Content Overview

Dear Family,

In this unit of *Math Expressions*, your child is studying multiplication and division with fractions.

Multiplication tells how many times we are taking a number. For example, when we take $\frac{4}{5}$ of something, we multiply it by $\frac{4}{5}$ to find the answer. In this unit, your child will learn to:

- multiply a whole number by a unit fraction $\quad \frac{1}{b} \cdot w = \frac{w}{b} \qquad \frac{1}{3} \cdot 5 = \frac{5}{3}$
- multiply a whole number by a non-unit fraction $\quad \frac{a}{b} \cdot w = \frac{a \cdot w}{b} \qquad \frac{2}{3} \cdot 5 = \frac{10}{3}$
- multiply two fractions $\quad \frac{a}{b} \cdot \frac{c}{d} = \frac{a \cdot c}{b \cdot d} \qquad \frac{2}{3} \cdot \frac{5}{7} = \frac{10}{21}$

Division tells us how many of a certain number are inside another number. For example, when we ask how many times $\frac{1}{5}$ fits inside a number, we divide it by $\frac{1}{5}$ to find out. Using the relationship between multiplication and division, your child will discover how to:

- divide a whole number by a whole number $\quad a \div b = a \cdot \frac{1}{b} = \frac{a}{b} \qquad 3 \div 4 = 3 \cdot \frac{1}{4} = \frac{3}{4}$
- divide a whole number by a unit fraction $\quad w \div \frac{1}{d} = w \cdot d \qquad 6 \div \frac{1}{5} = 6 \cdot 5 = 30$
- divide a unit fraction by a whole number $\quad \frac{1}{d} \div w = \frac{1}{d} \cdot \frac{1}{w} \qquad \frac{1}{2} \div 4 = \frac{1}{2} \cdot \frac{1}{4} = \frac{1}{8}$

Throughout the unit, students will also practice comparing, adding, and subtracting fractions. This helps them maintain what they have learned. It also helps them to see how the various fractional operations are alike and how they are different. It is particularly important for your child to realize that comparing, adding, and subtracting fractions require the denominators to be the same. For multiplying and dividing, this is not true.

If you have any questions about this unit, please call or write to me.

Sincerely,

Your child's teacher

CA CC

Unit 3 addresses the following standards from the *Common Core State Standards for Mathematics with California Additions:* **5.NF.3, 5.NF.4, 5.NF.4a, 5.NF.4b, 5.NF.5, 5.NF.5a, 5.NF.5b, 5.NF.6, 5.NF.7, 5.NF.7a, 5.NF.7b, 5.NF.7c,** and all Mathematical Practices.

Un vistazo general al contenido

Estimada familia:

En esta unidad de *Math Expressions* su niño está estudiando la multiplicación y la división con fracciones.

La multiplicación nos dice cuántas veces se toma un número. Por ejemplo, cuando tomamos $\frac{4}{5}$ de algo, lo multiplicamos por $\frac{4}{5}$ para hallar la respuesta. En esta unidad su niño aprenderá a:

- multiplicar un número entero por una fracción unitaria $\quad \frac{1}{b} \cdot w = \frac{w}{b} \quad \frac{1}{3} \cdot 5 = \frac{5}{3}$
- multiplicar un número entero por una fracción no unitaria $\quad \frac{a}{b} \cdot w = \frac{a \cdot w}{b} \quad \frac{2}{3} \cdot 5 = \frac{10}{3}$
- multiplicar dos fracciones $\quad \frac{a}{b} \cdot \frac{c}{d} = \frac{a \cdot c}{b \cdot d} \quad \frac{2}{3} \cdot \frac{5}{7} = \frac{10}{21}$

La división nos dice cuántas veces cabe un número dentro de otro número. Por ejemplo, cuando preguntamos cuántas veces cabe $\frac{1}{5}$ en un número, dividimos el número entre $\frac{1}{5}$ para saberlo. Al usar la relación entre la multiplicación y la división, su niño va a descubrir cómo:

- dividir un entero entre un entero $\quad a \div b = a \cdot \frac{1}{b} = \frac{a}{b} \quad 3 \div 4 = 3 \cdot \frac{1}{4} = \frac{3}{4}$
- dividir un entero entre una fracción unitaria $\quad w \div \frac{1}{d} = w \times d \quad 6 \div \frac{1}{5} = 6 \times 5 = 30$
- dividir una fracción unitaria entre un entero $\quad \frac{1}{d} \div w = \frac{1}{d} \times \frac{1}{w} \quad \frac{1}{2} \div 4 = \frac{1}{2} \times \frac{1}{4} = \frac{1}{8}$

En esta unidad los estudiantes también practicarán comparaciones, y sumas y restas con fracciones. Esto los ayudará a retener lo que han aprendido. También los ayudará a ver las semejanzas y diferencias entre las operaciones con fracciones. Es importante que su niño se dé cuenta de que para comparar, sumar y restar fracciones, las fracciones deben tener el mismo denominador. Esto no aplica para la multiplicación y división.

Si tiene alguna duda o algún comentario, por favor comuníquese conmigo.

Atentamente,
El maestro de su niño

CA CC

En la Unidad 3 se aplican los siguientes estándares auxiliares, contenidos en los Estándares estatales comunes de matemáticas con adiciones para California: **5.NF.3, 5.NF.4, 5.NF.4a, 5.NF.4b, 5.NF.5, 5.NF.5a, 5.NF.5b, 5.NF.6, 5.NF.7, 5.NF.7a, 5.NF.7b, 5.NF.7c,** y todos los de prácticas matemáticas.

3-1 Class Activity

Name _____ Date _____

CA CC Content Standards 5.NF.4, 5.NF.4a, 5.NF.6, Mathematical Practices MP.1, MP.4, MP.6, MP.7

▶ Multiply by a Unit Fraction

Complete.

1. A path around a large park is 8 kilometers long. Alex ran around the path 4 times.

   8 taken 4 times = _____ kilometers

   4 · 8 = _____ kilometers

2. Kento ran around the same path $\frac{1}{4}$ time.

   8 taken $\frac{1}{4}$ time = _____ kilometers

   $\frac{1}{4}$ · 8 = _____ kilometers

3 groups of 6

3. Markers come in boxes of 6. Alta has 3 boxes.

   6 taken 3 times = _____ markers

   3 · 6 = _____ markers

$\frac{1}{3}$ group of 6

4. Isabel has $\frac{1}{3}$ of a box of 6 markers.

   6 taken $\frac{1}{3}$ time = _____ markers

   $\frac{1}{3}$ · 6 = _____ markers

▶ Relate Fraction Multiplication and Whole Number Division

Complete each equation chain like the one shown.

$\frac{1}{4}$ of 8 = $\frac{1}{4}$ · 8 = 8 ÷ 4 = $\frac{8}{4}$ = 2

5. $\frac{1}{3}$ of 9 = _____ = _____ = _____ = _____

6. $\frac{1}{7}$ of 21 = _____ = _____ = _____ = _____

7. $\frac{1}{5}$ of 30 = _____ = _____ = _____ = _____

8. Which expression does *not* mean the same thing as the others?

   $\frac{1}{6}$ · 24 　 24 ÷ 6 　 $\frac{24}{6}$ 　 $\frac{6}{24}$ 　 $\frac{1}{6}$ of 24

3-1 Class Activity

Name _____ Date _____

VOCABULARY
comparison bars

▶ Discuss Comparison Problems

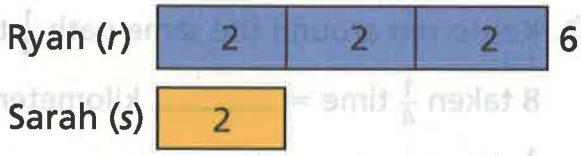
To prepare for a family gathering, Sara and Ryan made soup. Sara made 2 quarts. Ryan made 6 quarts.

You can compare amounts using multiplication and division.

Let r equal the number of quarts Ryan made.
Let s equal the number of quarts Sara made.

Ryan made 3 times as many quarts as Sara.

$$r = 3 \cdot s$$



Sara made one third as many quarts as Ryan.

$$s = \frac{1}{3} \cdot r \text{ or } s = r \div 3$$

Solve.

Natasha made 12 quarts of soup. Manuel made 3 quarts.

9. Draw comparison bars to show the amount of soup each person made.

10. _____ made 4 times as many quarts as _____.

11. _____ made $\frac{1}{4}$ as many quarts as _____.

12. Write two multiplication equations that compare the amounts.

$n =$ _____ $m =$ _____

13. Write a division equation that compares the amounts.

_____

3-1 Class Activity

Name _____ Date _____

▶ Solve Comparison Problems

Solve.

In the gym, 8 girls are standing in one line and 4 boys are standing in another line.

14. Draw comparison bars to compare the number of people in each line.

15. Write two multiplication equations that compare the number of girls (g) to the number of boys (b).

$g =$ _____ $b =$ _____

16. Write a division equation that compares the number of boys (b) to the number of girls (g).

_____

17. A collection of coins contains 20 pennies and 4 nickels.

Write two multiplication equations and a division equation that compare the number of pennies (p) and the number of nickels (n).

_____ _____ _____

18. A fifth-grade class is made up of 12 boys and 24 girls. How many times as many girls as boys are in the class?

_____

19. Fred has 24 football cards. Scott has $\frac{1}{6}$ as many football cards as Fred. How many football cards does Scott have?

