Measurement Conversions and Fraction Operations

Grade 5: Unit 6

Standards addressed: 5.MD.A.1, 5.NBT.A.1, 5.NBT.A.2, 5.NF.B.6, 5.MD.B.2, 5.NF.A.1, 5.NF.A.2, 5.NF.B.5, 5.OA.A

Unit 6 Progression Overview

Section A
Lessons 1-7
5.MD.A.1, 5.NBT.A.1, 5.NBT.A.2, 5.NF.B.6

- ➔ Explain patterns when multiplying and dividing by powers of 10.
- ➔ Solve multi-step problems involving measurement conversions.

centimeters (cm)	meters (m)	kilometers (km)
100	1	0.001
1,000	10	0.01
10,000	100	0.1

Section B
Lessons 8-15
5.MD.B.2, 5.NF.A.1, 5.NF.A.2

- ➔ Add and subtract fractions with unlike denominators.
- ➔ Create line plots to display fractional measurement data, and use the information to solve problems.
- ➔ Solve problems involving fraction operations.

Complete the diagram to represent how far Priya ran.

Section C
Lessons 16-21
5.MD.B.2, 5.NF.A.2, 5.NF.B.5, 5.OA.A

- ➔ Interpret multiplication as scaling (resizing).
- ➔ Make generalizations about multiplying a whole number by a fraction greater than, less than and equal to 1.

Which of these expressions represents the largest product?

$\frac{5}{8} \times 4$ $\frac{7}{6} \times 4$ $\frac{1}{2} \times 4$

Unit 6 Quick Links

L1 L2 L3 L4 L5 L6 L7 Adapt 1 Adapt 2

Adapt 3 L8 L9 L10 L11 L12 L13 L14 L15

L16 L17 L18 L19 L20 L21

1

Patterns of Ten

Let's notice patterns in measurements.

5.MD.A.1, 5.NBT.A.1, 5.NBT.A.2

Number Talk

Warm up

Find the value of each expression mentally.

$$100 \times 1.5$$

Number Talk

Warm up

Find the value of each expression mentally.

$$1,000 \times 1.5$$

Number Talk

Warm up

Find the value of each expression mentally.

$$15 \div 10$$

Number Talk

Warm up

Find the value of each expression mentally.

$$15 \div 100$$

Broad Jump

Activity #1

1. The average standing broad jump distance for 5th graders is 148 centimeters. Are each of the students in the table below, at, or above the average? Explain or show your reasoning.

Here are the distances that each student jumped.

student	distance
Mai	1.61 meters
Tyler	1.43 meters
Clare	1.57 meters

2. The world record for the standing broad jump is 337 centimeters. Jada says that's more than Mai and Clare jumped combined. Do you agree with Jada? Explain or show your reasoning.

Broad Jump

Activity #1

Here are the distances that each student jumped.

student	distance
Mai	1.61 meters
Tyler	1.43 meters
Clare	1.57 meters

3. Tyler says his jump sounds more impressive if he reports it in millimeters.

a. How far is Tyler's jump in millimeters? What about Mai's and Clare's jumps?

b. Does the order of the jumps depend on the unit they are reported in?

c. Which unit do you think is best for reporting the jumps? Explain your reasoning

How Tall? How Long? How Far?

Activity #2

Below is some information about track and field events.

- The height of a hurdle is 1 meter.
- The approximate distance between hurdles in 110 meter races is 10 meters.
- The shortest race in many track competitions is 100 meters.

1. Complete the table.

meters	centimeters	millimeters
1		
10		
100		

2. What patterns do you notice in the table?

How Tall? How Long? How Far?

Activity #2

Below is some information about track and field events.

- The height of a hurdle is 1 meter.
- The approximate distance between hurdles in 110 meter races is 10 meters.
- The shortest race in many track competitions is 100 meters.

3. Three long-distance races are 10 kilometers, 100 kilometers, and 1,000 kilometers. How many meters are there in these races?

distance in kilometers	distance in meters
1	1,000
10	
100	
1,000	

4. What patterns do you notice in the table?

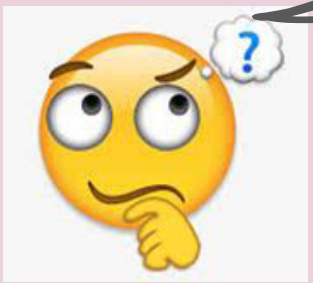
Lesson Synthesis

Today we converted between metric units to express distances related to track events in different ways.

kilometers	meters	centimeters	millimeters
1			

Jada ran 1 kilometer. How many meters is that?

How many centimeters is that?



How many millimeters is that?

2

Metric Conversion and Division by Powers of 10

Let’s convert units.

5.MD.A.1, 5.NBT.A.2

Warm up

True or False:
Divide by a Hundred and a Thousand

Decide whether each statement is true or false.

$$5 \div 1{,}000 = 0.05$$

Warm up

True or False:
Divide by a Hundred and a Thousand

Decide whether each statement is true or false.

$$36 \div 100 = 0.36$$

Warm up

True or False:
Divide by a Hundred and a Thousand

Decide whether each statement is true or false.

$$1{,}328 \div 1{,}000 = 1.328$$

Long Jump, Javelin Throw, and Shot Put

Activity #1

athlete	long jump	javelin throw	shot put
Jackie Joyner-Kersee, USA	727 cm	4,566 cm	1,580 cm
Sabine John, Germany	671 cm	4,256 cm	1,623 cm
Anke Behmer, Germany	678 cm	4,454 cm	1,420 cm

1. Below are some results Jackie Joyner-Kersee recorded in different heptathlon events in 1988. Complete the table.

event	centimeters	meters
long jump	727	
javelin throw	4,566	
shot put	1,580	

Long Jump, Javelin Throw, and Shot Put

Activity #1

athlete	long jump	javelin throw	shot put
Jackie Joyner-Kersee, USA	727 cm	4,566 cm	1,580 cm
Sabine John, Germany	671 cm	4,256 cm	1,623 cm
Anke Behmer, Germany	678 cm	4,454 cm	1,420 cm

2. Which unit of measure helps you picture the distance, centimeters or meters? Explain your reasoning.

3. Why do you think that the distances are measured to the nearest centimeter?

Hurdles

Activity #2

1. The table shows how many meters some students ran during a week. Complete the table to show how many kilometers each student ran

student	distance (meters)	distance (kilometers)
Diego	9,513	
Clare	11,018	
Priya	8,210	
Andre	10,000	

2. What patterns do you notice in the table?

Hurdles

Activity #2

3. Below is Tyler's strategy to divide a whole number by 10, 100, or 1,000.

I find the quotient by shifting the digits to the right — once when I divide by 10, twice when I divide by 100, 3 times when I divide by 1,000.

5,632 / 10 = 563.2
5,632 / 100 = 56.32
5,632 / 1,000 = 5.632

Describe to your partner what Tyler means.

Hurdles

Activity #2

4. Why does Tyler's strategy work? Will Tyler's strategy always work? Show or explain your reasoning.

I find the quotient by shifting the digits to the right — once when I divide by 10, twice when I divide by 100, 3 times when I divide by 1,000.

5,632 / 10 = 563.2
5,632 / 100 = 56.32
5,632 / 1,000 = 5.632

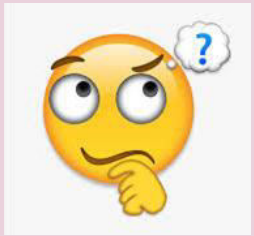
Lesson Synthesis

Today we converted from smaller metric measurements to larger metric measurements. We noticed and explained patterns when dividing by 10, 100, and 1,000

kilometers	meters
	7,864
2,037	

How is converting from smaller millimeters to larger meters different from converting from larger meters to smaller millimeters?

What are the missing values in the table? How do you know?



3

Write Powers of 10 with Exponents

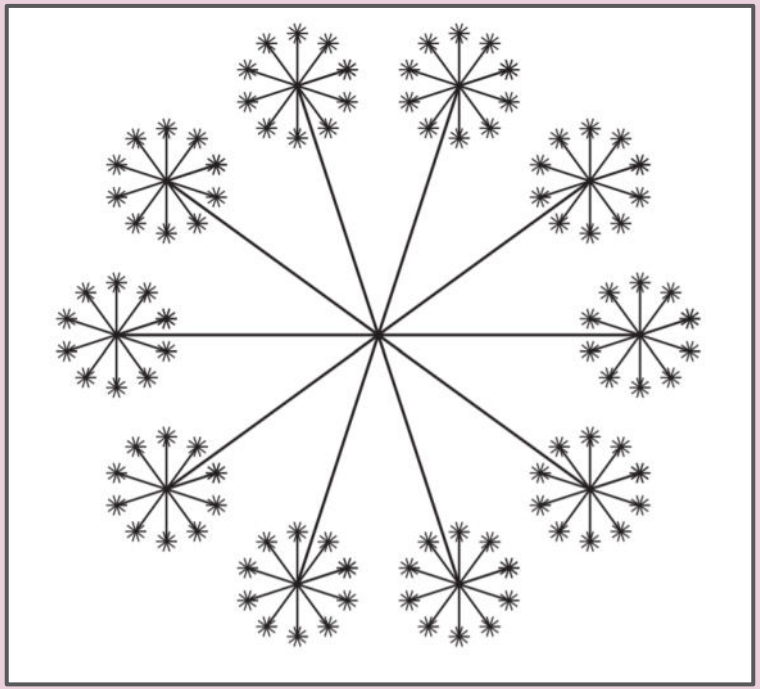
Let's use exponents.

5.NBT.A.1, 5.NBT.A.2

Warm up

How Many Do You See: Starburst

How many do you see?



How do you see them?

Population of Delaware and India

Activity #1

1. About 1,000,000 people live in Delaware.

a. How do you say this number?

b. How many thousands is this? Explain or show your reasoning.

c. Write the number using powers of 10.

d. How many times would you need to extend the diagram from the warm-up to get 1,000,000 tiny segments? Explain or show your reasoning

Population of Delaware and India

Activity #1

2. In 1997, the population of India was about 1,000,000,000.

a. How would you say this number?

b. How many millions is this? How many thousands is it? Explain or show your reasoning.

c. Write the number using powers of 10.

d. How many times would you need to extend the diagram from the warm-up to get 1,000,000 tiny segments? Explain or show your reasoning.

