# 5 GRADE Mathematics Curriculum

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# GRADE 5 • MODULE 4

Multiplication and Division of Fractions and Decimal Fractions

Name _____ Date _____

1. Estimate the length of your pencil to the nearest inch. **6 in.**

2. Using a ruler, measure your pencil strip to the nearest $\frac{1}{2}$ inch and mark the measurement with an X above the ruler below. Construct a line plot of your classmates' pencil measurements.
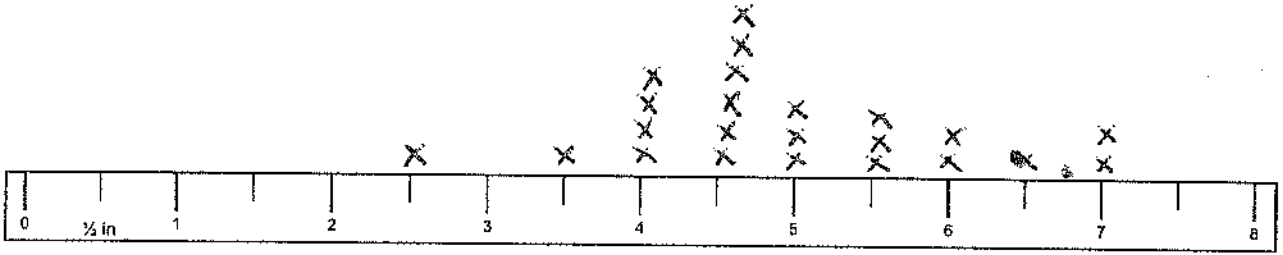
3. Using a ruler, measure your pencil strip to the nearest $\frac{1}{4}$ inch and mark the measurement with an X above the ruler below. Construct a line plot of your classmates' pencil measurements.
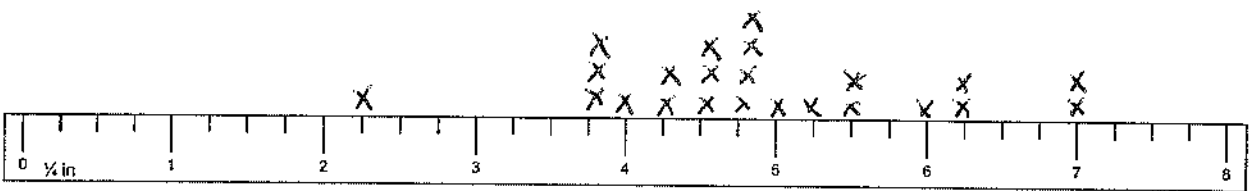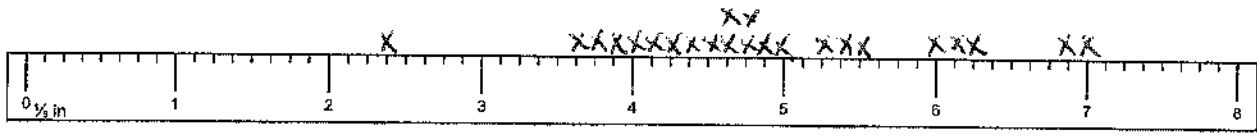
4. Using a ruler, measure your pencil strip to the nearest $\frac{1}{8}$ inch and mark the measurement with an X above the ruler below. Construct a line plot of your classmates' pencil measurements.

COMMON CORE

Lesson 1:    Measure and compare pencil lengths to the nearest $\frac{1}{2}$, $\frac{1}{4}$, and $\frac{1}{8}$ of an inch, and analyze the data through line plots.

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engage^ny    4.A.10

5. Use all three of your line plots to complete the following.

   a. Compare the three plots, and write one sentence that describes how the plots are alike and one sentence that describes how they are different.

   > All 3 line plots are similar because they all show that the majority of the pencil lengths were between 4 and $5\frac{1}{2}$ inches. The 3rd line plot looks different from the others because there's usually only 1 pencil per measurement, except for $4\frac{5}{8}$ and $4\frac{3}{4}$ in.

   b. What is the difference between the measurements of the longest and shortest pencils on each of the three line plots?

   > line plot 1:   $7$ in. $- 2\frac{1}{2}$ in. $= 4\frac{1}{2}$ in.
   >
   > line plot 2:   $7$ in. $- 2\frac{1}{4}$ in. $= 4\frac{3}{4}$ in.
   >
   > line plot 3:   $7$ in. $- 2\frac{3}{8}$ in. $= 4\frac{5}{8}$ in.

   c. Write a sentence describing how you could create a more precise ruler to measure your pencil strip.

   > Well, the most precise ruler we've used so far had us measure to the nearest $\frac{1}{8}$ inch. We could divide each $\frac{1}{8}$ into 2 equal parts and measure to the nearest $\frac{1}{16}$ inch.

**COMMON CORE**  |  Lesson 1:   Measure and compare pencil lengths to the nearest $\frac{1}{2}, \frac{1}{4}$, and $\frac{1}{8}$ of an inch, and analyze the data through line plots.    **engage**^ny    4.A.11
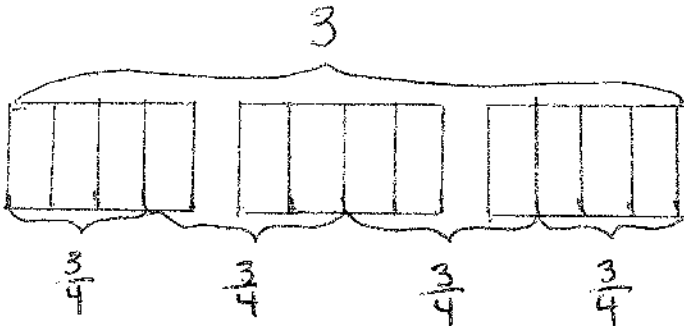
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1.  Draw a picture to show the division.  Write a division expression using unit form.  Then, express your answer as a fraction.  The first one is partially done for you.
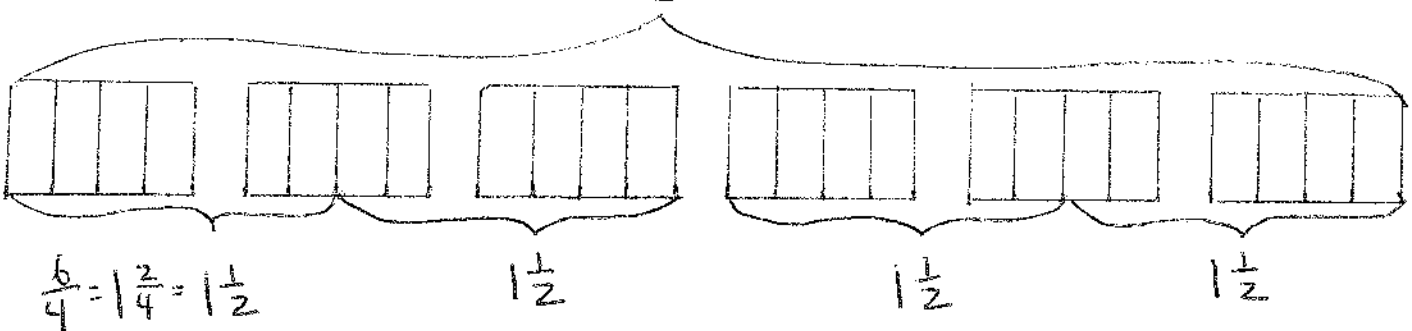
a.   $1 \div 5 = 5$ fifths $\div 5 = 1$ fifth $= \frac{1}{5}$
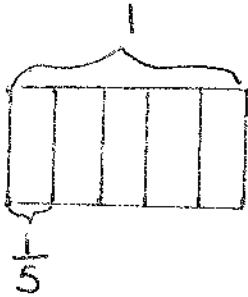


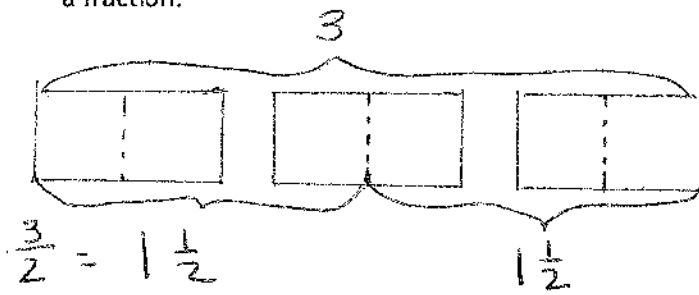b.  $3 \div 4 = 12$ fourths $\div 4 = 3$ fourths $= \frac{3}{4}$



c.  $6 \div 4 = 24$ fourths $\div 4 = 6$ fourths $= \frac{6}{4} = 1\frac{2}{4} = 1\frac{1}{2}$



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

2.  Draw to show how 2 children can equally share 3 cookies. Write an equation, and express your answer as a fraction.

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

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

Each child gets $1\frac{1}{2}$ cookies.

3.  Carly and Gina read the following problem in their math class.

    *Seven cereal bars were shared equally by 3 children. How much did each child receive?*

    Carly and Gina solve the problem differently. Carly gives each child 2 whole cereal bars, and then divides the remaining cereal bar between the 3 children. Gina divides all the cereal bars into thirds and shares the thirds equally among the 3 children.

    a.  Illustrate both girls' solutions.

Carly:  7

$2\frac{1}{3}$

Gina:  7
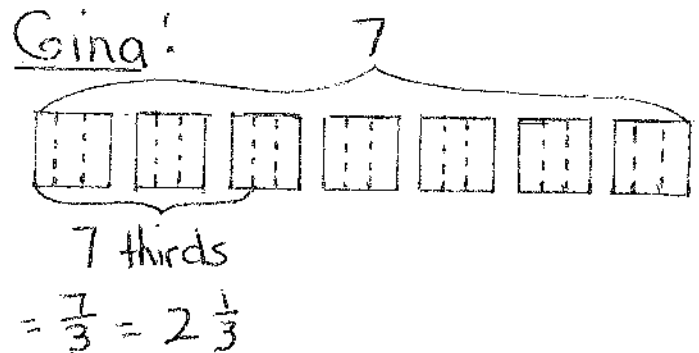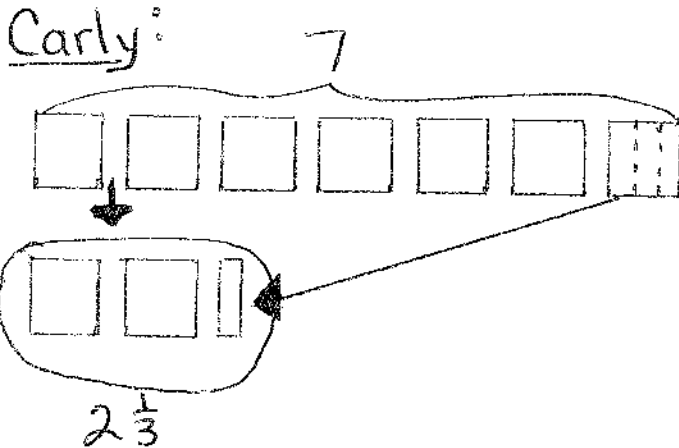
7 thirds
$= \frac{7}{3} = 2\frac{1}{3}$

    b.  Explain why they are both right.

Both girls are right. They used different strategies to solve the division problem and still ended up with the same answer.