_____

Name _____ Date _____

▶ Compare Data in Graphs and Tables

20. How many times as many fish did Bill catch as Amy?

_____

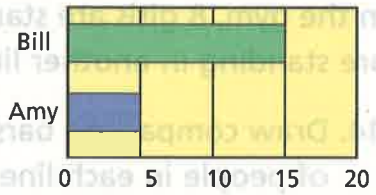
21. How many times as many fish did Amy catch as Bill?

_____

22. What is $\frac{1}{3} \cdot 15$? What is $15 \div 3$? What is $\frac{15}{3}$?

_____

Fish Caught at the Lake



Write two statements for each pair of players. Use the word *times*.

23. Compare Gina's points and Brent's points.

_____

_____

Points at the Basketball Game

Player	Points
Gina	32
Brent	8
Jacob	4

24. Compare Brent's points and Jacob's points.

_____

_____

25. Compare Jacob's points and Gina's points.

_____

_____

26. Which are the shortest and longest snakes? How do you know?

_____

_____

Length of Snakes at the Zoo

Snake	Inches
Speedy	n
Lola	$\frac{1}{5} \cdot n$
Pretzel	$5 \cdot n$

27. If Speedy is 25 inches long, how long is Lola?

_____

28. If Pretzel is 50 inches long, how long is Speedy? How long is Lola?

_____

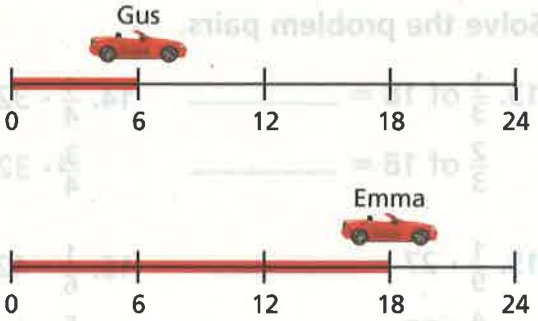
3-2 Class Activity

Name _____ Date _____

CA CC Content Standards 5.NF.4, 5.NF.4a, 5.NF.6, Mathematical Practices MP.1, MP.4, MP.6, MP.7

▶ Visualize the Separate Steps

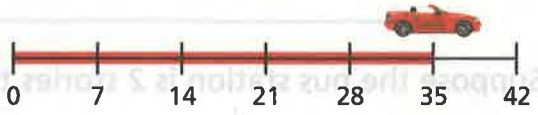
Silver City is 24 miles away. Gus has driven $\frac{1}{4}$ of the distance. Emma has driven $\frac{3}{4}$ of the distance.



1. How many miles has Gus driven? _____
2. How many miles has Emma driven? _____
3. How many times as far as Gus has Emma driven? _____
4. If $\frac{1}{5}$ of a distance is 3 km, how far is $\frac{4}{5}$? _____
5. If $\frac{1}{8}$ of a container weighs 2 pounds, how many pounds is $\frac{3}{8}$ of the container? _____
6. If $\frac{1}{7}$ of a book is 4 pages, how many pages is $\frac{2}{7}$ of the book? _____

Shady Grove is 40 miles away. Middletown is $\frac{1}{5}$ of the way there and Parkview is $\frac{2}{5}$ of the way.

7. How many miles away is Middletown? _____
8. How many miles away is Parkview? _____
9. Ocean City is 42 miles from home. We have gone 35 miles. What fraction of the distance have we gone? _____



10. Eagle Rock is 72 miles away. When we had gone $\frac{2}{9}$ of the distance, we stopped for gas. How many miles had we traveled? _____
11. Perilous Peak is 80 miles away. We are $\frac{3}{10}$ of the way there. How many more miles do we have to go? _____
12. Windy Bay is 48 miles away. Make up your own fraction word problem with multiplication. Be sure to include a non-unit fraction.

_____

_____

3-2 Class Activity

Name _____ Date _____

VOCABULARY
factor
product

▶ Practice Multiplication with Fractions

Solve the problem pairs.

13. $\frac{1}{3}$ of 18 = _____
    $\frac{2}{3}$ of 18 = _____

14. $\frac{1}{4} \cdot 32$ = _____
    $\frac{3}{4} \cdot 32$ = _____

15. $\frac{1}{9} \cdot 27$ = _____
    $\frac{4}{9} \cdot 27$ = _____

16. $\frac{1}{6} \cdot 42$ = _____
    $\frac{5}{6} \cdot 42$ = _____

Parts of a Multiplication Problem

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

factor factor product

17. Which expression does *not* have the same value as the others?

$\frac{2}{3} \cdot 21$	$\frac{2}{3}$ of 21	$\left(\frac{1}{3} \text{ of } 21\right) + \left(\frac{1}{3} \text{ of } 21\right)$
$\frac{2}{3} + 21$	$\frac{21}{3} + \frac{21}{3}$	$\left(\frac{1}{3} \text{ of } 21\right) \cdot 2$

Use the table to answer each question.

18. Which building is the tallest? Which is the shortest? How do you know?

_____

_____

_____

Building	Number of Stories
Bank	n
Bus station	$\frac{1}{6} \cdot n$
Sport shop	$\frac{5}{6} \cdot n$
Hotel	$6 \cdot n$

Suppose the bus station is 2 stories tall.

19. How many stories does the sport shop have? _____

20. How many stories does the bank have? _____

Suppose the bank is 5 stories tall.

21. How many stories tall is the hotel? _____

Suppose the hotel is 36 stories tall.

22. How many stories does the bank have? _____

23. How many stories does the bus station have? _____

24. How many stories does the sport shop have? _____

Name _____ Date _____

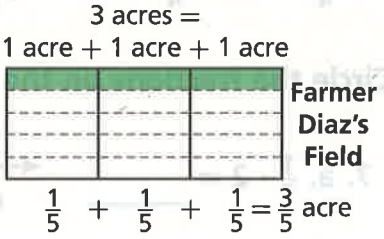
CA CC Content Standards 5.NF.4, 5.NF.4a, 5.NF.6,
Mathematical Practices MP.1, MP.2, MP.5

▶ Model the Product $\frac{1}{d} \bullet w$

Farmer Diaz has 3 acres of land. He plows $\frac{1}{5}$ of this land. The number of acres he plows is

$\frac{1}{5}$ *of* 3 or $\frac{1}{5} \cdot 3$

The diagram at the right shows Farmer Diaz's land divided vertically into 3 acres. The dashed horizontal segments divide the land into five parts. The shaded strip is the $\frac{1}{5}$ of the land Farmer Diaz plowed.



The drawing shows that taking $\frac{1}{5}$ of the 3 acres is the same as taking $\frac{1}{5}$ of each acre and combining them. We can show this mathematically.

$$\frac{1}{5} \cdot 3 = \frac{1}{5}(1 + 1 + 1)$$
$$= \left(\frac{1}{5} \cdot 1\right) + \left(\frac{1}{5} \cdot 1\right) + \left(\frac{1}{5} \cdot 1\right)$$
$$= \frac{1}{5} + \frac{1}{5} + \frac{1}{5}$$
$$= \frac{3}{5}$$

So $\frac{1}{5}$ of the 3 acres is $\frac{3}{5}$ acre.

1. Farmer Smith has 4 acres of land. She plows $\frac{1}{3}$ of her land. Divide and shade the drawing at the right to show the part of the land she plows.

4 acres =
1 acre + 1 acre + 1 acre + 1 acre

2. Express $\frac{1}{3} \cdot 4$ as a sum of unit fractions.

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

3. What area does Farmer Smith plow? _____

4. Farmer Hanson plows $\frac{1}{7}$ of his 2 acres of land. What area does he plow?

_____

5. Olga walks 9 blocks to school. Her friend Louis walks only $\frac{1}{5}$ of that distance. How many blocks does Louis walk to school?

_____

Name _____ Date _____

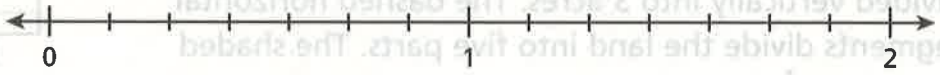
▶ Multiply by a Non-Unit Fraction

6. Which expression does *not* have the same value as the others?

$\frac{1}{4}$ of 3 $\quad \frac{1}{4} \cdot 3 \quad 4 \cdot \frac{1}{3} \quad \frac{1}{4} + \frac{1}{4} + \frac{1}{4} \quad 3 \cdot \frac{1}{4}$

Circle the fractions on the number lines to help you multiply.