Powers of 10

Activity #2

1. Find the missing number that makes each equation true. Show your reasoning.

a. 2,000 = _____ × 20

b. 20 × 10 × _____ = 20,000

c. _____ × 10 = 100,000

d. 1,000 × 10,000 = _____

2. How were products of 10s useful in solving these problems?

3. Write each power of 10 as a number.

a. 10^3

b. 10^4

c. 10^7

Beyond a Billion

Activity #3

1. How would you say the number 1,000,000,000,000?

2. How many billions is that? How many millions is it? Explain or show your reasoning.

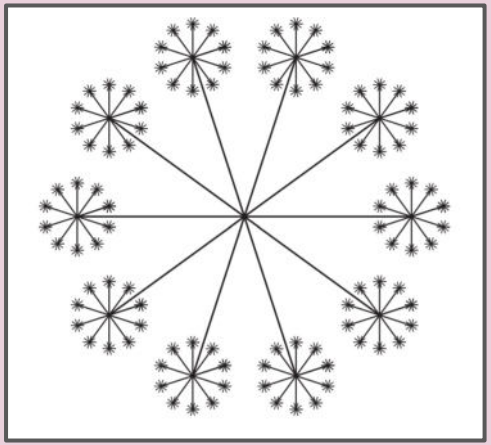
3. Write the number using powers of 10.

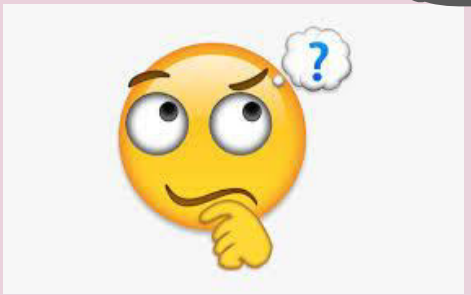
4. Describe an example of something that there are 1,000,000,000,000 of in the world.

millions	hundred thousands	ten thousands	thousands	hundreds	tens	ones
1,000,000	100,000	10,000	1,000	100	10	1
10^6	10^5	10^4	10^3	10^2	10^1	10^0

Lesson Synthesis

Today we looked at some really big numbers that are powers of 10 and represented them using powers of 10.





How many of the medium sized segments are there?

Where do we see this expression in the representation?

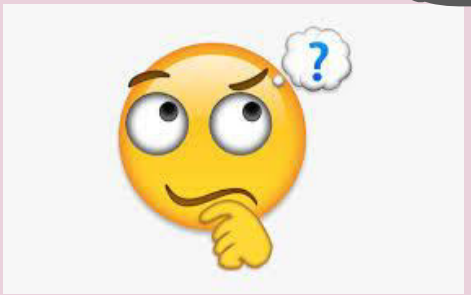
Lesson Synthesis

Today we looked at some really big numbers that are powers of 10 and represented them using powers of 10.

$: 10 \times 10 \equiv 10^2.$

We can also represent this expression with a power of ten.

$10 \times 10 \times 10 =$ _____.



What power of ten can we write to make this equation true

4

Multi-step Measurement Conversion Problems

Let’s solve problems about metric lengths.

Warm up

True or False: Powers of 10

Decide whether each statement is true or false.

$$5{,}423 \times 10 = 50{,}423$$

Warm up

True or False: Powers of 10

Decide whether each statement is true or false.

$$5{,}423 \div 10 = 542.3$$

Warm up

True or False: Powers of 10

Decide whether each statement is true or false.

$$5{,}423 \div 100 = 54.23$$

Activity #1

Walk All Day

Each of Andre's steps is 50 cm. Use this information to fill out the table.

1. Complete the table.

number of steps	distance (cm)	distance (m)
1		
10		
100		
1,000		

2. What patterns do you notice in the table?

3. Andre lives 1.25 km from school. How many steps is that?

4. One day, Andre made a total of about 8,500 steps. How many km did Andre walk?

Activity #2

Who Ran Farther?

1. Use the table to find the total distance Tyler ran during the week. Show your reasoning.

day	distance (km)
Monday	8.5
Tuesday	6.25
Wednesday	10.3
Thursday	5.75
Friday	9.25

2. Use the table to find the total distance Clare ran during the week. Show your reasoning.

day	distance (m)
Monday	5,400
Tuesday	7,500
Wednesday	8,250
Thursday	6,750
Friday	7,250

3. Who ran farther, Clare or Tyler? How much farther? Explain or show your reasoning.

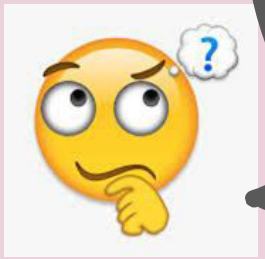
Lesson Synthesis

Today we solved problems and converted length measurements in metric units.

Tyler	Clare
34.5 km	45,800 m

"In a different week, Tyler ran 34.5 kilometers and Clare ran 45,800 meters."

Who ran farther? How do you know?



In order to determine how much farther Clare ran, would you convert Tyler's distance to meters or Clare's distance to kilometers? Be prepared to explain your reasoning.

5

Convert Liquid Measurement

Let’s solve liquid measurement problems.

5.NBT.A.3, 5.NBT.A.3.b

Number Talk

Warm up

Find the value of each expression mentally.

$$1{,}400 \div 10$$

Number Talk

Warm up

Find the value of each expression mentally.

$$1{,}400 \div 100$$

Number Talk

Warm up

Find the value of each expression mentally.

$$1{,}400 \div 1{,}000$$

Number Talk

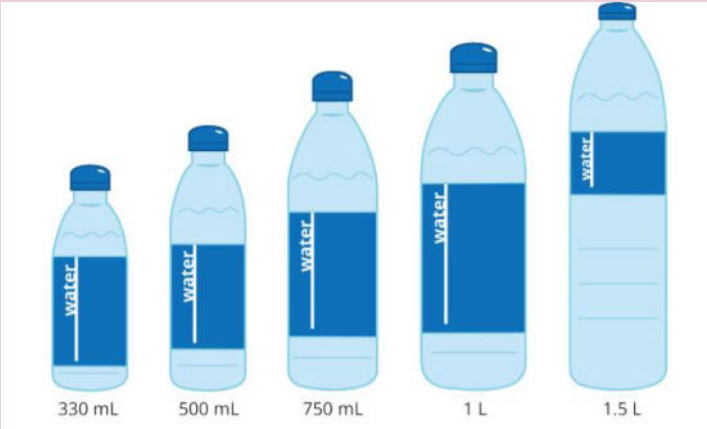
Warm up

Find the value of each expression mentally.

$$1{,}401 \div 1{,}000$$

Liquid Volume Conversions

Activity #1

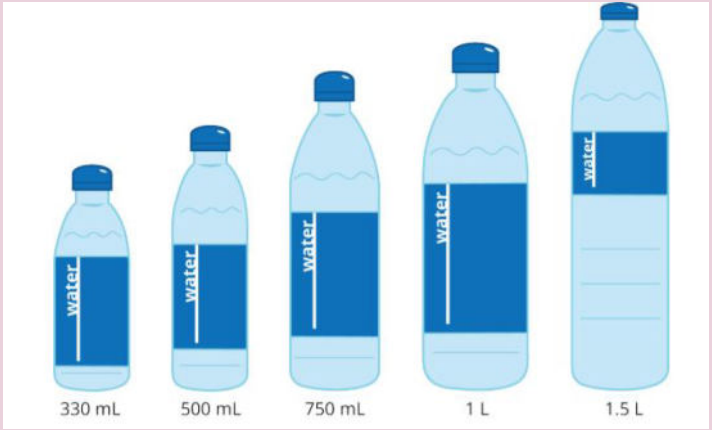


1. Complete the table.

L	mL
5	
6.3	
0.95	
10^2	
	800,000
	10^6
	65

Liquid Volume Conversions

Activity #1



2. Decide if the two measurements are equal. If not, choose which one is greater. Explain or show your reasoning.

a. 15 mL and 0.15 L

b. 2,500 mL and 2.5 L

c. 200 mL and ¼ L

d. 1 mL and 1/1,000 L

e. 15,600 mL and 15.5 L

Rehydrating Dancers

Activity #2

There are 25 dancers in the performance group. During practice, each dancer drinks 1 ½ bottles of water.

1. Each bottle holds 500 mL of water. How many liters of water do the dancers drink?

2. Each cooler holds 15 L of water. How many coolers does the team need? How much water will they have left over after practice?

Rehydrating Dancers

Activity #2

There are 25 dancers in the performance group.
During practice, each dancer drinks 1 ½ bottles of water.

3. The dancers can make a sports drink by mixing 30 mL of drink mix with each 500 mL of water. How many liters of drink mix does the team need for their practice?

Lesson Synthesis

Today we converted between liters and milliliters and used these conversions to solve problems.

We saw two ways to solve the water cooler problem.

18,750 mL is 18.75 L
15 L is 15,000 mL

Which method do you prefer? Why?

6

Convert Customary Length Units

Let’s solve more measurement problems.

5.MD.A.1

Number Talk: Multiples of 12

Warm up

Find the value of each expression mentally.

$$45 \times 10$$

Number Talk: Multiples of 12

Warm up

Find the value of each expression mentally.

$$45 \times 2$$

Number Talk: Multiples of 12

Warm up

Find the value of each expression mentally.

$$45 \times 12$$

Number Talk: Multiples of 12

Warm up

Find the value of each expression mentally.

$$46 \times 12$$

Card Sort: Assorted Measurements

Activity #1

1. Your teacher will give you a set of cards that show different measurements. Sort the cards into 2 categories of your choosing. Be prepared to explain the meaning of your categories.

1,800 inches

36 inches

$1\frac{1}{2}$ feet

18 inches

150 feet

50 yards

$\frac{1}{2}$ yard

0.3 foot

0.1 yard

1.8 inches

0.15 foot

0.05 yard

Card Sort: Assorted Measurements

Activity #1

2. Match the cards with the same measurements.
Then list the measurements in increasing order.

1,800 inches

36 inches

$1\frac{1}{2}$ feet

18 inches

150 feet

50 yards

$\frac{1}{2}$ yard

0.3 foot

0.1 yard

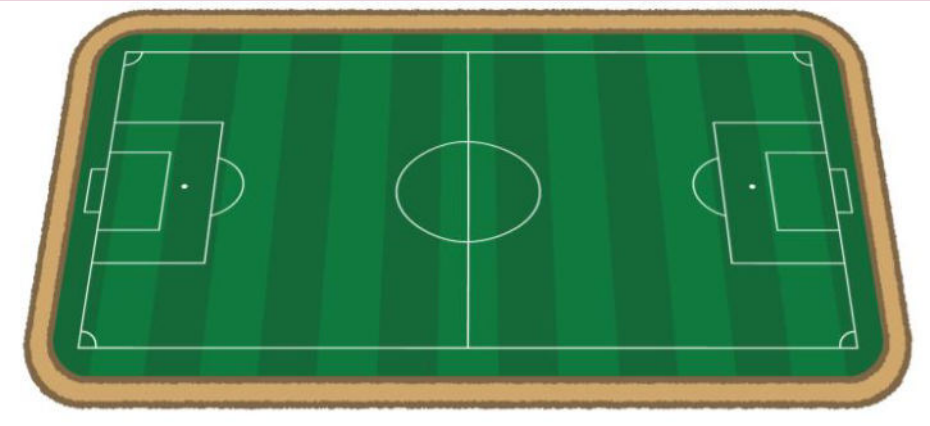
1.8 inches

0.15 foot

0.05 yard

Activity #2

Run a Mile or Two



1. A rectangular field is 90 yards long and 42.25 yards wide. Priya says that 6 laps around the field is more than a mile. Do you agree with Priya? Explain your reasoning.

