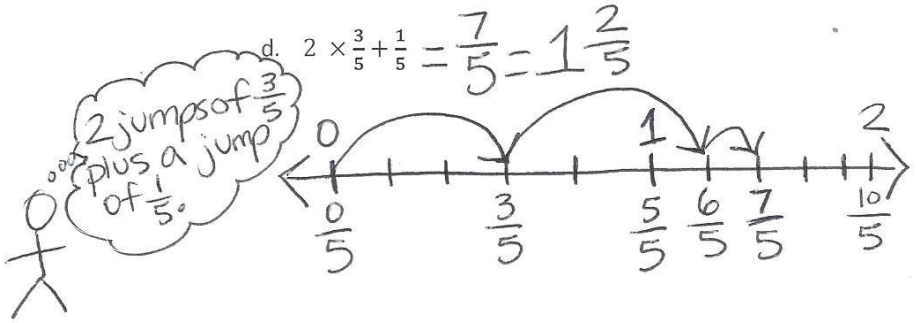
a. $\frac{4}{9}+\frac{1}{9}=\frac{5}{9}$




b. $\frac{1}{4}+\frac{1}{4}+\frac{1}{4}+\frac{1}{4}$

c. $\frac{2}{7}+\frac{2}{7}+\frac{2}{7}$

d. $2\times\frac{3}{5}+\frac{1}{5}=\frac{7}{5}=1\frac{2}{5}$



# Grade 5 Module 3 Topic B

# Making Like Units Pictorially

## Focus Standards:

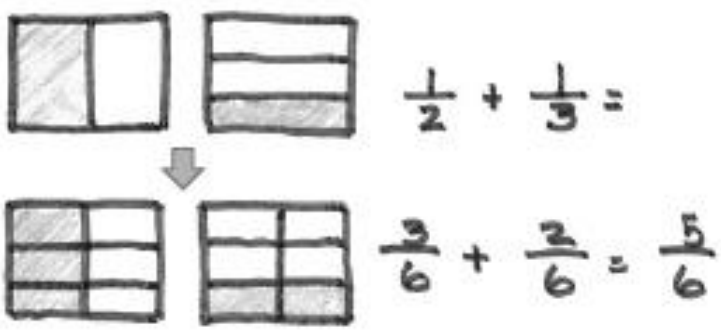
5.NF.1 Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. *For example, 2/3 + 5/4 = 8/12 + 15/12 = 23/12. (In general, a/b + c/d = (ad + bc)/bd.).*

5.NF.2 Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers. *For example, recognize an incorrect result 2/5 + 1/2 = 3/7, by observing that 3/7 < 1/2.*

## Instructional Days Recommended: 5

In Topic B, students use the familiar rectangular fraction model to add and subtract fractions with unlike denominators.

Students make like units for all addends or both minuend and subtrahend. First, they draw a wide rectangle and partition it with vertical lines as they would a tape diagram, representing the first fraction with a bracket and shading. They then partition a second congruent rectangle with horizontal lines to show the second fraction. Next, they partition both rectangles with matching lines to create like units.



This strategy pictorially proves 3 sixths are equal to 1 half and 2 sixths are equal to 1 third. Students practice making these models extensively until they internalize the process of making like units. Students use the same systematic drawing for addition as they do for subtraction. In this manner, students are prepared to generalize with understanding to multiply the numerator and denominator by the same number. The topic closes with a lesson devoted to solving two-step word problems involving addition and subtraction 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 3

Objective: Add fractions with unlike units using the strategy of creating equivalent fractions.

### Homework Key

1. a. Accurate picture drawn; $\frac{7}{12}$
   b. Accurate picture drawn; $\frac{9}{20}$
   c. Accurate picture drawn; $\frac{5}{12}$
   d. Accurate picture drawn; $\frac{14}{45}$
   e. Accurate picture drawn; $\frac{13}{20}$
   f. Accurate picture drawn; $1\frac{1}{35}$