7. a. $\frac{1}{7} \cdot 2 =$ _____



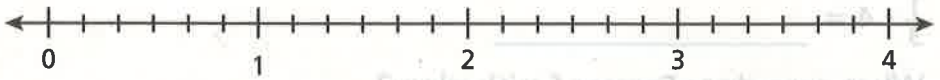
b. $\frac{3}{7} \cdot 2 =$ _____

8. a. $\frac{1}{5} \cdot 3 =$ _____

b. $\frac{4}{5} \cdot 3 =$ _____

9. a. $\frac{1}{6} \cdot 4 =$ _____

b. $\frac{5}{6} \cdot 4 =$ _____



10. a. $\frac{1}{3} \cdot 8 =$ _____

b. $\frac{2}{3} \cdot 8 =$ _____

3-4 Class Activity

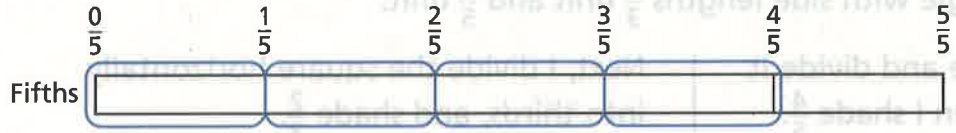
Name _____ Date _____

CA CC Content Standards 5.NF.4, 5.NF.4a, 5.NF.4b, 5.NF.5, 5.NF.6 Mathematical Practices MP.1, MP.2, MP.4, MP.5, MP.6, MP.7

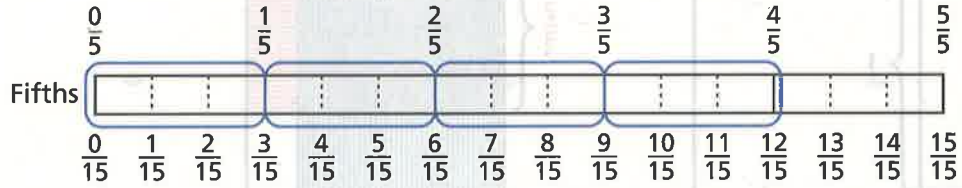
▶ Use Bar Models to Multiply Fractions

Miguel explains how to use fraction bars to find $\frac{2}{3} \cdot \frac{4}{5}$:

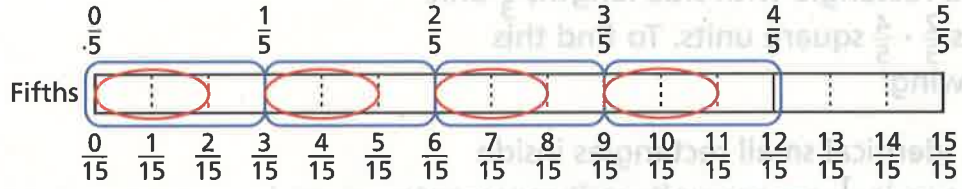
First, I circle 4 fifths on the fifths fraction bar.



To find $\frac{2}{3}$ of $\frac{4}{5}$, I can circle $\frac{2}{3}$ of each fifth. But, first I have to split each fifth into three parts. After I do this, the bar is divided into fifteenths.



Now, it is easy to circle 2 thirds of each of the 4 fifths.



Each group I circled has 2 fifteenths, so I circled 4 groups of 2 fifteenths. That's 8 fifteenths in all. So, $\frac{2}{3} \cdot \frac{4}{5} = \frac{8}{15}$.

1. Use the sixths bar below to model $\frac{3}{4} \cdot \frac{5}{6}$.

$\frac{3}{4} \cdot \frac{5}{6} =$ _____

Sixths

2. Use the sevenths bar below to model $\frac{2}{3} \cdot \frac{4}{7}$.

$\frac{2}{3} \cdot \frac{4}{7} =$ _____

Sevenths

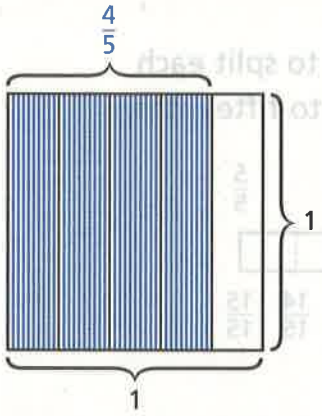
Name _____ Date _____

▶ Use Area Models to Multiply Fractions

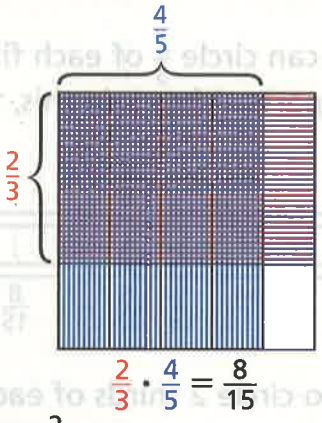
Jessie knows that the area of a rectangle is its length times its width. She explains how to use this idea to model $\frac{2}{3} \cdot \frac{4}{5}$:

I need to draw a rectangle with side lengths $\frac{2}{3}$ unit and $\frac{4}{5}$ unit.

I start with a unit square and divide it vertically into fifths. Then I shade $\frac{4}{5}$.



Next, I divide the square horizontally into thirds, and shade $\frac{2}{3}$.



The overlapping part is a rectangle with side lengths $\frac{2}{3}$ unit and $\frac{4}{5}$ unit. So, its area is $\frac{2}{3} \cdot \frac{4}{5}$ square units. To find this area, I noticed the following:

- There are $3 \cdot 5$, or 15, identical small rectangles inside the unit square. Each one is $\frac{1}{15}$ square unit, so it represents the unit fraction $\frac{1}{15}$.
- There are $2 \cdot 4$, or 8, of these unit-fraction rectangles inside the $\frac{2}{3}$ by $\frac{4}{5}$ rectangle.

So the area of the overlapping region is $8 \cdot \frac{1}{15}$, or $\frac{8}{15}$ square units. This means $\frac{2}{3} \cdot \frac{4}{5} = \frac{8}{15}$.

Divide and shade the unit square to make an area model for the multiplication. Then find the product.

3. $\frac{1}{2} \cdot \frac{3}{8} =$ _____

4. $\frac{3}{4} \cdot \frac{2}{3} =$ _____

5. $\frac{5}{6} \cdot \frac{1}{3} =$ _____

Name _____ Date _____

▶ Practice Multiplying Fractions

Find the product. You do not need to simplify your answer.

6. $\frac{1}{7} \cdot 6 =$ _____

7. $5 \cdot \frac{1}{4} =$ _____

8. $\frac{2}{3} \cdot 9 =$ _____

9. $4 \cdot \frac{3}{8} =$ _____

10. $\frac{1}{9} \cdot \frac{1}{2} =$ _____

11. $\frac{1}{3} \cdot \frac{1}{4} =$ _____

12. $\frac{2}{5} \cdot \frac{1}{3} =$ _____

13. $\frac{5}{6} \cdot \frac{3}{4} =$ _____

14. $\frac{3}{7} \cdot \frac{1}{3} =$ _____

15. $\frac{7}{10} \cdot \frac{7}{10} =$ _____

16. $\frac{3}{4} \cdot \frac{6}{11} =$ _____

17. $\frac{7}{8} \cdot \frac{8}{9} =$ _____

18. $\frac{4}{5} \cdot \frac{4}{5} =$ _____

19. $\frac{2}{7} \cdot \frac{4}{9} =$ _____

20. $\frac{4}{7} \cdot \frac{2}{9} =$ _____

21. $\frac{3}{4} \cdot 20 =$ _____

22. $\frac{1}{10} \cdot \frac{1}{10} =$ _____

23. $6 \cdot \frac{2}{3} =$ _____

24. $\frac{7}{8} \cdot \frac{1}{3} =$ _____

25. $\frac{7}{10} \cdot \frac{2}{7} =$ _____

26. $\frac{2}{5} \cdot 12 =$ _____

27. $\frac{1}{4} \cdot \frac{1}{2} =$ _____

28. $\frac{1}{5} \cdot 5 =$ _____

29. $\frac{6}{7} \cdot \frac{7}{8} =$ _____

Name _____ Date _____

▶ Fraction Word Problems

Represent the problem with an equation. Then solve. *Show your work.*

30. Of the 304 people who attended the school play, $\frac{5}{8}$ were students. How many of the people who attended were students?

_____

31. One lap around the track is $\frac{1}{4}$ mile. Abby ran around the track 13 times. How far did she run?

_____

32. Cam is filling his bathtub. The tub holds 32 gallons of water. It is now $\frac{4}{7}$ full. How many gallons of water are in the tub?

_____

33. One third of the campers at a summer camp signed up for an arts-and-crafts class. Of these campers, one fifth signed up for woodworking. What fraction of the campers signed up for woodworking?

_____

34. Two thirds of the students in the orchestra play string instruments. Half of the students who play string instruments play violins. What fraction of all the students in the orchestra play violins?

_____

35. Ms. Hernandez knitted a scarf for her grandson. The scarf is $\frac{5}{6}$ yard long and $\frac{2}{9}$ yard wide. What is the area of the scarf?

_____

3-5
Class Activity

Name _____ Date _____

CA CC Content Standards 5.NF.4, 5.NF.4a, 5.NF.6
Mathematical Practices MP.1, MP.3, MP.6

▶ Simplify and Multiply Fractions

Multiply. Simplify first if you can.

1. $\frac{2}{3} \cdot 30 =$ _____
2. $\frac{2}{5} \cdot 35 =$ _____
3. $\frac{5}{6} \cdot 4 =$ _____
4. $\frac{7}{16} \cdot 8 =$ _____
5. $\frac{7}{20} \cdot \frac{5}{14} =$ _____
6. $\frac{2}{16} \cdot \frac{4}{21} =$ _____
7. $\frac{9}{10} \cdot \frac{7}{10} =$ _____
8. $\frac{7}{15} \cdot \frac{10}{21} =$ _____
9. $\frac{5}{24} \cdot \frac{6}{25} =$ _____
10. $\frac{5}{8} \cdot \frac{32}{45} =$ _____
11. $\frac{8}{49} \cdot \frac{7}{10} =$ _____
12. $\frac{7}{25} \cdot \frac{3}{4} =$ _____

13. Which fraction is not equivalent to the others?

$\frac{3}{9}$ $\frac{1}{3}$ $\frac{8}{24}$ $\frac{10}{30}$ $\frac{6}{18}$ $\frac{9}{36}$ $\frac{20}{60}$

▶ Solve Word Problems

Write an equation. Then solve. *Show your work.*

14. In the Fireside Ski Shop, $\frac{11}{28}$ of the ski caps have tassels. Of the caps with tassels, $\frac{7}{11}$ are blue. What fraction of the caps in the shop are blue with tassels?