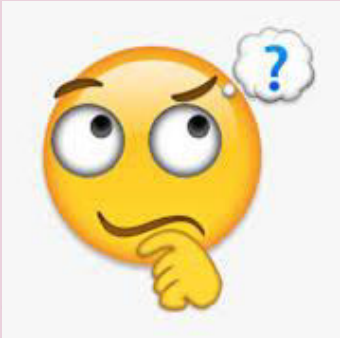
2. A different rectangular field is 408.5 feet long and 240.25 feet wide. How many laps around this field would Priya need to run if she wants to run at least 2 miles?

Lesson Synthesis

kilometers	meters	centimeters
.001 or $\frac{1}{1000}$	1	
		500
	10	
		2,000

yards	feet	inches
$\frac{1}{3}$	1	
		60
	10	
		240

Work with a partner to fill out the tables.



- How are the tables different?
- Converting in metric units lets us use our place value system since we multiply and divide by powers of 10. Where do we see this in the table?

7

More Conversion Problems

Let’s solve a multi-step conversion problem.

5.MD.A.1, 5.NF.B.6

Warm up

Notice and Wonder: Two Hikers

What do you notice?

What do you wonder?

Clare and Diego are on a hike. Clare drinks 1 ¼ cups of water each hour of a hike and Diego drinks ¾ cup of water every 30 minutes.

Who Drinks More Water?

Activity #1

Clare drinks 1 ¼ cups of water each hour of a hike and Diego drinks ¾ cup of water every 30 minutes.

At the end of 2 hours, who drank more water, Clare or Diego? Show or explain your reasoning.

Will Clare and Diego Run Out of Water?

Activity #2

Diego and Clare are going on a hike. The hike is 6 miles long and it takes them 40 minutes to hike each mile.

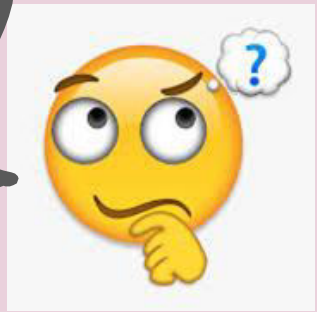
Clare drinks 1 ¼ cups of water each hour of the hike and Diego drinks ¾ cup of water each 30 minutes.

Clare and Diego plan to bring 3 quarts of water for the hike. Is this enough?

Lesson Synthesis

Today we solved a multi-step problem that involved converting different units. We converted minutes to hours and cups to quarts. What was challenging about today's activities? What strategies did you use to work through the challenges?

What was challenging about today's activities?



What strategies did you use to work through the challenges?

Adaptation
Lesson 1

Fractions as Sums

Let’s write fractions as sums.

Warm up

Choral Count: Three-Fourths at a Time

Count by ¾ , starting at 0

Barley Soup

Activity #1

Lin is learning to make barley soup using a family recipe. Here are some ingredients in the recipe:

- ¾ cup of barley
- 5/4 cups of chopped celery
- 6/4 cups of chopped carrots
- 1 cup of chopped onions
- 2 ¼ cups of vegetable broth

1. Lin has only one measuring cup that measures ¼ cup. Show how Lin could use the cup to measure the right amount of each ingredient.

- Barley:
- Celery:
- Carrots:
- Onions:
- Vegetable broth:

Barley Soup

Activity #1

Lin is learning to make barley soup using a family recipe. Here are some ingredients in the recipe:

- ¾ cup of barley
- 5/4 cups of chopped celery
- 6/4 cups of chopped carrots
- 1 cup of chopped onions
- 2 ¼ cups of vegetable broth

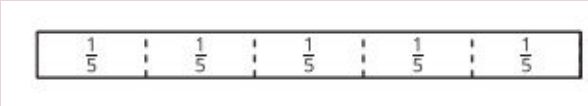
2. Lin later found a ¾ -cup measuring cup. Show how she could use the cups to measure the right amount of each ingredient.

- Barley:
- Celery:
- Carrots:
- Onions:
- Vegetable broth:

Sums in Fifths and Thirds

Activity #2

1. Use different combinations of fifths to make a sum of 9/5.



a. $\frac{9}{5} =$ _____ + _____ + _____ + _____ + _____

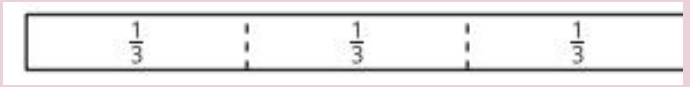
b. $\frac{9}{5} =$ _____ + _____ + _____ + _____

c. $\frac{9}{5} =$ _____ + _____ + _____

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

2. Write different ways to use thirds to make a sum of 4/3.

How many can you think of? Write an equation for each combination.



Lesson Synthesis

In earlier lessons, we saw that a fraction whose numerator is greater than 1 can be written as products. Let's take 4/3, for example.

We can write:

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

Today, we saw that a fraction whose numerator is greater than 1 can also be seen as sums.

Compare these two ways of thinking about fractions. How are they alike?

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

How are they different

Adaptation
Lesson 2

Addition of Fractions

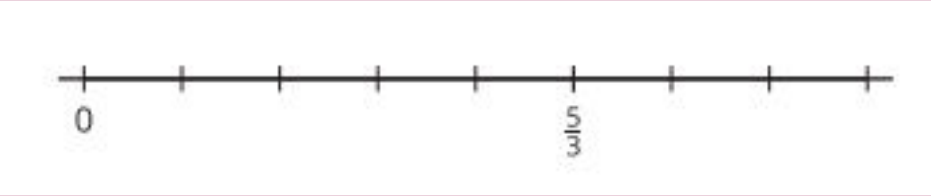
Let’s explore sums of fractions on a number line.

4.NF.B.3.a, 4.NF.B.3.b

Warm up

Notice and Wonder: A Fraction on a Number Line

What do you notice?

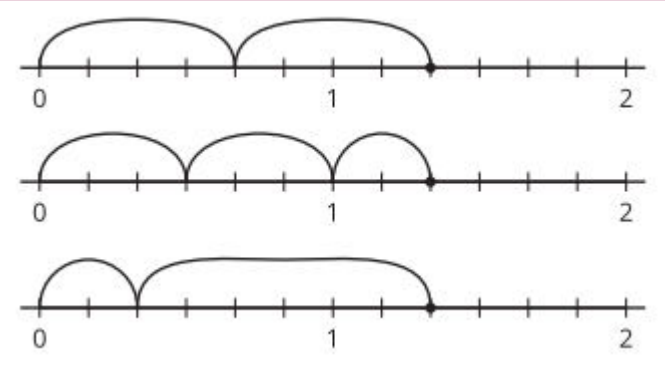


What do you wonder?

Sum of Jumps

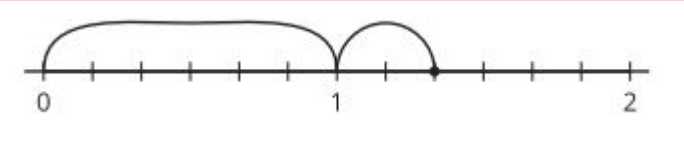
Activity #1

1. Noah draws number lines with a series of “jumps” to show different ways to use sixths to make a sum of 8/6 . He writes 8/6 = 4/6 + 4/6 for the first diagram.



a. Write an equation for each of the other two diagrams.

b. For the following diagram,
Noah writes: 8/6 = 6/6 + 2/6 and 8/6 = 1 + 2/6.
Which equation is correct? Explain your reasoning.

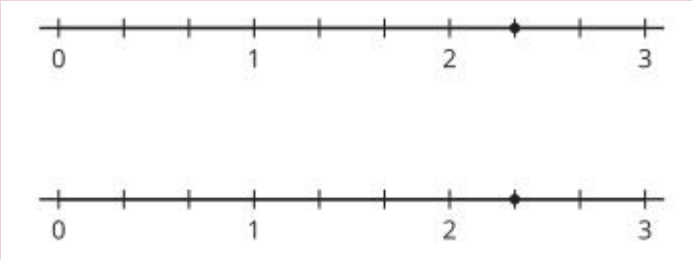


Sum of Jumps

Activity #1

2.

a. Draw "jumps" on the number lines to show two ways to use thirds to make a sum of 7/3 . Then, represent each combination of jumps as an equation.



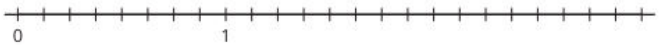
b. Write 7/3 as a sum of a whole number and a fraction.

Activity #2

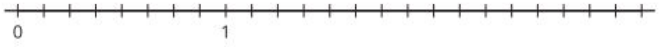
What is the Sum?

1. Use a number line to represent each addition expression and to find the sum.

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

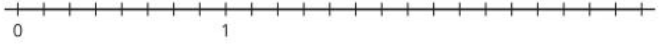


b. $\frac{1}{8} + \frac{9}{8}$

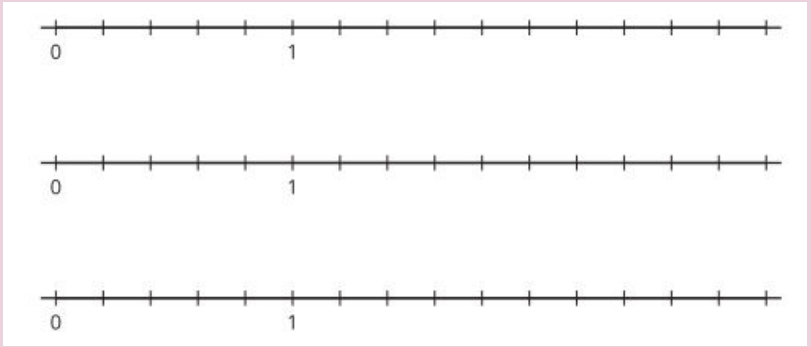


c. $\frac{11}{8} + \frac{9}{8}$

d. $2\frac{1}{8} + \frac{4}{8}$



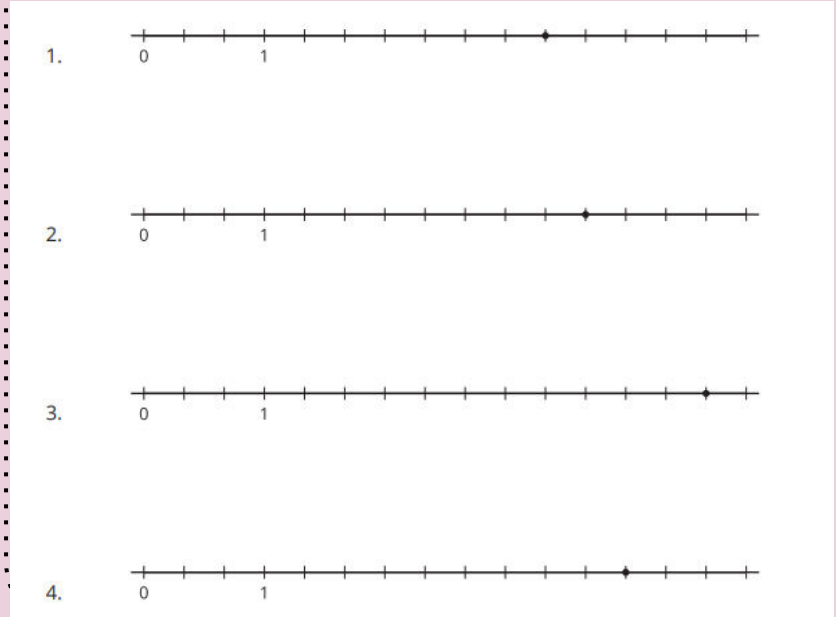
2. Priya says the sum of 1 ⅖ and ⅘ is 1 6/5 . Kiran says the sum is 11/5 . Tyler says it is 2 ⅕ . Do you agree with any of them? Explain or show your reasoning. Use one or more number lines if you find them helpful.