$7 \div 3 = \frac{7}{3} = 2\frac{1}{3}$ ( that's what Carly did )

$7 \div 3 = 21$ thirds $\div 3 = 7$ thirds
$= \frac{7}{3} = 2\frac{1}{3}$ (that's what Gina did)

4. Fill in the blanks to make true number sentences.

a. $2 \div 3 = \dfrac{2}{3}$

b. $15 \div 8 = \dfrac{15}{8}$

c. $11 \div 4 = \dfrac{11}{4}$

d. $\dfrac{3}{2} = 3 \div 2$

e. $\dfrac{9}{13} = 9 \div 13$

f. $1\dfrac{1}{3} = 4 \div 3$

   $\rightarrow \dfrac{4}{3}$

Name _____ Date _____

1. Fill in the chart. The first one is done for you.

| Division Expression | Unit Forms | Improper Fraction | Mixed Numbers | Standard Algorithm (Write your answer in whole numbers and fractional units. Then check.) |
|---|---|---|---|---|
| a. $5 \div 4$ | 20 fourths ÷ 4<br>= 5 fourths | $\frac{5}{4}$ | $1\frac{1}{4}$ | $4\overline{)\,5\phantom{x}}$ $\begin{array}{r}1\frac{1}{4}\\ \hline 5 \\ -4 \\ \hline 1\end{array}$  Check $4 \times 1\frac{1}{4} = 1\frac{1}{4} + 1\frac{1}{4} + 1\frac{1}{4} + 1\frac{1}{4}$ $= 4 + \frac{4}{4}$ $= 4 + 1$ $= 5$ |
| b. $3 \div 2$ | _6_ halves ÷ 2<br>= _3_ halves | $\frac{3}{2}$ | $1\frac{1}{2}$ | $\begin{array}{r}1\frac{1}{2}\\2\overline{)\,3}\\-2\\ \hline 1\end{array}$  $2 \times 1\frac{1}{2} = 1\frac{1}{2} + 1\frac{1}{2}$ $= 2 + \frac{2}{2}$ $= 2 + 1$ $= 3$ |
| c. _6 ÷ 4_ | 24 fourths ÷ 4<br>= 6 fourths | $\frac{6}{4}$ | $1\frac{1}{2}$ | $\begin{array}{r}1\frac{2}{4}\\4\overline{)\,6}\\-4\\ \hline 2\end{array}$  $4 \times 1\frac{1}{2} = 1\frac{1}{2} + 1\frac{1}{2} + 1\frac{1}{2} + 1\frac{1}{2}$ $= 4 + \frac{4}{2}$ $= 4 + 2$ $= 6$ |
| d. $5 \div 2$ | 10 halves ÷ 2<br>= 5 halves | $\frac{5}{2}$ | $2\frac{1}{2}$ | $\begin{array}{r}2\frac{1}{2}\\2\overline{)\,5}\\-4\\ \hline 1\end{array}$  $2 \times 2\frac{1}{2} = 2\frac{1}{2} + 2\frac{1}{2}$ $= 4\frac{2}{2}$ $= 4 + 1$ $= 5$ |

COMMON CORE | Lesson 3: Interpret a fraction as division.<br>Date: 9/17/14

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2. A principal evenly distributes 6 reams of copy paper to 8 fifth-grade teachers.

   a. How many reams of paper does each fifth-grade teacher receive? Explain how you know using pictures, words, or numbers.

   6 reams divided amongst 8 teachers

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

   Each teacher gets $\frac{3}{4}$ ream of paper.

   b. If there were twice as many reams of paper and half as many teachers, how would the amount each teacher receives change? Explain how you know using pictures, words, or numbers.

   6 reams x 2 = 12 reams        $12 \div 4 = 48$ fourths $\div 4 = 12$ fourths
   8 teachers $\div$ 2 = 4 teachers                        $= \frac{12}{4}$

   Each teacher gets 3 reams of paper.                      $= 3$

3. A caterer has prepared 16 trays of hot food for an event. The trays are placed in warming boxes for delivery. Each box can hold 5 trays of food.

   a. How many warming boxes are necessary for delivery if the caterer wants to use as few boxes as possible? Explain how you know.

   16 trays in groups of 5

   $16 \div 5 = \frac{16}{5} = 3\frac{1}{5}$

   16 trays will require $3\frac{1}{5}$ warming boxes. Which means that 3 boxes could be full and the 4th box might have just 1 tray. But the caterer will need 4 boxes.

   b. If the caterer fills a box completely before filling the next box, what fraction of the last box will be empty?

   $3\frac{1}{5}$ boxes used

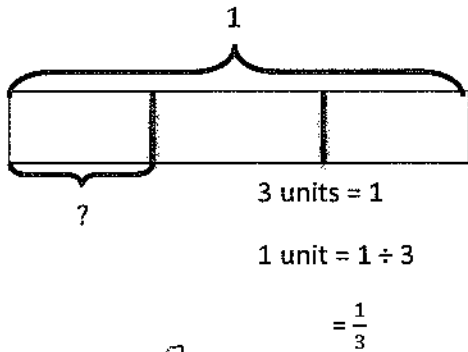   (3 filled)  (1 filled $\frac{1}{5}$)

   The last box will be $\frac{4}{5}$ empty.

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1. Draw a tape diagram to solve.  Express your answer as a fraction.  Show the multiplication sentence to check your answer.  The first one is done for you.
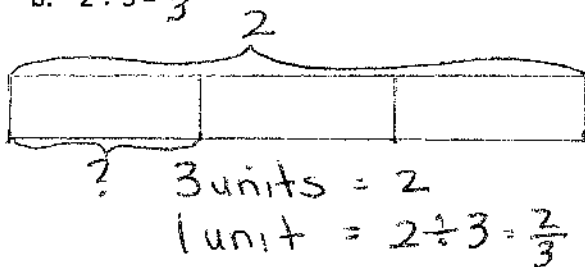
   a.  $1 \div 3 = \frac{1}{3}$

   Check:  $3 \times \frac{1}{3}$

   $$3 \overline{)\,1\phantom{x}}^{\,0\ \ \frac{1}{3}}$$
   $$-0$$
   $$\overline{\phantom{x}1}$$

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

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

   $$= 1$$

   1

   3 units = 1

   ?

   1 unit = 1 ÷ 3

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

   b.  $2 \div 3 = \frac{2}{3}$

   2

   ?  3 units = 2

   1 unit = 2 ÷ 3 = $\frac{2}{3}$

   $$3\overline{)\,2\phantom{x}}^{\,0\ \frac{2}{3}}$$
   $$-0$$
   $$\overline{\phantom{x}2}$$

   check:  $3 \times \frac{2}{3}$

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

   $= \frac{6}{3}$

   $= 2$

   c.  $7 \div 5 = 1\frac{2}{5}$

   7

   ?  5 units = 7

   1 unit = 7 ÷ 5 = $\frac{7}{5}$ = $1\frac{2}{5}$

   $$5\overline{)\,7\phantom{x}}^{\,1\frac{2}{5}}$$
   $$-5$$
   $$\overline{\phantom{x}2}$$
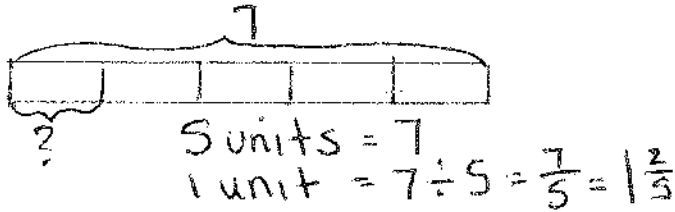
   check:  $5 \times 1\frac{2}{5}$

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

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

   $= 7$

   d.  $14 \div 5 = 2\frac{4}{5}$

   14

   ?  5 units = 14

   1 unit = 14 ÷ 5

   $= \frac{14}{5}$

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

   $$5\overline{)\,14\phantom{x}}^{\,2\frac{4}{5}}$$
   $$-10$$
   $$\overline{\phantom{x}4}$$
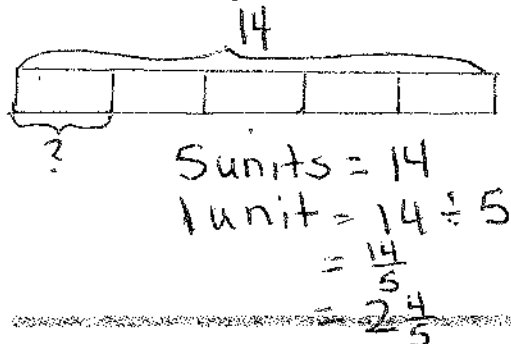
   check:  $5 \times 2\frac{4}{5}$

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

   $= 10 + \frac{20}{5}$

   $= 14$

2. Fill in the chart. The first one is done for you.

| Division Expression | Fraction | Between which two whole numbers is your answer? | Standard Algorithm |
|---|---|---|---|
| a. $13 \div 3$ | $\dfrac{13}{3}$ | 4 and 5 | $4\frac{1}{3}$<br>$3\,\overline{\smash{\big)}\,13}$<br>$\underline{-12}$<br>$1$ |
| b. $6 \div 7$ | $\dfrac{6}{7}$ | 0 and 1 | $0\frac{6}{7}$<br>$7\,\overline{\smash{\big)}\,6}$<br>$\underline{-0}$<br>$6$ |
| c. $55 \div 10$ | $\dfrac{55}{10}$ | 5 and 6 | $5\frac{5}{10}$<br>$10\,\overline{\smash{\big)}\,55}$<br>$\underline{-50}$<br>$5$ |
| d. $32 \div 40$ | $\dfrac{32}{40}$ | 0 and 1 | $0\frac{32}{45}$<br>$40\,\overline{\smash{\big)}\,32}$<br>$\underline{-0}$<br>$32$ |

3. Greg spent $4 on 5 packs of sport cards.
   a. How much did Greg spend on each pack?

   $4

   ? = $\frac{4}{5}$
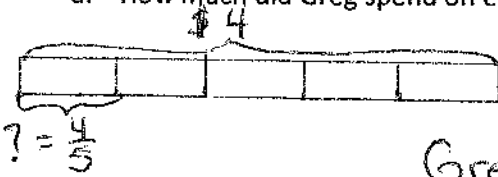
   5 units = $4
   1 unit = $4 ÷ 5 = $\frac{4}{5}$

   $\frac{4}{5}$ of $1 = 80¢

   Greg spent 80¢ on each pack.

   b. If Greg spent half as much money and bought twice as many packs of cards, how much did he spend on each pack? Explain your thinking.

   $2

   ?
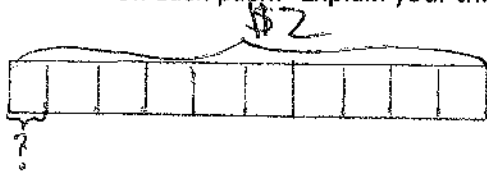
   10 units = $2
   1 unit = 2 ÷ 10 = $\frac{2}{10}$ = $\frac{1}{5}$
   $\frac{1}{5}$ of $1 = 20¢

   He spent 20¢ on each pack.

4. Five pounds of birdseed is used to fill 4 identical bird feeders.
   a. What fraction of the birdseed will be needed to fill each feeder?

   There are 4 identical bird feeders, so $\frac{1}{4}$ of the birdseed will be needed to fill each feeder.

   b. How many pounds of birdseed are used to fill each feeder? Draw a tape diagram to show your thinking.

   5 lb.

   ?
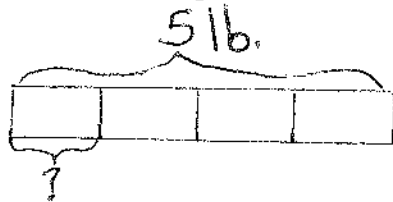
   4 units = 5 lb.
   1 unit = 5 lb. ÷ 4
   = $\frac{5}{4}$
   = $1\frac{1}{4}$ lb.