2. $\frac{22}{24}$ or $\frac{11}{12}$ mi

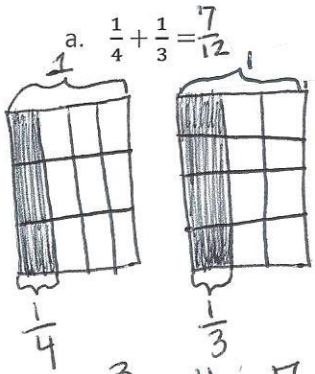
3. $\frac{19}{24}$; $\frac{5}{24}$

4. $\frac{17}{30}$; $\frac{13}{30}$

### Homework Samples

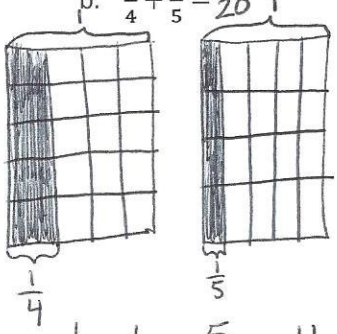
1. Draw a rectangular fraction model to find the sum. Simplify your answer, if possible.

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




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


b. $\frac{1}{4}+\frac{1}{5}=\frac{9}{20}$




$\frac{1}{4}+\frac{1}{5}=\frac{5}{20}+\frac{4}{20}=\frac{9}{20}$

c. $\frac{1}{4}+\frac{1}{6}=$

d. $\frac{1}{5}+\frac{1}{9}=$

## Lesson 4

Objective: Add fractions with sums between 1 and 2.

### Homework Key

1. a. Accurate picture drawn; $1\frac{1}{12}$
   b. Accurate picture drawn; $1\frac{5}{12}$
   c. Accurate picture drawn; $\frac{14}{15}$
   d. Accurate picture drawn; $1\frac{1}{3}$
   e. Accurate picture drawn; $1\frac{1}{2}$
   f. Accurate picture drawn; $1\frac{19}{21}$

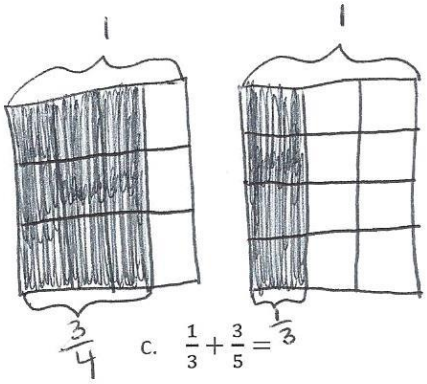
2. $1\frac{5}{12}$ L

3. $1\frac{3}{8}$

### Homework Samples

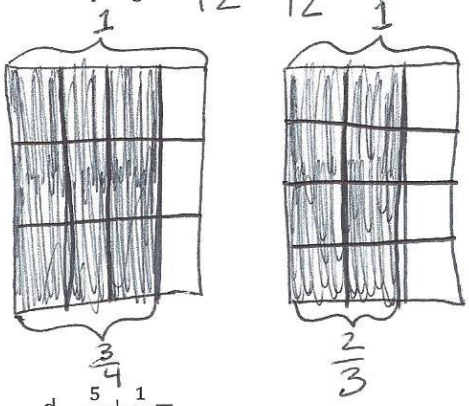
1. For the following problems, draw a picture using the rectangular fraction model and write the answer. When possible, write your answer as a mixed number.

a. $\frac{3}{4}+\frac{1}{3}=\frac{9}{12}+\frac{4}{12}=\frac{13}{12}=1\frac{1}{12}$




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

b. $\frac{3}{4}+\frac{2}{3}=\frac{9}{12}+\frac{8}{12}=\frac{17}{12}=1\frac{5}{12}$




d. $\frac{5}{6}+\frac{1}{2}=$

## Lesson 5

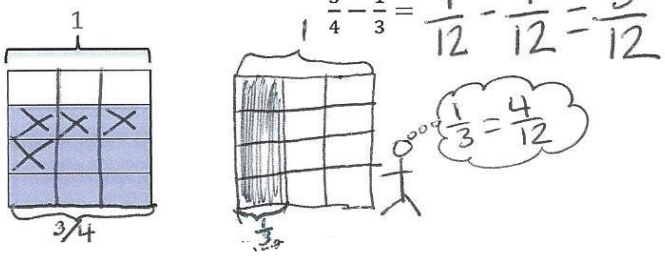
Objective: Subtract fractions with unlike units using the strategy of creating equivalent fractions.