_____

15. In the shop, $\frac{27}{32}$ of the jackets have zippers. Of the jackets with zippers, $\frac{8}{9}$ have hoods. What fraction of the jackets in the shop have both zippers and hoods?

_____

16. Five of the 16 workers in the shop know how to ski. $\frac{1}{5}$ of those who can ski know how to snowboard. What fraction of the workers can ski and snowboard?

_____

3-5 Class Activity

Name _____ Date _____

What's the Error?

Dear Math Students,

I multiplied $\frac{7}{12} \cdot \frac{3}{4}$, but I think my answer is wrong. When you take a fraction of a fraction, you should get a smaller fraction. But my answer is larger. What mistake did I make? How do I correct it?

$$\frac{\cancel{7}^{1}}{\cancel{12}_{3}} \cdot \frac{3}{\cancel{4}_{1}} = \frac{21}{3} = 7$$

Your friend,
Puzzled Penguin

17. Write a response to Puzzled Penguin.

Write Word Problems

Write a word problem that can be represented by the multiplication. Give the solution to your problem.

18. $\frac{3}{4} \cdot 8 = x$

19. $\frac{8}{15} \cdot \frac{5}{12} = x$

3-6

Class Activity

Name _____ Date _____

CA CC Content Standards 5.NF.4, 5.NF.4a, 5.NF.4b, 5.NF.5, 5.NF.5a, 5.NF.5b, 5.NF.6 Mathematical Practices MP.1, MP.2, MP.7

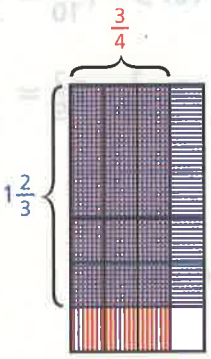
▶ Area Model for Mixed-Number Multiplication

A farmer has a rectangular field $1\frac{2}{3}$ miles long and $\frac{3}{4}$ mile wide. What is the area of the field?

Melinda knows the area is $1\frac{2}{3} \cdot \frac{3}{4}$. She explains how she makes an area model to find this product:

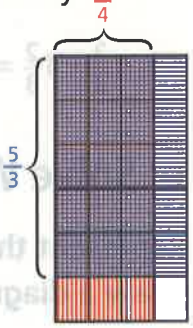
I need to make a rectangle with side lengths $1\frac{2}{3}$ units and $\frac{3}{4}$ unit. I start with 2 unit squares because one side of my rectangle will have a length greater than 1 unit.

I shade $\frac{3}{4}$ vertically in red. Horizontally, I shade 1 square and $\frac{2}{3}$ of another in blue. The overlap has an area of $1\frac{2}{3} \cdot \frac{3}{4}$, but I can't tell what this area is.



I divide the top square horizontally into thirds too. So, $\frac{5}{3}$ is shaded horizontally. Now, I can see that each unit square is divided into twelfths.

There are 15 twelfths in the overlap, so $1\frac{2}{3} \cdot \frac{3}{4} = \frac{15}{12}$, which is $1\frac{1}{4}$. The area of the field is $1\frac{1}{4}$ miles.



When I rewrite the factor $1\frac{2}{3}$ as a fraction, I can see that the product is the product of the numerators over the product of the denominators.

$$1\frac{2}{3} \cdot \frac{3}{4} = \frac{5}{3} \cdot \frac{3}{4} = \frac{15}{12} = \frac{5}{4} = 1\frac{1}{4}$$

Discuss this model for $1\frac{2}{5} \cdot 1\frac{1}{2}$ with your partner. Then answer the questions.

1. What unit fraction does each of the smallest rectangles represent?

_____

2. How many unit-fraction rectangles are in the overlap?

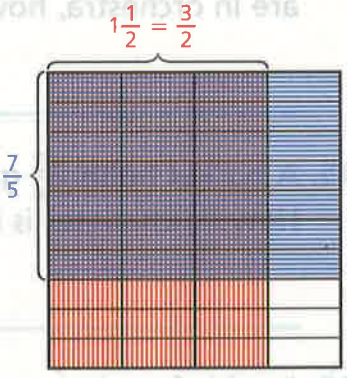
_____

3. Express the product of $1\frac{2}{5} \cdot 1\frac{1}{2}$ as a fraction and as a mixed number.

_____

4. Rewrite $1\frac{2}{5} \cdot 1\frac{1}{2}$ as a product of fractions. Is the product equal to the product of the numerators over the product of the denominators?

_____



Name _____ Date _____

▶ Practice Multiplying Mixed Numbers

Find each product by first rewriting each mixed number as a fraction.

5. $\frac{5}{6} \cdot 1\frac{1}{3} =$ _____

6. $3\frac{2}{3} \cdot 7 =$ _____

7. $1\frac{3}{4} \cdot 2\frac{1}{4} =$ _____

8. $4\frac{1}{2} \cdot \frac{4}{5} =$ _____

9. $\frac{7}{8} \cdot 1\frac{2}{5} =$ _____

10. $5 \cdot 1\frac{7}{10} =$ _____

11. $1\frac{2}{3} \cdot 1\frac{2}{3} =$ _____

12. $\frac{1}{12} \cdot 2\frac{2}{9} =$ _____

▶ Solve Word Problems

Represent the problem with an equation. Then solve. Draw a diagram if you need to.

13. Sara built a pen for her pet rabbits. The pen measures $2\frac{5}{6}$ yards by $1\frac{1}{2}$ yards. What is the area of the pen?

_____

14. At Southtown High School, the number of students in band is $1\frac{3}{4}$ times the number in orchestra. If 56 students are in orchestra, how many are in band?

_____

15. A bucket holds $2\frac{3}{4}$ gallons of water. The bucket is $\frac{5}{8}$ full. How much water is in the bucket?

_____

16. Jacob's favorite movie is $1\frac{5}{6}$ hours long. He says he has watched the movie $5\frac{1}{2}$ times. If that is true, how many hours has Jacob spent watching the movie?

_____

3-7

Class Activity

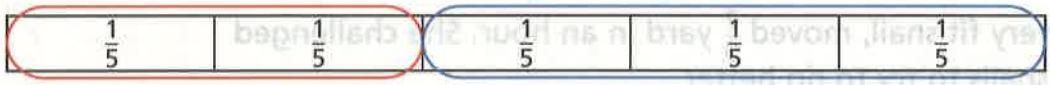
Name _____ Date _____

CA CC Content Standards 5.NF.1, 5.NF.2, 5.NF.4, 5.NF.4a, 5.NF.5, 5.NF.5a, 5.NF.5b, 5.NF.6 Mathematical Practices MP.1, MP.2, MP.3, MP.6, MP.8

▶ Compare Multiplication and Addition

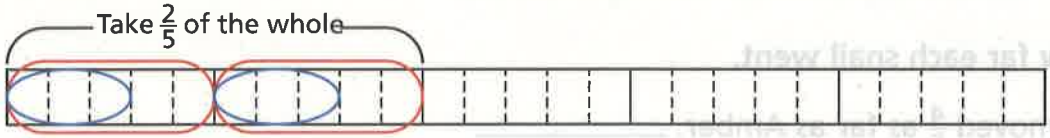
These fraction bars show how we add and multiply fractions.

Add



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

Multiply



$\frac{3}{5} \cdot \frac{2}{5} = \frac{6}{25}$

1. Which problem above has the greater answer?

_____

2. Circle the problem that will have the greater answer. Then solve.

$\frac{2}{7} + \frac{3}{7} =$ _____ $\frac{3}{7} \cdot \frac{2}{7} =$ _____

3. The fractions in the problems at the right have different denominators. Circle the problem that will have the greater answer. Then solve.

$\frac{1}{6} + \frac{3}{4} =$ _____ $\frac{3}{4} \cdot \frac{1}{6} =$ _____

▶ Compare Fraction and Whole-Number Operations

Tell whether the answer will be less than or greater than the red number.

4. $a + b$

5. $a - b$

6. $b \cdot a$

7. $\frac{a}{b} + \frac{c}{d}$

8. $\frac{a}{b} - \frac{c}{d}$

9. $\frac{c}{d} \cdot \frac{a}{b}$

10. How is multiplying fractions different from multiplying whole numbers?

_____

_____

Keep in Mind

a and b are whole numbers greater than 1.

All of the fractions are less than 1.

3-7 Class Activity

Name _____ Date _____

VOCABULARY
Commutative Property

▶ Comparison Problems with Mixed Operations

Amber, a very fit snail, moved $\frac{7}{9}$ yard in an hour. She challenged the other snails to try to do better.

Write how far each snail went.