   $1\frac{1}{4}$ lb. of birdseed is used to fill each feeder.

   c. How many ounces of birdseed are used to fill three birdfeeders?

   1 lb. = 16 oz.
   $1\frac{1}{4}$ lb. = ? oz.
   = $1\frac{1}{4}$ × 16 oz
   = 16 oz. + 4 oz.
   = 20 oz.

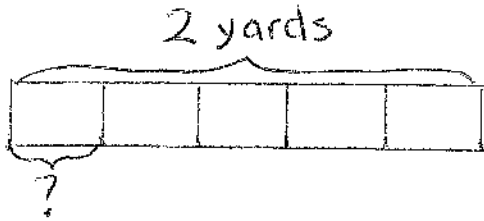   1 unit = 20 oz.
   3 units = 3 × 20 = 60 oz.

   60 oz. of birdseed are used to fill three bird feeders.

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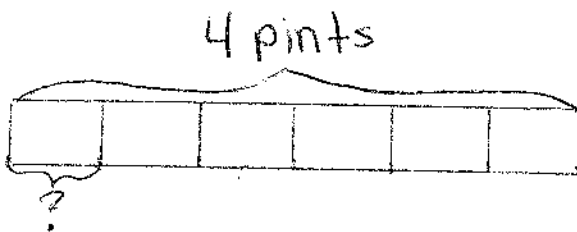1. A total of 2 yards of fabric is used to make 5 identical pillows. How much fabric is used for each pillow?

2 yards

5 units = 2 yards

1 unit = 2 ÷ 5

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

Each pillow uses $\frac{2}{5}$ yard of fabric.
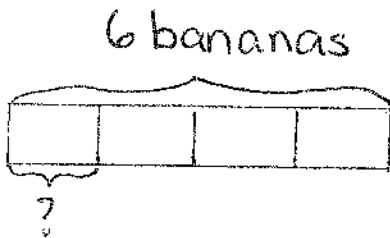
2. An ice-cream shop uses 4 pints of ice cream to make 6 sundaes. How many pints of ice cream are used for each sundae?

4 pints

6 units = 4 pints

1 unit = 4 ÷ 6

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

$\frac{4}{6}$ or $\frac{2}{3}$ pint of ice cream is used in each sundae.

3. An ice-cream shop uses 6 bananas to make 4 identical sundaes. How many bananas are used in each sundae? Use a tape diagram to show your work.

6 bananas

4 units = 6 bananas

1 unit = 6 ÷ 4

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

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

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

$4\overline{)6}$
$\underline{-4}$
$2$

Each sundae gets $\frac{6}{4}$ or $1\frac{1}{2}$ bananas.

4. Julian has to read 4 articles for school. He has 8 nights to read them. He decides to read the same number of articles each night.

   a. How many articles will he have to read per night?

4 articles

8 units = 4 articles

1 unit = 4 ÷ 8

$$= \frac{4}{8} \text{ article}$$

$$= \frac{1}{2} \text{ article}$$
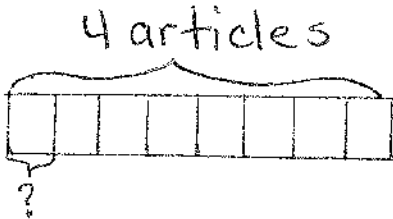
Julian must read $\frac{4}{8}$ or $\frac{1}{2}$ of an article each night.
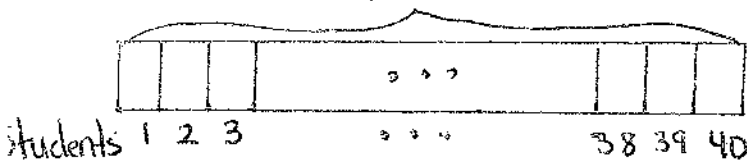
   b. What fraction of the reading assignment will he read each night?

Since Julian is reading for each of 8 nights, he reads $\frac{1}{8}$ of his total assignment each night.

5. 40 students shared 5 pizzas equally. How much pizza will each student receive? What fraction of the pizza did each student receive?

5 pizzas

Students 1 2 3     38 39 40

40 units = 5 pizzas

1 unit = 5 ÷ 40
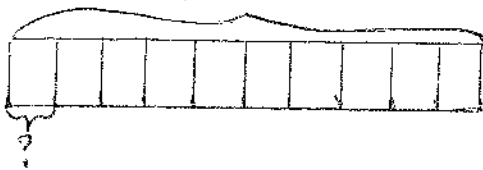
$$= \frac{5}{40} \text{ pizza}$$

Each student gets $\frac{5}{40}$ of a pizza.

6. Lillian had 2 two-liter bottles of soda, which she distributed equally between 10 glasses.

   a. How much soda was in each glass? Express your answer as a fraction of a liter.

4 liters

10 units = 4 liters

1 unit = 4 ÷ 10

$$= \frac{4}{10} \text{ liter}$$

Each glass will have $\frac{4}{10}$ liter of soda.

COMMON CORE  |  Lesson 5:    Solve word problems involving the division of whole numbers with answers in the form of fractions or whole numbers.    engage<sup>ny</sup>    4.B.54

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b.   Express your answer as a decimal number of liters.

$$\frac{4}{10} = 4 \text{ tenths} = 0.4$$

Each glass will have 0.4 liter of soda.

c.   Express your answer as a whole number of milliliters.

1 liter = 1,000 ml
0.4 × 1,000 = 400
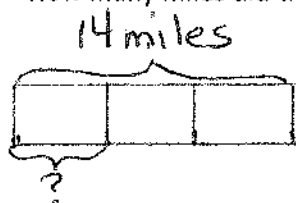0.4 L = 400 ml

Each glass will have 400 ml of soda.

7.   The Calef family likes to paddle along the Susquehanna River.

a.   They paddled the same distance each day over the course of 3 days, traveling a total of 14 miles. How many miles did they travel each day?  Show your thinking in a tape diagram.

14 miles

3 units = 14 miles
1 unit = 14 ÷ 3
$$= \frac{14}{3} \text{ miles}$$
$$= 4\frac{2}{3} \text{ miles}$$

$3\overline{)14}$   $4\frac{2}{3}$
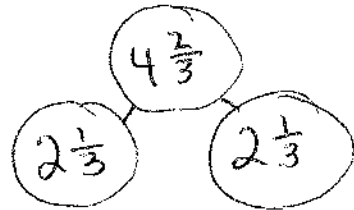$-\underline{12}$
$2$

The Calef's travel $4\frac{2}{3}$ miles each day.

b.   If the Calefs went half their daily distance each day, but extended their trip to twice as many days, how far would they travel?

__Half the distance__

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

__Twice as many days__

3 days × 2 = 6 days

The Calef family would still travel 14 miles.

__Distance Traveled__

6 days at $2\frac{1}{3}$ miles
$= 6 \times 2\frac{1}{3}$
$= 2\frac{1}{3} \times 2\frac{1}{3} \times 2\frac{1}{3} \times 2\frac{1}{3} \times 2\frac{1}{3} \times 2\frac{1}{3}$
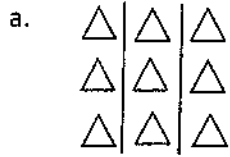$= 12\frac{6}{3}$
$= 12 + 2$
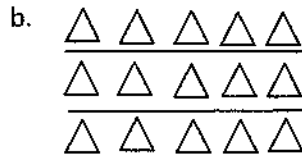$= 14$

Name _____          Date _____

1.  Find the value of each of the following.

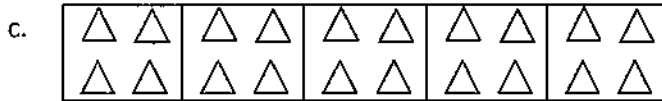a.

$\frac{1}{3}$ of 9 = 3

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

$\frac{3}{3}$ of 9 = 9

b.

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

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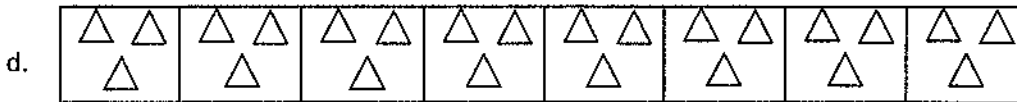
$\frac{3}{3}$ of 15 = 15

c.

$\frac{1}{5}$ of 20 = 4

$\frac{4}{5}$ of 20 = 16
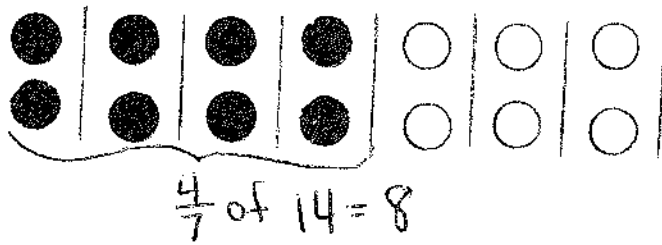
$\frac{5}{5}$ of 20 = 20

d.

$\frac{1}{8}$ of 24 = 3

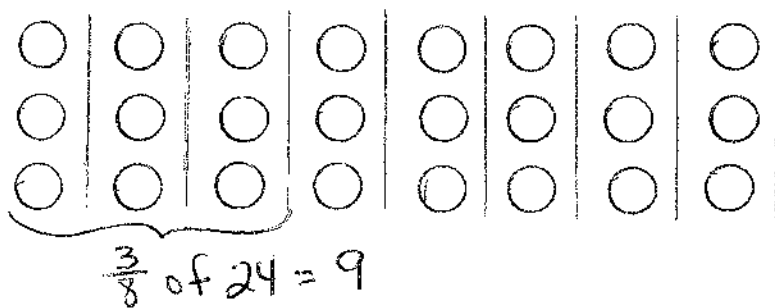$\frac{3}{8}$ of 24 = 9

$\frac{4}{8}$ of 24 = 12

$\frac{6}{8}$ of 24 = 18

$\frac{7}{8}$ of 24 = 21

2.  Find $\frac{4}{7}$ of 14.  Draw a set and shade to show your thinking.
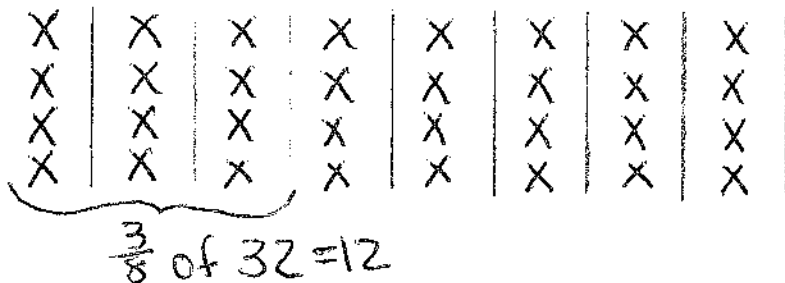
$\frac{4}{7}$ of 14 = 8

3.  How does knowing $\frac{1}{8}$ of 24 help you find three-eighths of 24?  Draw a picture to explain your thinking.

Once I Knew $\frac{1}{8}$ of 24 is 3, then to find $\frac{3}{8}$ is $3 \times 3 = 9$.

$\frac{3}{8}$ of 24 = 9

4.  There are 32 students in a class.  Of the class, $\frac{3}{8}$ of the students bring their own lunches.  How many students bring their lunches?

12 students bring their lunches.