### Homework Key

1. Pictures will vary; $\frac{5}{12}$
2. a. Accurate picture drawn; $\frac{1}{2}$
   b. Accurate picture drawn; $\frac{1}{6}$
   c. Accurate picture drawn; $\frac{7}{12}$
   d. Accurate picture drawn; $\frac{3}{10}$
   e. Accurate picture drawn; $\frac{4}{15}$
   f. Accurate picture drawn; $\frac{1}{21}$
3. $\frac{5}{8}$ lb
4. No; $\frac{6}{35}$ kg

### Homework Samples

1. The picture below shows $\frac{3}{4}$ of the rectangle shaded. Use the picture to show how to create an equivalent fraction for $\frac{3}{4}$, and then subtract $\frac{1}{3}$.



## Lesson 6

Objective: Subtract fractions from numbers between 1 and 2.

### Homework Key

1. a. Accurate picture drawn; $\frac{1}{6}$
   b. Accurate picture drawn; $\frac{2}{3}$
   c. Accurate picture drawn; $\frac{13}{21}$
   d. Accurate picture drawn; $\frac{21}{40}$
   e. Accurate picture drawn; $\frac{13}{20}$
   f. Accurate picture drawn; $\frac{23}{24}$
   g. Accurate picture drawn; $\frac{15}{28}$
   h. Accurate picture drawn; $\frac{7}{12}$

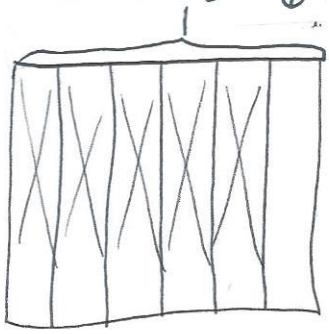
2. $\frac{7}{8}$ m

3. $\frac{17}{24}$ kg

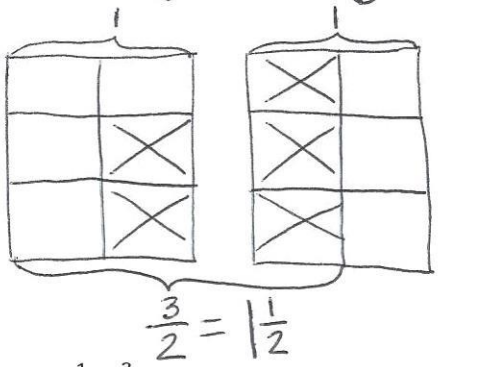
### Homework Samples

1. For the following problems, draw a picture using the rectangular fraction model and write the answer. Simplify your answer, if possible.

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




b. $\frac{3}{2}-\frac{5}{6}=\frac{9}{6}-\frac{5}{6}=\frac{4}{6}=\frac{2}{3}$




c. $\frac{4}{3}-\frac{5}{7}=$

d. $1\frac{1}{8}-\frac{3}{5}=$

## Lesson 7

Objective: Solve two-step word problems.

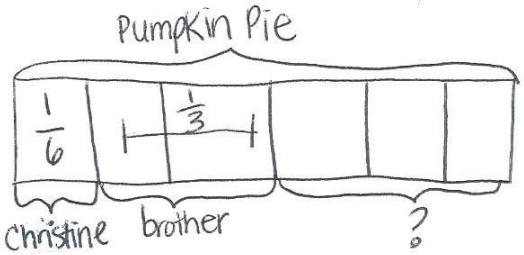
### Homework Key

1. $\frac{1}{2}$
2. $\frac{2}{21}$
3. $\frac{7}{10}$
4. $\frac{1}{4}$
5. $1\frac{1}{15}$ m

### Homework Samples

Solve the word problems using the RDW strategy. Show all of your work.

1. Christine baked a pumpkin pie. She ate $\frac{1}{6}$ of the pie. Her brother ate $\frac{1}{3}$ of it and gave the leftovers to his friends. What fraction of the pie did he give to his friends?




Christine's brother gave $\frac{3}{6}$ $\left(\frac{1}{2}\right)$ of the pie to his friends.