11. Willy moved $\frac{4}{5}$ as far as Amber. _____

12. Dusty went $\frac{1}{3}$ yard less than Amber. _____

13. Pearl went twice as far as Amber. _____

14. Casey moved $\frac{4}{9}$ yard more than Amber. _____

15. Minnie moved half as far as Amber. _____

16. Make up your own question about another snail, Shelly. Ask a classmate to solve it.

_____

_____

_____

▶ Properties and Fractions

Commutative Property of Multiplication

$$\frac{a}{b} \cdot \frac{c}{d} = \frac{c}{d} \cdot \frac{a}{b}$$

Look at the proof of the **Commutative Property** below.

$$\frac{a}{b} \cdot \frac{c}{d} = \frac{a \cdot c}{b \cdot d} = \frac{c \cdot a}{d \cdot b} = \frac{c}{d} \cdot \frac{a}{b}$$

Step 1 Step 2 Step 3

17. Explain why each step is true.

Step 1 _____

Step 2 _____

Step 3 _____

Name _____ Date _____

VOCABULARY
Associative Property
Distributive Property

▶ Properties and Fractions (continued)

Associative Property of Multiplication

$$\frac{a}{b} \cdot \left(\frac{c}{d} \cdot \frac{e}{f}\right) = \left(\frac{a}{b} \cdot \frac{c}{d}\right) \cdot \frac{e}{f}$$

Look at the proof of the **Associative Property** below.

$$\frac{a}{b} \cdot \left(\frac{c}{d} \cdot \frac{e}{f}\right) = \frac{a}{b} \cdot \frac{c \cdot e}{d \cdot f} = \frac{a \cdot (c \cdot e)}{b \cdot (d \cdot f)} = \frac{(a \cdot c) \cdot e}{(b \cdot d) \cdot f} = \frac{a \cdot c}{b \cdot d} \cdot \frac{e}{f} = \left(\frac{a}{b} \cdot \frac{c}{d}\right) \cdot \frac{e}{f}$$

Step 1 Step 2 Step 3 Step 4 Step 5

18. Explain why each step is true.

Step 1 _____

Step 2 _____

Step 3 _____

Step 4 _____

Step 5 _____

Distributive Property

$$\frac{a}{b} \cdot \left(\frac{c}{d} + \frac{e}{f}\right) = \frac{a}{b} \cdot \frac{c}{d} + \frac{a}{b} \cdot \frac{e}{f}$$

For example, the **Distributive Property** tells us that

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

19. Find the value of $\frac{1}{2} \cdot \left(\frac{2}{3} + \frac{1}{4}\right)$ by adding inside the parentheses first and then multiplying.

_____

20. Find the value of $\frac{1}{2} \cdot \frac{2}{3} + \frac{1}{2} \cdot \frac{1}{4}$ by multiplying and then adding.

_____

21. How do your answers to Exercises 19 and 20 compare?

_____

_____

3-7 Class Activity

Name _____ Date _____

Mixed Practice

Find the value of the expression.

22. $\frac{4}{5} \cdot \frac{3}{7}$ _____

23. $\frac{4}{5} - \frac{3}{7}$ _____

24. $6 \cdot 1\frac{1}{3}$ _____

25. $6 + 1\frac{1}{3}$ _____

26. $1\frac{1}{2} + \frac{2}{3}$ _____

27. $1\frac{1}{2} \cdot \frac{2}{3}$ _____

28. $\frac{5}{8} \cdot \frac{8}{5}$ _____

29. $\frac{5}{8} + \frac{8}{5}$ _____

Write an equation. Then solve.

30. Daniel puts some wheat flour into an empty bowl. Then he adds $\frac{2}{3}$ cup rye flour to make a total of $2\frac{5}{12}$ cups of flour. How much wheat flour is in the bowl?

_____

31. Mañuela has a bag containing $5\frac{1}{3}$ cups of sugar. She uses $\frac{1}{8}$ of the sugar in a recipe. How much sugar does she use?

_____

32. Ashanti has a bag that contains $4\frac{1}{4}$ cups of rice. She uses $\frac{2}{3}$ cup. How much rice is left in the bag?

_____

33. Seth's route to school is $1\frac{3}{10}$ miles long. He has walked $\frac{4}{5}$ mile so far. How much farther does he have to go?

_____

34. Mara's walk to school is $1\frac{2}{5}$ miles. She is $\frac{5}{8}$ of the way there. How far has she walked so far?

_____

3-8 Class Activity

Name _____ Date _____

CA CC Content Standards 5.NF.1, 5.NF.2, 5.NF.4, 5.NF.5a, 5.NF.6 Mathematical Practices MP.1, MP.2, MP.3, MP.6

▶ Add, Subtract, Compare, and Multiply

The fraction box to the right shows the same two fractions compared, added, subtracted, and multiplied.

	$\frac{1}{3}$ and $\frac{1}{6}$
>	$\frac{1}{3} > \frac{1}{6}$ or $\frac{2}{6} > \frac{1}{6}$
+	$\frac{1}{3} + \frac{1}{6} = \frac{2}{6} + \frac{1}{6} = \frac{3}{6} = \frac{1}{2}$
−	$\frac{1}{3} - \frac{1}{6} = \frac{2}{6} - \frac{1}{6} = \frac{1}{6}$
·	$\frac{1}{3} \cdot \frac{1}{6} = \frac{1}{18}$

Complete the fraction box.

1.

	$\frac{2}{5}$ and $\frac{7}{10}$
>	
+	
−	
·	

2.

	$\frac{3}{5}$ and $\frac{4}{7}$
>	
+	
−	
·	

▶ What's the Error?

Dear Math Students,

One of my friends said that he would give $\frac{1}{2}$ of his sandwich to me and $\frac{1}{2}$ of his sandwich to my sister. My sister said, "But then you won't have any left for yourself." This doesn't make sense to me. I know that $\frac{1}{2} + \frac{1}{2} = \frac{2}{4}$. My friend should have plenty left for himself. Did I do something wrong? What do you think?

Puzzled Penguin

3. Write a response to Puzzled Penguin.

Name _____ Date _____

▶ Word Problems with Mixed Operations

Solve. *Show your work.*

4. Yesterday Mr. Swenson made $2\frac{3}{4}$ quarts of strawberry jam and $1\frac{1}{8}$ quarts of raspberry jam. How much more strawberry jam did he make than raspberry?

5. Today Mr. Swenson is making $\frac{2}{5}$ quart of grape jelly. He will give $\frac{1}{2}$ of this amount to his neighbor. How much jelly will the neighbor get?

6. Mr. Swenson is also making $2\frac{1}{6}$ quarts of cherry jelly and $3\frac{1}{12}$ quarts of orange jelly. He will mix the two kinds together. How much of this mixed jelly will he have?

7. Yesterday Mr. Swenson made $\frac{7}{10}$ quart of blueberry jam. His family ate $\frac{1}{10}$ of it. How much of the blueberry jam is left?

8. Suppose Mr. Swenson has jars that hold $\frac{5}{6}$ quart, jars that hold $\frac{3}{4}$ quart, and jars that hold $\frac{2}{3}$ quart. Which size holds the most? Which size holds the least? How do you know?

9. Mr. Swenson made $6\frac{2}{3}$ quarts of jam last weekend. This weekend he plans to make $1\frac{1}{2}$ times this much. How much jam will he make this weekend?

3-9 Class Activity

Name _____ Date _____

CA CC Content Standards 5.NF.4, 5.NF.5, 5.NF.5a, 5.NF.5b, 5.NF.6 Mathematical Practices MP.1, MP.6, MP.8

▶ Predict and Multiply

Predict whether the product will be greater than, less than, or equal to the second factor. Then compute the product.

1. $\frac{2}{5} \cdot \frac{3}{4} = x$
   Predict: x ◯ $\frac{3}{4}$
   Compute: $x =$ _____

2. $\frac{6}{6} \cdot \frac{3}{4} = x$
   Predict: x ◯ $\frac{3}{4}$
   Compute: $x =$ _____

3. $1\frac{3}{7} \cdot \frac{3}{4} = x$
   Predict: x ◯ $\frac{3}{4}$
   Compute: $x =$ _____

4. $\frac{3}{3} \cdot 2\frac{1}{2} = x$
   Predict: x ◯ $2\frac{1}{2}$
   Compute: $x =$ _____

5. $2\frac{2}{3} \cdot 2\frac{1}{2} = x$
   Predict: x ◯ $2\frac{1}{2}$
   Compute: $x =$ _____

6. $\frac{7}{8} \cdot 2\frac{1}{2} = x$
   Predict: x ◯ $2\frac{1}{2}$
   Compute: $x =$ _____

7. $1\frac{1}{10} \cdot 5 = x$
   Predict: x ◯ 5
   Compute: $x =$ _____

8. $\frac{9}{10} \cdot 5 = x$
   Predict: x ◯ 5
   Compute: $x =$ _____

9. $\frac{10}{10} \cdot 5 = x$
   Predict: x ◯ 5
   Compute: $x =$ _____

▶ Generalize

Complete the statement with *greater than*, *less than*, or *equal to*.

10. Multiplying any number, n, by a factor less than 1 gives a product _____ n.

11. Multiplying any number, n, by a factor equal to 1 gives a product _____ n.

12. Multiplying any number, n, by a factor greater than 1 gives a product _____ n.

Multiplying a fraction by a fraction equal to 1 gives an equivalent fraction. It is the same as multiplying both the numerator and denominator by the same number.

$$\frac{4}{7} = \frac{4}{7} \cdot \frac{3}{3} = \frac{12}{21} \qquad \frac{4}{7} = \frac{4 \cdot 3}{7 \cdot 3} = \frac{12}{21}$$

Multiply the fraction by a factor equal to 1 to create an equivalent fraction.

13. $\frac{4}{5}$

14. $\frac{3}{11}$

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

Name _____ Date _____

▶ Predict and Solve

Solve. *Show your work.*

16. A box of granola weighs 18 ounces. A box of corn flakes weighs $\frac{7}{9}$ as much as the granola.

Do the corn flakes weigh more or less than 18 ounces?

_____

How much do the corn flakes weigh?

_____

17. A rectangle has length $3\frac{1}{4}$ feet and width $1\frac{1}{3}$ feet.

Is the area of the rectangle greater or less than $3\frac{1}{4}$ square feet?

_____

What is the area of the rectangle?