$\frac{3}{8}$ of 32 = 12

5.  Jack collected 18 ten dollar bills while selling tickets for a show.  He gave $\frac{1}{6}$ of the bills to the theater and kept the rest.  How much money did he keep?
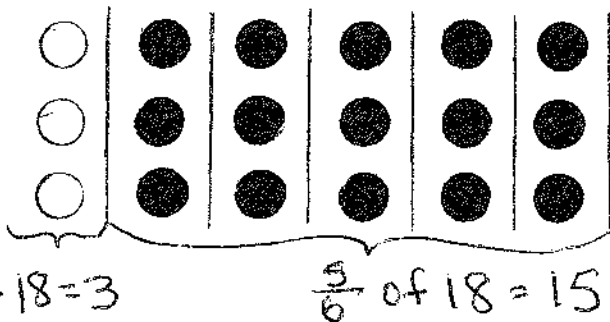
Jack kept 15 ten-dollar bills, which is $150.

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

**COMMON CORE** | Lesson 6: | Relate fractions as division to fraction of a set.
Date: | 9/17/14

engage<sup>ny</sup>    4.C.13

Name _____  Date _____

1.  Solve using a tape diagram.

a. $\frac{1}{3}$ of 18

18

?

3 units = 18
1 unit = $18 \div 3$
$= \frac{18}{3}$
$= 6$

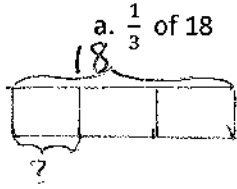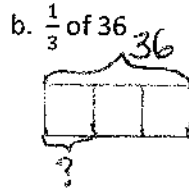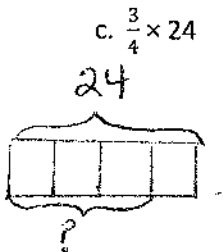b. $\frac{1}{3}$ of 36

36

?

3 units = 36
1 unit = $36 \div 3$
$= \frac{36}{3}$
$= 12$

c. $\frac{3}{4} \times 24$

24

?

4 units = 24
1 unit = $\frac{24}{4} = 6$
3 units = $3 \times 6$
$= 18$

d. $\frac{3}{8} \times 24$

24

?
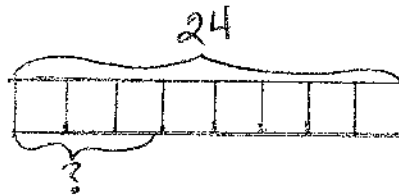
8 units = 24
1 unit = $24 \div 8$
$= \frac{24}{8} = 3$
3 units = $3 \times 3$
$= 9$

e. $\frac{4}{5} \times 25$

25

?
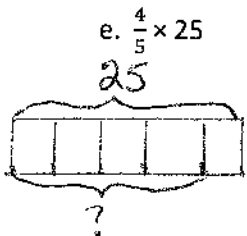
5 units = 25
1 unit = $\frac{25}{5} = 5$
4 units = $4 \times 5$
$= 20$

f. $\frac{1}{7} \times 140$

140

?
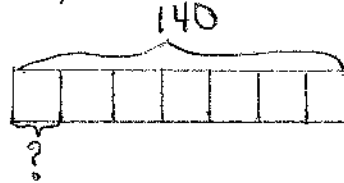
7 units = 140
1 unit = $\frac{140}{7}$
$= 20$

g. $\frac{1}{4} \times 9$

9

?
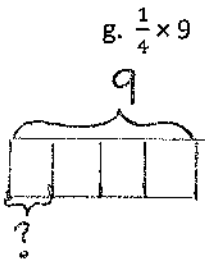
4 units = 9
1 unit = $\frac{9}{4}$
$= 2\frac{1}{4}$

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

12

?
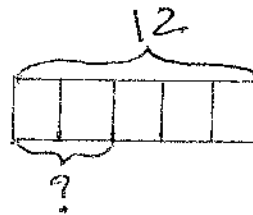
5 units = 12
1 unit = $\frac{12}{5}$
$= 2\frac{2}{5}$
2 units = $2\frac{2}{5} + 2\frac{2}{5}$
$= 4\frac{4}{5}$

i. $\frac{2}{3}$ of a number is 10.  What's the number?

?

10
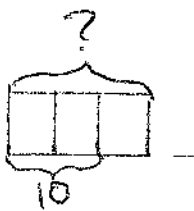
2 units = 10
1 unit = $\frac{10}{2}$
$= 5$
3 units = $3 \times 5 = 15$

The number is 15.

j. $\frac{3}{4}$ of a number is 24.  What's the number?

?

24
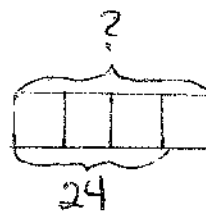
3 units = 24
1 unit = $\frac{24}{3} = 8$
4 units = $4 \times 8 = 32$

The number is 32.

2. Solve using tape diagrams.

a. There are 48 students going on a field trip. One-fourth are girls. How many boys are going on the trip?

48

| G | B | B | B |

?
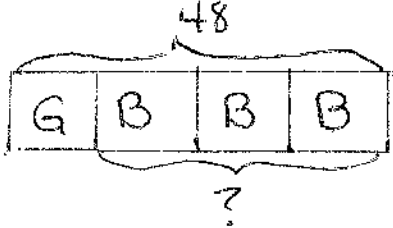
4 units = 48

1 unit = $\frac{48}{4}$ = 12

3 units = 3 × 12
           = 36

There are 36 boys going on the field trip.

b. Three angles are labeled below with arcs. The smallest angle is $\frac{3}{8}$ as large as the 160° angle. Find the value of angle a.

160°

a°

160

?
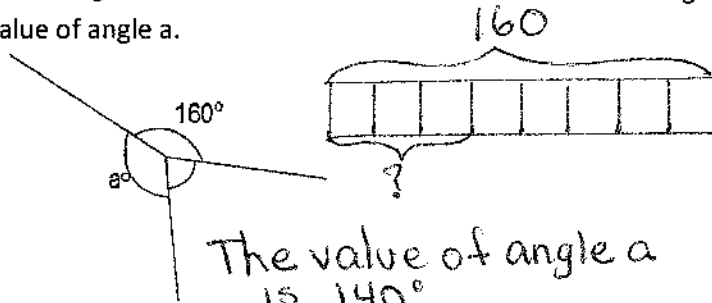
The value of angle a is 140°

8 units = 160

1 unit = $\frac{160}{8}$ = 20

3 units = 3 × 20 = 60

160 + 60 = 220

360 - 220 = 140

c. Abbie spent $\frac{5}{8}$ of her money and saved the rest. If she spent $45, how much money did she have at first? ?

45
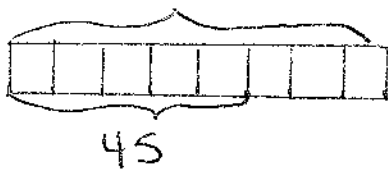
5 units = 45

1 unit = $\frac{45}{5}$ = 9

8 units = 8 × 9
           = 72

Abbie started with $72.

d. Mrs. Harrison used 16 ounces of dark chocolate while baking. She used $\frac{2}{5}$ of the chocolate to make some frosting and used the rest to make brownies. How much more chocolate did Mrs. Harrison use in the brownies than in the frosting?

16

| F | F | B | B | B |

?    ?
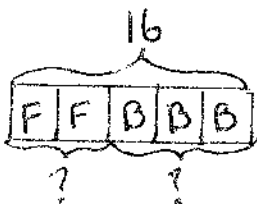
5 units = 16

1 unit = $\frac{16}{5}$ = 3$\frac{1}{5}$

2 units = 6$\frac{2}{5}$

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

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

Mrs. Harrison used 3$\frac{1}{5}$ more ounces of chocolate in the brownies than in the frosting.

Name _____     Date _____

1.  Laura and Sean find the product of $\frac{2}{3} \times 4$ using different methods.

    *Laura:* It's 2 thirds of 4.                    *Sean:* It's 4 groups of 2 thirds.

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

Use words, pictures, or numbers to compare their methods in the space below.

Both methods are correct. $\frac{2}{3} \times 4$ is 2 thirds of 4, and it will also have the same product a 4 groups of 2 thirds.

$\frac{2}{3} \times 4$   [diagram]   $4 \times \frac{2}{3}$   [diagram 2/3 | 2/3 | 2/3 | 2/3]

2.  Rewrite the following addition expressions as fractions as shown in the example.

    Example: $\frac{2}{3} + \frac{2}{3} + \frac{2}{3} + \frac{2}{3} = \frac{4 \times 2}{3} = \frac{8}{3}$

    a. $\frac{7}{4} + \frac{7}{4} + \frac{7}{4} = \frac{3 \times 7}{4} = \frac{21}{4}$    b. $\frac{14}{5} + \frac{14}{5} = \frac{2 \times 14}{5} = \frac{28}{5}$    c. $\frac{4}{7} + \frac{4}{7} + \frac{4}{7} = \frac{3 \times 4}{7} = \frac{12}{7}$

3.  Solve and model each problem as a fraction of a set and as repeated addition.

    [diagram labeled 6 and 4]          [diagram labeled 4 with 2/3 cells]
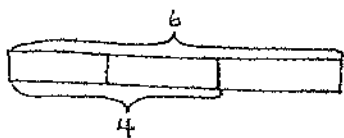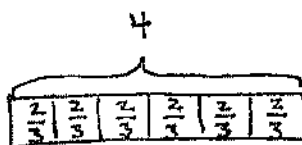
    Example: $\frac{2}{3} \times 6 = 2 \times \frac{6}{3} = 2 \times 2 = 4.$     $6 \times \frac{2}{3} = \frac{6 \times 2}{3} = 4$

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

    [diagram labeled 8 and 4]          [diagram labeled 4 with 1/2 cells]
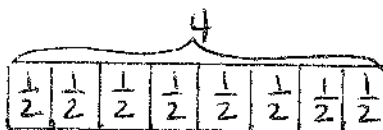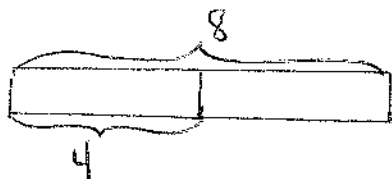
    b. $\frac{3}{5} \times 10 = 3 \times \frac{10}{5} = 3 \times 2 = 6$     $10 \times \frac{3}{5} = \frac{10 \times 3}{5} = \frac{30}{5} = 6$

    [diagram labeled 10 and 6]          [diagram labeled 6 with 3/5 cells]

COMMON CORE    Lesson 8:    Relate a fraction of a set to the repeated addition interpretation of fraction multiplication.
               Date:       9/17/14

engage^ny   4.C.38
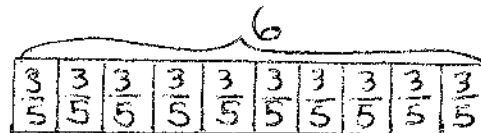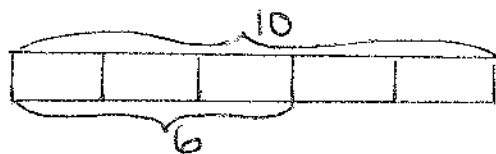
4. Solve each problem in two different ways as modeled in the example.

