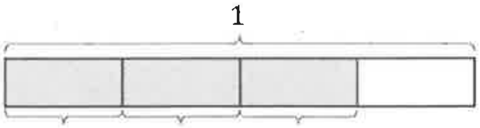
Homework Helpers

Grade 4
Module 5

G4-M5-Lesson 1

1. Draw a number bond, and write the number sentence to match each tape diagram.

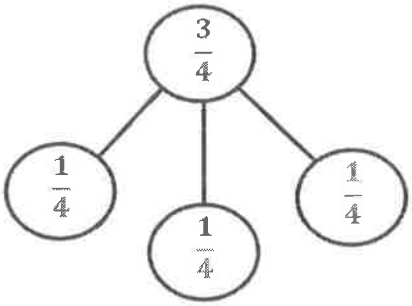
a.



The rectangle represents 1 and is partitioned into 4 equal units. Each unit is equal to 1 fourth.

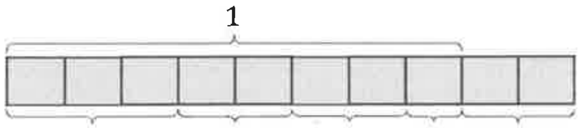
$$\frac{3}{4} = \frac{1}{4} + \frac{1}{4} + \frac{1}{4}$$

I can decompose any fraction into unit fractions. 3 fourths is composed of 3 units of 1 fourth.



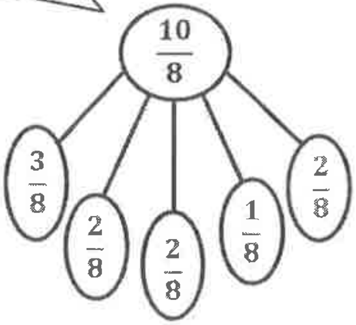
b.

I can rename a fraction greater than 1, such as $\frac{10}{8}$, as a whole number and a fraction, $1\frac{2}{8}$.



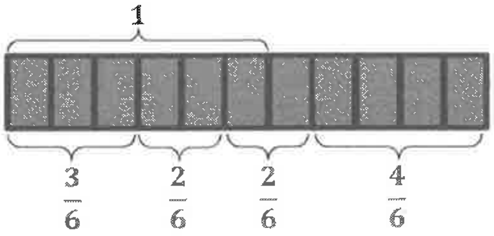
$$\frac{10}{8} = \frac{3}{8} + \frac{2}{8} + \frac{2}{8} + \frac{1}{8} + \frac{2}{8}$$

I know the fractional unit is eighths. I count 8 equal units bracketed as 1 whole.

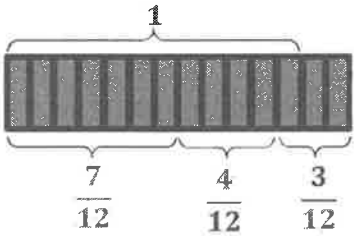


2. Draw and label tape diagrams to match each number sentence.

a. $\frac{11}{6} = \frac{3}{6} + \frac{2}{6} + \frac{2}{6} + \frac{4}{6}$



b. $1\frac{2}{12} = \frac{7}{12} + \frac{4}{12} + \frac{3}{12}$



I know the unit is twelfths. I partition my tape diagram into 12 equal units to represent the whole. I draw 2 more twelfths.

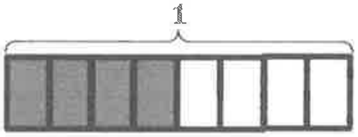
G4-M5-Lesson 2

Step 1: Draw and shade a tape diagram of the given fraction.

Step 2: Record the decomposition as a sum of unit fractions.

Step 3: Record the decomposition of the fraction two more ways.

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



The bottom number in the fraction determines the fractional size. I draw a whole partitioned into 8 equal parts.

$\frac{4}{8} = \frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8}$

$\frac{1}{8}$ is a unit fraction because it identifies 1 of the specified fractional size, eighths.

Sample Student Responses:

$\frac{4}{8} = \frac{2}{8} + \frac{1}{8} + \frac{1}{8}$

$\frac{4}{8} = \frac{3}{8} + \frac{1}{8}$

Adding fractions is like adding whole numbers. Just as 3 ones plus 1 one is 4 ones, 3 eighths plus 1 eighth is 4 eighths.

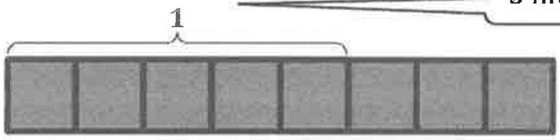
Step 1: Draw and shade a tape diagram of the given fraction.

Step 2: Record the decomposition of the fraction in three different ways using number sentences.

2. $\frac{8}{5}$

This fraction is greater than 1.

5 fifths is equal to 1.



Sample Student Responses:

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

$\frac{8}{5} = \frac{4}{5} + \frac{4}{5}$

$\frac{8}{5} = \frac{2}{5} + \frac{2}{5} + \frac{3}{5} + \frac{1}{5}$

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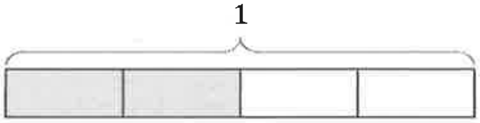
G4-M5-Lesson 3

1. Decompose each fraction modeled by a tape diagram as a sum of unit fractions. Write the equivalent multiplication sentence.

a.

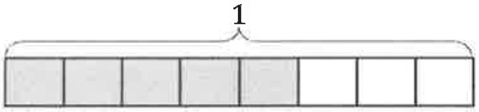


$\frac{2}{4} = \frac{1}{4} + \frac{1}{4}$ $\frac{2}{4} = 2 \times \frac{1}{4}$

There are 2 copies of $\frac{1}{4}$ shaded, so I write $2 \times \frac{1}{4}$.

I can multiply fourths like I multiply any other unit. 1 banana times 2 is 2 bananas and 1 ten times 2 is 2 tens, so 1 fourth times 2 is 2 fourths.

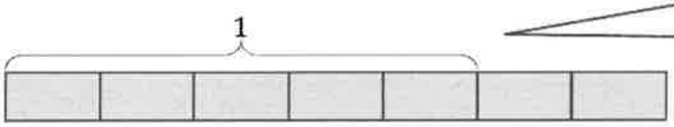
b.



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

I can add 1 eighth 5 times. Whew! That's a lot of writing! Or I can multiply to show 5 copies of $\frac{1}{8}$.

2. The tape diagram models a fraction greater than 1. Write the fraction greater than 1 as the sum of two products.

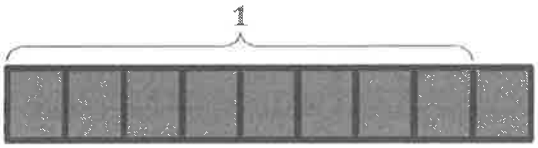


This bracket identifies the whole. This tape diagram models a fraction greater than 1.

$\frac{7}{5} = \left(5 \times \frac{1}{5}\right) + \left(2 \times \frac{1}{5}\right)$

I see in the tape diagram that $\frac{7}{5}$ is the same as $1\frac{2}{5}$. I can use the distributive property to express the whole part and the fractional part as 2 different multiplication expressions.

3. Draw a tape diagram to model $\frac{9}{8}$. Record the decomposition of $\frac{9}{8}$ into unit fractions as a multiplication sentence.

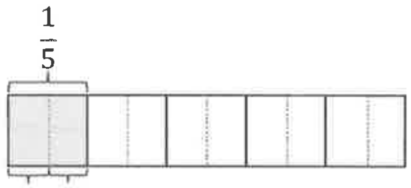


$\frac{9}{8} = 9 \times \frac{1}{8}$

G4-M5-Lesson 4

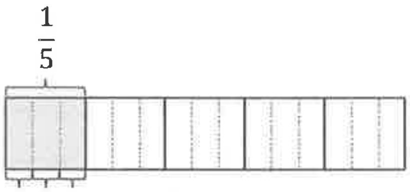
1. The total length of each tape diagram represents 1. Decompose the shaded unit fractions as the sum of smaller unit fractions in at least two different ways.

a.



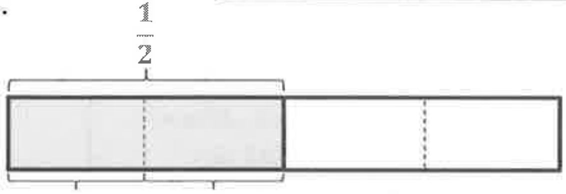
$$\frac{1}{5} = \frac{1}{10} + \frac{1}{10}$$

After decomposing each fifth into 2 equal parts, the new unit is tenths.

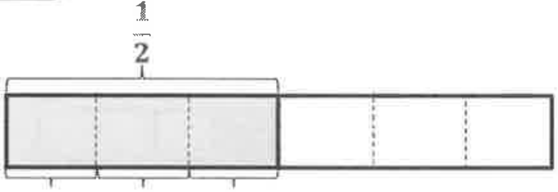


$$\frac{1}{15} + \frac{1}{15} + \frac{1}{15} = \frac{1}{5}$$

b.

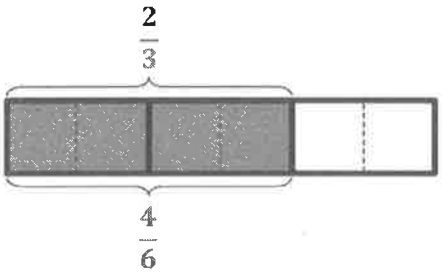


$$\frac{1}{2} = \frac{1}{4} + \frac{1}{4}$$



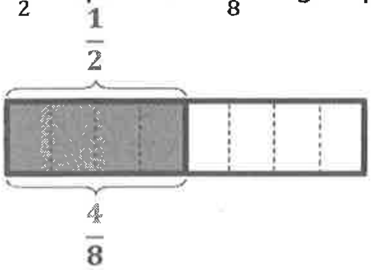
$$\frac{1}{2} = \frac{1}{6} + \frac{1}{6} + \frac{1}{6}$$

2. Draw a tape diagram to prove $\frac{2}{3} = \frac{4}{6}$.



I know that $\frac{2}{3}$ and $\frac{4}{6}$ are equal because they take up the same amount of space.

3. Show that $\frac{1}{2}$ is equivalent to $\frac{4}{8}$ using a tape diagram and a number sentence.



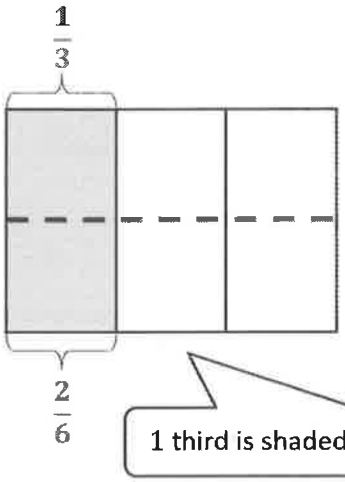
$$\frac{1}{2} = 4 \times \frac{1}{8}$$

I quadrupled the number of units within each half, which I can record as a multiplication sentence.

G4-M5-Lesson 5

1. Draw horizontal line(s) to decompose the rectangle into 2 rows. Use the model to name the shaded area as both a sum of unit fractions and as a multiplication sentence.

I draw 1 horizontal line to decompose the whole into 2 equal rows. Now there are 6 equal units in all. 2 sixths is the same as 1 third.



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

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

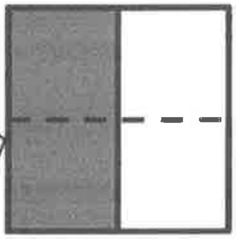
$$\frac{1}{3} = 2 \times \frac{1}{6} = \frac{2}{6}$$

1 third is shaded. Or, 2 sixths is shaded.

2. Draw area models to show the decompositions represented by the number sentences below. Represent the decomposition as a sum of unit fractions and as a multiplication sentence.

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

There were 2 units, but now there are 4.

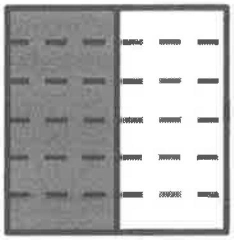


$$\frac{1}{2} = \frac{1}{4} + \frac{1}{4} = \frac{2}{4}$$

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

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

After decomposing, there are *more* units, and they are *smaller*.



To make twelfths, I partition each half into 6 units.

$$\frac{1}{2} = \frac{1}{12} + \frac{1}{12} + \frac{1}{12} + \frac{1}{12} + \frac{1}{12} + \frac{1}{12} = \frac{6}{12}$$

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

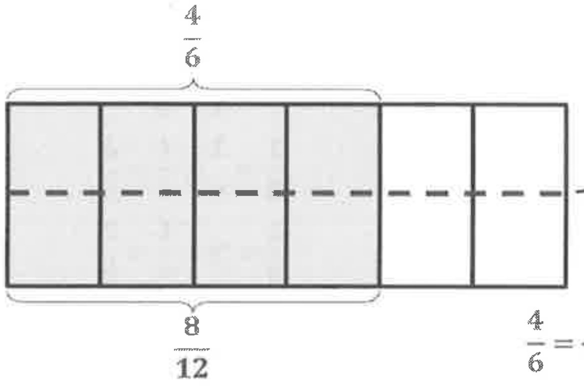
3. Explain why $\frac{1}{12} + \frac{1}{12} + \frac{1}{12} + \frac{1}{12} + \frac{1}{12} + \frac{1}{12}$ is the same as $\frac{1}{2}$.