_____

18. The number of students on the football team is $1\frac{3}{4}$ times the number on the basketball team. There are 16 students on the basketball team.

Are there more or fewer than 16 students on the football team?

_____

How many students are on the football team?

_____

19. It's $9\frac{4}{5}$ miles from Justin's house to the art museum. The distance to the history museum is $\frac{9}{10}$ this far.

Is the history museum more or less than $9\frac{4}{5}$ miles from Justin's house?

_____

How far from Justin's house is the history museum?

_____

3-10 Class Activity

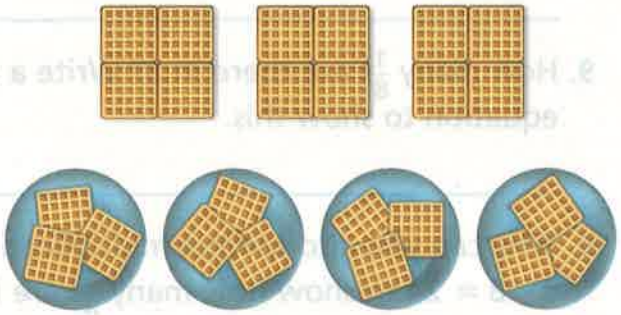
Name _____ Date _____

CA CC Content Standards 5.NF.3, 5.NF.4, 5.NF.4a, 5.NF.7, 5.NF.7a, 5.NF.7b Mathematical Practices MP.1, MP.3, MP.4, MP.6, MP.8

▶ Explore Fractional Shares

There are 4 people in the Walton family, but there are only 3 waffles. How can the Waltons share the waffles equally?

Divide each waffle into 4 pieces.



Each person's share of one waffle is $\frac{1}{4}$. Since there are 3 waffles, each person gets 3 of the $\frac{1}{4}$s, or $\frac{3}{4}$ of a whole waffle.

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

1. Suppose there are 5 people and 4 waffles.

   What is each person's share of 1 waffle? _____

   What is each person's share of 4 waffles? _____

   Complete the equation: $4 \div 5 =$ _____ $\cdot$ _____ $=$ _____

2. Suppose there are 10 people and 7 waffles.

   What is each person's share of 1 waffle? _____

   What is each person's share of 7 waffles? _____

   Complete the equation: $7 \div 10 =$ _____ $\cdot$ _____ $=$ _____

Complete.

3. $5 \div 6 =$ _____ $\cdot$ _____ $=$ _____

4. $4 \div 9 =$ _____ $\cdot$ _____ $=$ _____

Give your answer in the form of an equation.

5. How can you divide 7 waffles equally among 8 people?

   _____

6. How can you divide 39 waffles equally among 5 serving plates?

   _____

7. Discuss why this equation is true for any whole numbers n and d, except $d = 0$.

$$n \div d = \underbrace{n \cdot \frac{1}{d}}_{n \text{ unit fractions } \frac{1}{d}} = \frac{n}{d}$$

Name _____ Date _____

▶ Divide by a Unit Fraction

8. How many $\frac{1}{8}$s are there in 1? Write a division equation to show this.

_____

9. How many $\frac{1}{8}$s are there in 3? Write a division equation to show this.

_____

10. Why can you also use the multiplication equation $3 \cdot 8 = 24$ to show how many $\frac{1}{8}$s are in 3?

_____

_____

11. How many $\frac{1}{4}$s are there in 5? Write a division and a multiplication equation to show this.

_____

12. Complete the equation. w and d are whole numbers and d is not 0. $w \div \frac{1}{d} =$ _____

Write a division equation. Then solve. *Show your work.*

13. Olivia made 9 sandwiches and cut each one into fourths. How many fourths does she have?

_____

14. The 10 members of a hiking club will walk 9 miles. Each person will carry the food pack for an equal distance. How far will each hiker carry the food pack?

_____

15. Damon has a 6-pound bag of cat food. He feeds his cat $\frac{1}{8}$ pound every day. How many days will the bag last?

_____

16. Jodie and 7 friends share 12 oranges equally. How many oranges does each person get? Give your answer as a mixed number.

_____

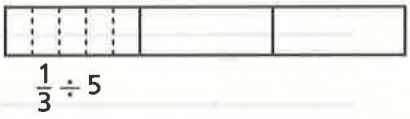
Name _____ Date _____

▶ Unit Fractions in Action

Karen's 5 grandchildren came to visit for 3 days. Karen found a long roll of drawing paper. She said, "I'll cut this paper into 3 equal parts, and we'll use one part on each day." Then she cut the first part into 5 equal parts so each grandchild could make a drawing. She asked her grandchildren, "What part of the whole roll of paper do each of you have? What math problem is this? Make a drawing so Sammy will understand."

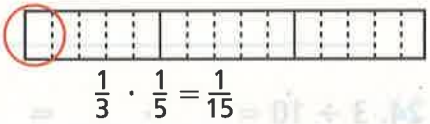
Tommy, the oldest, said, "Today we are using $\frac{1}{3}$ of the whole roll because we have 3 equal parts."

Lucy said, "Then we cut that $\frac{1}{3}$ into 5 equal parts. So we found $\frac{1}{3} \div 5$, a unit fraction divided by the whole number 5."



Asha said, "But we have to divide each of the other two thirds into 5 equal parts to find out how many equal parts we have in all. That's like multiplying by $\frac{1}{5}$!"

Phoebe said, "Oh look, we have 15 equal parts in all. So today we are each using $\frac{1}{15}$ of the whole roll."



Sammy, the youngest grandchild said, "So dividing by 5 is the same as multiplying by $\frac{1}{5}$ because that also means finding one of five equal parts."

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

The children said, "So dividing by a whole number w is the same as multiplying by $\frac{1}{w}$."

$$\frac{1}{d} \div w = \frac{1}{d} \cdot \frac{1}{w} = \frac{1}{d \cdot w}$$

Solve.

17. $\frac{1}{2} \div 3 = \frac{1}{2} \cdot$ ____ = ____

18. $\frac{1}{5} \div 2 = \frac{1}{5} \cdot$ ____ = ____

19. $\frac{1}{3} \div 4 = \frac{1}{3} \cdot$ ____ = ____

20. $\frac{1}{6} \div 4 = \frac{1}{6} \cdot$ ____ = ____

Name _____ Date _____

▶ Practice Division

$n \div d = n \cdot \frac{1}{d} = \frac{n}{d}$ $\quad w \div \frac{1}{d} = w \cdot d$ $\quad \frac{1}{d} \div w = \frac{1}{d} \cdot \frac{1}{w} = \frac{1}{d \cdot w}$

21. Describe patterns you see in the equations above.

22. Why is dividing by a whole number the same as multiplying by a unit fraction with that number as its denominator?

23. Why does dividing w by a unit fraction $\frac{1}{d}$ make $w \cdot d$, a number greater than w?

24. $3 \div 10 =$ ___ · ___ = ___

25. $5 \div 8 =$ ___ · ___ = ___

26. $4 \div \frac{1}{3} =$ ___ · ___ = ___

27. $7 \div \frac{1}{2} =$ ___ · ___ = ___

28. $\frac{1}{2} \div 5 =$ ___ · ___ = ___

29. $\frac{1}{3} \div 4 =$ ___ · ___ = ___

30. For the two problems below, which answer will be greater? Explain.

$\frac{1}{3} \div 5$ $\quad 5 \div \frac{1}{3}$

3-11
Class Activity

Name _____ Date _____

CA CC Content Standards 5.NF.3, 5.NF.7, 5.NF.7a, 5.NF.7b, 5.NF.7c Mathematical Practices MP.1, MP.2, MP.4, MP.5, MP.6

▶ Division Situations and Diagrams

1. Consider the division problem $2 \div 5$.

   Describe a situation this division could represent.

   _____

   _____

   Draw a diagram to represent the division. Then find the solution.

2. Consider the division problem $4 \div \frac{1}{3}$.

   Describe a situation this division could represent.

   _____

   _____

   Draw a diagram to represent the division. Then find the solution.

3. Consider the division problem $\frac{1}{4} \div 2$.

   Describe a situation this division could represent.

   _____

   _____

   Draw a diagram to represent the division. Then find the solution.

Name _____ Date _____

▶ Division Word Problems

Write an equation. Then solve. *Show your work.*

4. One lap around the track is $\frac{1}{4}$ mile. José wants to run 5 miles. How many times must he run around the track?

_____

5. There is $\frac{1}{6}$ of an extra large pizza left over in the fridge. If three friends share the pizza equally, what fraction of a whole pizza will each friend get?

_____

6. Oscar's aunt lives 50 miles away. This is 6 times as far as Oscar's grandfather lives. How far away does Oscar's grandfather live?

_____

7. A banner has a length of 10 feet and an area of 7 square feet. What is the width of the banner?

_____

8. Brady has three goldfish. This is $\frac{1}{5}$ times as many as Sam has. How many goldfish does Sam have?

_____

9. Lucy has $\frac{1}{2}$ hour to decorate a dozen cupcakes for a bake sale. How much time can she spend on each cupcake?

_____

10. If $\frac{1}{8}$ pound of uncooked rice makes one serving, how many servings are in a 15-pound bag of rice?

_____

11. On Wednesday, 72 people watched the softball game. It rained on Friday, so only 18 people watched the game. The number of people who watched on Friday is how many times the number who watched on Wednesday?