Example: $6 \times \frac{2}{3} = \frac{6 \times 2}{3} = \frac{3 \times 2 \times 2}{3} = \frac{3 \times 4}{3} = 4$   $\qquad$   $6 \times \frac{2}{3} = \frac{\overset{2}{\cancel{6}} \times 2}{\cancel{3}} = 4$

a. $14 \times \frac{3}{7}$

$= \frac{14 \times 3}{7} = \frac{7 \times 2 \times 3}{7} = \frac{7 \times 6}{7} = 6$

$= \frac{\overset{2}{\cancel{14}} \times 3}{\cancel{7}_{1}} = \frac{2 \times 3}{1} = 6$

b. $\frac{3}{4} \times 36$

$= \frac{3 \times 36}{4} = \frac{3 \times 4 \times 9}{4} = \frac{4 \times 27}{4} = 27$

$= \frac{3 \times \overset{9}{\cancel{36}}}{\cancel{4}_{1}} = \frac{3 \times 9}{1} = 27$

c. $30 \times \frac{13}{10}$

$= \frac{30 \times 13}{10} = \frac{10 \times 3 \times 13}{10} = \frac{10 \times 39}{10} = 39$

$= \frac{\overset{3}{\cancel{30}} \times 13}{\cancel{10}_{1}} = \frac{3 \times 13}{1} = 39$

d. $\frac{9}{8} \times 32$

$= \frac{9 \times 32}{8} = \frac{9 \times 4 \times 8}{8} = \frac{36 \times 8}{8} = 36$

$= \frac{9 \times \overset{4}{\cancel{32}}}{\cancel{8}_{1}} = \frac{9 \times 4}{1} = 36$

5. Solve each problem any way you choose.

a. $\frac{1}{2} \times 60$

$= \frac{1 \times \overset{30}{\cancel{60}}}{\cancel{2}_{1}} = \frac{1 \times 30}{1} = 30$

$\frac{1}{2}$ minute = __30__ seconds

b. $\frac{3}{4} \times 60$

$= \frac{3 \times \overset{15}{\cancel{60}}}{\cancel{4}_{1}} = \frac{3 \times 15}{1} = 45$

$\frac{3}{4}$ hour = __45__ minutes
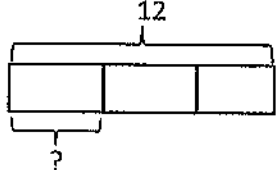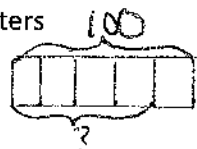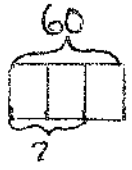
c. $\frac{3}{10} \times 1000$

$= \frac{3 \times \overset{100}{\cancel{1000}}}{\cancel{10}_{1}} = \frac{3 \times 100}{1} = 300$

$\frac{3}{10}$ kilogram = __300__ grams

d. $\frac{4}{5} \times 100$

$= \frac{4 \times \overset{20}{\cancel{100}}}{\cancel{5}_{1}} = \frac{4 \times 20}{1} = 80$

$\frac{4}{5}$ meter = __80__ centimeters

Name _____    Date _____

1. Convert. Show your work using a tape diagram or an equation. The first one is done for you.

---

a. $\frac{1}{2}$ yard = ___$1\frac{1}{2}$___ feet

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

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

$= \frac{3}{2}$ feet

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

---

b. $\frac{1}{3}$ foot = ___4___ inches

$\frac{1}{3}$ foot $= \frac{1}{3} \times 1$ foot

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

$= \frac{12}{3}$

$= 4$ inches

---

c. $\frac{5}{6}$ year = ___10___ months

$\frac{5}{6}$ year $= \frac{5}{6} \times 1$ year

$= \frac{5}{6} \times 12$ months

$= \frac{60}{6}$ months

$= 10$ months

---

d. $\frac{4}{5}$ meter = ___80___ centimeters

$\frac{4}{5}$ m $= \frac{4}{5} \times 1$ m

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

$= \frac{400}{5}$ cm

$= 80$ cm

5 units = 100
1 unit = 100 ÷ 5 = 20
4 units = 4 × 20 = 80

---

e. $\frac{2}{3}$ hour = ___40___ minutes

$\frac{2}{3}$ hr $= \frac{2}{3} \times 1$ hr.

$= \frac{2}{3} \times 60$ min.

$= \frac{120}{3}$ min

$= 40$ min.

3 units = 60
1 unit = 60 ÷ 3 = 20
2 units = 2 × 20
= 40

---

f. $\frac{3}{4}$ yard = ___27___ inches

$\frac{3}{4}$ yd $= \frac{3}{4} \times 1$ yd.

$= \frac{3}{4} \times 36$ in.

$= \frac{108}{4}$ in.

$= 27$ in

---

2. Mrs. Lang told her class that the class's pet hamster is $\frac{1}{4}$ ft in length. How long is the hamster in inches?

$$\frac{1}{4} ft = \frac{1}{4} \times 1 \, ft.$$
$$= \frac{1}{4} \times 12 \, in.$$
$$= \frac{12}{4} in = 3 in.$$

The hamster is 3 inches long.

3. At the market, Mr. Paul bought $\frac{7}{8}$ lb of cashews and $\frac{3}{4}$ lb of walnuts.

   a. How many ounces of cashews did Mr. Paul buy?

$$\frac{7}{8} lb = \frac{7}{8} \times 1 \, lb.$$
$$= \frac{7}{8} \times 16 \, oz.$$
$$= \frac{112}{8} oz = 14 oz.$$

Mr. Paul bought 14 ounces of cashews.

   b. How many ounces of walnuts did Mr. Paul buy?

$$\frac{3}{4} lb = \frac{3}{4} \times 1 \, lb.$$
$$= \frac{3}{4} \times 16 \, oz$$
$$= \frac{48}{4} oz = 12 oz.$$

Mr Paul bought 12 ounces of walnuts.

   c. How many more ounces of cashews than walnuts did Mr. Paul buy?

$$14 oz. - 12 oz. = 2 oz.$$

Mr Paul bought 2 ounces more of cashews than walnuts.

   d. If Mrs. Toombs bought $1\frac{1}{2}$ pounds of pistachios, who bought more nuts, Mr. Paul or Mrs. Toombs? How many ounces more?

Mr. Paul
$$\begin{array}{r} 14 oz. \\ + 12 oz. \\ \hline 26 oz. \end{array}$$

Mrs. Toombs:
$$1\frac{1}{2} lb = \frac{3}{2} lb. = \frac{3}{2} \times 1 \, lb.$$
$$= \frac{3}{2} \times 16 \, oz.$$
$$= \frac{48}{2} oz = 24 oz.$$

$$26 oz - 24 oz = 2 oz$$

Mr. Paul bought more nuts than Mrs. Toombs. He bought 2 ounces more than she did.

4. A jewelry maker purchased 20 inches of gold chain. She used $\frac{5}{8}$ of the chain for a bracelet. How many inches of gold chain did she have left?

20 inches

used    left
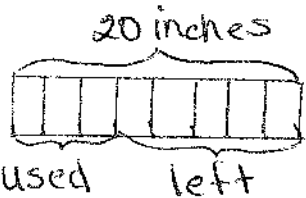
$$8 \text{ units} = 20$$
$$1 \text{ unit} = \frac{20}{8} = 2\frac{4}{8}$$
$$5 \text{ units} = 2\frac{4}{8} + 2\frac{4}{8} + 2\frac{4}{8} + 2\frac{4}{8} + 2\frac{4}{8}$$
$$= 10\frac{20}{8}$$
$$= 12\frac{4}{8} = 12\frac{1}{2}$$
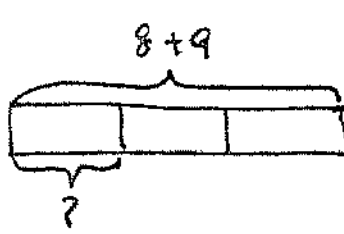
She had $12\frac{1}{2}$ inches left.

COMMON CORE    Lesson 9:    Find a fraction of measurement, and solve word problems.
Date:    9/17/14

engage^ny    4.C.50
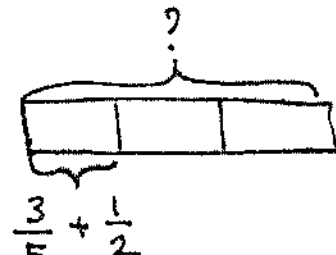
Name _____          Date _____

1.  Write expressions to match the diagrams.  Then, evaluate.

$\frac{1}{3} \times (8+9) =$
$\frac{1}{3} \times 17 =$
$\frac{1 \times 17}{3} = 5\frac{2}{3}$

$\left(\frac{3}{5} + \frac{1}{2}\right) \times 3 =$
$\left(\frac{6}{10} + \frac{5}{10}\right) \times 3 =$
$\frac{11}{10} \times 3 =$
$\frac{11 \times 3}{10} = \frac{33}{10} = 3\frac{3}{10}$

2.  Write an expression to match, then evaluate.

a.  $\frac{1}{6}$ the sum of 16 and 20.

$(16+20) \times \frac{1}{6} =$
$36 \times \frac{1}{6} =$
$\frac{36 \times 1}{6} = 6$

b.  Subtract 5 from $\frac{1}{3}$ of 23.

$\left(\frac{1}{3} \times 23\right) - 5 =$
$\frac{23}{3} - 5 =$
$7\frac{2}{3} - 5 = 2\frac{2}{3}$

c.  3 times as much as the sum of $\frac{3}{4}$ and $\frac{2}{6}$.

$\left(\frac{3}{4} + \frac{2}{6}\right) \times 3 =$
$\left(\frac{9}{12} + \frac{4}{12}\right) \times 3 = \frac{13}{12} \times 3 =$
$\frac{13 \times 3}{12} = \frac{13}{4} = 3\frac{1}{4}$

d.  $\frac{2}{5}$ of the product of $\frac{5}{6}$ and 42.

$\left(\frac{5}{6} \times 42\right) \times \frac{2}{5} =$
$\frac{5 \times 42^{7}}{6_{1}} \times \frac{2}{5} =$
$35 \times \frac{2}{5} = \frac{35 \times 2}{5_{1}} = 14$

e.  8 copies of the sum of 4 thirds and 2 more.

$\left(\frac{4}{3} + 2\right) \times 8 =$
$\left(1\frac{1}{3} + 2\right) \times 8 =$
$3\frac{1}{3} \times 8 = \frac{10}{3} \times 8 =$
$\frac{80}{3} = 26\frac{2}{3}$

f.  4 times as much as 1 third of 8.

$\left(\frac{1}{3} \times 8\right) \times 4 =$
$\frac{8}{3} \times 4 =$
$\frac{32}{3} = 10\frac{2}{3}$

3. Circle the expression(s) that gives the same product as $\frac{4}{5} \times 7$. Explain how you know.

$4 \div (7 \times 5)$     $7 \div 5 \times 4$     $(4 \times 7) \div 5$     $4 \div (5 \times 7)$     $4 \times \frac{7}{5}$     $7 \times \frac{4}{5}$

I can prove the expressions have the same product by solving them!  $\frac{4}{5} \times 7 = \frac{4}{5} \times \frac{7}{1} = \frac{28}{5}$

$(4 \times 7) \div 5 = \frac{4 \times 7}{5} = \frac{28}{5}$

$4 \times \frac{7}{5} = \frac{4}{1} \times \frac{7}{5} = \frac{28}{5}$

$7 \times \frac{4}{5} = \frac{7}{1} \times \frac{4}{5} = \frac{28}{5}$

They all have the same product of $\frac{28}{5}$.