Sample Student Response:

I see in the area model that I drew that 6 twelfths takes up the same space as 1 half. 6 twelfths and 1 half have exactly the same area.

G4-M5-Lesson 6

1. The rectangle represents 1. Draw horizontal line(s) to decompose the rectangle into *twelfths*. Use the model to name the shaded area as a sum and as a product of unit fractions. Use parentheses to show the relationship between the number sentences.



4 sixths are shaded. I draw one line to partition sixths into twelfths. 8 twelfths are shaded.

I write addition and multiplication sentences using unit fractions.

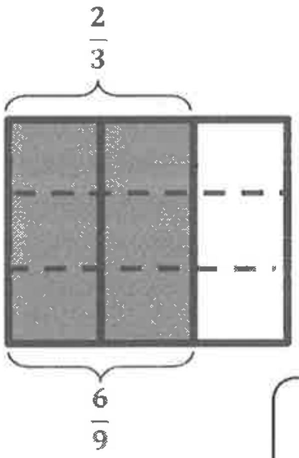
$$\frac{4}{6}=\frac{8}{12}$$

$$\frac{1}{6}+\frac{1}{6}+\frac{1}{6}+\frac{1}{6}=\left(\frac{1}{12}+\frac{1}{12}\right)+\left(\frac{1}{12}+\frac{1}{12}\right)+\left(\frac{1}{12}+\frac{1}{12}\right)+\left(\frac{1}{12}+\frac{1}{12}\right)=\frac{8}{12}$$

$$\left(\frac{1}{12}+\frac{1}{12}\right)+\left(\frac{1}{12}+\frac{1}{12}\right)+\left(\frac{1}{12}+\frac{1}{12}\right)+\left(\frac{1}{12}+\frac{1}{12}\right)=\left(2\times\frac{1}{12}\right)+\left(2\times\frac{1}{12}\right)+\left(2\times\frac{1}{12}\right)+\left(2\times\frac{1}{12}\right)=\frac{8}{12}$$

$$\frac{4}{6}=8\times\frac{1}{12}=\frac{8}{12}$$

2. Draw an area model to show the decompositions represented by $\frac{2}{3}=\frac{6}{9}$. Express $\frac{2}{3}=\frac{6}{9}$ as a sum and product of unit fractions. Use parentheses to show the relationship between the number sentences.



I draw thirds vertically and partition the thirds into ninths with two horizontal lines.

$$\frac{2}{3}=\frac{6}{9}$$

$$\frac{1}{3}+\frac{1}{3}=\left(\frac{1}{9}+\frac{1}{9}+\frac{1}{9}\right)+\left(\frac{1}{9}+\frac{1}{9}+\frac{1}{9}\right)=\frac{6}{9}$$

$$\left(\frac{1}{9}+\frac{1}{9}+\frac{1}{9}\right)+\left(\frac{1}{9}+\frac{1}{9}+\frac{1}{9}\right)=\left(3\times\frac{1}{9}\right)+\left(3\times\frac{1}{9}\right)=\frac{6}{9}$$

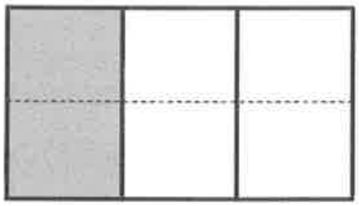
I write parentheses that show the decomposition of $\frac{1}{3}$. Just as the area model shows 1 third partitioned into 3 ninths, so do the parentheses.

G4-M5-Lesson 7

Each rectangle represents 1.

1. The shaded unit fractions have been decomposed into smaller units. Express the equivalent fractions in a number sentence using multiplication.

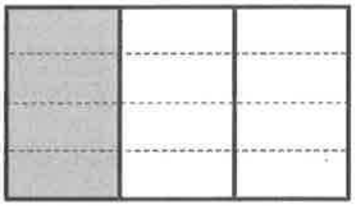
a.



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

The numerator is 1.
The denominator is 3.

b.

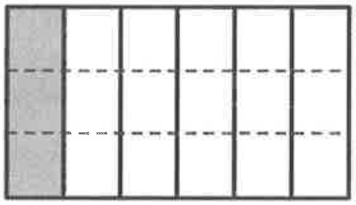


$$\frac{1}{3} = \frac{1 \times 4}{3 \times 4} = \frac{4}{12}$$

I can multiply the numerator (number of fractional units selected) and the denominator (the fractional unit) by 4 to make an equivalent fraction.

2. Decompose the shaded fraction into smaller units using the area model. Express the equivalent fractions in a number sentence using multiplication.

The area model shows that $\frac{1}{6}$ equals $\frac{3}{18}$.

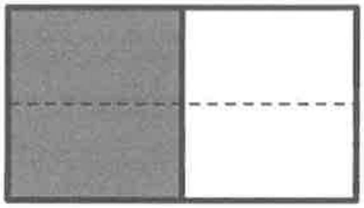


As I multiply, the size of the units gets smaller.

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

3. Draw three different area models to represent 1 half by shading.
Decompose the shaded fraction into (a) fourths, (b) sixths, and (c) eighths.
Use multiplication to show how each fraction is equivalent to 1 half.

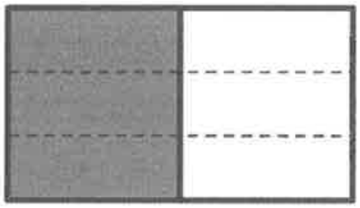
a.



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

The number of units doubled.

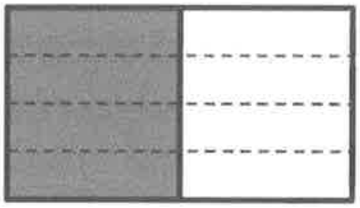
b.



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

The number of units tripled.

c.



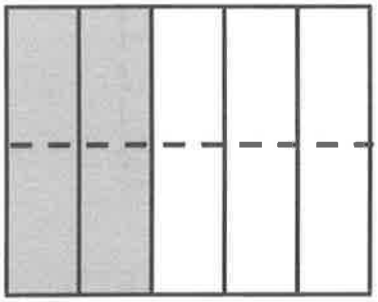
$$\frac{1}{2} = \frac{1 \times 4}{2 \times 4} = \frac{4}{8}$$

The number of units quadrupled.

G4-M5-Lesson 8

Each rectangle represents 1.

1. The shaded fraction has been decomposed into smaller units. Express the equivalent fraction in a number sentence using multiplication.

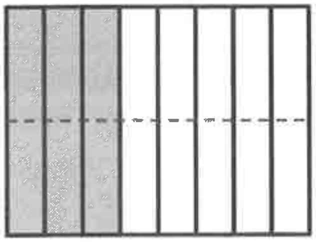


$$\frac{2}{5}=\frac{2\times 2}{5\times 2}=\frac{4}{10}$$

The number of units in the area model has been doubled. There were 5 units, and now there are 10 units.

2. Decompose both shaded fractions into sixteenths. Express the equivalent fractions in a number sentence using multiplication.

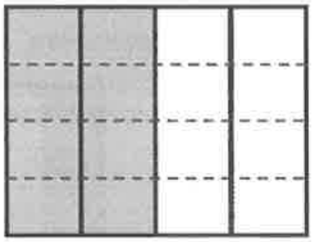
a.



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

I draw 1 line to partition each unit into 2.

b.



$$\frac{2}{4}=\frac{2\times 4}{4\times 4}=\frac{8}{16}$$

I draw 3 lines to partition each unit into 4.

3. Use multiplication to create an equivalent fraction for the fraction $\frac{8}{6}$.

$$\frac{8}{6}=\frac{8\times 2}{6\times 2}=\frac{16}{12}$$

To make an equivalent fraction, I can choose any fraction equivalent to 1. I can choose $\frac{3}{3}, \frac{4}{4}, \frac{5}{5}$, etc.

4. Determine if the following is a true number sentence. Correct it if it is false by changing the right-hand side of the number sentence.

$$\frac{5}{4}=\frac{15}{16}$$

This is false! The numerator was multiplied by 3. The denominator was multiplied by 4. Three fourths is not a fraction equal to 1.

Sample Student Response:

Not true!

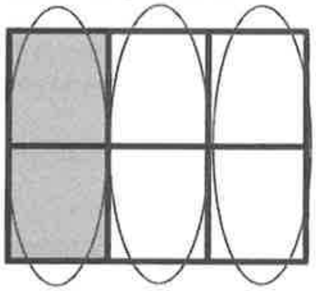
$$\frac{5}{4}=\frac{5\times 3}{4\times 3}=\frac{15}{12}$$

G4-M5-Lesson 9

Each rectangle represents 1.

1. Compose the shaded fraction into larger fractional units. Express the equivalent fractions in a number sentence using division.

a.

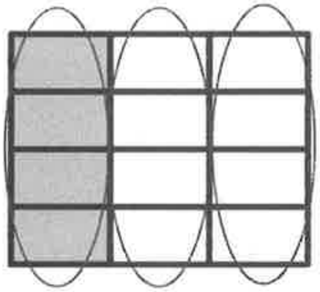


2 units are shaded. I make groups of 2. Sixths are composed as thirds.

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

I divide the numerator and denominator by 2.

b.

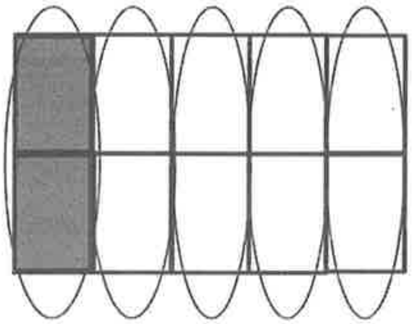


$$\frac{4}{12}=\frac{4\div 4}{12\div 4}=\frac{1}{3}$$

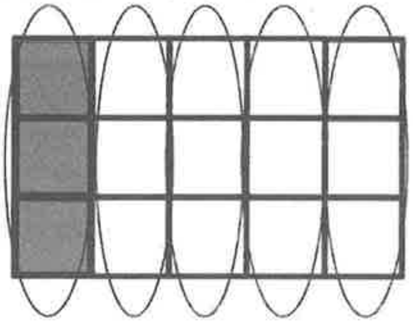
When I compose thirds, the number of units decreases. I make a larger unit.

2.

a. In the first model, show 2 tenths. In the second area model, show 3 fifteenths. Show how both fractions can be composed, or renamed, as the same unit fraction.



$2 \textit{ tenths} = 1 \textit{ fifth}$



$3 \textit{ fifteenths} = 1 \textit{ fifth}$

Before I draw my model, I identify the larger unit fraction. I know 3 fifteenths is the same as $\frac{1\times 3}{5\times 3}$.

b. Express the equivalent fractions in a number sentence using division.

$\frac{2}{10} = \frac{2 \div 2}{10 \div 2} = \frac{1}{5}$

I circled groups of 2 units, so I divide the numerator and denominator by 2.

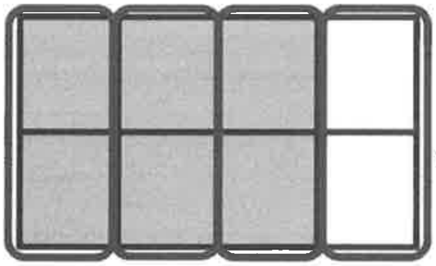
$\frac{3}{15} = \frac{3 \div 3}{15 \div 3} = \frac{1}{5}$

I circled groups of 3 units, so I divide the numerator and denominator by 3.

G4-M5-Lesson 10

Each rectangle represents 1.

1. Compose the shaded fraction into larger fractional units. Express the equivalent fractions in a number sentence using division.



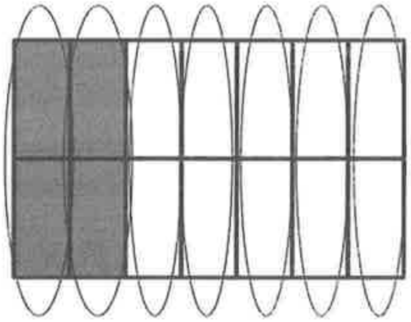
$$\frac{6}{8} = \frac{6 \div 2}{8 \div 2} = \frac{3}{4}$$

This work is a lot like what I did in Lesson 9. However, once I compose units, the renamed fraction is not a unit fraction.

2. Draw an area model to represent the number sentence below.

$$\frac{4}{14} = \frac{4 \div 2}{14 \div 2} = \frac{2}{7}$$

Looking at the numerator and denominator, I draw 14 units and shade 4 units.

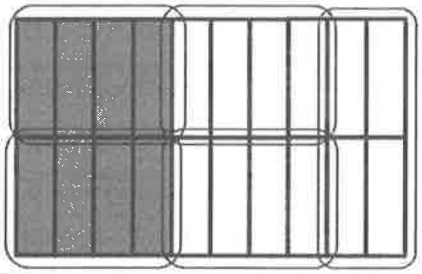


Looking at the divisor, $\frac{2}{2}$, I circle groups of 2. I make 7 groups. 2 sevenths are shaded.

3. Use division to rename the fraction below. Draw a model if that helps you. See if you can use the largest common factor.

$$\frac{8}{20} = \frac{8 \div 4}{20 \div 4} = \frac{2}{5}$$

I could choose 2, but the largest common factor is 4.