Make Two Jumps

Activity #3

Here are four number lines, each with a point on it.



For each number line, label the point. This is your target. Make two forward jumps to get from 0 to the target.

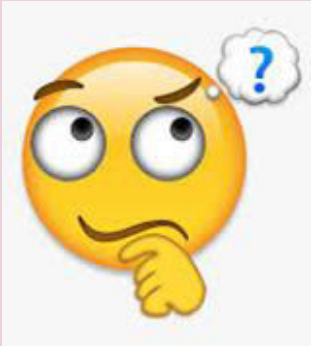
- Pick a card from the set given to you. Use the fraction on it for your first jump. Draw the jump and label it with the fraction.
- From there, draw the second jump to reach the target. What fraction do you need to add? Label the jump with the fraction.
- Write an equation to represent the sum of your two fractions.

Lesson Synthesis

Today, we used number lines to decompose fractions into sums of smaller fractions or sums of a whole number and a fraction. We also learn that a fraction greater than 1 can be written as a mixed number.

How would you explain to a classmate who is absent today what a mixed number is? What examples would you give to help them understand it

Let's look at some sums you found in the second activity: ⅞ ,10/8 , and 20/8 . Which ones can be written as mixed numbers and why?



What mixed number is equivalent to each of those fractions? How do you know?

Adaptation
Lesson 3

Differences of Fractions

Let’s explore differences of fractions on a number line.

4.NF.B.3.a, 4.NF.B.3.c

Warm up

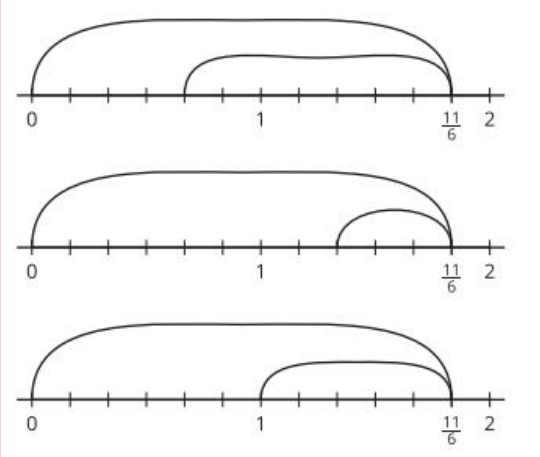
What Do You Know About:

$$\frac{11}{6}$$

Differences of Jumps

Activity #1

1. To subtract different fractions from 11/6, Noah draws “jumps” on number lines.



a. The first diagram shows how he finds $\frac{11}{6} - \frac{7}{6}$

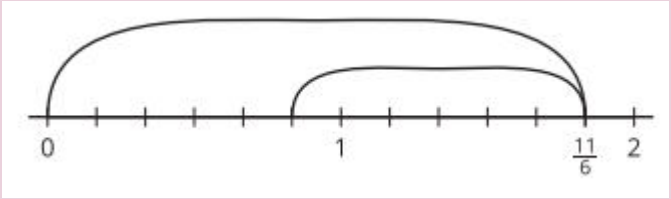
What is the difference (the result of the subtraction)?

b. Write an equation and find the difference for each of Noah’s diagrams.

Differences of Jumps

Activity #1

2. Here is another diagram Noah draws:



Which equations could the diagram represent? Explain your reasoning.

$$\frac{11}{6} - \frac{6}{6} = \frac{5}{6}$$

$$\frac{11}{6} - 1 = \frac{5}{6}$$

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

3. Use a number line to show how to find each difference.

a. $\frac{8}{3} - \frac{2}{3}$

b. $\frac{8}{3} - \frac{4}{3}$

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

What's the Difference?

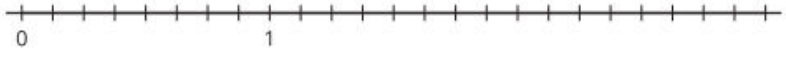
Activity #2

Use a number line to represent each subtraction expression and to find the difference.

1. $\frac{13}{8} - \frac{2}{8}$

2. $\frac{13}{8} - \frac{6}{8}$

3. $\frac{13}{8} - 1$



4. $1\frac{5}{8} - \frac{4}{8}$

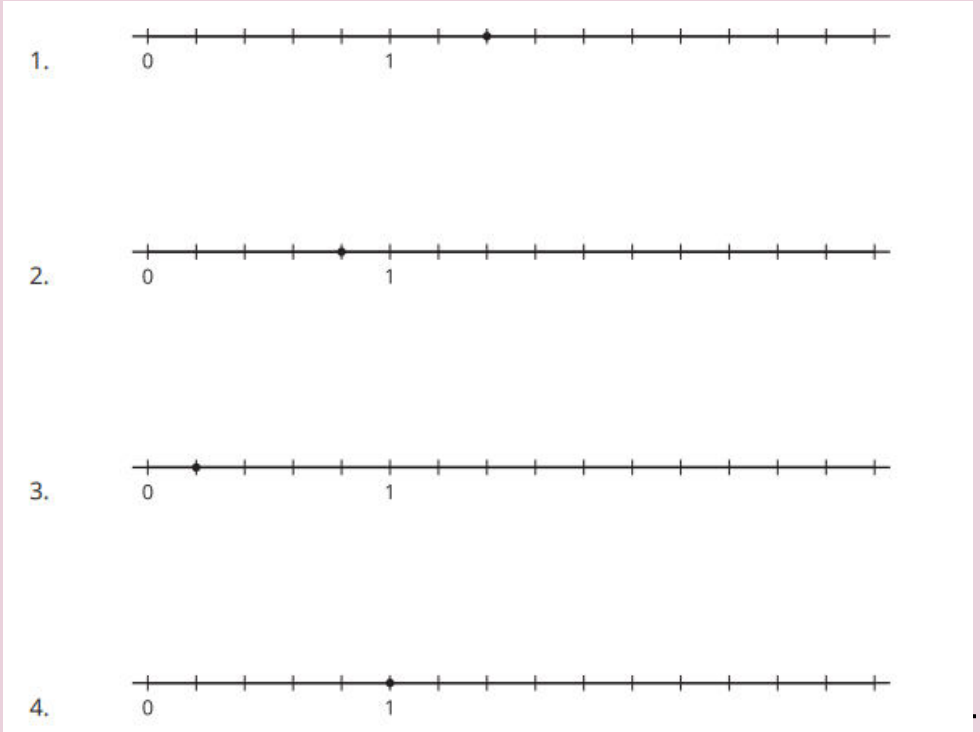
5. $1\frac{5}{8} - 1$

6. $1\frac{5}{8} - 1\frac{4}{8}$

Make Two Jumps, Subtraction Edition

Activity #3

Here are four number lines, each with a point on it.



For each number line, label the point. This is your target. Then, make two jumps to get from 0 to the target.

- Pick a card from the set given to you. Use the fraction on it for your first jump. Draw the jump and label it with the fraction.
- From there, draw the second jump to reach the target. What fraction do you need to subtract? Label the jump with the fraction.
- Write an equation to represent the difference of your two fractions.

Lesson Synthesis

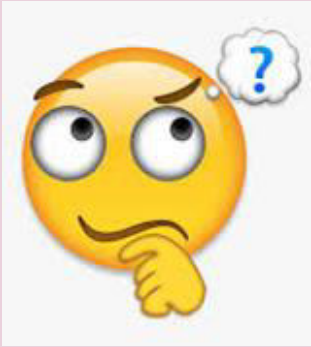
Today we learned to subtract a fraction from a fraction and a whole number from a fraction. We used a number line to help us.

How might we find the value of:

$\frac{11}{8} - \frac{7}{8}$

How might we find the value of:

$\frac{11}{8} - 1$



How might we find the value of:

$\frac{11}{8} - 1\frac{1}{8}$

Section Summary

We converted between smaller metric measurements and larger metric measurements. We began with whole numbers and then worked with decimals too. We noticed and explained patterns when multiplying and dividing by 10, 100, and 1,000. We learned these numbers are called powers of 10.

distance in meters	distance in millimeters
1	1,000
10	10,000
100	100,000

Section Summary

For example, we noticed there are three more zeros for each distance in millimeters compared to the distance in meters. This is because we multiply by 1,000 and move the digit three places to the left so there are 3 zeroes in those places.

distance (meters)	distance (kilometers)
9,513	9.513
11,018	11.018

Section Summary

We also noticed that the digits shift when we multiply or divide by powers of 10. We represented really big numbers using powers of 10. We learned that 10^7 means 10 multiplied by itself 7 times.

$$10^7 = 10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 = 10{,}000{,}000$$

We solved problems involving metric length measurements, liquid measurements (liters and milliliters), and customary length measurements (inches, feet, and yards), time, and customary volume units (cups and quarts). We decided to convert from the smaller unit to the larger unit or the other way around.

8

Add Fractions with Unlike Denominators

Let’s add fractions with unlike denominators.

5.NF.A.1, 5.NF.A.2

True or False: Sum of 1

Warm up

Decide whether each statement is true or false.

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

True or False: Sum of 1

Warm up

Decide whether each statement is true or false.

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

True or False: Sum of 1

Warm up

Decide whether each statement is true or false.