4. Use <, >, or = to make true number sentences without calculating. Explain your thinking.

a. $4 \times 2 + 4 \times \frac{2}{3}$  $>$  $3 \times \frac{2}{3}$

$4 \times \frac{2}{3}$ is more than $3 \times \frac{2}{3}$ without adding $(4 \times 2)$.

b. $\left(5 \times \frac{3}{4}\right) \times \frac{2}{5}$  $>$  $\left(5 \times \frac{3}{4}\right) \times \frac{2}{7}$

$\frac{2}{5}$ of a number is more than $\frac{2}{7}$ of the same number.

c. $3 \times \left(3 + \frac{15}{12}\right)$  $>$  $(3 \times 3) + \frac{15}{12}$

3 times $\frac{15}{12}$ is more than adding $\frac{15}{12}$.

5. Collette bought milk for herself each month and recorded the amount in the table below. For (a–c), write an expression that records the calculation described. Then, solve to find the missing data in the table.

a. She bought $\frac{1}{4}$ of July's total in June.

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

| Month | Amount (in gallons) |
|---|---|
| January | 3 |
| February | 2 |
| March | $1\frac{1}{4}$ |
| April | $1\frac{1}{2}$ |
| May | $\frac{7}{4} = 1\frac{3}{4}$ |
| June | $\frac{2}{4}$ |
| July | 2 |
| August | 1 |
| September | $3\frac{3}{4}$ |
| October | $\frac{1}{4}$ |

b. She bought $\frac{3}{4}$ as much in September as she did in January and July combined.

$$\frac{3}{4} \times (3 \times 2) =$$
$$\frac{3}{4} \times 5 = \frac{15}{4} = 3\frac{3}{4}$$

c. In April, she bought $\frac{1}{2}$ gallon less than twice as much as she bought in August.

$$(2 \times 1) - \frac{1}{2} =$$
$$2 - \frac{1}{2} = 1\frac{1}{2}$$

d. Display the data from the table in a line plot.
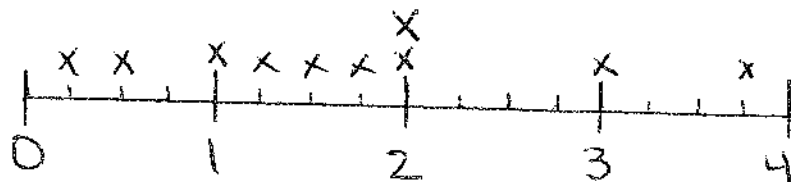


e. How many gallons of milk did Collette buy from January to October?

$$3 + 2 + 1\frac{1}{4} + 1\frac{2}{4} + 1\frac{3}{4} + \frac{2}{4} + 2 + 1 + 3\frac{3}{4} + \frac{1}{4} =$$
$$14 + \frac{12}{4} =$$
$$14 + 3 = 17$$

Collette bought 17 gal of milk.

**COMMON CORE** | Lesson 10: Compare and evaluate expressions with parentheses.
Date: 9/18/14

engage^ny   4.D.13

Name _____    Date _____

1.  Kim and Courtney share a 16-ounce box of cereal.  By the end of the week, Kim has eaten $\frac{3}{8}$ of the box, and Courtney has eaten $\frac{1}{4}$ of the box of cereal.  What fraction of the box is left?

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

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

$\frac{5}{8}$ eaten

16 oz

$\frac{5}{8}$    ?

$\frac{8}{8} - \frac{5}{8} = \frac{3}{8}$
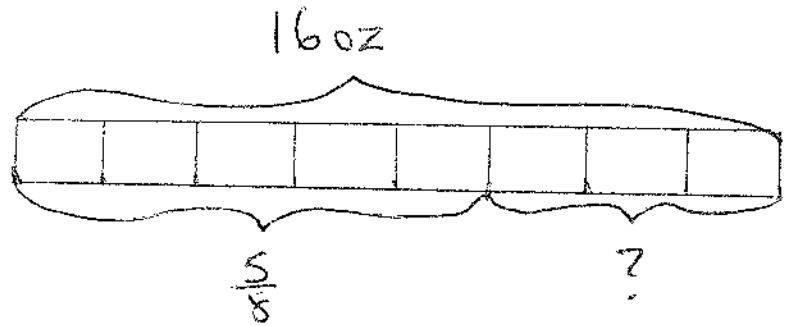
$\frac{3}{8}$ of the box is left.

2.  Mathilde has 20 pints of green paint.  She uses $\frac{2}{5}$ of it to paint a landscape and $\frac{3}{10}$ of it while painting a clover.  She decides that, for her next painting, she will need 14 pints of green paint.  How much more paint will she need to buy?

Landscape  $\frac{2}{5} \times 20 = \frac{2 \times \overset{4}{\cancel{20}}}{\cancel{5}_1} = 8$ pints

Clover  $\frac{3}{10} \times 20 = \frac{3 \times \overset{2}{\cancel{20}}}{\cancel{10}_1} = 6$ pints

Used  8 + 6 = 14 pints
Remaining  20 - 14 = 6 pints
Needs  14 - 6 = 8 pints

Mathilde needs 8 more pints for the next painting.

COMMON CORE    Lesson 11:   Solve and create fraction word problems involving addition, subtraction, and multiplication..
Date:   9/18/14

engage^ny   4.D.27

3. Jack, Jill, and Bill each carried a 48-ounce bucket full of water down the hill. By the time they reached the bottom, Jack's bucket was only $\frac{3}{4}$ full, Jill's was $\frac{2}{3}$ full, and Bill's was $\frac{1}{6}$ full. How much water did they spill altogether on their way down the hill?

Jack $\frac{1}{4} \times 48 = \frac{48}{4} = 12$ oz.      $12 + 16 + 40 = 68$ oz

Jill $\frac{1}{3} \times 48 = \frac{48}{3} = 16$ oz.

Bill $\frac{5}{6} \times 48 = \frac{240}{6} = 40$ oz.      Together they split 68 oz. of water.

4. Mrs. Diaz makes 5 dozen cookies for her class. One-ninth of her 27 students are absent the day she brings the cookies. If she shares the cookies equally among the students who are present, how many cookies will each student get?

$\frac{1}{9} \times 27 = \frac{27}{9} = 3$     3 students are absent.

$27 - 3 = 24$ students

5 dozen $\times 12 = 60$ cookies       Each student gets

$60 \div 24 = \frac{60}{24} = \frac{5}{2} = 2\frac{1}{2}$         $2\frac{1}{2}$ cookies.

5. Create a story problem about a fish tank for the tape diagram below. Your story must include a fraction.

84

?
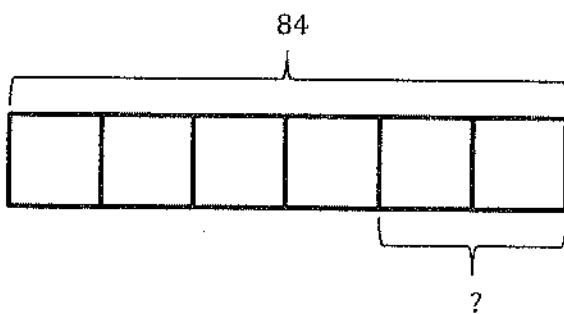
There are 84 organisms in a freshwater aquarium. One half of the organisms are top-feeding fish. One sixth are crustaceans. The remaining organisms are apple snails. How many snails are in the tank?

COMMON CORE    Lesson 11:  Solve and create fraction word problems involving addition, subtraction, and multiplication..
Date:    9/18/14

engage^ny    4.D.28

Name _____    Date _____

1. A baseball team played 32 games and lost 8. Katy was the catcher in $\frac{5}{8}$ of the winning games and $\frac{1}{4}$ of the losing games.

   a. What fraction of the games did the team win?

32 games

W    L

?    8

$32 - 8 = 24$

$\frac{24}{32} = \frac{3}{4}$

The team won $\frac{3}{4}$ of the games they played.

   b. In how many games did Katy play catcher?

Katy won: $\frac{5}{8} \times 24 = \frac{5 \times 24^{3}}{8_{1}} = 15$ games

Lost: $\frac{1}{4} \times 8 = \frac{8}{4} = 2$ games

Katy played 17 games.

2. In Mrs. Elliott's garden, $\frac{1}{8}$ of the flowers are red, $\frac{1}{4}$ of them are purple, and $\frac{1}{5}$ of the remaining flowers are pink. If there are 128 flowers, how many flowers are pink?
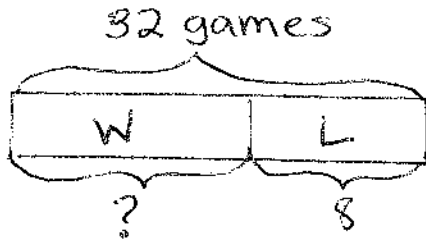
$\frac{1}{8} + \frac{1}{4} = \frac{1}{8} + \frac{2}{8} = \frac{3}{8}$ of the flowers are red and purple.

$\frac{3}{8}$ of 128 = $\frac{3 \times 128^{16}}{8_{1}} = 48$

$128 - 48 = 80$

$\frac{1}{5}$ of 80 = $\frac{80}{5} = 16$

16 flowers are pink.

COMMON CORE    |  Lesson 12:   Solve and create fraction word problems involving addition,
                               subtraction, and multiplication.
               |  Date:        9/18/14

engage^ny    4.D.42

3.  Lillian and Darlene plan to get their homework finished within one hour.  Darlene completes her math homework in $\frac{3}{5}$ hour.  Lillian completes her math homework with $\frac{5}{6}$ hour remaining.  Who completes her homework faster and by how many minutes?

Bonus:  Give the answer as a fraction of an hour.

Darlene: $\frac{3}{5} \times 60 \text{ min} = \frac{3 \times \overset{12}{\cancel{60}}}{\cancel{5}_1} = 36 \text{ minutes}$

Lillian: $\frac{1}{6} \times 60 \text{ min} = \frac{60}{6} = 10 \text{ minutes}$

$36 - 10 = 26$

Lillian completed the homework 26 minutes faster than Darlene

Bonus: $\frac{26}{60} = \frac{13}{30}$ of an hour

4.  Create and solve a story problem about a baker and some flour whose solution is given by the expression $\frac{1}{4} \times (3 + 5)$.

A baker used a combination of whole wheat and white flour to bake bread. She then divided the flour into 4 batches. If she used 3 cups of white flour and 5 cups of whole wheat flour, how much flour is used for each loaf?

COMMON CORE

Lesson 12:  Solve and create fraction word problems involving addition, subtraction, and multiplication.
Date:      9/18/14

engage^ny     4.D.43

5. Create and solve a story problem about a baker and 36 kilograms of an ingredient that is modeled by the following tape diagram. Include at least one fraction in your story.

36
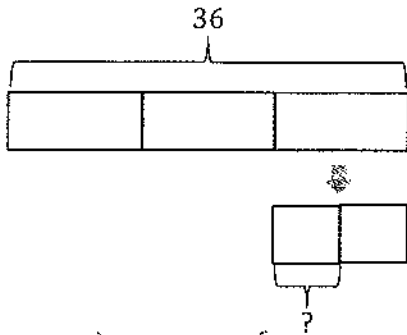
3 units = 36
1 unit = 12
$\frac{1}{2}$ of 12 = 6 kg

A baker used 36 kilograms of flour equally over three days. On one of these days she used the flour, equally, to make two treats. How much flour was used for one treat

6 kg. was used for one treat.

6. Of the students in Mr. Smith's fifth grade class, $\frac{1}{3}$ were absent on Monday. Of the students in Mrs. Jacobs' class, $\frac{2}{5}$ were absent on Monday. If there were 4 students absent in each class on Monday, how many students are in each class?

Mr. Smith's class

?