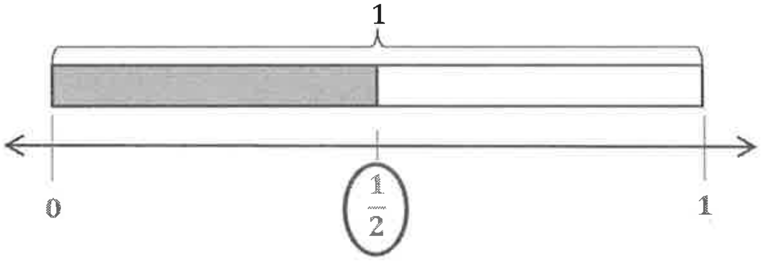


Whether I compose units vertically or horizontally, I get the same answer!

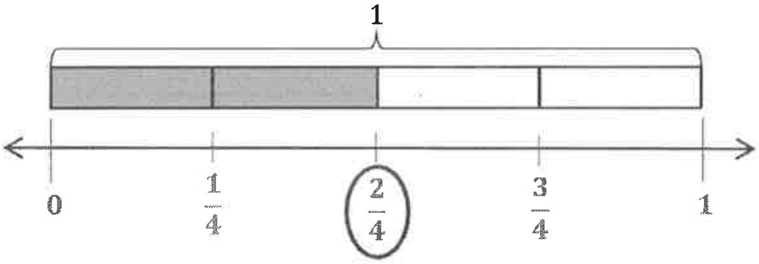
G4-M5-Lesson 11

1. Label each number line with the fractions shown on the tape diagram. Circle the fraction that labels the point on the number line and also names the shaded part of the tape diagram.

a.



b.



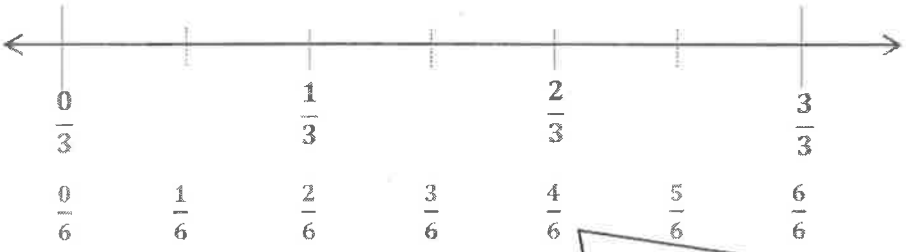
The number line and tape diagram show that $\frac{2}{4}$ is equivalent to $\frac{1}{2}$.

2. Write number sentences using multiplication to show the fraction represented in 1(a) is equivalent to the fraction represented in 1(b).

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

3.

a. Partition a number line from 0 to 1 into thirds. Decompose $\frac{2}{3}$ into 4 equal lengths.



To decompose 2 thirds into 4 equal parts, each unit is partitioned into two. To name the new, smaller units, I decompose each third. Thirds become sixths, so $\frac{2}{3} = \frac{4}{6}$.

b. Write 1 multiplication and 1 division sentence to show what fraction represented on the number line is equivalent to $\frac{2}{3}$.

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

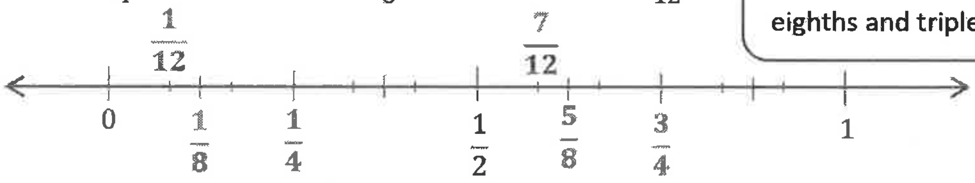
G4-M5-Lesson 12

1.

a. Plot the following points on the number line without measuring.

i. $\frac{3}{4}$ ii. $\frac{5}{8}$ iii. $\frac{7}{12}$

I notice a relationship between the units. Fourths are twice the size of eighths and triple the size of twelfths.



I use benchmark fractions I know to plot twelfths. After marking fourths, I know that 1 fourth is the same as 3 twelfths, so I decompose each fourth into 3 units to make twelfths.

b. Use the number line in part (a) to compare the fractions by writing >, <, or = on the lines.

i. $\frac{3}{4}$ __>__ $\frac{1}{2}$ ii. $\frac{7}{12}$ __<__ $\frac{5}{8}$

c. Explain how you plotted the points in Part (a).

Sample Student Response:

The number line was partitioned into halves. I doubled the units to make fourths. I plotted 3 fourths. I doubled the units again to make eighths. Knowing that 1 half and 4 eighths are equivalent fractions, I simply counted on 1 more eighth to plot 5 eighths. Lastly, I thought about twelfths and fourths. 1 fourth is the same as 3 twelfths. I marked twelfths by partitioning each fourth into 3 units. I plotted 7 twelfths.

2. Compare the fractions given below by writing < or > on the line.

   Give a brief explanation for each answer referring to the benchmarks of $0, \frac{1}{2}$, and/or 1.

   $\frac{5}{8}$ ___>___ $\frac{6}{10}$

   Possible student response:

   If I think about eighths, I know that 1 half is equal to 4 eighths. Therefore, 5 eighths is 1 eighth greater than 1 half.

   I also know that 5 tenths is equal to 1 half. 6 tenths is 1 tenth greater than 1 half. Comparing the size of the units, I know that 1 eighth is more than 1 tenth. So, 5 eighths is greater than 6 tenths.

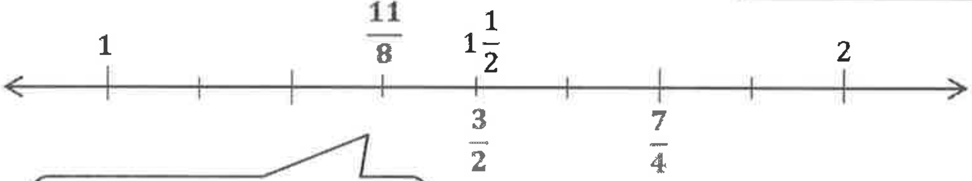
G4-M5-Lesson 13

1. Place the following fractions on the number line given.

$\frac{8}{4}$ is equal to 2. Therefore, $\frac{7}{4}$ is 1 fourth less than 2.

a. $\frac{7}{4}$ b. $\frac{3}{2}$ c. $\frac{11}{8}$

I can draw a number bond, breaking $\frac{11}{8}$ into $\frac{8}{8}$ and $\frac{3}{8}$.



$\frac{11}{8}$ is 3 eighths more than 1.

2. Use the number line in Problem 1 to compare the fractions by writing <, >, or = on the lines.

a. $1\frac{3}{4}$ __>__ $1\frac{1}{2}$ b. $1\frac{3}{8}$ __<__ $1\frac{3}{4}$

Using the benchmark $\frac{1}{2}$, I compare the fractions. $1\frac{3}{8}$ is less than 1 and 1 half, while $1\frac{3}{4}$ is more than 1 and 1 half.

3. Use the number line in Problem 1 to explain the reasoning you used when determining whether $\frac{11}{8}$ or $\frac{7}{4}$ was greater.

Sample Student Response:

After I plotted $\frac{11}{8}$ and $\frac{7}{4}$, I noticed that $\frac{7}{4}$ was greater than $1\frac{1}{2}$, whereas $\frac{11}{8}$ is less than $1\frac{1}{2}$.

4. Compare the fractions given below by writing $<$ or $>$ on the lines. Give a brief explanation for each answer referring to benchmarks.

a. $\frac{5}{4}$ $\underline{\;>\;}$ $\frac{9}{10}$

$\frac{5}{4}$ *is greater than* 1.

$\frac{9}{10}$ *is less than* 1.

b. $\frac{7}{12}$ $\underline{\;<\;}$ $\frac{7}{6}$

I use two different benchmarks to compare these fractions.

$\frac{7}{12}$ *is one twelfth greater than* $\frac{1}{2}$.

$\frac{7}{6}$ *is one sixth greater than* 1.

G4-M5-Lesson 14

1. Compare the pairs of fractions by reasoning about the size of the units. Use >, <, or =.

a. 1 fourth $\underline{\ >\ }$ 1 eighth

I envision a tape diagram. 1 fourth is double the size of 1 eighth.

b. 2 thirds $\underline{\ >\ }$ 2 fifths

When I'm comparing the same number of units, I consider the size of the fractional unit. Thirds are bigger than fifths.

2. Compare by reasoning about the following pair of fractions with related numerators. Use >, <, or =. Explain your thinking using words, pictures, or numbers.

$\frac{3}{7}\ \underline{\ >\ }\ \frac{6}{15}$

To compare, I can make the numerators the same.

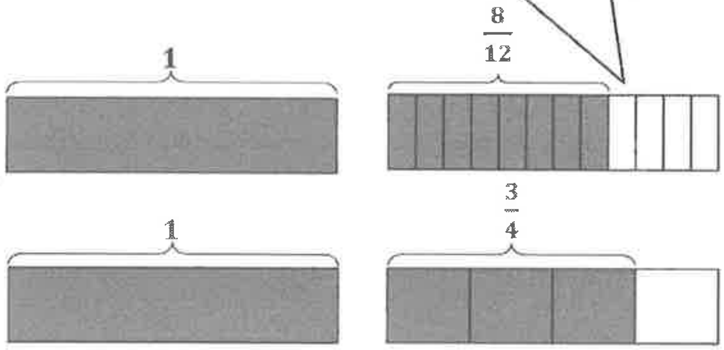
3 sevenths are equal to 6 fourteenths. Fourteenths are greater than fifteenths. So, 3 sevenths are greater than 6 fifteenths.

3. Draw two tape diagrams to model and compare $1\frac{3}{4}$ and $1\frac{8}{12}$.

$1\frac{3}{4}\ \underline{\ >\ }\ 1\frac{8}{12}$

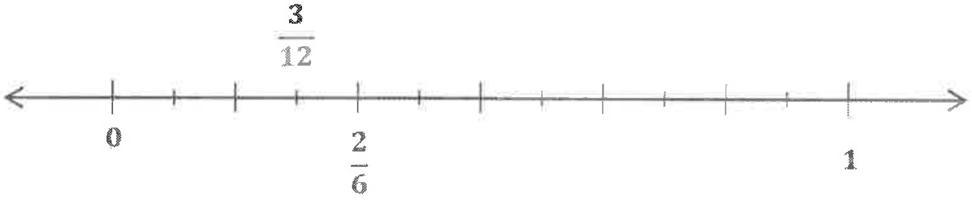
The model shows that $\frac{9}{12}$ is equal to $\frac{3}{4}$. So, $\frac{8}{12}$ is less.

I'm careful to make each tape diagram the same size.



4. Draw one number line to model the pair of fractions with related denominators. Use >, <, or = to compare.

$\frac{3}{12}\ \underline{\ <\ }\ \frac{2}{6}$



G4-M5-Lesson 15

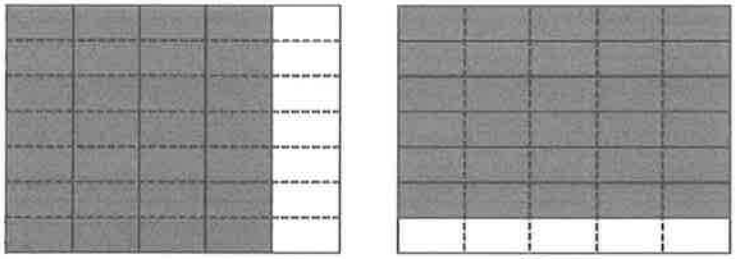
1. Draw an area model for the pair of fractions, and use it to compare the two fractions by writing <, >, or = on the line.

$\frac{4}{5} \underline{\;<\;} \frac{6}{7}$

I use two area models that are exactly the same size to find like units. After partitioning, I have 35 units in each model. Now I can compare!

$\frac{28}{35} \underline{\;<\;} \frac{30}{35}$

$\frac{4 \times 7}{5 \times 7} = \frac{28}{35}$



$\frac{6 \times 5}{7 \times 5} = \frac{30}{35}$

I represent fifths with vertical lines and then partition fifths by drawing horizontal lines.

I represent sevenths with horizontal lines and then partition sevenths by drawing vertical lines.

2. Rename the fractions below using multiplication, and then compare by writing <, >, or =.

$\frac{5}{8} \underline{\;<\;} \frac{9}{12}$ $\frac{5 \times 12}{8 \times 12} = \frac{60}{96}$ $\frac{9 \times 8}{12 \times 8} = \frac{72}{96}$

Whew! That would have been a lot of units to draw in an area model!

$\frac{60}{96} \underline{\;<\;} \frac{72}{96}$

Using multiplication to make common units is quick and precise. It is best to compare fractions when the units are the same.

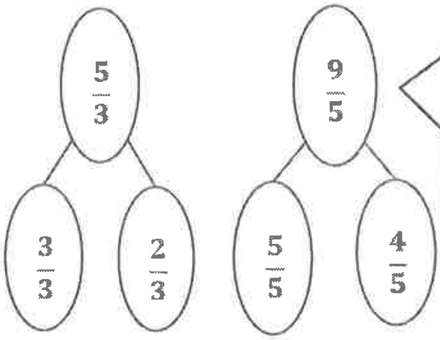
3. Use any method to compare the fractions below. Record your answer using <, >, or =.