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

Tyler's Jog-A-Thon

Activity #1

Tyler trains for his school's Jog-A-Thon and needs to run at least 1 mile per day. In the morning, Tyler runs to his grandma's house, which is 5/8 mile away. In the afternoon, Tyler runs to his friend Jada's house, which is ¼ mile away.

1. Estimate whether or not Tyler ran 1 mile. Explain or show your reasoning.

2. How far did Tyler run? Explain or show your thinking.

How Far Did Kiran Run?

Activity #2

1. Below are entries from Kiran's running log. Did he run at least 1 mile each day? Show your reasoning.

day	morning distance	afternoon distance
day 1	$\frac{2}{8}$ mile	$\frac{5}{8}$ mile
day 2	$\frac{1}{2}$ mile	$\frac{5}{8}$ mile
day 3	$\frac{3}{4}$ mile	$\frac{2}{8}$ mile
day 4	$\frac{1}{2}$ mile	$\frac{2}{6}$ mile
day 5	$\frac{2}{3}$ mile	$\frac{4}{6}$ mile
day 6	$\frac{1}{3}$ mile	$\frac{5}{6}$ mile

2. Each of the expressions below could be used to find the total distance Kiran ran on a given day. Match each of the expressions to one of the days entered in Kiran's running log. Some days will have more than one match.

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

b. $\frac{4}{6} + \frac{4}{6}$

c. $\frac{1}{3} + \frac{2}{3} + \frac{1}{6}$

d. $\frac{1}{2} + \frac{1}{2} + \frac{1}{8}$

e. $\frac{2}{3} + \frac{2}{3}$

f. $\frac{6}{8} + \frac{2}{8}$

g. $\frac{2}{6} + \frac{4}{6} + \frac{1}{6}$

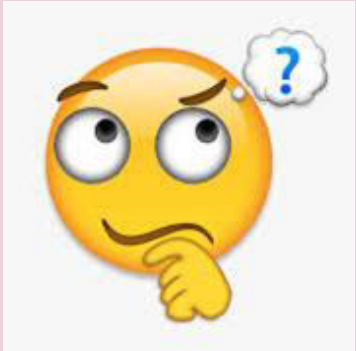
h. $\frac{3}{6} + \frac{2}{6}$

i. $\frac{3}{4} + \frac{1}{4}$

Lesson Synthesis

Today we added fractions with unlike denominators. What is challenging about adding fractions with unlike denominators?

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



Describe how you would add these two fractions.

Subtract Fractions with Unlike Denominators

Let’s subtract fractions with unlike denominators.

Warm up

Number Talk:
Fraction Addition and Subtraction

Find the value of each expression mentally.

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

Warm up

Number Talk:
Fraction Addition and Subtraction

Find the value of each expression mentally.

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

Warm up

Number Talk:
Fraction Addition and Subtraction

Find the value of each expression mentally.

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

Warm up

Number Talk:
Fraction Addition and Subtraction

Find the value of each expression mentally.

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

Diego and Priya's Race

Activity #1

1. On Monday morning, Diego ran ⅔ mile and Priya ran ⅚ mile. Here is a diagram that represents how far Diego ran. Complete the diagram to represent how far Priya ran.

2. How much farther did Priya run? Explain or show your reasoning.

Add and Subtract Unlike Denominators

Activity #2

Evaluate each expression. Use a diagram if it helps.

1. $\frac{4}{6} - \frac{1}{3} =$ _____

2. $\frac{7}{9} - \frac{2}{3} =$ _____

3. $\frac{7}{8} + \frac{11}{24} =$ _____

4. $\frac{3}{4} - \frac{4}{12} =$ _____

Grow Plants

Activity #3

1. Jada and Andre compare the growth of their plants. Jada's plant grew 1 ⅓ inches since last week. Andre's plant grew 8/9 inches. How much more did Jada's plant grow? Show reasoning.

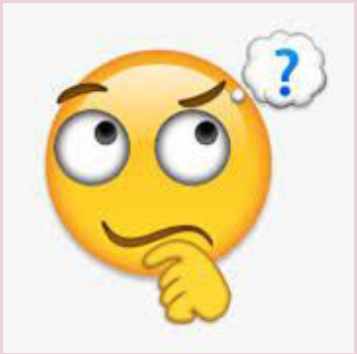
2. Diego and Clare compare the growth of their plants. Diego's plant grew 7/4 inches since last week. Clare's plant grew 9/8 inches. Whose plant grew more? How much more did it grow? Show your reasoning.

Lesson Synthesis

Today we subtracted fractions with unlike denominators.

$$\frac{2}{3} - \frac{4}{9}$$

Describe to your partner how you find the value of this expression.



10

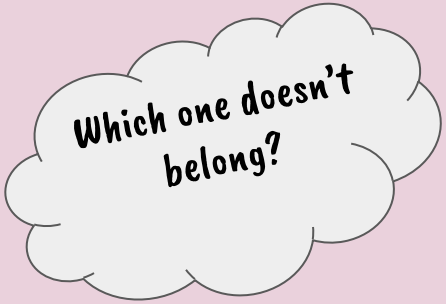
Add and Subtract Fractions with Unlike Denominators

Let’s add and subtract fractions to solve problems.

5.NF.A.1, 5.NF.A.2

Which One Doesn't Belong: Fraction Addition and Subtraction

Warm up



A. $\frac{1}{6} - \frac{1}{2}$

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

C. $\frac{3}{8} + \frac{5}{16}$

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

Activity #1

Select Equal Expressions

1. Select all the expressions that are equal to: $\frac{5}{6} + \frac{3}{12}$.

A. $\frac{10}{12} + \frac{3}{12}$

B. $\frac{8}{18}$

C. $\frac{5}{6} + \frac{1}{4}$

D. $\frac{5}{6} + \frac{2}{6}$

E. $\frac{20}{24} + \frac{6}{24}$

2. Choose one of the expressions that is equal to ⅚ + 3/12 and explain or show how you know they are equal.

3. Choose one of the expressions that is not equal to ⅚ + 3/12 and explain or show how you know it is not equal.

4. Write at least one more expression that is equal to ⅚ + 3/12.

5. What is the value of ⅚ + 3/12?

Interpret Expressions

Activity #2

1. Andre picked 1 ⅔ pounds of blueberries and ½ pound of raspberries. Elena picked ¾ pound of raspberries.

Based on the situation above, write a question that represents each expression.

Partner A:

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

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

Partner B:

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

$1\frac{5}{6} - \frac{3}{4}$

2. Discuss the questions you wrote with your partner. If anything is unclear, work with your partner to write revised questions. After you agree that all the questions make sense, find the value of each expression

Lesson Synthesis

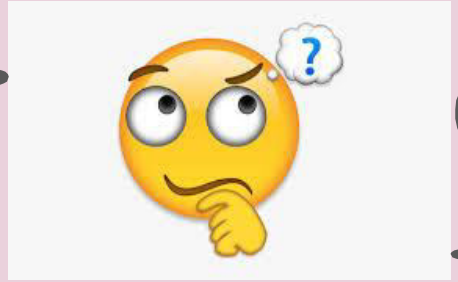
Today we solved problems involving adding and subtraction of fractions with unlike denominators.

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

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

How do we know these equations are true?

Which of these equations would you prefer to use to find the value of 2/8 + ¾ and why?



What other equal expressions could we use to find the value of 2/8 + ¾ ?

11

All Sorts of Denominators

Let’s find common denominators.

5.NF.A.1, 5.NF.A.2

Warm up

Number Talk: Double the Fun

Find the value of each expression mentally.

$$\frac{2}{12} + \frac{3}{6}$$

Warm up

Number Talk: Double the Fun

Find the value of each expression mentally.

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

Warm up

Number Talk: Double the Fun

Find the value of each expression mentally.

$$\frac{2}{8} + \frac{3}{4}$$

Warm up

Number Talk: Double the Fun

Find the value of each expression mentally.

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

Choose Equal Expressions

Activity #1

1. Choose all the expressions that are equal to ½ + ⅔ . Be prepared to explain your thinking.

A. $\frac{2}{4} + \frac{3}{9}$

B. $\frac{3}{6} + \frac{4}{6}$

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

D. $\frac{5}{10} + \frac{6}{9}$

E. $\frac{1}{2} + \frac{1}{3} + \frac{2}{6}$

2. Choose one of the expressions that is equal to ½ + ⅔ and use it to find the value of ½ + ⅔ .

True and False: Fraction Addition and Subtraction

Activity #2

1. Write a number in the box to make the equations true.

a. $\frac{3}{7} + \frac{1}{2} = \frac{6}{\square} + \frac{7}{14}$

b. $\frac{5}{9} + \frac{1}{2} = \frac{\square}{18} + \frac{9}{\square}$

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

2. Decide whether each equation is true or false. Show your reasoning.

a. $\frac{1}{3} + \frac{2}{7} = \frac{1}{21} + \frac{6}{21}$

b. $\frac{4}{7} + \frac{11}{6} = \frac{15}{13}$

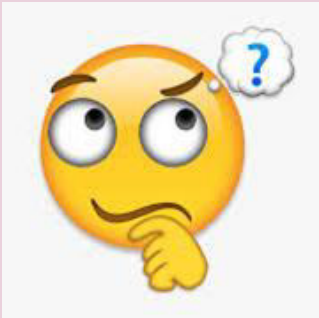
c. $\frac{1}{2} - \frac{4}{9} = \frac{9}{18} - \frac{1}{18}$

d. $\frac{2}{3} - \frac{2}{5} = \frac{10}{15} - \frac{5}{15}$

Lesson Synthesis

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

Describe how you would add these two fractions.



In order to add these fractions, we need to write an equivalent expression with common denominators. What are some common denominators we can use?

Solve Problems

Let’s solve more problems by adding and subtracting fractions with unlike denominators.

Estimation Exploration: Large Denominators

Warm up

What is the sum?

$$\frac{3}{17} + \frac{17}{19}$$

Record an estimate that is:

Too low	About right	Too high

Priya's Salad Dressing

Activity #1

Priya's Salad Dressing Recipe

- $\frac{3}{4}$ cup olive oil
- $\frac{1}{3}$ cup lemon juice
- $\frac{1}{2}$ cup mustard
- Pinch of salt and pepper

1. Priya has ⅔ cup of olive oil. She is going to borrow some more from her neighbor. How much more olive oil does she need to borrow so she has enough to make the dressing?

2. 1 tablespoon is equal to 1/16 of a cup. Priya decides that 1 tablespoon of olive oil is close enough to what she needs to borrow from her neighbor. Do you agree with Priya? Explain or show your reasoning.

3. Priya says her recipe will make about 1 ½ cups of dressing. Do you agree? Explain or show your reasoning.

Activity #2

More Problems to Solve

1. Choose a problem to solve.

Problem A:

Jada is baking protein bars for a hike. She adds ½ cup of walnuts and then decides to add another ⅓ cup. How many cups of walnuts has she added altogether?