_____

3-12 Class Activity

Name _____ Date _____

CA CC Content Standards 5.NF.4, 5.NF.6, 5.NF.7, 5.NF.7a, 5.NF.7b, 5.NF.7c Mathematical Practices MP.1, MP.2, MP.3, MP.6, MP.8

▶ Solve Word Problems with Multiplication and Division

Decide whether you need to multiply or divide. Then solve. *Show your work.*

1. A turtle crawls 3 yards in an hour. How far will it crawl in 2 hours?

   _____

   How far will the turtle crawl in $\frac{1}{4}$ hour?

   _____

2. Emily has 2 tons of sand. She will move it by wheelbarrow to the garden. Her wheelbarrow holds $\frac{1}{10}$ ton. How many trips will she make?

   _____

3. Tawana has 3 pounds of nuts. She is using them to fill small bags with $\frac{1}{4}$ pound each. How many bags can she fill?

   _____

4. Roberto has a recipe that calls for 4 cups of flour. He wants to use only $\frac{1}{2}$ of the recipe today. How much flour will he need?

   _____

5. A picnic jug holds 1 gallon of lemonade. Each paper cup holds $\frac{1}{12}$ gallon. How many paper cups can be filled?

   _____

6. It rained on $\frac{2}{5}$ of all the days last month. On $\frac{1}{6}$ of these rainy days, there were thunderstorms. On what fraction of the days last month were there thunderstorms?

   _____

3-12 Class Activity

Name _____ Date _____

VOCABULARY
dividend
divisor
quotient

▶ Generalize Results

In the equations below, a and b are whole numbers greater than 1. $\frac{n}{d}$ is a fraction less than 1. $\frac{1}{d}$ is a unit fraction. Answer the questions about the equations.

Parts of a Division Problem

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

dividend divisor quotient

Multiplication

7. $a \cdot b = c$

Will c be greater than or less than a? _____ Why?

_____

_____

8. $a \cdot \frac{n}{d} = c$

Will c be greater than or less than a? _____ Why?

_____

_____

Division

9. $a \div b = c$

Will c be greater than or less than a? _____ Why?

_____

_____

10. $a \div \frac{1}{d} = c$

Will c be greater than or less than a? _____ Why?

_____

_____

Circle the problem with the greater answer.
Do not try to calculate the answer.

11. 4,826 · 581 4,826 ÷ 581

12. 347 · $\frac{1}{72}$ 347 ÷ $\frac{1}{72}$

Name _____ Date _____

▶ Predict the Size of the Result

Decide what operation to use, predict the size of the result, then solve the problem.

Show your work.

13. Lucy spends 4 hours a week babysitting. Her sister Lily spends $\frac{7}{8}$ as much time babysitting. Does Lily babysit for more or less than 4 hours?

_____

Now find the exact amount of time Lily babysits.

_____

14. Yoshi has a rope 30 feet long. He must cut it into pieces that are each $\frac{1}{4}$-foot long. Will he get more or fewer than 30 pieces?

_____

Now find the exact number of pieces Yoshi will get.

_____

15. Carlos can throw a ball 14 yards. His friend Raul can throw $\frac{3}{7}$ of that distance. Is Raul's throw longer or shorter than 14 yards?

_____

Now find the exact length of Raul's throw.

_____

16. An apple orchard covers 12 acres. There is a watering spout for every $\frac{1}{4}$ acre. Are there more or fewer than 12 watering spouts?

_____

Now find the exact number of watering spouts in the orchard.

_____

Name _____ Date _____

▶ What's the Error?

Dear Math Students,

I have to divide 5 cups in half for a recipe. Here's what I did:

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

I know I did the division correctly, but my answer should be less than 5, not more. Can you explain my mistake and help me fix it?

Your friend,
Puzzled Penguin

17. Write a response to Puzzled Penguin.

_____

_____

_____

▶ Summarize Fraction Operations

18. You have just won a prize on a new quiz show called *Quick Thinking*. The prize will be n album downloads from an online music store. You have a chance to change your prize if you think you can make it better. The screen shows the choices you have. Which will you choose?

_____

19. Suppose $n = 6$. How many albums have you won? _____

20. Suppose $n = 12$. How many albums have you won? _____

21. Discuss what you have learned about the size of the answers when you mulitiply and divide by whole numbers and by fractions.

3-13 Class Activity

Name _____ Date _____

CA CC Content Standards 5.NF.1, 5.NF.2, 5.NF.3, 5.NF.4, 5.NF.5, 5.NF.5a, 5.NF.6, 5.NF.7, 5.NF.7a, 5.NF.7b, 5.NF.7c, 5.MD.2 Mathematical Practices MP.1

▶ Choose the Operation

Decide what operation to use. Then solve.

1. Hala can ride her bike $7\frac{1}{2}$ miles in an hour. How far will she ride in 3 hours? How far will she ride in $\frac{1}{3}$ of an hour?

2. Eryn's pet rabbit eats $\frac{1}{12}$ pound of food every day. If Eryn buys rabbit food in 5-pound bags, how many days does one bag of rabbit food last?

3. Mr. Dayton uses 8 cups of flour to make three identical loaves of bread. How much flour is in each loaf?

4. Jonathan can throw a baseball $10\frac{1}{3}$ yards. His brother Joey can throw a baseball $13\frac{1}{12}$ yards. How much farther can Joey throw the ball?

5. Kim bought $\frac{3}{8}$ pound of sunflower seeds and $\frac{3}{16}$ pound of thistle seed for her bird feeder. How much seed did she buy in all?

6. Casandra's fish bowl holds $\frac{9}{10}$ gallon of water. It is now $\frac{2}{3}$ full. How much water is in the bowl?

▶ Predict and Solve

7. Marcus plays basketball for 9 hours each week. His friend Luis spends $\frac{5}{6}$ as much time playing basketball. Who plays more basketball?

   How much time does Luis spend playing basketball?

8. Stacey's long jump was 10 feet. That is $\frac{5}{6}$ foot longer than Ron's long jump. Did Ron jump more or less than 10 feet?

   How long was Ron's jump?

3-13 Class Activity

Name _____ Date _____

▶ Practice Fraction Operations

Write the answer in simplest form.

9. $7 \div \frac{1}{3} =$ _____

10. $1\frac{5}{12} + 2\frac{5}{8} =$ _____

11. $\frac{1}{8} + \frac{5}{6} =$ _____

12. $\frac{4}{9} \cdot 8 =$ _____

13. $\frac{4}{7} - \frac{1}{3} =$ _____

14. $9 \div 10 =$ _____

15. $2\frac{3}{5} - 2\frac{6}{35} =$ _____

16. $\frac{2}{5} \cdot 5\frac{1}{2} =$ _____

17. $\frac{1}{6} + \frac{2}{9} =$ _____

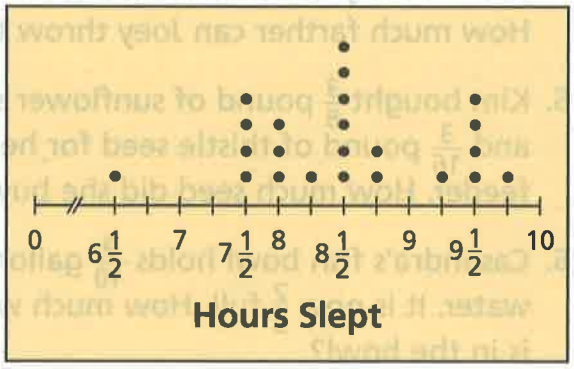
18. $3\frac{1}{3} - 1\frac{3}{4} =$ _____

19. $1\frac{7}{8} \cdot 3\frac{2}{5} =$ _____

20. $\frac{1}{9} \div 3 =$ _____

Solve.

21. Mr. Jones's students recorded the number of hours they slept last night to the nearest quarter hour. The results are shown on this line plot.



a. What is the range of values for the data (the difference between the greatest value and the least value)?

_____

b. Six students slept $8\frac{1}{2}$ hours. What total number of hours do these six values represent?

_____

c. Olivia said, "The longest time value is $1\frac{1}{2}$ times the shortest time value." Is she correct? Explain.

_____

3-14
Class Activity

Name _____ Date _____

CA CC Content Standards 5.NF.6, 5.NF.7c
Mathematical Practices MP.4, MP.5, MP.6, MP.7, MP8

Math and Marching Bands

The musicians in a marching band play many different kinds of musical instruments. Each type of instrument represents a part of the whole, which is all of the instruments in the band.

The circle graph below shows the fraction of all of the instruments in a school marching band that are bass drums.

Solve. Use the circle graph above. *Show your work.*

1. The marching band has 15 bass drums. How many instruments altogether are in the band?

_____

Name _____ Date _____

▶ Math and Marching Bands (continued)

Solve. Use the circle graph.

2. How many instruments of each kind are in the band?

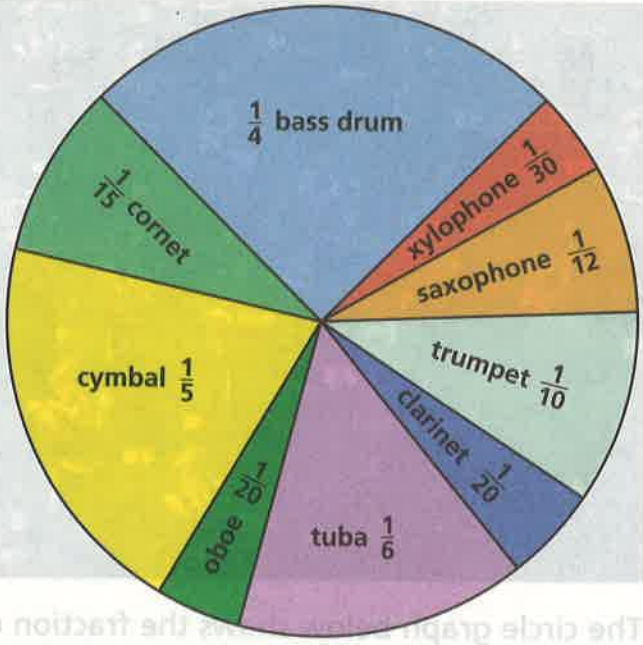
a.  saxophone _____

b.  tuba _____

c.  cornet _____

d.  cymbal _____

e.  xylophone _____



3. The total number of clarinets and oboes is the same as the number of what other instrument?

_____

4. Suppose the number of xylophones was doubled and the number of cornets was halved.

   a. In simplest form, what fraction of all of the instruments in the band would the new number of xylophones represent?