4
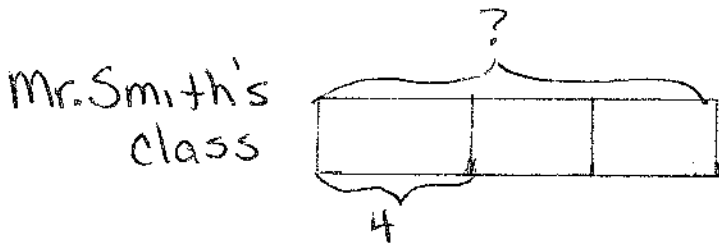
1 unit = 4
3 units = 12

There are 12 students in Mr. Smith's class.

Mrs. Jacob's class

?

4
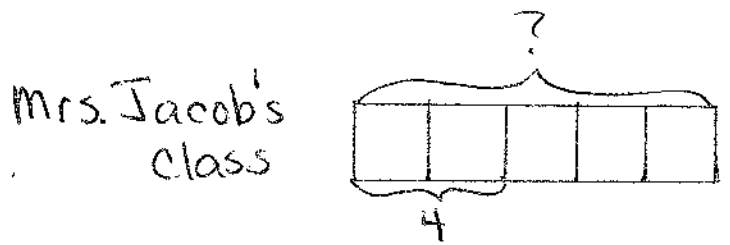
2 units = 4
1 unit = 2
5 units = 10

There are 10 students in Mrs. Jacob's class.

COMMON CORE          Lesson 12:   Solve and create fraction word problems involving addition,
                                   subtraction, and multiplication.                          engage^ny     4.D.44
                      Date:        9/18/14

Name _____    Date _____

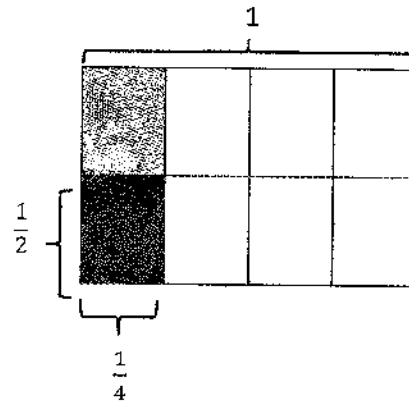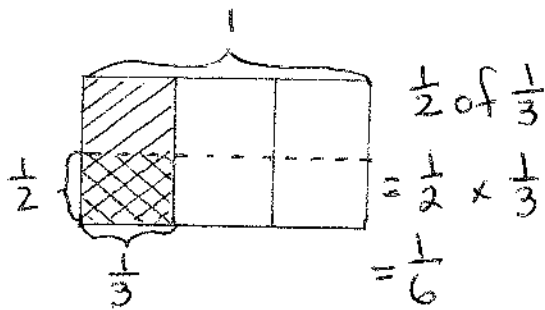1. Solve. Draw a rectangular fraction model to show your thinking. Then, write a multiplication sentence. The first one has been done for you.

a. Half of $\frac{1}{4}$ pan of brownies = ___$\frac{1}{8}$___ pan of brownies

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

b. Half of $\frac{1}{3}$ pan of brownies = ___$\frac{1}{6}$___ pan of brownies

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

c. A fourth of $\frac{1}{3}$ pan of brownies = ___$\frac{1}{12}$___ pan of brownies

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

d. $\frac{1}{4}$ of $\frac{1}{4} = \frac{1}{16}$
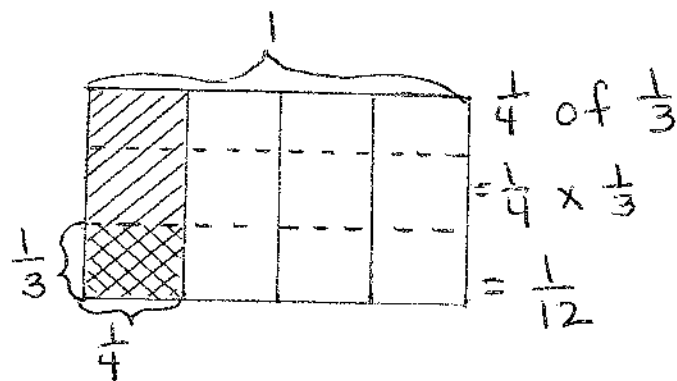
$\frac{1}{4}$ of $\frac{1}{4}$
$= \frac{1}{4} \times \frac{1}{4}$
$= \frac{1}{16}$
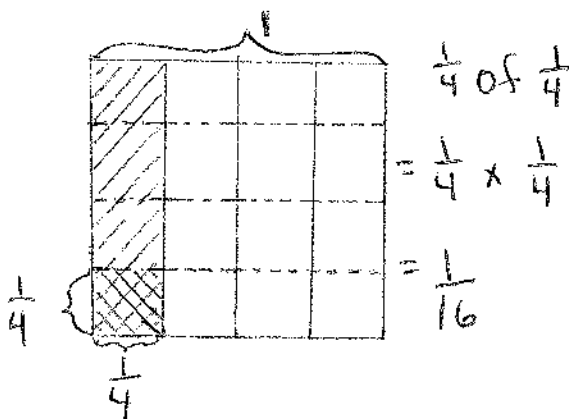
e. $\frac{1}{2}$ of $\frac{1}{6} = \frac{1}{12}$

$\frac{1}{2}$ of $\frac{1}{6}$
$= \frac{1}{2} \times \frac{1}{6}$
$= \frac{1}{12}$
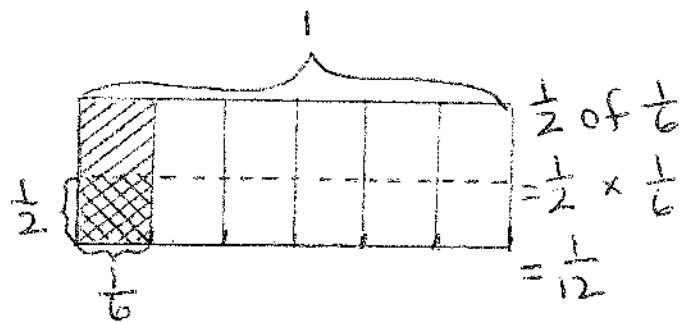
2. Draw rectangular fraction models of $3 \times \frac{1}{4}$ and $\frac{1}{3} \times \frac{1}{4}$. Compare multiplying a number by 3 and by 1 third.

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

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

$= \frac{3}{4}$

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

$= \frac{1}{12}$

$3 \times \frac{1}{4} > \frac{1}{3} \times \frac{1}{4}$

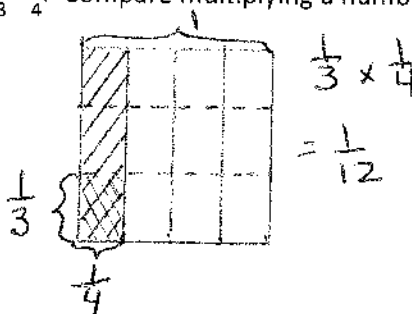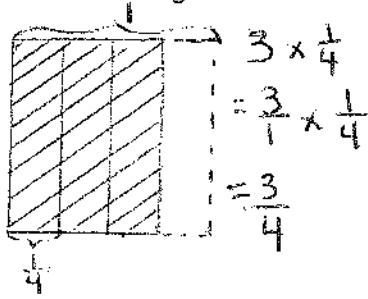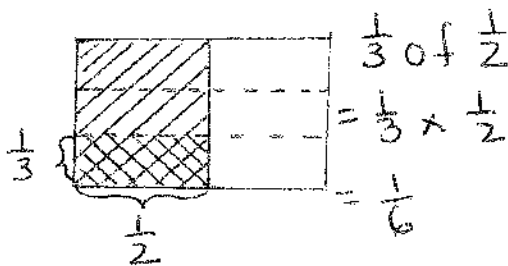3. $\frac{1}{2}$ of Ila's workspace is covered in paper. $\frac{1}{3}$ of the paper is covered in yellow sticky notes. What fraction of Ila's workspace is covered in yellow sticky notes? Draw a picture to support your answer.

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

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

$= \frac{1}{6}$

$\frac{1}{6}$ of Ila's workplace is covered in yellow sticky Notes.

4. A marching band is rehearsing in rectangular formation. $\frac{1}{5}$ of the marching band members play percussion instruments. $\frac{1}{2}$ of the percussionists play the snare drum. What fraction of all the band members play the snare drum?

$\frac{1}{2}$ of $\frac{1}{5}$

$= \frac{1}{2} \times \frac{1}{5}$

$= \frac{1}{10}$

$\frac{1}{10}$ of all the band members play the snare drum.

5. Marie is designing a bedspread for her grandson's new bedroom. $\frac{2}{3}$ of the bedspread is covered in race cars and the rest is striped. $\frac{1}{4}$ of the stripes are red. What fraction of the bedspread is covered in red stripes?
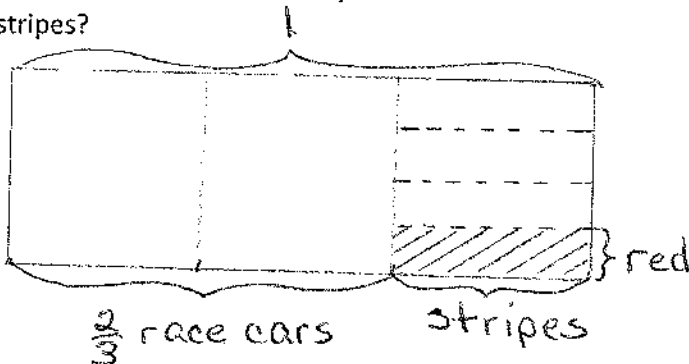
$\frac{1}{12}$ of the bedspread is covered in red stripes.

$\frac{2}{3}$ race cars     stripes     } red

Name _____     Date _____

1. Solve. Draw a rectangular fraction model to explain your thinking. Then, write a number sentence. An example has been done for you.
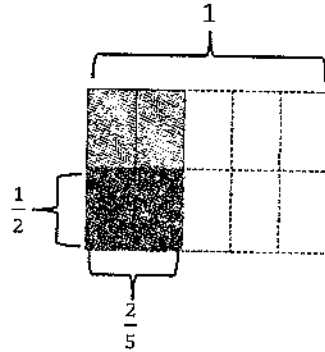
Example:

$\frac{1}{2}$ of $\frac{2}{5}$ = $\frac{1}{2}$ of 2 fifths = 1 fifth

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

a. $\frac{1}{3}$ of $\frac{3}{4}$ = $\frac{1}{3}$ of __3__ fourths = __1__ fourth
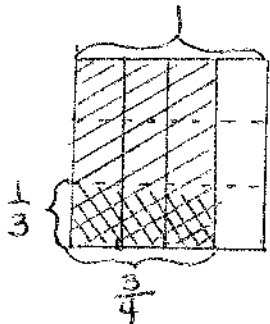
$\frac{1}{3} \times \frac{3}{4} = \frac{3}{12}$

$= \frac{1}{4}$

b. $\frac{1}{2}$ of $\frac{4}{5}$ = $\frac{1}{2}$ of __4__ fifths = __2__ fifths
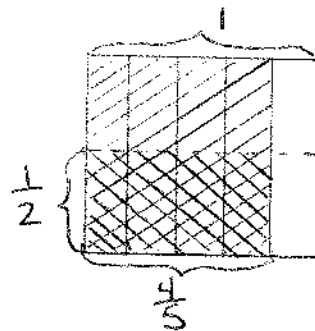
$\frac{1}{2} \times \frac{4}{5} = \frac{4}{10}$

$= \frac{2}{5}$

c. $\frac{1}{2}$ of $\frac{2}{2}$ =
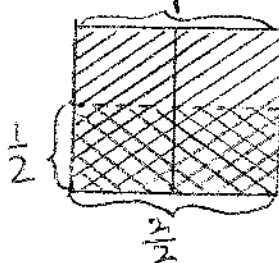
$\frac{1}{2} \times \frac{2}{2} = \frac{2}{4}$

$= \frac{1}{2}$

d. $\frac{2}{3}$ of $\frac{1}{2}$ =

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

$= \frac{1}{3}$

e. $\frac{1}{2} \times \frac{3}{5}$ =
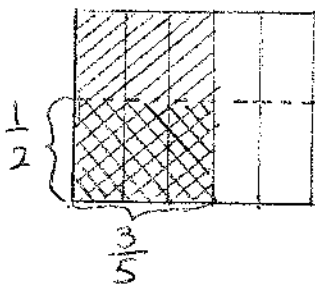
$\frac{1}{2} \times \frac{3}{5} = \frac{3}{10}$

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

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

$= \frac{1}{6}$

2. $\frac{5}{8}$ of the songs on Harrison's music player are hip-hop. $\frac{1}{3}$ of the remaining songs are rhythm and blues.