If the recipe requires 1 ⅓ cups of walnuts, how many more cups of walnuts does Jada need to add? Show your reasoning.

Problem B:

Kiran and Jada hiked ⅔ mile and took a rest. Then they hiked another4/5 mile before stopping for lunch. How many miles have they hiked so far?

If the trail they are hiking is a total of 2 ⅓ miles, how much more do they have to hike? Show your reasoning.

2. Discuss the problems and solutions with your partner. What is the same about your strategies and solutions? What is different?

3. Revise your work if necessary.

Lesson Synthesis

In the past few lessons we noticed to add and subtract fractions with unlike denominators, we can multiply the two denominators to find a common denominator.

$$\frac{6}{8} - \frac{2}{5} = \frac{6\times5}{8\times5} - \frac{2\times8}{5\times8}$$

Why are both numerators and denominators multiplied by 5 and 8, respectively?

13

Put It All Together: Add and Subtract Fractions

Let’s add and subtract fractions with unlike denominators.

5.NF.A.1

Warm up

Notice and Wonder: Fraction Addition

What do you notice?

$$\frac{2}{3} + \frac{3}{5} = \frac{3}{6} + \frac{6}{10} + \_\_\_\_\_$$

What do you wonder?

Common Denominators

Activity #1

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

- Tyler says: “To find the sum, I can use 18 as a common denominator.”
- Han says: “To find the sum, I can use 24 as a common denominator.”
- Clare says: “To find the sum, I can use 48 as a common denominator.”

1. Who do you agree with?
   Explain or show your reasoning.

2. What is the value of 4/6 + 5/8

Unlike Denominators

Activity #2

1. Evaluate each expression.

a. $\frac{2}{5} + \frac{13}{15}$

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

c. $\frac{11}{12} + 3\frac{5}{9}$

d. $\frac{6}{10} - \frac{9}{25}$

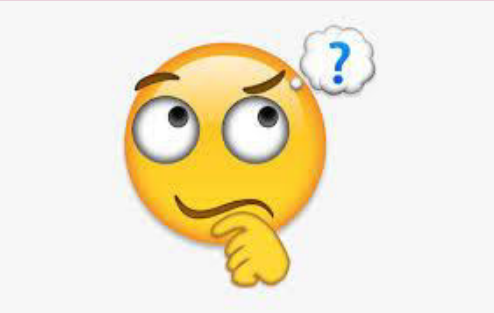
Lesson Synthesis

Today we added and subtracted fractions with unlike denominators. We found common denominators other than the product of the denominators.

$$\frac{6}{10} + \frac{9}{25}$$

Why would someone want to use 50 as a common denominator?

Why would someone want to use 250 as a common denominator?



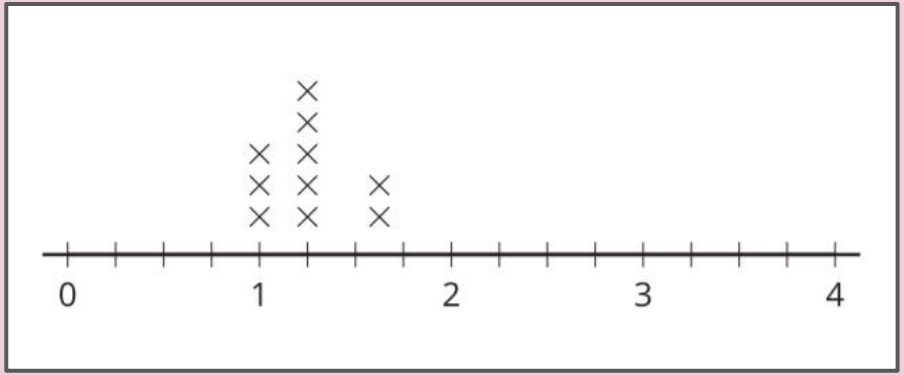
Remember the Line Plot

Let’s make a line plot.

Warm up

Notice and Wonder: Line Plot

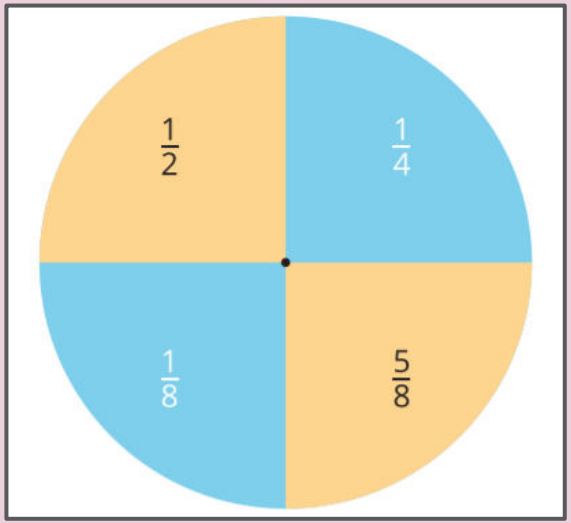
What do you notice?



What do you wonder?

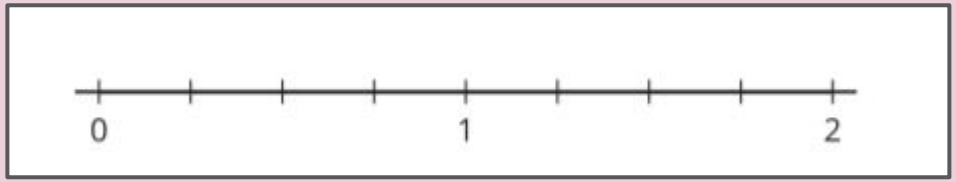
Sums of Fractions

Activity #1



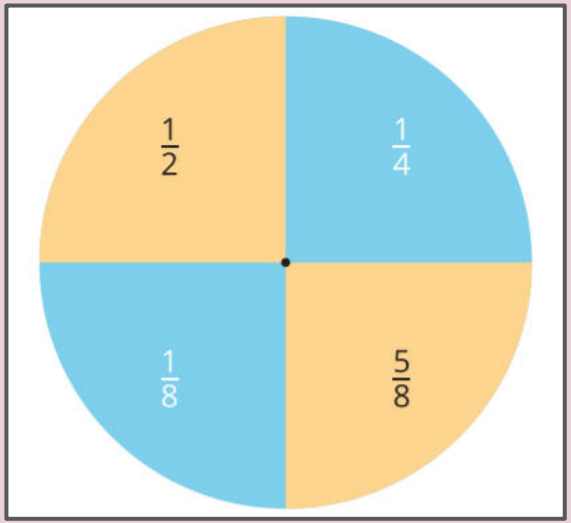
1. Play Sums of Fractions with your partner.

- Take turns with your partner.
- Spin the spinner twice.
- Add the two fractions.
- Record the sum on the line plot.
- Play the game until you have 12 data points.



Sums of Fractions

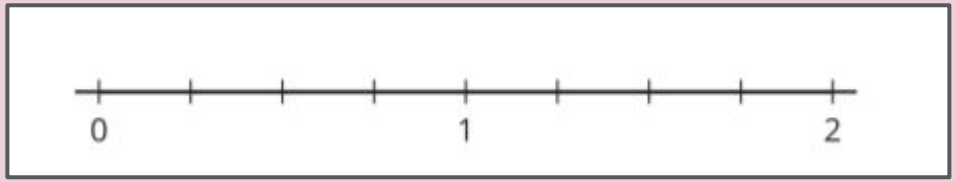
Activity #1



2. How did you know where to plot the sums of eighths?

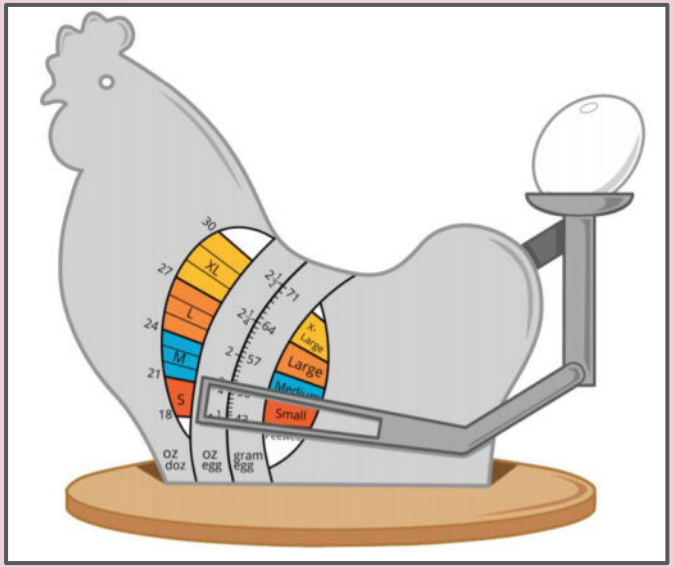
3. What is the difference between your highest and lowest number?

4. What do you notice about the data you collected?



Activity #2

Lots of Eggs



1. Use the data below to make a line plot.

Weight of 1 egg: $1\frac{7}{8}, 2\frac{1}{2}, 2\frac{3}{8}, 1\frac{3}{4}, 2\frac{1}{4}, 2\frac{4}{8}, 2\frac{1}{8}, 1\frac{7}{8}, 2\frac{1}{4}, 1\frac{6}{8}, 2\frac{1}{8}, 1\frac{7}{8}$

2. Jada said that ¼ of the eggs weigh 1 ⅞ ounces. Do you agree? Explain or show your reasoning.

3. How much heavier is the heaviest egg than the lightest egg?

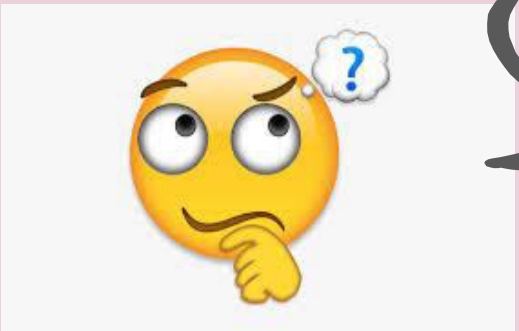
Lesson Synthesis

"Tyler says that $\frac{1}{6}$ of the eggs are the heaviest eggs. How can we figure out if Tyler is correct?"

What did you learn about line plots?

Discuss your answer with a partner.

What do you still wonder about line plots?



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Problem Solving with Line Plots

Let’s solve problems using the line plot.

5.MD.B.2, 5.NF.A.2

Warm up

Number Talk: Multiply by 18

Find the value of each expression mentally.

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

Warm up

Number Talk: Multiply by 18

Find the value of each expression mentally.

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

Warm up

Number Talk: Multiply by 18

Find the value of each expression mentally.