   _____

   b. In simplest form, what fraction of all of the instruments in the band would the new number of cornets represent?

   _____

   c. In simplest form, what fraction represents all of the *other* instruments in the band?

   _____

Name _____ Date _____

1. For numbers 1a–1d, without multiplying, use the symbols from the list on the right to indicate the product will compare with the factor. Symbols can be used more than once.

<	>	=

1a. $\frac{13}{4} \cdot \frac{5}{8} = x$ $x \bigcirc \frac{13}{4}$ $x \bigcirc \frac{5}{8}$

1b. $\frac{4}{3} \cdot 6 = x$ $x \bigcirc \frac{4}{3}$ $x \bigcirc 6$

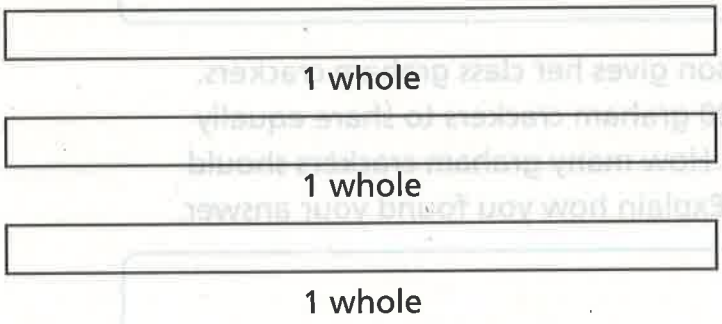
1c. $\frac{2}{5} \cdot \frac{1}{7} = x$ $x \bigcirc \frac{2}{5}$ $x \bigcirc \frac{1}{7}$

1d. $\frac{5}{8} \cdot \frac{7}{7} = x$ $x \bigcirc \frac{5}{8}$ $x \bigcirc \frac{7}{7}$

2. Three packages of trail mix are shared equally between Alycia and her four classmates.

Part A

Each bar represents one package of trail mix. Shade the bars to show how much of each package of trail mix one person will get.



Part B

How much of one package of trail mix will each person get? Write and solve an equation.

3. For the breakfast buffet, Mr. Walker must equally divide 12 loaves of bread between seven platters. How many loaves of bread are placed on each platter? Write and solve an equation.

Name _____ Date _____

4. Elin has $\frac{1}{3}$ hour to warm up for her gymnastics meet. She must complete each of 6 different stretches. She spends an equal amount of time on each type of stretch and she does not take a break. How long, in hours, does she spend on each type of stretch? Write and solve an equation.

5. Ava has two frogs. This is $\frac{1}{3}$ the number of frogs that Heather has. How many frogs does Heather have? Draw a diagram to represent the division. Then write and solve an equation.

6. For a snack, Miss Johnson gives her class graham crackers. She has a package of 20 graham crackers to share equally among eight students. How many graham crackers should each student receive? Explain how you found your answer.

7. For numbers 7a–7d, select True or False for each the product.

7a. $\frac{3}{5} \cdot \frac{2}{7} = \frac{21}{10}$ ○ True ○ False

7b. $\frac{2}{9} \cdot \frac{5}{3} = \frac{10}{27}$ ○ True ○ False

7c. $\frac{7}{8} \cdot \frac{5}{9} = \frac{35}{72}$ ○ True ○ False

7d. $\frac{1}{2} \cdot \frac{3}{5} = \frac{4}{10}$ ○ True ○ False

Name _____ Date _____

8. Juan needs to measure six cups of flour for a recipe. He only has a $\frac{1}{4}$ measuring cup. How many times must he fill the measuring cup to get six cups of flour?

For numbers 8a–8e, choose Yes or No to tell whether the equation can be used to solve the word problem shown above.

8a. $6 \cdot \frac{1}{4} =$ ● ○ Yes ○ No

8b. $6 \cdot 4 =$ ● ○ Yes ○ No

8c. $1 \cdot \frac{4}{6} =$ ● ○ Yes ○ No

8d. $6 \div \frac{1}{4} =$ ● ○ Yes ○ No

8e. $6 \div 4 =$ ● ○ Yes ○ No

9. Ben has a piece of cord that is 40 feet long. He wants to cut the cord into pieces to tie up the tomato plants in his garden. How many pieces can he cut if each piece is $\frac{1}{2}$ foot long? Draw a diagram to represent the division. Then write and solve an equation to find the solution.

10. Of the fifth grade students, $\frac{15}{20}$ went to the book fair. Of the students who went to the book fair, $\frac{12}{16}$ bought at least one book. What fraction of fifth grade students bought at least one book? Show your work.

Name _____ Date _____

11. Marie plants flowers in a planter that is $1\frac{1}{2}$ feet long and $1\frac{2}{3}$ feet wide. She plans to cover the entire area with fertilizer. How much area will she need to spread with fertilizer?

_____ square feet

12. Of the coins in Simone's collection, $\frac{13}{25}$ are quarters. Of these quarters, $\frac{2}{3}$ are state quarters. What fraction of Simone's coins are state quarters?

13. A square *Do Not Enter* sign has a height and width of $2\frac{1}{2}$ feet.

Part A

Will the area of the sign be greater than or less than $2\frac{1}{2}$ square feet? Explain how you know.

Part B

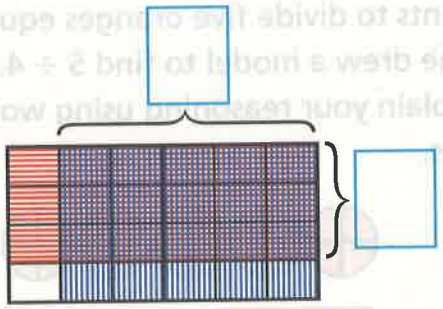
What is the area of the sign? Show your work.

Name _____ Date _____

14. Patel drew the area model to help him solve a multiplication problem.

Part A

Use the numbers from the list on the right to complete the area model.



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

Part B

What is the answer to the problem Patel was working on? Show your work.

Without multiplying, choose the symbol from the box to compare the product on the left with the factor shown on the right.

15. $\frac{4}{5} \cdot \frac{3}{8}$ [< > =] $\frac{4}{5}$

16. $\frac{8}{6} \cdot \frac{2}{3}$ [< > =] $\frac{2}{3}$

17. $\frac{5}{5} \cdot \frac{3}{8}$ [< > =] $\frac{3}{8}$

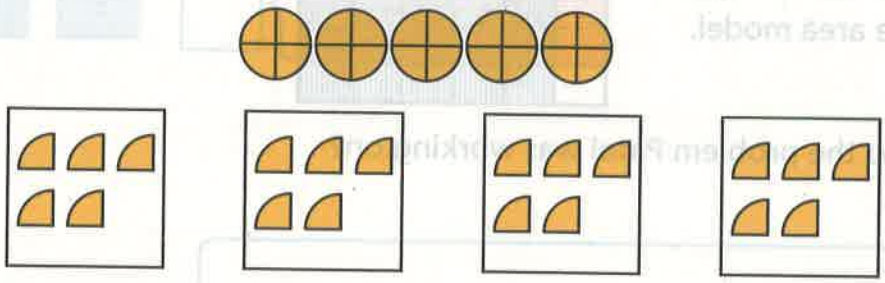
18. Without multiplying, classify each product as being less than $\frac{2}{3}$, equal to $\frac{2}{3}$, or greater than $\frac{2}{3}$. Write the letter of each expression in the correct box.

A $\frac{2}{3} \cdot \frac{1}{5}$ B $\frac{2}{3} \cdot \frac{8}{5}$ C $\frac{2}{3} \cdot \frac{9}{9}$ D $\frac{2}{3} \cdot \frac{6}{1}$ E $\frac{2}{3} \cdot \frac{8}{9}$ F $\frac{2}{3} \cdot 2$

Less Than $\frac{2}{3}$	Equal to $\frac{2}{3}$	Greater Than $\frac{2}{3}$

Name _____ Date _____

19. Hannah wants to divide five oranges equally among four children. She drew a model to find $5 \div 4$. Is Hannah's model correct? Explain your reasoning using words, numbers, and pictures.



20. Axel paints his doghouse using leftover paint. He has two identical walls and two identical sections of roof unpainted. The dimensions of the rectangular wall and roof sections are listed in the table.

Part A

Complete the table by writing the area of one wall and one roof section.

Part	Length (ft)	Width (ft)	Total Area (ft^2)
Wall	$1\frac{1}{3}$	$2\frac{1}{6}$	
Roof	$1\frac{1}{2}$	$2\frac{1}{12}$	

Part B

Axel has enough blue paint to cover six square feet. For which part of the doghouse will Axel have enough blue paint–two walls or two roof sections?

two _____