# Grade 5 Module 3 Topic C

# Making Like Units Numerically

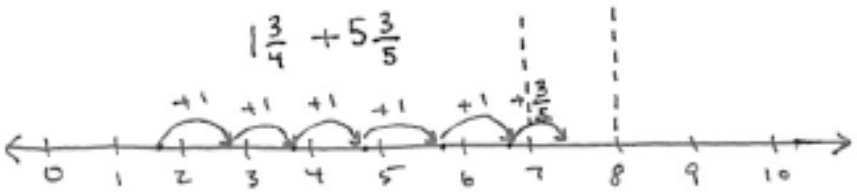
## Focus Standards:

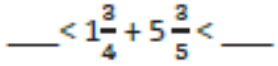
5.NF.1 Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. *For example, 2/3 + 5/4 = 8/12 + 15/12 = 23/12. (In general, a/b + c/d = (ad + bc)/bd.)*

5.NF.2 Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers. *For example, recognize an incorrect result 2/5 + 1/2 = 3/7, by observing that 3/7 < 1/2.*

## Instructional Days Recommended: 5

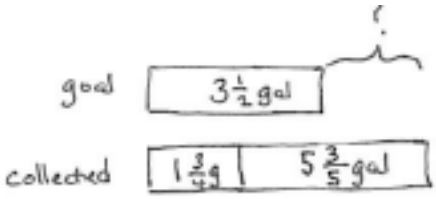
In Topic C, students use the number line when adding and subtracting fractions greater than or equal to 1. The number line helps students see that fractions are analogous to whole numbers. The number line makes it clear that numbers on the left are smaller than numbers on the right, which leads to an understanding of integers in Grade 6. Using this tool, students recognize and manipulate fractions in relation to larger whole numbers and to each other. For example, "Between which two whole numbers does the sum of $1\frac{2}{3}$ and $5\frac{3}{4}$ lie?"



This leads to an understanding of and skill with solving more complex problems often embedded within multi-step word problems:

*Cristina and Matt's goal is to collect a total of $3\frac{1}{2}$ gallons of sap from the maple trees. Cristina collected $1\frac{3}{4}$ gallon. Matt collected $5\frac{3}{5}$ gallons. By how much did they beat their goal?*




$$1\frac{3}{4}\text{ gal} + 5\frac{3}{5}\text{ gal} - 3\frac{1}{2}\text{gal} = 3 + \left(\frac{3\times 5}{4\times 5}\right) + \left(\frac{3\times 4}{5\times 4}\right) - \left(\frac{1\times 10}{2\times 10}\right)$$

$$= 3 + \frac{15}{20} + \frac{12}{20} - \frac{10}{20} = 3\frac{17}{20}\text{ gal}$$

*Cristina and Matt beat their goal by $3\frac{17}{20}$ gallons.*

Word problems are a part of every lesson. Students are encouraged to utilize tape diagrams, which facilitate analysis of the same part–whole relationships they have worked with since Grade 1.

**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 8

Objective: Add fractions to and subtract fractions from whole numbers using equivalence and the number line as strategies.

### Homework Key

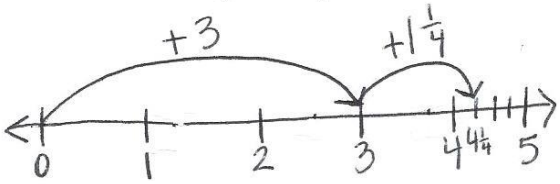
1. a. $4\frac{1}{4}$
   b. $\frac{3}{8}$
   c. 8
   d. $1\frac{2}{7}$
   e. $15\frac{4}{5}$
   f. $2\frac{1}{4}$
   g. $34\frac{5}{6}$
   h. $49\frac{5}{8}$

2. $5\frac{3}{8}$ m
3. $5\frac{1}{2}$ mi
4. Answers will vary.

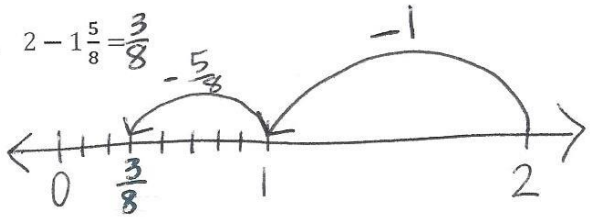
### Homework Samples

1. Add or subtract.

a. $3 + 1\frac{1}{4} = 4\frac{1}{4}$




b. $2 - 1\frac{5}{8} = \frac{3}{8}$



## Lesson 9

Objective: Add fractions making like units numerically.