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

Warm up

Number Talk: Multiply by 18

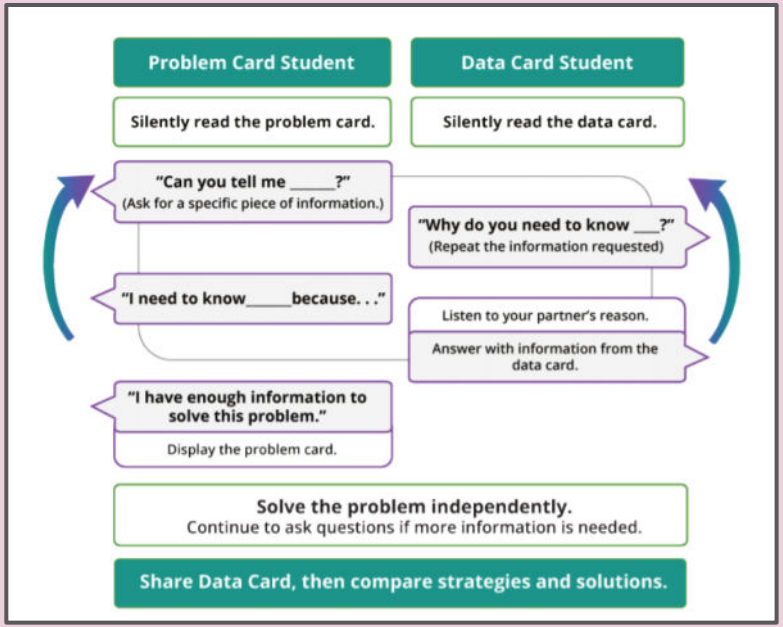
Find the value of each expression mentally.

$$\frac{5}{3} \times 18$$

Activity #1

Info Gap: Picking Fruit

Your teacher will give you either a problem card or a data card. Do not show or read your card to your partner.

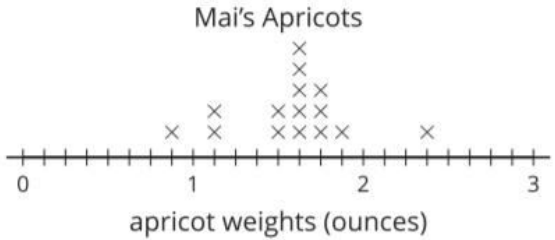


Pause here so your teacher can review your work. Ask your teacher for a new set of cards and repeat the activity, trading roles with your partner.

Activity #2

Mathematical Questions

The line plot below shows the weights of some apricots that Mai picked.



1. What fraction of the apricots weigh less than 1 ½ ounces?

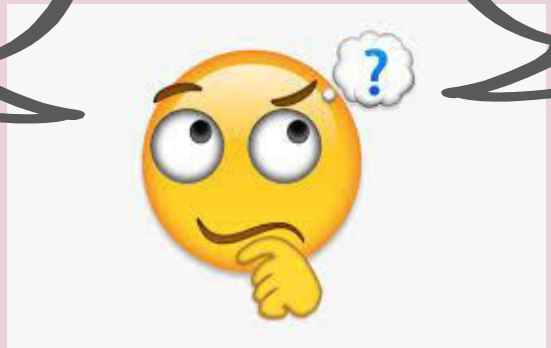
2. Write a multiplication equation that represents the total weight of the apricots that each weigh 1 ⅝ ounces.

3. Do all of Mai's apricots together weigh more or less than a pound? Explain or show your reasoning.

Lesson Synthesis

Today we solved problems about line plots. How do you know you accounted for all the data points in your sum?

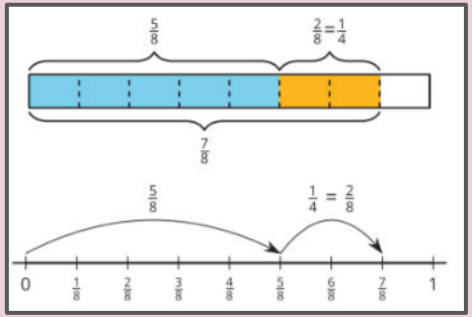
What was the most challenging part of the Info Gap activity we did today?



What was the most challenging part of the Info Gap activity we did today?

Section Summary

In the beginning of this section, we reviewed what we know about using equivalent fractions to create fractions with common denominators.



Then, we used common denominators to add and subtract fractions with unlike denominators where one denominator was a multiple of the other denominator. For example, to find the difference of ⅔ - 4/9 , we can use the expression 6/9 - 4/9 because ⅔ = 4/9 so we know that ⅔ - 4/9 = 6/9 - 4/9.

Section Summary

Next, we learned to use common multiples to generate different common denominators in order to add and subtract fractions with unlike denominators. ⅔ + ⅗

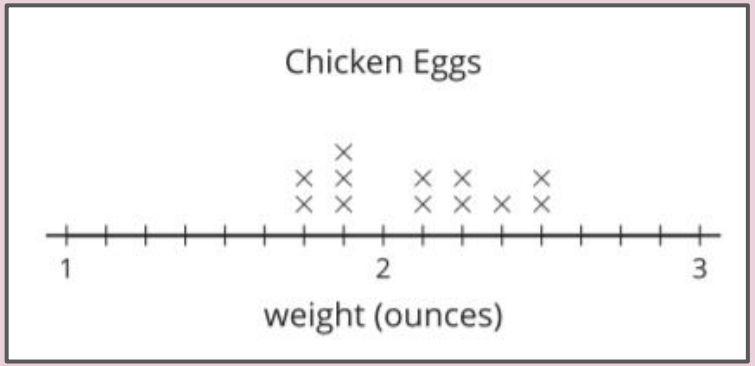
Next, we learned to use common multiples to generate different common denominators in order to add and subtract fractions with unlike denominators.

$$\frac{2}{3} + \frac{3}{5} = \frac{10}{15} + \frac{9}{15}$$

$$\frac{2}{3} + \frac{3}{5} = \frac{20}{30} + \frac{18}{30}$$

Section Summary

Finally, we created line plots and used them to solve problems.



What do you know about the weights of the chicken eggs from looking at this line plot?

Compare Products

Let’s compare products.

Warm up

True or False: Compare Products

Decide if each statement is true or false.

$$\frac{4}{5} \times 100 = 120$$

Be prepared to explain your reasoning.

Warm up

True or False: Compare Products

Decide if each statement is true or false.

$$\frac{4}{5} \times 100 < 100$$

Be prepared to explain your reasoning.

Warm up

True or False: Compare Products

Decide if each statement is true or false.

$$\frac{4}{5} \times 100 = 80$$

Be prepared to explain your reasoning.

Activity #1

Go the Distance

Kiran, Noah, and Elena were trying to run as far as they could in one hour.

- Elena ran $\frac{3}{4}$ of a 5 mile trail.
- Noah ran $\frac{1}{2}$ of a 5 mile trail.
- Kiran ran $1\frac{1}{4}$ of a 5 mile trail.

1. List the students in increasing order of the distance they ran. Be prepared to explain your reasoning.

2. Fill in the blanks to make each statement true. Be prepared to explain your reasoning.

a. Diego ran farther than Noah, but not as far as Kiran. Diego ran ___ of a 5 mile trail.

b. Lin ran farther than Kiran, but not twice as far as Kiran. Lin ran ___ of a 5 mile trail.

c. Tyler ran farther than Noah, but not as far as Elena. Tyler ran ___ of a 5 mile trail.

Activity #2

Compare Expressions

1. Use the symbols < and > to show whether each expression is greater than or less than the given number. Explain or show your reasoning.

a. $\frac{5}{4} \times 100 \_\_\_ 100$

b. $\frac{5}{7} \times 2 \_\_\_ 2$

c. $\frac{1}{3} \times 50 \_\_\_ 100$

2. Fill in each box with a number to make the equation true. Explain or show your reasoning.

a. $\frac{\square}{9} \times 50 < 50$

b. $\frac{\square}{9} \times 50 = 50$

c. $\frac{\square}{9} \times 50 > 50$

3. Fill in each box with a number to make the equation true. Explain or show your reasoning.

a. $\frac{9}{\square} \times 50 < 50$

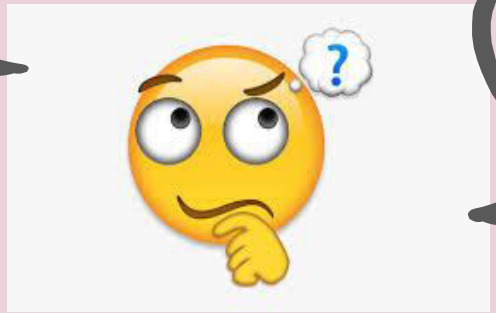
b. $\frac{9}{\square} \times 50 = 50$

c. $\frac{9}{\square} \times 50 > 50$

Lesson Synthesis

Today we compared the value of a product to the value of one of the factors.

What patterns did you notice?



Do you think these patterns will always be true?

Interpret Diagrams

Let’s compare products without multiplying.

Estimation Exploration: Fraction of a Whole Number

Warm up

$$\frac{5}{3} \times 9{,}625$$

Record an estimate that is:

Too low	About right	Too high

Match the Diagram

Activity #1

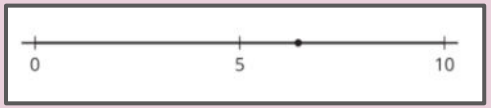
1. Match the expressions and diagrams.

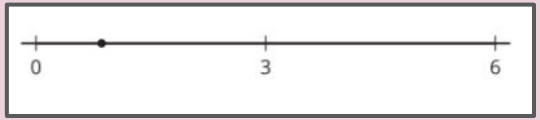
$\frac{2}{7} \times 3$

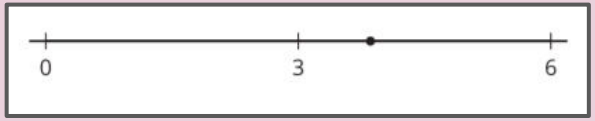
$\frac{9}{7} \times 3$

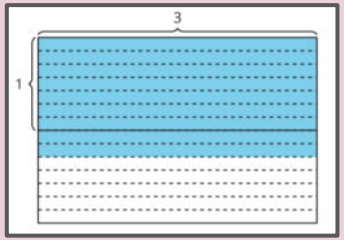
$\frac{9}{7} \times 5$

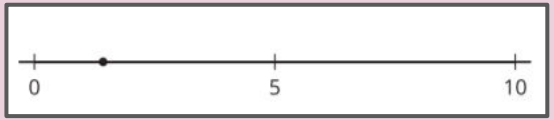
$\frac{2}{7} \times 5$

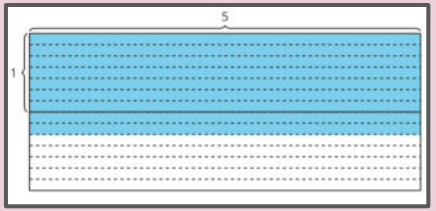












Match the Diagram

Activity #1

2. Fill in each blank with < or > to make the inequality true.

a. $\frac{2}{7} \times 3 \_\_\_\_ 3$

b. $\frac{9}{7} \times 3 \_\_\_\_ 3$

c. $\frac{2}{7} \times 5 \_\_\_\_ 5$

d. $\frac{9}{7} \times 5 \_\_\_\_ 5$

Activity #2

Who Ran Farther?