$\frac{5}{3}$ $\underline{<}$ $\frac{9}{5}$

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

$\frac{2}{3} < \frac{4}{5}$

I use benchmarks to compare. $\frac{4}{5}$ is closer to 1 than $\frac{2}{3}$ because fifths are smaller than thirds.



I use number bonds to decompose fractions greater than 1. This lets me focus on the fractional parts, $\frac{2}{3}$ and $\frac{4}{5}$, to compare since $\frac{3}{3}$ and $\frac{5}{5}$ are equivalent.

G4-M5-Lesson 16

Solve.

1. 5 sixths − 3 sixths = ___*2 sixths*___

The units in both numbers are the same, so I can think "5 − 3 = 2," so 5 sixths − 3 sixths = 2 sixths.

I can rewrite the number sentence using fractions.

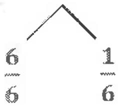
$$\frac{5}{6} - \frac{3}{6} = \frac{2}{6}$$

2. 1 sixth + 4 sixths = ___*5 sixths*___

If I know that 1 + 4 = 5, then 1 sixth + 4 sixths = 5 sixths.

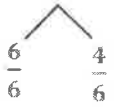
Solve. Use a number bond to rename the sum or difference as a mixed number. Then, draw a number line to model your answer.

3. $\frac{12}{6} - \frac{5}{6} = \frac{7}{6} = 1\frac{1}{6}$



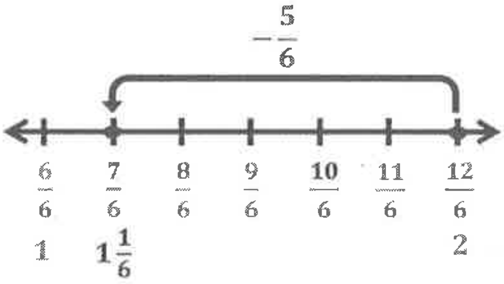
I can rename $\frac{7}{6}$ as a mixed number using a number bond to separate, or decompose, $\frac{7}{6}$ into a whole number and a fraction. $\frac{6}{6}$ is the whole, and the fractional part is $\frac{1}{6}$.

4. $\frac{5}{6} + \frac{5}{6} = \frac{10}{6} = 1\frac{4}{6}$

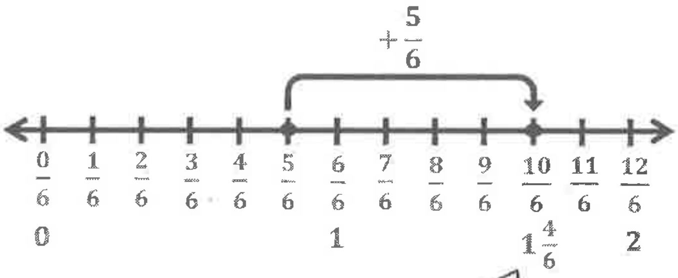


I decompose $\frac{10}{6}$ into 2 parts: $\frac{6}{6}$ and $\frac{4}{6}$. $\frac{6}{6}$ is the same as 1, so I rewrite $\frac{10}{6}$ as the mixed number $1\frac{4}{6}$.

I can think of the number sentence in unit form: 5 sixths + 5 sixths = 10 sixths.



I plot a point at $\frac{12}{6}$ because that is the whole. Then, I count backward to subtract $\frac{5}{6}$.



I draw a number line and plot a point at $\frac{5}{6}$. I count up $\frac{5}{6}$. The model verifies the sum is $1\frac{4}{6}$.

G4-M5-Lesson 17

1. Use the three fractions $\frac{8}{8}$, $\frac{3}{8}$, and $\frac{5}{8}$ to write two addition and two subtraction number sentences.

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

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

This is like the relationship between 3, 5, and 8:

$3 + 5 = 8$ $8 - 5 = 3$

$5 + 3 = 8$ $8 - 3 = 5$

except these fractions have units of eighths.

2. Solve by subtracting and counting up. Model with a number line.

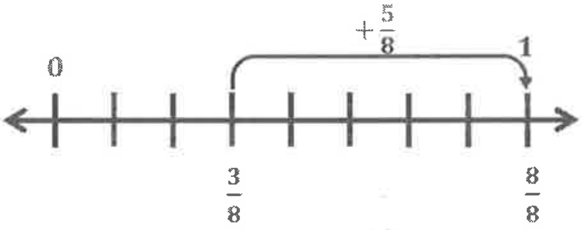
$1 - \frac{3}{8}$

$\frac{8}{8} - \frac{3}{8} = \frac{5}{8}$

I rename 1 as $\frac{8}{8}$. Now, I have like units, eighths, and I can subtract.

Or, I count up by thinking about how many eighths it takes to get from $\frac{3}{8}$ to $\frac{8}{8}$.

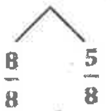
$$\frac{3}{8} + x = \frac{8}{8}$$
$$x = \frac{5}{8}$$



A number line shows how to count up from $\frac{3}{8}$ to $\frac{8}{8}$. I can also start at 1 and show the subtraction of $\frac{3}{8}$ on the number line.

3. Find the difference in two ways. Use a number bond to decompose the whole.

$1\frac{5}{8} - \frac{7}{8}$



I can use a number bond to rename $1\frac{5}{8}$ as $\frac{8}{8}$ and $\frac{5}{8}$.

$\frac{8}{8} + \frac{5}{8} = \frac{13}{8}$

$\frac{13}{8} - \frac{7}{8} = \boxed{\frac{6}{8}}$

I rename $1\frac{5}{8}$ as a fraction greater than 1. I have like units, so I can subtract $\frac{7}{8}$ from $\frac{13}{8}$.

$\frac{8}{8} - \frac{7}{8} = \frac{1}{8}$

$\frac{1}{8} + \frac{5}{8} = \boxed{\frac{6}{8}}$

Or, I can subtract $\frac{7}{8}$ from $\frac{8}{8}$, or 1, first and then add the remaining part of the number bond, $\frac{5}{8}$.

G4-M5-Lesson 18

Show two ways to solve each problem. Express the answer as a mixed number when possible. Use a number bond when it helps you.

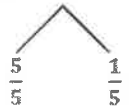
1. $\frac{2}{5}+\frac{3}{5}+\frac{1}{5}$

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

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

I can add $\frac{2}{5}$ and $\frac{3}{5}$ to make 1. Then, I can just add $\frac{1}{5}$ more to get $1\frac{1}{5}$.

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



Since the units, or denominators, are the same for each addend, fifths, I can just add the number of units, or numerators.

I can use a number bond to decompose $\frac{6}{5}$ into $\frac{5}{5}$ and $\frac{1}{5}$. Since $\frac{5}{5}=1$, I can rewrite $\frac{6}{5}$ as $1\frac{1}{5}$.

2. $1-\frac{3}{12}-\frac{4}{12}$

I add $\frac{3}{12}$ and $\frac{4}{12}$ to get $\frac{7}{12}$. I need to subtract a total of $\frac{7}{12}$ from 1.

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

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

I can rename 1 as $\frac{12}{12}$, and I can subtract $\frac{7}{12}$ from $\frac{12}{12}$.

$$\frac{12}{12}-\frac{3}{12}=\frac{9}{12}$$

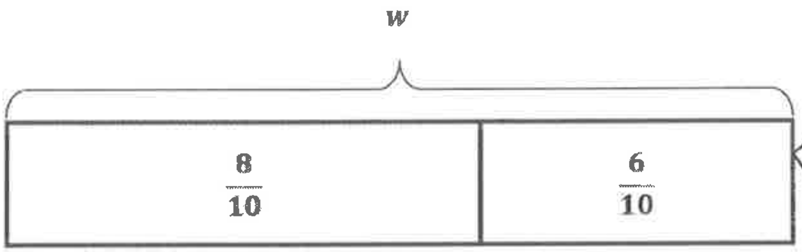
$$\frac{9}{12}-\frac{4}{12}=\frac{5}{12}$$

I rename 1 as $\frac{12}{12}$. Then, I subtract $\frac{3}{12}$, and finally I subtract $\frac{4}{12}$.

G4-M5-Lesson 19

Use the RDW process to solve.

1. Noah drank $\frac{8}{10}$ liter of water on Monday and $\frac{6}{10}$ liter on Tuesday. How many liters of water did Noah drink in the 2 days?

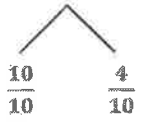


I draw a tape diagram to model the problem. The parts in my tape diagram represent the water Noah drank on Monday and Tuesday. I use the variable *w* to represent the liters of water Noah drank on Monday and Tuesday.

$$\frac{8}{10} + \frac{6}{10} = w$$

I add the parts in my tape diagram to find the total amount of water that Noah drank.

$$\frac{8}{10} + \frac{6}{10} = \frac{14}{10} = 1\frac{4}{10}$$



Since the addends have like units, I add the numerators to get $\frac{14}{10}$. I use a number bond to decompose $\frac{14}{10}$ into a whole number and a fraction. This helps me rename $\frac{14}{10}$ as a mixed number.

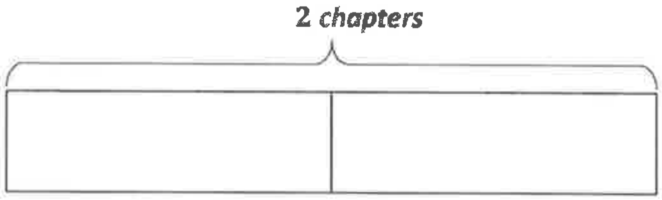
$$w = 1\frac{4}{10}$$

Noah drank $1\frac{4}{10}$ liters of water.

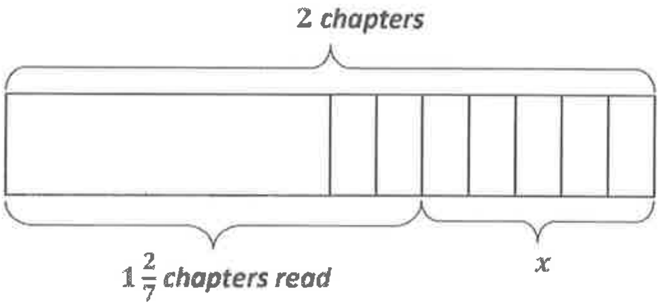
I write a statement to answer the question. I also think about the reasonableness of my answer. The water drunk on each day is less than 1 liter, so I would expect to get a total less than 2 liters. My answer of $1\frac{4}{10}$ liters is a reasonable total amount.

G4-M1-HWH-1.3.0-07.2015

2. Muneeb had 2 chapters to read for homework. By 9:00 p.m., he had read $1\frac{2}{7}$ chapters. What fraction of chapters is left for Muneeb to read?



I can draw a tape diagram with 2 equal parts to represent the 2 chapters of the book.

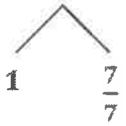


To show $1\frac{2}{7}$ on my tape diagram, I partition one chapter into sevenths. I label the amount that Muneeb has read and the amount that is left, x.

$$2 - 1\frac{2}{7} = x$$

The unknown in my tape diagram is one of the parts, so I subtract the known part, $1\frac{2}{7}$, from the whole, 2.

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



I use a number bond to show how to decompose one of the chapters into sevenths. My tape diagram shows that there is $\frac{5}{7}$ of a chapter left. My equation shows that, too!

$$x = \frac{5}{7}$$

Muneeb has $\frac{5}{7}$ *chapter left to read.*

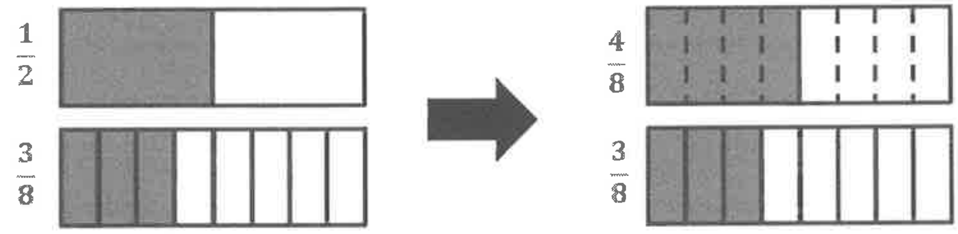
Muneeb started with 2 chapters to read. He read 1 chapter and a little more, so he should have less than 1 chapter left. My answer of $\frac{5}{7}$ chapter is a reasonable amount left because it's less than 1 chapter.

G4-M5-Lesson 20

1. Use a tape diagram to represent each addend. Decompose one of the tape diagrams to make like units. Then, write the complete number sentence.

$\frac{1}{2}+\frac{3}{8}$

I make like units by decomposing the halves to make eighths.



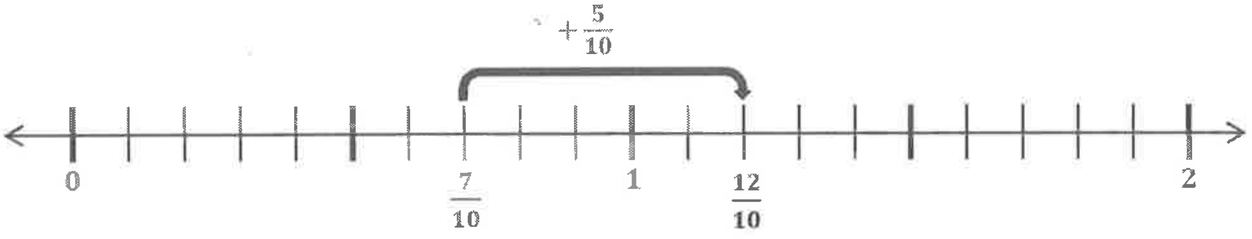
$\frac{4}{8}+\frac{3}{8}=\frac{7}{8}$

I draw tape diagrams to model each addend.