### Homework Key

1. a. $\frac{14}{15}$
   b. $\frac{38}{55}$
   c. $1\frac{1}{18}$
   d. $\frac{3}{4}$
   e. $1\frac{11}{15}$
   f. $1\frac{5}{24}$
   g. $2\frac{1}{12}$ or $\frac{25}{12}$
   h. $2\frac{1}{12}$
2. $1\frac{5}{12}$
3. $2\frac{17}{20}$ kg
4. $\frac{9}{40}$

### Homework Samples

1. Make like units, then add.

a. $\frac{3}{5}+\frac{1}{3}=\left(\frac{3\times3}{5\times3}\right)+\left(\frac{1\times5}{3\times5}\right)$

$=\frac{9}{15}+\frac{5}{15}$

$=\frac{14}{15}$

b. $\frac{3}{5}+\frac{1}{11}=\left(\frac{3\times11}{5\times11}\right)+\left(\frac{1\times5}{11\times5}\right)$

$=\frac{33}{55}+\frac{5}{55}$

$=\frac{38}{55}$

## Lesson 10

Objective: Add fractions with sums greater than 2.

### Homework Key

1. a. $3\frac{7}{10}$
   b. $4\frac{1}{10}$
   c. $4\frac{8}{15}$
   d. $5\frac{4}{15}$
   e. $6\frac{19}{21}$
   f. $8\frac{8}{21}$
   g. $19\frac{23}{40}$
   h. $20\frac{31}{40}$
2. $8\frac{1}{2}$ hr
3. $6\frac{1}{12}$ m
4. Answers will vary.

### Homework Samples

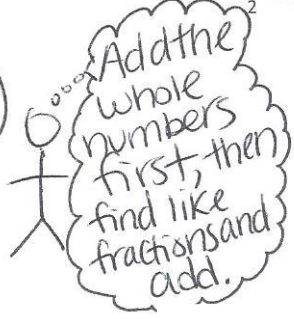
1. Add.

a. $2\frac{1}{2}+1\frac{1}{5} = 3+\frac{1}{2}+\frac{1}{5}$

$= 3+\left(\frac{1\times5}{2\times5}\right)+\left(\frac{1\times2}{5\times2}\right)$

$= 3+\frac{5}{10}+\frac{2}{10}$

$= 3\frac{7}{10}$




b. $2\frac{1}{2}+1\frac{3}{5} = 3+\frac{1}{2}+\frac{3}{5}$

$= 3+\left(\frac{1\times5}{2\times5}\right)+\left(\frac{3\times2}{5\times2}\right)$

$= 3+\frac{5}{10}+\frac{6}{10}$

$= 3+\frac{11}{10} = 4\frac{1}{10}$

## Lesson 11

Objective: Subtract fractions making like units numerically.

### Homework Key

1. a. $\frac{3}{10}$
   b. $\frac{13}{24}$
   c. $\frac{1}{10}$
   d. $1\frac{1}{6}$
   e. $1\frac{1}{20}$
   f. $2\frac{4}{21}$
   g. $10\frac{1}{8}$
   h. $12\frac{7}{24}$
2. $\frac{14}{24}$ or $\frac{7}{12}$
3. $2\frac{3}{14}$ yd
4. $\frac{2}{15}$
5. $3\frac{1}{6}$ gal

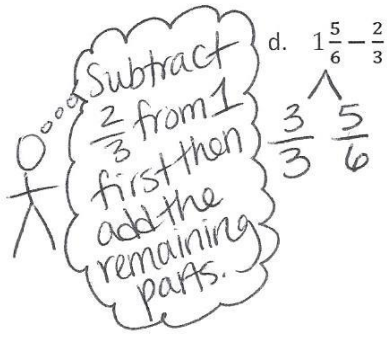
### Homework Samples

1. Generate equivalent fractions to get like units. Then, subtract.

a. $\frac{1}{2}-\frac{1}{5}=\frac{5}{10}-\frac{2}{10}=\frac{3}{10}$

b. $\frac{7}{8}-\frac{1}{3}=$

c. $\frac{7}{10}-\frac{3}{5}=$




d. $1\frac{5}{6}-\frac{2}{3}=$

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

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

$\frac{1}{3}+\frac{5}{6}=\frac{6}{18}+\frac{15}{18}=\frac{21}{18}$

$=1\frac{3}{18}=1\frac{1}{6}$

e. $2\frac{1}{4}-1\frac{1}{5}=$

f. $5\frac{6}{7}-3\frac{2}{3}=$

## Lesson 12

Objective: Subtract fractions greater than or equal to 1.