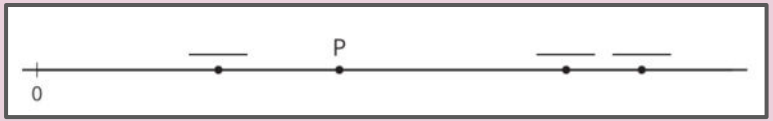
- Priya ran to her grandmother's house.
- Jada ran twice as far as Priya.
- Han ran $\frac{6}{7}$ as far as Priya.
- Clare ran $\frac{14}{8}$ as far as Priya.
- Mai ran $\frac{3}{5}$ times as far as Priya.

1. Which students ran farther than Priya?

2. Which students did not run as far as Priya?

3. List the runners in order from shortest distance run to longest. Show or explain your reasoning.

4. The point P represents how far Priya ran. Write the initial of each student in the blank that shows how far they ran



5. Label the distance for the missing student on the number line above. Explain how you knew where to place the distance for each missing student.

Lesson Synthesis

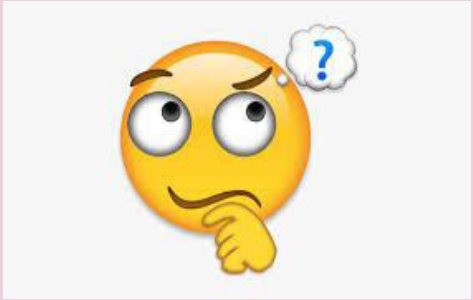
Today we compared products without calculating their values.

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

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

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

Describe to your partner how you would decide which expressions have a value that is greater than 4.



Compare Without Multiplying

Let’s compare expressions, without evaluating them.

Notice and Wonder: Expressions and Number Lines

Warm up

What do you notice?

$\frac{2}{3} \times 5$

What do you wonder?

Approximate Location

Activity #1

1. Label each expression in its approximate location on the number line.

Partner A

a. $\frac{2}{5} \times 12$

b. $\frac{5}{3} \times 12$

c. $\frac{7}{7} \times 12$

Partner B

a. $\frac{4}{7} \times 12$

b. $\frac{8}{5} \times 12$

c. $\frac{9}{9} \times 12$

Approximate Location

Activity #1

2. Fill in the blank to make the statement true.

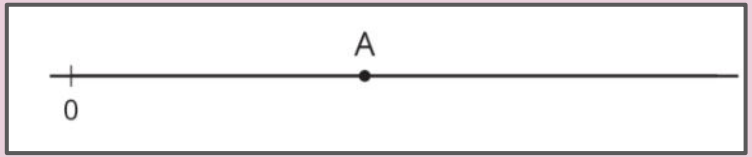
a. $\frac{\quad}{11} \times 12 > 12$

b. $\frac{\quad}{15} \times 12 = 12$

c. $\frac{13}{\quad} \times 12 < 12$

Activity #2

An Unknown Number



The letter A represents a number on the number line. Label the approximate location of the value of each expression. Explain or show your reasoning.

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

$2 \times A$

$\frac{13}{8} \times A$

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

Activity #2

An Unknown Number

2. Is 13/8 x 11/39 less than, greater than, or equal to 11/39? Explain or show your reasoning.

3. Is ⅔ x 17/53 less than, greater than, or equal to 17/53 ? Explain or show your reasoning.

Lesson Synthesis

1. ____ × 6 < 6
2. ____ × 6 = 6
3. ____ × 6 > 6

What numbers make these statements true

What can we say is always true about the size of the product of a fraction and a whole number?

Compare to 1

Let’s explain what happens when we multiply a fraction by a fraction greater than, less than, or equal to 1.

What Do You Know About...

Warm up

What do you know about $\frac{15}{14} \times \frac{23}{30}$?

Activity #1

Compare Fraction Products on the Number Line

Match the expressions and number lines that show the same value.

1. $\frac{3}{4} \times \frac{5}{2}$

2. $\frac{4}{3} \times \frac{5}{2}$

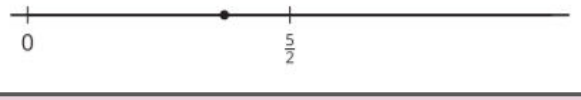
3. $\frac{2}{5} \times \frac{4}{3}$

4. $\left(1 - \frac{1}{4}\right) \times \frac{5}{2}$

5. $\left(1 + \frac{1}{3}\right) \times \frac{5}{2}$

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

A



B

C

Choose one of the expressions from each set and explain whether the value is greater than or less than the second factor.

Activity #2

True Statement

1. Rewrite each expression as a sum or difference of 2 products.

a. $\left(1-\frac{2}{5}\right)\times\frac{4}{7}$

b. $\left(1+\frac{1}{5}\right)\times\frac{4}{7}$

c. $\left(1-\frac{3}{8}\right)\times\frac{4}{7}$

d. $\left(1+\frac{1}{8}\right)\times\frac{4}{7}$

2. Fill in each blank < or > to make the inequality true.

a. $\left(1-\frac{2}{5}\right)\times\frac{4}{7}$ ____ $\frac{4}{7}$

b. $\left(1+\frac{1}{5}\right)\times\frac{4}{7}$ ____ $\frac{4}{7}$

c. $\left(1-\frac{3}{8}\right)\times\frac{4}{7}$ ____ $\frac{4}{7}$

d. $\left(1+\frac{1}{8}\right)\times\frac{4}{7}$ ____ $\frac{4}{7}$

3. Describe the value of the product when 4/7 is multiplied by a fraction greater than 1. Explain your reasoning.

4. Describe the resulting product when 4/7 is multiplied by a fraction less than 1. Explain your reasoning.

Lesson Synthesis

Today we compared the value of a product of fractions to the value of one of the factors without calculating the product.

$\frac{3}{5} \times 10.$

What are some ways you can compare the value of this product with 10?

Will it Always Work?

Let’s make generalizations about multiplying a whole number by a fraction.

Warm up

True or False: Distributing

Decide if each statement is true or false.

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

Be prepared to explain your reasoning.

Warm up

True or False: Distributing

Decide if each statement is true or false.

$$\left(1-\frac{1}{4}\right)\times 9 = 9-\left(\frac{1}{4}\times 9\right)$$

Be prepared to explain your reasoning.

Warm up

True or False: Distributing

Decide if each statement is true or false.

$$\left(\left(1+\frac{1}{4}\right)\times 7\right)=(1\times 7)+\frac{1}{4}$$

Be prepared to explain your reasoning.

Activity #1

True Statements

Write < , > , or = in each blank to make true statements. Choose one problem and explain or show your reasoning.

1. 567 ____ 345×567

2. $\frac{4}{5} \times 851$ ____ 851

3. $\frac{1}{4}$ ____ $\frac{5}{5} \times \frac{1}{4}$

4. $\frac{103}{104}$ ____ $\frac{103}{104} \times \frac{103}{104}$

5. $\frac{99}{8} \times \frac{23}{22}$ ____ $\frac{99}{8}$

6. $\frac{10}{10} \times \frac{1}{2}$ ____ $\frac{1}{2}$

7. $\frac{100}{7} \times \frac{9}{13}$ ____ $\frac{9}{13}$

Activity #2

Andre's Rules

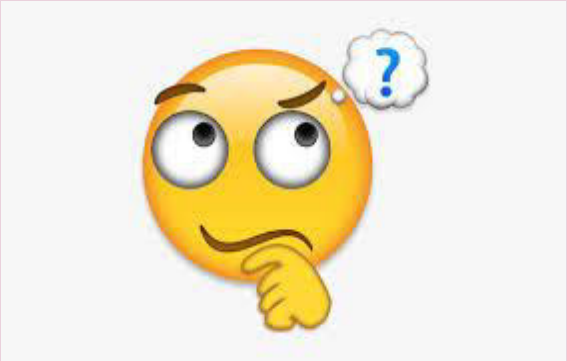
Andre says:

- When you multiply any fraction by a number less than 1, the product will be less than the fraction.
- When you multiply any fraction by a number greater than 1, the product will be greater than the fraction.

Each partner, choose one of the statements and describe why it is true. You may want to include details such as notes, diagrams, drawings, etc. to help others understand your thinking.

Lesson Synthesis

Today we generalized some rules to compare products of fractions. What is your favorite way to compare products of fractions?

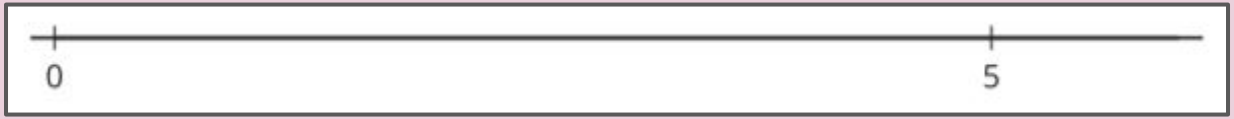


Section Summary

In this section, we learned how to compare the value of products without multiplying. We used number lines and the meaning of multiplication to reason about the size of the factors in relation to each other and the product.

$$\left(1-\frac{2}{5}\right)\times\frac{4}{7}=\frac{4}{7}-\left(\frac{2}{5}\times\frac{4}{7}\right)$$

Without multiplying, determine the approximate location of the value of on the number line?



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Weekend Investigation

Let’s find out about how students spend free time on the weekend.

5.MD.B.2, 5.NF.A.2

Activity #1

Data Collection

Imagine on the weekend you have 2 hours of free time that you can spend any way you like.

1. How would you spend it? Record your answer in fractions of an hour using multiples of ½ , ¼ , and ⅛ . Show your reasoning.

2. Record the time for each activity from your list, if there is a poster for it.

Activity #2

Data Analysis

Your teacher will assign a poster with a data set for one of the categories from the previous activity.

1. Create a line plot for the activity. Make sure to label the line plot.

2. Analyze the data and tell the story of your data. Choose at least 3 things. Use the following questions if they are helpful.

- What is the total number of hours the class spends on this activity?
- What is the difference between greatest and least time?
- Is there something surprising?
- How many data points are there? What does that tell you?
- What fraction of your classmates spend less than an hour on this activity? More than an hour?

Be prepared to share the story with the class.

Lesson Synthesis

Today, we thought about how we might spend free time. We made and analyzed line plots.

Who might be interested in collecting and analyzing data like this? Why?