2. Estimate to determine if the sum is between 0 and 1 or 1 and 2. Draw a number line to model the addition. Then, write a complete number sentence.

$\frac{7}{10}+\frac{1}{2}$

$\frac{7}{10}$ is a little bit more than $\frac{1}{2}$. When I add a fraction that is a little bigger than $\frac{1}{2}$ to $\frac{1}{2}$, I should get a total that is between 1 and 2.



$\frac{7}{10}+\frac{5}{10}=\frac{12}{10}$

To make like units in order to add, I decompose halves. The number line and the number sentence show the total, $\frac{12}{10}$, which is between 1 and 2.

3. Solve the following addition problem without drawing a model. Show your work.

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

$\frac{2}{3} = \frac{2 \times 3}{3 \times 3} = \frac{6}{9}$

I can decompose thirds to make ninths by multiplying the numerator and denominator of $\frac{2}{3}$ by 3.

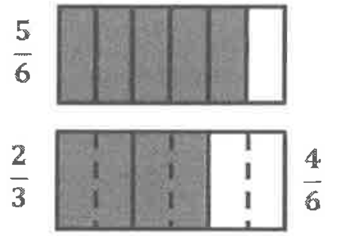
$\frac{6}{9} + \frac{1}{9} = \frac{7}{9}$

Now, I have like units, ninths, and I can add.

G4-M5-Lesson 21

1. Use a tape diagram to represent each addend. Decompose one of the tape diagrams to make like units. Then, write the complete number sentence. Use a number bond to write the sum as a mixed number.

$\frac{5}{6}+\frac{2}{3}$



$\frac{5}{6}+\frac{4}{6}=\frac{9}{6}=1\frac{3}{6}$

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

I add now that I have like units.

I can make like units by decomposing the thirds as sixths. I decompose the thirds because they are the larger unit (thirds > sixths).

2. Draw a number line to model the addition. Then, write a complete number sentence. Use a number bond to write the sum as a mixed number.

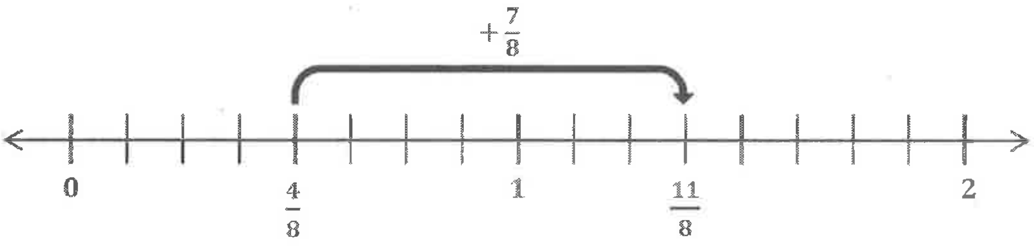
$\frac{1}{2}+\frac{7}{8}$

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

I rename halves as eighths to make like units to add.

$\frac{4}{8}+\frac{7}{8}=\frac{11}{8}=1\frac{3}{8}$

$\frac{8}{8}$ $\frac{3}{8}$



3. Solve. Write the sum as a mixed number. Draw a model if needed.

$\frac{5}{6}+\frac{2}{3}$

$\frac{5}{6}+\frac{2}{3}=\frac{5}{6}+\frac{4}{6}=\frac{9}{6}=1\frac{3}{6}$

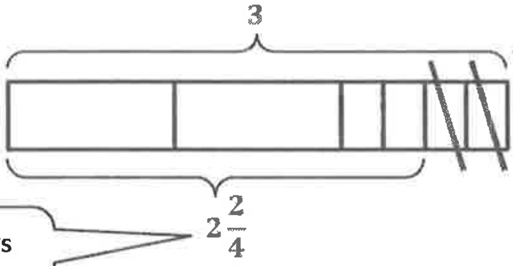
$\frac{6}{6}$ $\frac{3}{6}$

I double the units (denominator) to make sixths, which means I also need to double the number of units (numerator). $\frac{2}{3}$ is equal to $\frac{4}{6}$.

G4-M5-Lesson 22

1. Draw a tape diagram to match the number sentence. Then, complete the number sentence.

$3 - \frac{2}{4} = \underline{2\frac{2}{4}}$



I draw a tape diagram with 3 equal units, with 1 unit decomposed into fourths. To show the subtraction, I cross off $\frac{2}{4}$.

The tape diagram shows the difference is $2\frac{2}{4}$.

2. Use $\frac{5}{6}$, 3, and $2\frac{1}{6}$ to write two subtraction and two addition number sentences.

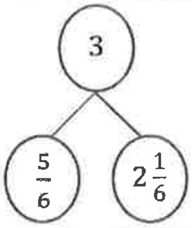
$\frac{5}{6} + 2\frac{1}{6} = 3$

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

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

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

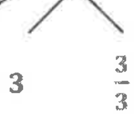
I can also represent the relationship between these 3 numbers with a number bond.



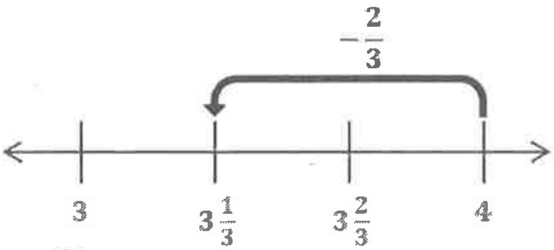
3. Solve using a number bond. Draw a number line to represent the number sentence.

$4 - \frac{2}{3} = \underline{3\frac{1}{3}}$

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



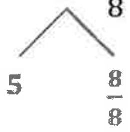
I use a number bond to decompose 4 into 3 and $\frac{3}{3}$. Then, I subtract $\frac{2}{3}$ from $\frac{3}{3}$.



I draw a number line with the endpoints 3 and 4 because I am starting at 4 and subtracting a number less than 1.

4. Complete the subtraction sentence using a number bond.

$6 - \frac{6}{8} = \underline{5\frac{2}{8}}$



$\frac{8}{8} - \frac{6}{8} = \frac{2}{8}$

$5 + \frac{2}{8} = 5\frac{2}{8}$

I subtract $\frac{6}{8}$ from $\frac{8}{8}$ to get $\frac{2}{8}$. I add $\frac{2}{8}$ back to 5.

G4-M5-Lesson 23

1. Count by 1 fifths. Start at 0 fifths. End at 10 fifths. Circle any fractions that are equivalent to a whole number. Record the whole number below the fraction.

$$\underset{0}{\frac{0}{5}},\ \frac{1}{5},\ \frac{2}{5},\ \frac{3}{5},\ \frac{4}{5},\ \underset{1}{\frac{5}{5}},\ \frac{6}{5},\ \frac{7}{5},\ \frac{8}{5},\ \frac{9}{5},\ \underset{2}{\frac{10}{5}}$$

I know that 5 fifths equals 1, so 10 fifths equals 2.

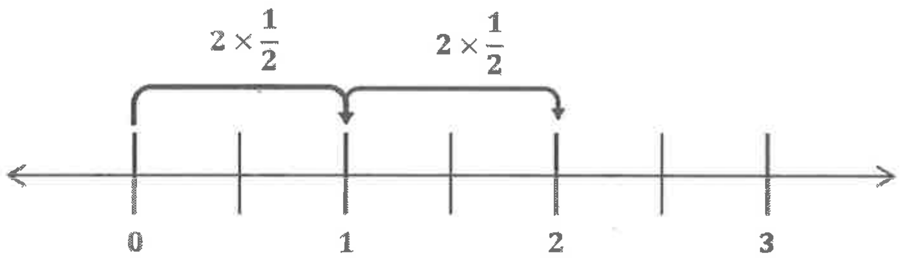
2. Use parentheses to show how to make ones in the following number sentence.

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

I draw parentheses around groups of 4 fourths because the denominator (fourths) tells me how many unit fractions composed make 1.

3. Multiply. Draw a number line to support your answer.

$4 \times \frac{1}{2}$



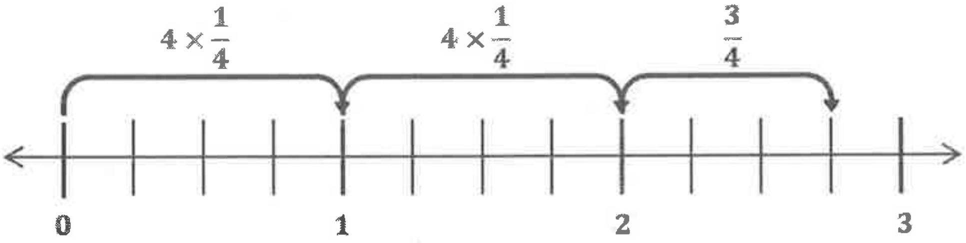
$$4 \times \frac{1}{2} = 2 \times \frac{2}{2} = 2$$

I see on my number line that 4 copies of $\frac{1}{2}$ is the same as 2 copies of $\frac{2}{2}$. Since $\frac{2}{2}$ is the same as 1, I think of 2 copies of $\frac{2}{2}$ as the multiplication sentence, $2 \times 1 = 2$. So, $4 \times \frac{1}{2} = 2$.

4. Multiply. Write the product as a mixed number. Draw a number line to support your answer.

$11 \times \frac{1}{4}$

I draw a number line and partition each whole into fourths since the fractional unit that I'm multiplying by is fourths.



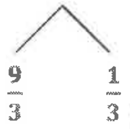
$$11 \times \frac{1}{4} = \left(2 \times \frac{4}{4}\right) + \frac{3}{4} = 2 + \frac{3}{4} = 2\frac{3}{4}$$

I can see on my number line that 11 copies of $\frac{1}{4}$ equals 2 copies of $\frac{4}{4}$ plus $\frac{3}{4}$.

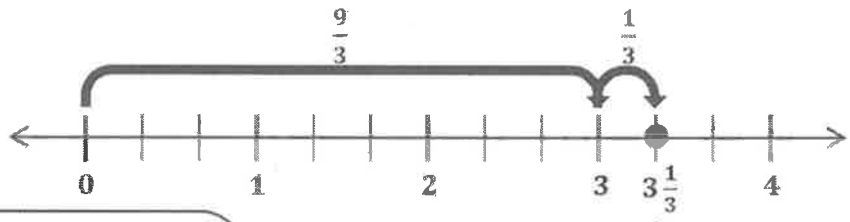
G4-M5-Lesson 24

1. Rename $\frac{10}{3}$ as a mixed number by decomposing it into two parts. Model the decomposition with a number line and a number bond.

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



I choose the 2 parts $\frac{9}{3}$ and $\frac{1}{3}$ for the number bond because $\frac{9}{3}$ is 3 groups of $\frac{3}{3}$, or 3. Then, I add the other part of my number bond, $\frac{1}{3}$, to get the mixed number $3\frac{1}{3}$.

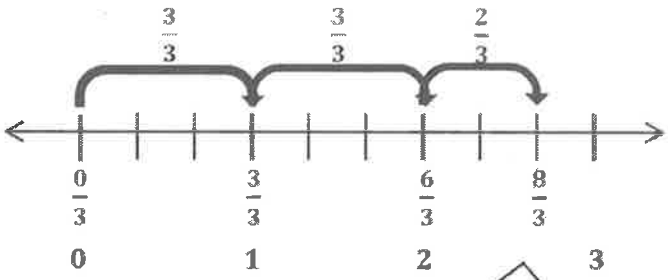


The number line shows that decomposing $\frac{10}{3}$ as $\frac{9}{3}$ and $\frac{1}{3}$ is the same as $3\frac{1}{3}$.

2. Rename $\frac{8}{3}$ as a mixed number using multiplication. Draw a number line to support your answer.

$$\frac{8}{3}=\frac{3\times 2}{3}+\frac{2}{3}=2+\frac{2}{3}=2\frac{2}{3}$$

I use multiplication to show that $\frac{6}{3}$ is 2 copies of $\frac{3}{3}$, which is the same as 2.



The number line supports $\frac{8}{3}$ renamed as $2\frac{2}{3}$. They are equal.

3. Convert $\frac{22}{7}$ to a mixed number.

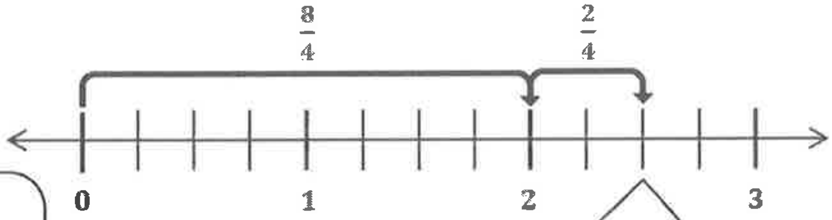
$$\frac{22}{7}=\left(3\times\frac{7}{7}\right)+\frac{1}{7}=3+\frac{1}{7}=3\frac{1}{7}$$

I can make 3 groups of $\frac{7}{7}$, which equals $\frac{21}{7}$.