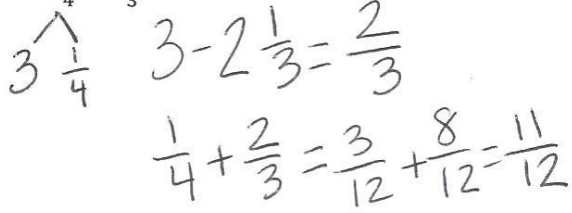
### Homework Key

1. a. $\frac{11}{12}$
   b. $\frac{11}{12}$
   c. $1\frac{19}{20}$
   d. $1\frac{17}{20}$
   e. $\frac{20}{21}$
   f. $4\frac{20}{21}$
   g. $12\frac{7}{8}$
   h. $14\frac{23}{40}$
2. Yes; number line drawn correctly
3. $4\frac{13}{20}$ gal
4. $2\frac{7}{12}$ ft

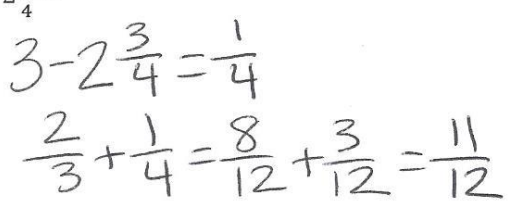
### Homework Samples

1. Subtract.

a. $3\frac{1}{4} - 2\frac{1}{3} =$




b. $3\frac{2}{3} - 2\frac{3}{4} =$



# Grade 5 Module 3 Topic D

# Further Applications

## Focus Standards:

5.NF.1 Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. *For example, 2/3 + 5/4 = 8/12 + 15/12 = 23/12. (In general, a/b + c/d = (ad + bc)/bd.)*

5.NF.2 Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers. *For example, recognize an incorrect result 2/5 + 1/2 = 3/7, by observing that 3/7 < 1/2.*

## Instructional Days Recommended: 4

Topic D opens with students estimating the value of expressions involving sums and differences with fractions. "Will your sum be less than or greater than one half? One? How do you know?" Though these conversations have been embedded within almost every Student Debrief up to this point, by setting aside an instructional day to dig deeply into logical arguments, students can easily forget to make sense of numbers when calculating. This is really the theme of this topic—reasoning while using fractions.

In Lesson 14, students look for number relationships before calculating, for example, to use the associative property or part−whole understanding. Looking for relationships allows them to see shortcuts and connections that are so often bypassed in the rush to get the answer.

In Lesson 15, students solve multi-step word problems and actively assess the reasonableness of their answers. In Lesson 16, they explore part−whole relationships while solving a challenging problem: "One half of Nell's money is equal to 2 thirds of Jennifer's." This lesson challenges the underlying assumption of all fraction arithmetic—that when adding and subtracting, fractions are always defined in relationship to the same whole amount. The beauty of this exploration is to see students grasp that $\frac{1}{2}$ of one thing can be equivalent to $\frac{2}{3}$ of 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 13

Objective: Use fraction benchmark numbers to assess reasonableness of addition and subtraction equations.

### Homework Key

1. a. Less than 1
   b. Greater than 1
   c. Less than 1
   d. Less than 1
2. a. Less than $\frac{1}{2}$
   b. Greater than $\frac{1}{2}$
   c. Less than $\frac{1}{2}$
   d. Greater than $\frac{1}{2}$
3. a. $<$
   b. $<$
   c. $>$
   d. $<$
4. No; answers will vary.
5. No
6. Yes

### Homework Samples

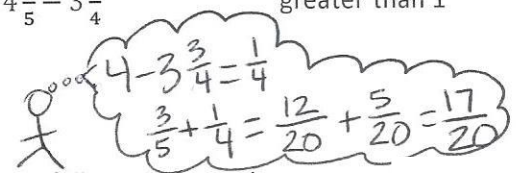
1. Are the following expressions greater than or less than 1? Circle the correct answer.

   a. $\frac{1}{2}+\frac{4}{9}=\frac{9}{18}+\frac{8}{18}=\frac{17}{18}$ — greater than 1 — (less than 1)

   b. $\frac{5}{8}+\frac{3}{5}$ — (greater than 1) — less than 1

   c. $1\frac{1}{5}-\frac{1}{3}$ — greater than 1 — (less than 1)

   d. $4\frac{3}{5}-3\frac{3}{4}$ — greater than 1 — (less than 1)



## Lesson 14

Objective: Strategize to solve multi-term problems.

### Homework Key

1. a. 3
   b. $3\frac{1}{4}$
   c. $1\frac{6}{7}$
   d. 0

2. a. $4\frac{27}{28}$
   b. $2\frac{11}{12}$
   c. 1
   d. $37\frac{7}{8}$
   e. $2\frac{19}{30}$
   f. $18\frac{1}{5}$

3. $9\frac{1}{6}$ yd

4. $3\frac{19}{36}$ lb

### Homework Samples

1. Rearrange the terms so that you can add or subtract mentally, then solve.

a. $1\frac{3}{4}+\frac{1}{2}+\frac{1}{4}+\frac{1}{2}$

$\left(1\frac{3}{4}+\frac{1}{4}\right)+\left(\frac{1}{2}+\frac{1}{2}\right)$

$2+1=3$

b. $3\frac{1}{6}-\frac{3}{4}+\frac{5}{6}$

$\left(3\frac{1}{6}+\frac{5}{6}\right)-\frac{3}{4}$

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

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

c. $5\frac{5}{8}-2\frac{6}{7}-\frac{2}{7}-\frac{5}{8}$

$\left(5\frac{5}{8}-\frac{5}{8}\right)-\left(2\frac{6}{7}-\frac{2}{7}\right)$

$=5-2\frac{8}{7}$

$=5-3\frac{1}{7}=2-\frac{1}{7}=1\frac{6}{7}$

d. $\frac{7}{9}+\frac{1}{2}-\frac{3}{2}+\frac{2}{9}$

## Lesson 15

Objective: Solve multi-step word problems; assess reasonableness of solutions using benchmark numbers.

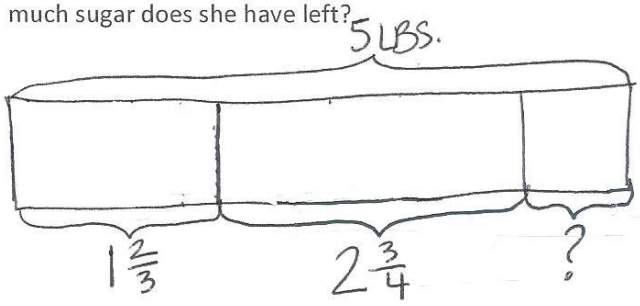
### Homework Key

1. $\frac{7}{12}$ lb
2. $1\frac{4}{5}$ kg
3. $28\frac{2}{3}$ mi
4. $2\frac{11}{24}$ lb
5. $2\frac{1}{3}$ hr

### Homework Samples

Solve the word problems using the RDW strategy. Show all of your work.

1. A baker buys a 5 lb bag of sugar. She uses $1\frac{2}{3}$ lb to make some muffins and $2\frac{3}{4}$ lb to make a cake. How much sugar does she have left?




$1\frac{2}{3} + 2\frac{3}{4}$

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

$= 3 + \frac{8}{12} + \frac{9}{12}$

$= 3 + \frac{17}{12}$

$= 4\frac{5}{12}$

$5 - 4\frac{5}{12}$

$= \frac{7}{12}$

The baker has $\frac{7}{12}$ LB of sugar left.

## Lesson 16

Objective: Explore part-to-whole relationships.

### Homework Key

a. Accurate drawing shown

b. Accurate drawing shown

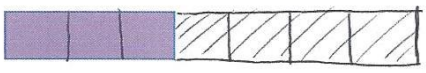
c. Accurate drawing shown; $\frac{1}{10}$; 21 mi

d. Answers will vary.

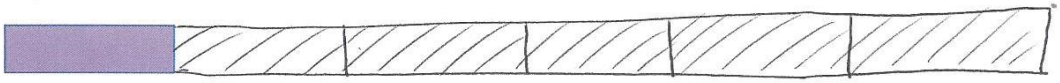
### Homework Samples

Draw the following roads.

a. 1 road. The piece shown below is only $\frac{3}{7}$ of the whole. Complete the drawing to show the whole road.



b. 1 road. The piece shown below is $\frac{1}{6}$ of the whole. Complete the drawing to show the whole road.



c. 3 roads, A, B, and C. B is three times longer than A. C is twice as long as B. Draw the roads. What fraction of the total length of the roads is the length of A? If Road B is 7 miles longer than Road A, what is the length of Road C?