I can add 1 more seventh to equal $\frac{22}{7}$.

G4-M5-Lesson 25

1. Convert the mixed number $2\frac{2}{4}$ to a fraction greater than 1. Draw a number line to model your work.



$2\frac{2}{4}$ is the same as $2 + \frac{2}{4}$. I rename 2 as $\frac{8}{4}$ because there are $\frac{8}{4}$ in 2. Then, I add $\frac{2}{4}$ to $\frac{8}{4}$ to get $\frac{10}{4}$.

The number line shows $2\frac{2}{4} = \frac{10}{4}$.

2. Use multiplication to convert the mixed number $5\frac{1}{4}$ to a fraction greater than 1.

$$5\frac{1}{4} = 5 + \frac{1}{4} = \left(5 \times \frac{4}{4}\right) + \frac{1}{4} = \frac{20}{4} + \frac{1}{4} = \frac{21}{4}$$

I rewrite 5 as the multiplication expression, $5 \times \frac{4}{4}$. Then, I can multiply $5 \times \frac{4}{4}$ to get $\frac{20}{4}$. So, there are $\frac{20}{4}$ in 5. Then, I add the $\frac{1}{4}$ from the $5\frac{1}{4}$ to get $\frac{21}{4}$.

3. Convert the mixed number $6\frac{1}{3}$ to a fraction greater than 1.

$$6\frac{1}{3} = \frac{18}{3} + \frac{1}{3} = \frac{19}{3}$$

I use mental math. There are 6 ones and 1 third in the number $6\frac{1}{3}$. I know that there are 18 thirds in 6 ones. 18 thirds plus 1 more third is 19 thirds.

G4-M5-Lesson 26

1.

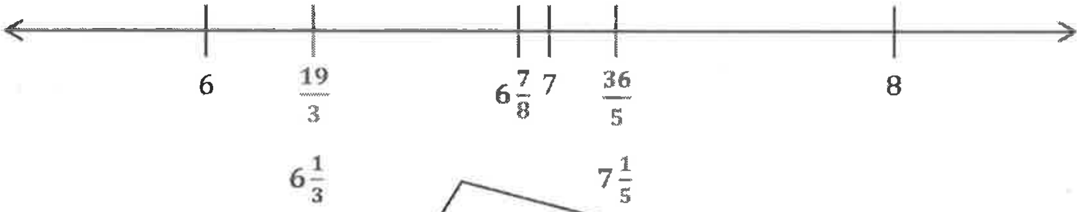
a. Plot the following points on the number line without measuring.

i. $6\frac{7}{8}$

ii. $\frac{36}{5} = 7\frac{1}{5}$

iii. $\frac{19}{3} = 6\frac{1}{3}$

To plot the numbers on the number line, I rewrite $\frac{36}{5}$ and $\frac{19}{3}$ as mixed numbers.



I estimate to plot each number on the number line. I know that $6\frac{7}{8}$ is $\frac{1}{8}$ less than 7. I use this strategy to plot $6\frac{1}{3}$ and $7\frac{1}{5}$.

b. Use the number line in Part 1(a) to compare the numbers by writing >, <, or =.

i. $\frac{19}{3}$ __<__ $6\frac{7}{8}$

ii. $\frac{36}{5}$ __>__ $\frac{19}{3}$

I remember from Lessons 12 and 13 how I used the benchmarks of 0, $\frac{1}{2}$, and 1 to compare. $\frac{19}{3}$ is less than $6\frac{1}{2}$, and $6\frac{7}{8}$ is greater than $6\frac{1}{2}$. $\frac{36}{5}$ is greater than 7 and $\frac{19}{3}$ is less than 7.

2. Compare the fractions given below by writing >, <, or =. Give a brief explanation for each answer, referring to benchmark fractions.

   a. $4\frac{4}{8}$ ___>___ $4\frac{2}{5}$

   $4\frac{4}{8}$ is the same as $4\frac{1}{2}$. $4\frac{2}{5}$ is less than $4\frac{1}{2}$, so $4\frac{4}{8}$ is greater than $4\frac{2}{5}$.

   b. $\frac{43}{9}$ ___<___ $\frac{35}{7}$

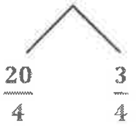
   $\frac{35}{7}$ is the same as 5. $\frac{43}{9}$ needs 2 more ninths to equal 5. That means that $\frac{35}{7}$ is greater than $\frac{43}{9}$.

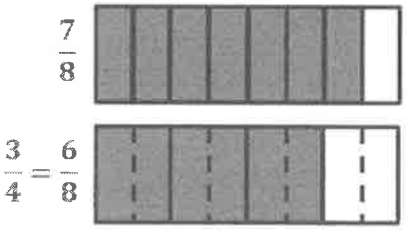
G4-M5-Lesson 27

1. Draw a tape diagram to model the comparison. Use >, <, or = to compare.

$5\frac{7}{8}$ __>__ $\frac{23}{4}$

$\frac{23}{4} = 5\frac{3}{4}$





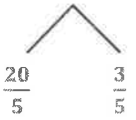
I can rename $\frac{23}{4}$ as a mixed number, $5\frac{3}{4}$.

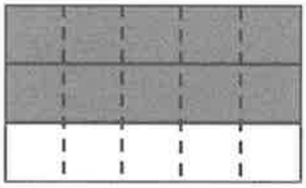
Since both numbers have 5 ones, I draw tape diagrams to represent the fractional parts of each number. I decompose fourths to eighths. My tape diagrams show that $\frac{3}{4} = \frac{6}{8}$ and $\frac{7}{8} > \frac{6}{8}$.

2. Use an area model to make like units. Then, use >, <, or = to compare.

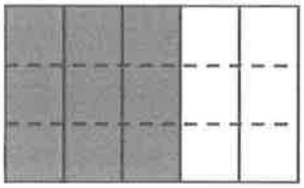
$4\frac{2}{3}$ __>__ $\frac{23}{5}$

$\frac{23}{5} = 4\frac{3}{5}$





$\frac{2}{3} = \frac{10}{15}$



$\frac{3}{5} = \frac{9}{15}$

I draw area models to represent the fractional parts of each number. I make like units by drawing fifths vertically on the thirds and thirds horizontally on the fifths.

3. Compare each pair of fractions using >, <, or = using any strategy.

a. $\frac{14}{6}$ __>__ $\frac{14}{9}$

Both fractions have the same numerator. Since sixths are bigger than ninths, $\frac{14}{6} > \frac{14}{9}$.

b. $\frac{19}{4}$ __<__ $\frac{25}{5}$

$\frac{25}{5} = 5$, and $\frac{19}{4} < 5$ because is takes 20 fourths to equal 5.

c. $6\frac{2}{6}$ __>__ $6\frac{4}{9}$

$$\frac{2 \times 3}{6 \times 3} = \frac{6}{18}$$

$$\frac{4 \times 2}{9 \times 2} = \frac{8}{18}$$

$$\frac{6}{18} < \frac{8}{18}$$

I make like units, eighteenths, and compare.

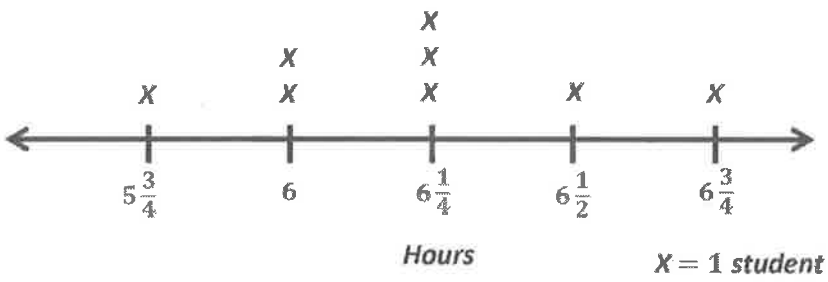
G4-M5-Lesson 28

1. A group of students recorded the amount of time they spent doing homework in a week. The times are shown in the table. Make a line plot to display the data.

Student	Time Spent Doing Homework (in hours)
Rebecca	$6\frac{1}{4}$ ✓
Noah	6 ✓
Wilson	$5\frac{3}{4}$ ✓
Jenna	$6\frac{1}{4}$ ✓
Sam	$6\frac{1}{2}$ ✓
Angie	6 ✓
Matthew	$6\frac{1}{4}$ ✓
Jessica	$6\frac{3}{4}$ ✓

I can make a line plot with an interval of fourths because that's the smallest unit in the table. My endpoints are $5\frac{3}{4}$ and $6\frac{3}{4}$ because those are the shortest and longest times spent doing homework. I can draw an X above the correct time on the number line to represent the time each student spent doing homework.

Time Spent Doing Homework in One Week



2. Solve each problem.

   a. Who spent 1 hour longer doing homework than Wilson?

   $$5\frac{3}{4} + 1 = 6\frac{3}{4}$$

   Jessica spent 1 hour longer doing homework than Wilson.

   I can add 1 hour to Wilson's time and look at the table to find the answer.

   b. How many quarter hours did Jenna spend doing homework?

   $$6\frac{1}{4} = \frac{24}{4} + \frac{1}{4} = \frac{25}{4}$$

   Jenna spent 25 quarter hours doing her homework.

c. What is the difference, in hours, between the most frequent amount of time spent doing homework and the second most frequent amount of time spent doing homework?

$6\frac{1}{4} - 6 = \frac{1}{4}$

The difference is 1 fourth hour.

The X's on the line plot help me see the most frequent time, $6\frac{1}{4}$ hours, and the second most frequent time, 6 hours.

d. Compare the times of Matthew and Sam using >, <, or =.

$6\frac{1}{4} < 6\frac{1}{2}$

Matthew spent less time doing his homework than Sam.

e. How many students spent less than $6\frac{1}{2}$ hours doing their homework?

Six students spent less than $6\frac{1}{2}$ hours doing their homework.

I can count the X's on the line plot for $5\frac{3}{4}$ hours, 6 hours, and $6\frac{1}{4}$ hours.

f. How many students recorded the amount of time they spent doing their homework?

Eight students recorded the amount of time they spent doing their homework.

I can count the X's on the line plot, or I can count the students in the table.

g. Scott spent $\frac{30}{4}$ hours in one week doing his homework. Use >, <, or = to compare Scott's time to the time of the student who spent the most hours doing homework. Who spent more time doing homework?

$\frac{30}{4} = \frac{28}{4} + \frac{2}{4} = 7 + \frac{2}{4} = 7\frac{2}{4}$

$7\frac{2}{4} > 6\frac{3}{4}$

I can rename Scott's time as a mixed number, and then I can compare (or I can rename Jessica's time as a fraction greater than 1). There are 7 ones in Scott's time and only 6 ones in Jessica's time.

Scott spent more time than Jessica doing homework.

G4-M5-Lesson 29

1. Estimate each sum or difference to the nearest half or whole number by rounding. Explain your estimate using words or a number line.

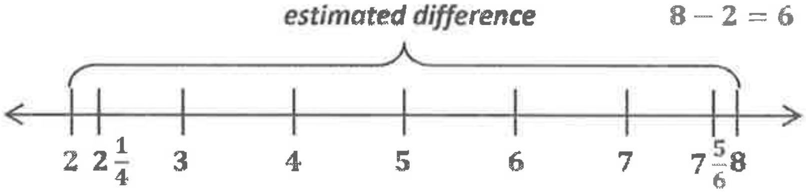
a. $4\frac{1}{9} + 2\frac{4}{5} \approx$ 7

$4\frac{1}{9}$ is close to 4, and $2\frac{4}{5}$ is close to 3. $4 + 3 = 7$

$4\frac{1}{9}$ is 1 ninth more than 4. $2\frac{4}{5}$ is 1 fifth less than 3.

b. $7\frac{5}{6} - 2\frac{1}{4} \approx$ 6

$8 - 2 = 6$



I draw a number line and plot the mixed numbers. It's easy to see on my number line that $7\frac{5}{6}$ is close to 8 and $2\frac{1}{4}$ is close to 2.

My number line makes it easy to see that the estimated difference is larger than the actual difference because I rounded one number up and the other number down.

c. $5\frac{4}{10} + 3\frac{1}{8} \approx$ $8\frac{1}{2}$

$5\frac{4}{10}$ is close to $5\frac{1}{2}$, and $3\frac{1}{8}$ is close to 3. $5\frac{1}{2} + 3 = 8\frac{1}{2}$

d. $\frac{15}{7} + \frac{20}{3} \approx$ 9

$\frac{15}{7} = 2\frac{1}{7}$

$2\frac{1}{7} \approx 2$

$\frac{20}{3} = 6\frac{2}{3}$

$6\frac{2}{3} \approx 7$

$2 + 7 = 9$

I renamed each fraction greater than 1 as a mixed number. Then, I rounded to the nearest whole number and added the rounded numbers.

2. Ben's estimate for $8\frac{6}{10} - 3\frac{1}{4}$ was 6. Michelle's estimate was $5\frac{1}{2}$. Whose estimate do you think is closer to the actual difference? Explain.

I think Michelle's estimate is closer to the actual difference. Ben rounded both numbers to the nearest whole number and then subtracted: $9 - 3 = 6$. *Michelle rounded* $8\frac{6}{10}$ *to the nearest half,* $8\frac{1}{2}$, *and she rounded* $3\frac{1}{4}$ *to the nearest whole number. Then, she subtracted:* $8\frac{1}{2} - 3 = 5\frac{1}{2}$. *Since* $8\frac{6}{10}$ *is closer to* $8\frac{1}{2}$ *than 9, rounding it to the nearest half will give a closer estimate than rounding both numbers to the nearest whole number.*

I can also draw number lines to show the actual difference, Ben's estimated difference, and Michelle's estimated difference. Because Ben rounded the total up and the part down, his estimated difference will be greater than the actual difference.

3. Use benchmark numbers or mental math to estimate the sum.

$14\frac{3}{8} + 7\frac{7}{12} \approx \mathbf{22}$

$14\frac{1}{2} + 7\frac{1}{2} = 21 + 1 = 22$

$\frac{3}{8}$ is 1 eighth less than $\frac{1}{2}$, and $\frac{7}{12}$ is 1 twelfth greater than $\frac{1}{2}$. I add the ones, and then I add the halves to get 22.

G4-M5-Lesson 30

1. Solve.

$6\frac{2}{5} + \frac{3}{5} = 6\frac{5}{5} = 7$

I add using unit form. 6 ones 2 fifths + 3 fifths = 6 ones 5 fifths. I know that $\frac{5}{5} = 1$, so $6 + 1 = 7$.

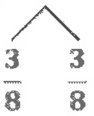
2. Complete the number sentence.

$18 = 17\frac{3}{10} + \underline{\frac{7}{10}}$

I know that $17 + 1 = 18$, so I need to find a fraction that equals 1 when added to $\frac{3}{10}$. $3 + 7 = 10$, so the fraction that completes the number sentence is 7 tenths.

3. Use a number bond and the arrow way to show how to make one. Solve.

$3\frac{5}{8} + \frac{6}{8}$



I decompose $\frac{6}{8}$ into $\frac{3}{8}$ and $\frac{3}{8}$ because I know $3\frac{5}{8}$ needs $\frac{3}{8}$ to make the next whole number, 4.

$3\frac{5}{8} \xrightarrow{+\frac{3}{8}} 4 \xrightarrow{+\frac{3}{8}} 4\frac{3}{8}$

The arrow way reminds me of making ten or making change from a dollar.

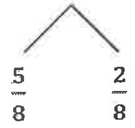
4. Solve.

$\frac{7}{8} + 4\frac{6}{8}$

$\frac{7}{8} + 4\frac{6}{8} = 4\frac{13}{8} = 5\frac{5}{8}$

I can add using any method that makes sense to me, like adding in unit form, using the arrow method, or adding to make the next 1, as shown below.

$\frac{7}{8} + 4\frac{6}{8} = \frac{5}{8} + 5 = 5\frac{5}{8}$



G4-M5-Lesson 31

1. Solve.

$3\frac{1}{5} + 2\frac{4}{5}$

I can add like units. 3 ones 1 fifth + 2 ones 4 fifths = 5 ones 5 fifths.

$$3\frac{1}{5} + 2\frac{4}{5} = 5 + \frac{5}{5} = 5 + 1 = 6$$

$3 \quad \frac{1}{5} \quad 2 \quad \frac{4}{5}$

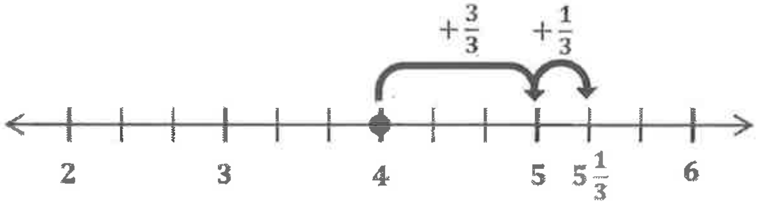
I can use number bonds to decompose the numbers into ones and fifths.

2. Solve. Use a number line to show your work.

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

$$1\frac{2}{3} + 3\frac{2}{3} = 4 + \frac{4}{3} = 5\frac{1}{3}$$

$\frac{3}{3} \quad \frac{1}{3}$



I add the ones and thirds. I decompose $\frac{4}{3}$ into 1 and $\frac{1}{3}$. $4 + 1 + \frac{1}{3} = 5\frac{1}{3}$

3. Solve. Use the arrow way to show how to make one.

$4\frac{7}{12} + 3\frac{9}{12}$

$$4\frac{7}{12} + 3\frac{9}{12} = 7\frac{7}{12} + \frac{9}{12} = 8\frac{4}{12}$$

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

$$7\frac{7}{12} \xrightarrow{+\frac{5}{12}} 8 \xrightarrow{+\frac{4}{12}} 8\frac{4}{12}$$

I use the arrow way to add $\frac{5}{12}$ and $7\frac{7}{12}$ to make the next whole number. Then, I add the other part of the number bond to get $8\frac{4}{12}$.

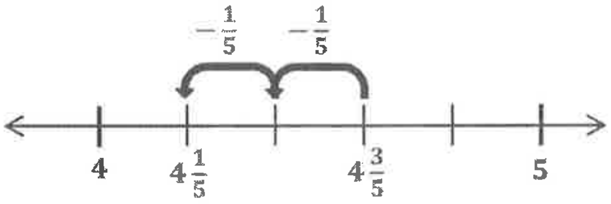
G4-M5-Lesson 32

1. Subtract. Model with a number line or the arrow way.

$4\frac{3}{5} - \frac{2}{5} = 4\frac{1}{5}$

I can subtract 2 fifths $\frac{1}{5}$ at a time or all at once.

$4\frac{3}{5} \xrightarrow{-\frac{1}{5}} 4\frac{2}{5} \xrightarrow{-\frac{1}{5}} 4\frac{1}{5}$



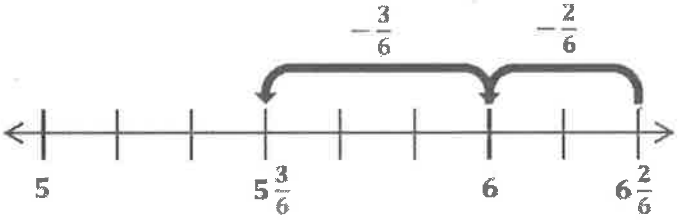
2. Use decomposition to subtract the fractions. Model with a number line or the arrow way.

$6\frac{2}{6} - \frac{5}{6}$

$\frac{2}{6}$ $\frac{3}{6}$

I decompose $\frac{5}{6}$ into $\frac{2}{6}$ and $\frac{3}{6}$ so that I can subtract $\frac{2}{6}$ from $6\frac{2}{6}$ to get to a whole number.

$6\frac{2}{6} \xrightarrow{-\frac{2}{6}} 6 \xrightarrow{-\frac{3}{6}} 5\frac{3}{6}$



I subtract the other part of the number bond, $\frac{3}{6}$.

3. Decompose the total to subtract the fraction.

$8\frac{2}{12} - \frac{9}{12}$

There aren't enough twelfths to subtract 9 twelfths, so I decompose the total to subtract $\frac{9}{12}$ from 1.

$8\frac{2}{12} - \frac{9}{12} = 7\frac{2}{12} + \frac{3}{12} = 7\frac{5}{12}$

$7\frac{2}{12}$ 1

Once $\frac{9}{12}$ is subtracted, the remaining numbers are added together.

G4-M5-Lesson 33

1. Write a related addition sentence. Subtract by counting on. Use a number line or the arrow way to help.

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

I add the numbers on top of the arrows to find the unknown addend.

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

$2\frac{3}{4} + \underline{3\frac{2}{4}} = 6\frac{1}{4}$

$2\frac{3}{4} \xrightarrow{+\frac{1}{4}} 3 \xrightarrow{+3} 6 \xrightarrow{+\frac{1}{4}} 6\frac{1}{4}$

I use the arrow way to count up to solve for the unknown in my addition sentence. I add $\frac{1}{4}$ to get to the next one, 3.

I add 3 to get to 6.

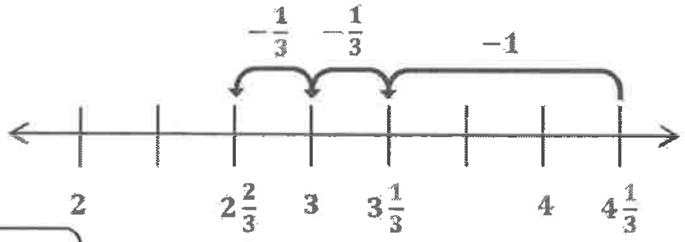
My final number needs to be $6\frac{1}{4}$, so I need to add 1 more fourth.

2. Subtract by decomposing the fractional part of the number you are subtracting. Use a number line or the arrow way to help you.

$4\frac{1}{3} - 1\frac{2}{3} = 3\frac{1}{3} - \underbrace{\frac{2}{3}}_{\frac{1}{3}\quad\frac{1}{3}} = 2\frac{2}{3}$

I subtract 1 from $4\frac{1}{3}$.

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



EUREKA MATH

3. Subtract by decomposing to take one out.

$7\frac{2}{10} - 5\frac{9}{10}$

$$7\frac{2}{10} - 5\frac{9}{10} = 2\frac{2}{10} - \frac{9}{10} = 1\frac{2}{10} + \frac{1}{10} = 1\frac{3}{10}$$

$1\frac{2}{10}$ 1

I decompose $2\frac{2}{10}$ to take 1 out.

I subtract $1 - \frac{9}{10}$.

I add the other part of the number bond, $1\frac{2}{10}$, to the difference of $1 - \frac{9}{10}$.

G4-M5-Lesson 34

1. Subtract.

$$8\frac{2}{7} - \frac{6}{7} = 7\frac{9}{7} - \frac{6}{7} = 7\frac{3}{7}$$

$7 \quad \frac{9}{7}$

Now I have 9 sevenths, which is enough sevenths to subtract 6 sevenths.

It's just like renaming 1 ten for 10 ones when subtracting whole numbers, except I rename 1 one for 7 sevenths.

2. Subtract the ones first.

$$7\frac{2}{6} - 4\frac{5}{6} = 3\frac{2}{6} - \frac{5}{6} = 2\frac{3}{6}$$

$2 \quad \frac{8}{6}$

I subtract 4 from $7\frac{2}{6}$.

Then, I decompose $3\frac{2}{6}$ to rename enough sixths to subtract 5 sixths.

$$7\frac{2}{6} \xrightarrow{-4} 3\frac{2}{6} \xrightarrow{-\frac{5}{6}} 2\frac{3}{6}$$

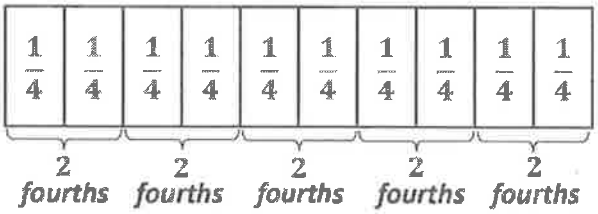
I can show the same work with the arrow way.

G4-M5-Lesson 35

1. Draw and label a tape diagram to show the following is true:

   10 fourths = 5 × (2 fourths) = (5 × 2) fourths

I can move the parentheses in the equation, associating the factors, 5 and 2. When I do so, fourths becomes the unit.



I can do this with any unit:

10 bananas = 5 × (2 bananas) = (5 × 2) bananas.

Using brackets to group every 2 units of $\frac{1}{4}$, I model 5 copies of 2 fourths.

The product of 5 and 2 is 10. My model shows that (5 × 2) fourths is the same as 5 × (2 fourths), or 10 fourths.

2. Write the equation in unit form to solve.

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

   8×2 *thirds* $= 16$ *thirds*

Unit form simplifies my multiplication. Instead of puzzling over how to multiply a fraction by a whole number, I unveil an easy fact I can solve fast! I know 8 × 2 is 16, so 8 × 2 thirds is 16 thirds.

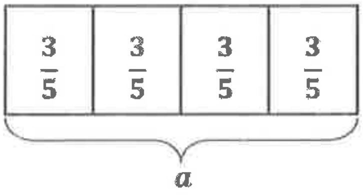
3. Solve.

   $6 \times \frac{3}{4}$

   $6 \times \frac{3}{4} = \frac{6 \times 3}{4} = \frac{18}{4}$

The unit is fourths! I think in unit form, 6 × 3 fourths is 18 fourths.

4. Ms. Swanson bought some apple juice. Each member of her family drank $\frac{3}{5}$ cup for breakfast. Including Ms. Swanson, there are four people in her family. How many cups of apple juice did they drink?



$$a = 4 \times \frac{3}{5}$$

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

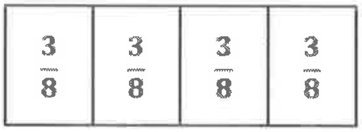
$$= \frac{12}{5}$$

$$a = 2\frac{2}{5}$$

Ms. Swanson and her family drank $2\frac{2}{5}$ *cups of apple juice.*

G4-M5-Lesson 36

1. Draw a tape diagram to represent $\frac{3}{8}+\frac{3}{8}+\frac{3}{8}+\frac{3}{8}$.



I model 4 copies of $\frac{3}{8}$.

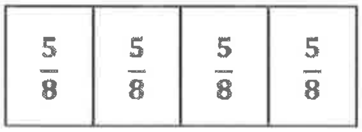
Write a multiplication expression equal to $\frac{3}{8}+\frac{3}{8}+\frac{3}{8}+\frac{3}{8}$.

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

Multiplication is more efficient than addition. I can solve easily by thinking in unit form: 4 × 3 eighths is 12 eighths.

2. Solve using any method. Express your answers as whole or mixed numbers.

a. $4\times\frac{5}{8}$



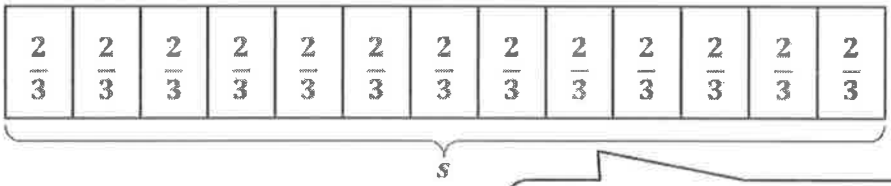
$$4\times\frac{5}{8}=\frac{4\times 5}{8}=\frac{20}{8}=2\frac{4}{8}=2\frac{1}{2}$$

b. $32\times\frac{2}{5}$

$$32\times\frac{2}{5}=32\times 2\ \textit{fifths}=64\ \textit{fifths}=\frac{64}{5}=12\frac{4}{5}$$

To solve, I think to myself, 5 times what number is close to or equal to 64? Or, I can divide 64 by 5.

3. A bricklayer places 13 bricks end to end along the entire outside length of a shed's wall. Each brick is $\frac{2}{3}$ foot long. How long is that wall of the shed?



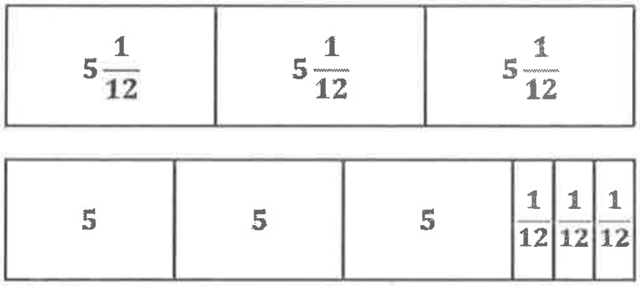
$$13\times\frac{2}{3}=\frac{13\times 2}{3}=\frac{26}{3}=8\frac{2}{3}$$

The wall of the shed is $8\frac{2}{3}$ *feet long.*

It would take too long to write an addition sentence to solve! Multiplication is quick and easy!

G4-M5-Lesson 37

1. Draw tape diagrams to show two ways to represent 3 units of $5\frac{1}{12}$.



I rearrange the model for 3 copies of $5\frac{1}{12}$ by decomposing $5\frac{1}{12}$ into two parts: 5 and $\frac{1}{12}$. I show 3 groups of 5 and 3 groups of $\frac{1}{12}$.

Write a multiplication expression to match each tape diagram.

$3 \times 5\frac{1}{12}$

$(3 \times 5) + \left(3 \times \frac{1}{12}\right)$

$5\frac{1}{12}$ is composed of two units: ones and twelfths. I use the distributive property to multiply the value of each unit by 3. $3 \times 5\frac{1}{12}$ is equal to 3 fives and 3 twelfths.

2. Solve using the distributive property.

a. $2 \times 3\frac{5}{6} = 2 \times \left(3 + \frac{5}{6}\right)$

$= (2 \times 3) + \left(2 \times \frac{5}{6}\right)$

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

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

$= 7\frac{4}{6}$

I omit writing this step for Part (b) because I can see it's 4 copies of 2 and 4 copies of $\frac{3}{4}$, or $8 + \frac{12}{4}$.

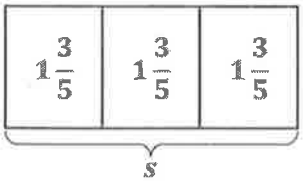
b. $4 \times 2\frac{3}{4} = 4 \times \left(2 + \frac{3}{4}\right)$

$= 8 + \frac{12}{4}$

$= 8 + 3$

$= 11$

3. Sara's street is $1\frac{3}{5}$ miles long. She ran the length of the street 3 times. How far did she run?



$$\begin{aligned} s &= 3 \times 1\frac{3}{5} \\ &= (3 \times 1) + \left(3 \times \frac{3}{5}\right) \\ &= 3 + \frac{9}{5} \\ &= 3 + 1\frac{4}{5} \\ s &= 4\frac{4}{5} \end{aligned}$$

I use the distributive property to multiply the ones by 3 and the fractional part by 3.

Sara ran $4\frac{4}{5}$ miles.

G4-M5-Lesson 38

1. Fill in the unknown factors.

a. $7 \times 3\frac{4}{5} = (\underline{\quad 7 \quad} \times 3) + (\underline{\quad 7 \quad} \times \frac{4}{5})$

The mixed number is distributed as the whole and the fraction. Both of the distributed numbers have to be multiplied by 7, so 7 is the missing factor.

b. $6 \times 4\frac{3}{8} = (6 \times \underline{\quad 4 \quad}) + (6 \times \underline{\quad \frac{3}{8} \quad})$

2. Multiply. Use the distributive property.

$5 \times 7\frac{3}{5}$

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

$$\begin{aligned} 5 \times 7\frac{3}{5} &= 35 + \frac{15}{5} \\ &= 35 + 3 \\ &= 38 \end{aligned}$$

I break apart $7\frac{3}{5}$ into 7 and $\frac{3}{5}$. 5 sevens equals 35, and 5 copies of 3 fifths equals 15 fifths, or 3.

3. Amina's dog ate $2\frac{2}{3}$ cups of dog food each day for three weeks. How much dog food did Amina's dog eat during the three weeks?

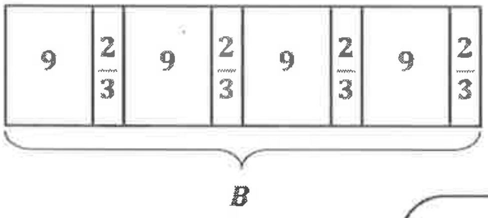
There are 7 days in a week. To find the number of days in 3 weeks, I multiply 7 × 3. There are 21 days in 3 weeks.

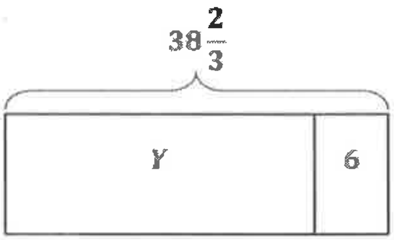
$$\begin{aligned} 21 \times 2\frac{2}{3} &= 42 + \frac{42}{3} \\ &= 42 + 14 \\ &= 56 \end{aligned}$$

Amina's dog ate 56 cups of food during the three weeks.

G4-M5-Lesson 39

1. It takes $9\frac{2}{3}$ yards of yarn to make one baby blanket. Upik needs four times as much yarn to make four baby blankets. She already has 6 yards of yarn. How many more yards of yarn does Upik need to buy in order to make four baby blankets?





$$\begin{aligned} B &= 4 \times 9\frac{2}{3} \\ &= 4 \times \left(9 + \frac{2}{3}\right) \\ &= (4 \times 9) + \left(4 \times \frac{2}{3}\right) \\ &= 36 + \frac{8}{3} \\ &= 36 + 2\frac{2}{3} \\ B &= 38\frac{2}{3} \end{aligned}$$

I multiply to solve for how many total yards of yarn it takes to make four baby blankets.

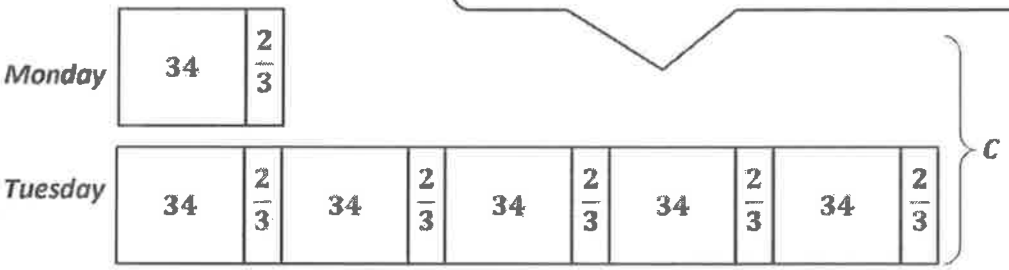
$$\begin{aligned} Y &= 38\frac{2}{3} - 6 \\ &= 32\frac{2}{3} \end{aligned}$$

I subtract 6 yards of yarn that Upik already has.

Upik needs to buy $32\frac{2}{3}$ more yards of yarn.

2. The caterpillar crawled $34\frac{2}{3}$ centimeters on Monday. He crawled 5 times as far on Tuesday. How far did he crawl in the two days?

I use the tape diagram to find the most efficient way to solve. To solve for C, I find the value of 6 units.



The caterpillar crawled 208 *centimeters, or* 2 *meters* 8 *centimeters, on Monday and Tuesday.*

$$C = 6 \times 34\frac{2}{3}$$

$$C = (6 \times 34) + \left(6 \times \frac{2}{3}\right)$$

$$C = 204 + \frac{12}{3}$$

$$C = 204 + 4$$

$$C = 208$$

G4-M5-Lesson 40

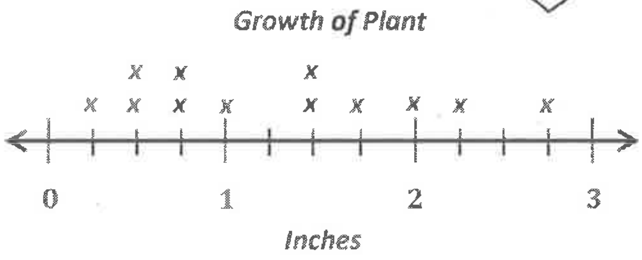
Noura recorded the growth of her plant during the year.

The measurements are listed in the table.

Month	Growth of Plant (in inches)
January	$\frac{1}{2}$
February	$\frac{3}{4}$
March	$1\frac{1}{2}$
April	2
May	$1\frac{1}{2}$
June	$1\frac{3}{4}$
July	$2\frac{3}{4}$
August	$2\frac{1}{4}$
September	1
October	$\frac{3}{4}$
November	$\frac{1}{2}$
December	$\frac{1}{4}$

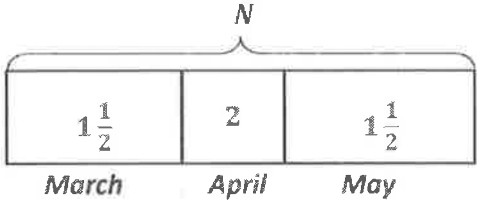
1. Use the data to create a line plot.

I remember making a line plot in Lesson 28.



x = growth in one month

2. How many inches did Noura's plant grow in the spring months of March, April, and May?



I add the whole numbers first!

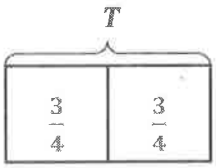
$N = 1\frac{1}{2} + 1 + 1\frac{1}{2}$

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

$N = 4$

Noura's plant grew a total of 4 inches during the spring months.

3. In which months did her plant grow twice as many inches as it did in October?



I use multiplication to solve!

$T = 2 \times \frac{3}{4}$

$T = \frac{6}{4}$

$T = 1\frac{1}{2}$

I can use a number bond or number line to help rename a fraction to a mixed number, if needed.

Noura's plant grew twice as many inches in the months of May and March as it did in October.

G4-M5-Lesson 41

1. Find the sums.

I draw brackets connecting fractions that add up to equal 1.

There are 2 pairs of fractions that equal 1. 2 fourths is leftover without a partner.

a. $\underbrace{\frac{0}{3}+\overbrace{\frac{1}{3}+\frac{2}{3}}^{1}+\frac{3}{3}}_{1}$

$\left(\frac{0}{3}+\frac{3}{3}\right)+\left(\frac{1}{3}+\frac{2}{3}\right)=1+1=2$

The denominator is odd. Every addend has a partner.

b. $\underbrace{\frac{0}{4}+\overbrace{\frac{1}{4}+\frac{2}{4}+\frac{3}{4}}^{1}+\frac{4}{4}}_{1}$

$\left(\frac{0}{4}+\frac{4}{4}\right)+\left(\frac{1}{4}+\frac{3}{4}\right)+\frac{2}{4}=1+1+\frac{1}{2}=2\frac{1}{2}$

The denominator is even. One addend does not have a partner. This could be a pattern.

2. Find the sums.

I notice patterns that help me solve without calculating!

a. $\frac{0}{13}+\frac{1}{13}+\frac{2}{13}+\cdots+\frac{13}{13}$

7

I think about the number of addends, 14, in the expression with odd denominators.

b. $\frac{0}{16}+\frac{1}{16}+\frac{2}{16}+\cdots+\frac{16}{16}$

$8\frac{8}{16}$

There are 17 addends in this expression with even denominators. Half of 17 is $8\frac{1}{2}$.

3. How can you apply this strategy to find the sum of all the whole numbers from 0 to 1,000?

Sample Student Response:

I can pair the $1,001$ *addends from* 0 *to* $1,000$ *to make sums that equal* $1,000$. *There would be* 500 *pairs. One addend would be left over. I multiply* $1,000 \times 500$, *which makes* $500,000$. *When I add the left over addend, I have a total sum of* $500,500$.