What fraction of all the songs are rhythm and blues? Use a tape diagram to solve.

total songs

hip-hop     ?     rhythm & blues
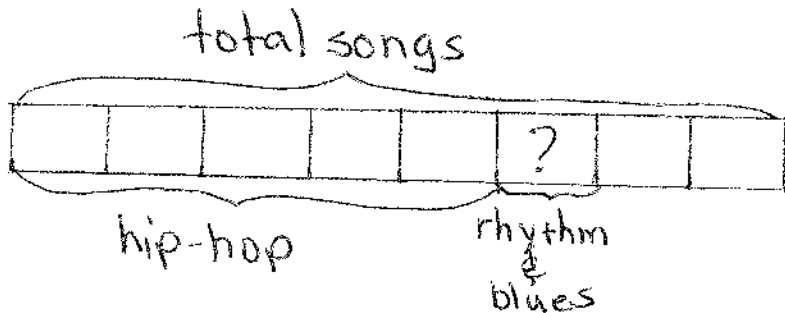
$\frac{1}{3}$ of 3 eighths = 1 eighth

$\frac{1}{8}$ of all the songs are rhythm and blues.

3. Three-fifths of the students in a room are girls. One-third of the girls have blond hair. One-half of the boys have brown hair.

   a. What fraction of all the students are girls with blond hair?

total students

blonde     brown

girls     boys
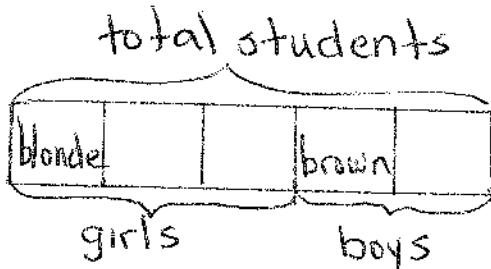
$\frac{1}{3}$ of 3 fifths = 1 fifth

$\frac{1}{5}$ of all the students are girls with blonde hair.

   b. What fraction of all the students are boys without brown hair?

$\frac{1}{2}$ of 2 fifths = 1 fifth

$\frac{1}{5}$ of all the students are boys without brown hair.

4. Cody and Sam mowed the yard on Saturday. Dad told Cody to mow $\frac{1}{4}$ of the yard. He told Sam to mow $\frac{1}{3}$ of the remainder of the yard. Dad paid each of the boys an equal amount. Sam said, "Dad, that's not fair! I had to mow one-third and Cody only mowed one-fourth!" Explain to Sam the error in his thinking. Draw a picture to support your reasoning.

whole yard

Cody   Sam
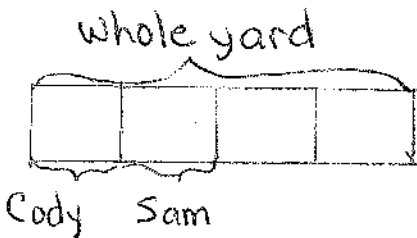
After Cody mowed $\frac{1}{4}$ of the yard, $\frac{3}{4}$ is left. Sam mowed $\frac{1}{3}$ of 3 fourths which is equal to 1 fourth. So, they mowed on equal part of the yard.

Name _____  Date _____

1. Solve. Draw a rectangular fraction model to explain your thinking. Then, write a multiplication sentence. The first one is done for you.
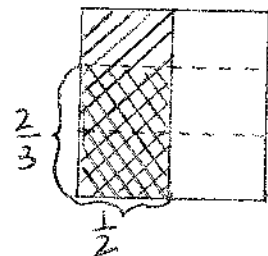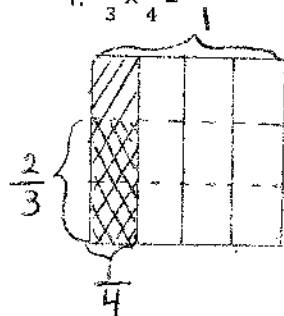
a. $\frac{2}{3}$ of $\frac{3}{5}$

$\frac{2}{3} \times \frac{3}{5} = \frac{6}{15} = \frac{2}{5}$
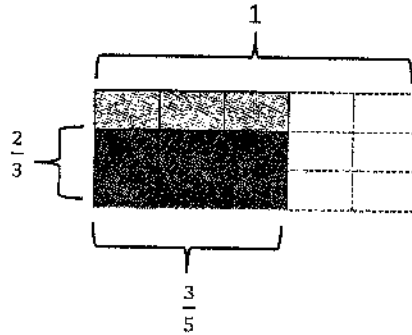


b. $\frac{3}{4}$ of $\frac{4}{5} = \frac{3}{4} \times \frac{4}{5} = \frac{3 \times 4}{4 \times 5} = \frac{3}{5}$

c. $\frac{2}{5}$ of $\frac{2}{3} = \frac{2}{5} \times \frac{2}{3} = \frac{2 \times 2}{5 \times 3} = \frac{4}{15}$
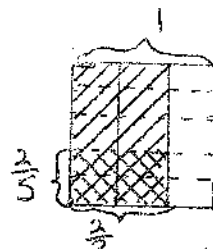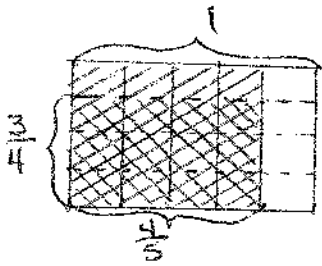
d. $\frac{4}{5} \times \frac{2}{3} = \frac{4 \times 2}{5 \times 3} = \frac{8}{15}$

e. $\frac{3}{4} \times \frac{2}{3} = \frac{3 \times 2}{4 \times 3} = \frac{1}{2}$
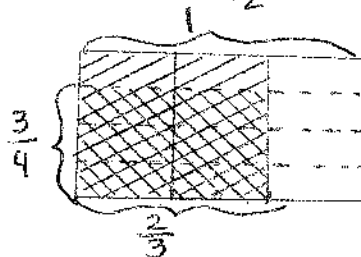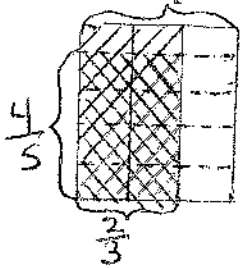
2. Multiply. Draw a rectangular fraction model if it helps you, or use the method in the example.

Example: $\frac{6}{7} \times \frac{5}{8} = \frac{\overset{3}{\cancel{6}} \times 5}{7 \times \cancel{8}} = \frac{15}{28}$

a. $\frac{3}{4} \times \frac{5}{6} = \frac{\overset{1}{\cancel{3}} \times 5}{4 \times \cancel{6}_2} = \frac{5}{8}$

b. $\frac{4}{5} \times \frac{5}{8} = \frac{\overset{1}{\cancel{4}} \times \cancel{5}}{\cancel{5} \times \cancel{8}_2} = \frac{1}{2}$

c. $\frac{2}{3} \times \frac{6}{7}$

$$= \frac{2 \times \overset{2}{6}}{\underset{1}{3} \times 7} = \frac{2 \times 2}{1 \times 7} = \frac{4}{7}$$

d. $\frac{4}{9} \times \frac{3}{10}$

$$= \frac{\overset{2}{4} \times \overset{1}{3}}{\underset{3}{9} \times \underset{5}{10}} = \frac{2 \times 1}{3 \times 5} = \frac{2}{15}$$

3. Phillip's family traveled $\frac{3}{10}$ of the distance to his grandmother's house on Saturday. They traveled $\frac{4}{7}$ of the remaining distance on Sunday. What fraction of the total distance to his grandmother's house was traveled on Sunday?

*total distance*

*traveled Sat.*    *traveled Sun.?*
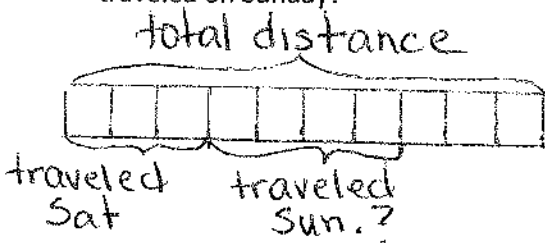
$\frac{4}{7}$ of 7 tenths = 4 tenths

$\frac{4}{10}$ of the distance to his grandmother's house was traveled on Sunday.

4. Santino bought a $\frac{3}{4}$ pound bag of chocolate chips. He used $\frac{2}{3}$ of the bag while baking. How many pounds of chocolate chips did he use while baking?
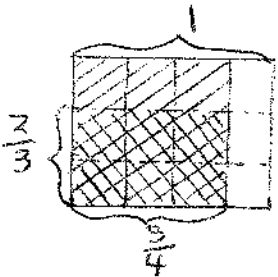
$\frac{2}{3}$ of $\frac{3}{4}$ = $\frac{2}{3} \times \frac{3}{4}$ = $\frac{\overset{1}{2} \times \overset{1}{3}}{\underset{1}{3} \times \underset{2}{4}}$ = $\frac{1}{2}$

Santino used half a pound of chocolate chips while baking.

5. Farmer Dave harvested his corn. He stored $\frac{5}{9}$ of his corn in one large silo and $\frac{3}{4}$ of the remaining corn in a small silo. The rest was taken to market to be sold.

a. What fraction of the corn was stored in the small silo?

*18 tons of corn*

*large silo*    *Small silo*    *to be sold?*
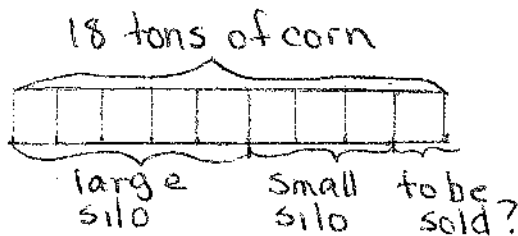
$\frac{3}{4}$ of 4 ninths = 3 ninths = 1 third

One third of the corn was stored in the small silo.

b. If he harvested 18 tons of corn, how many tons did he take to market?

$\frac{1}{9}$ of 18 = $\frac{1}{9} \times \frac{18}{1}$ = $\frac{1 \times \overset{2}{18}}{\underset{1}{9} \times 1}$ = 2

Farmer Dave took 2 tons of corn to market.

Name _____          Date _____

Solve and show your thinking with a tape diagram.

1. Mrs. Onusko made 60 cookies for a bake sale. She sold $\frac{2}{3}$ of them and gave $\frac{3}{4}$ of the remaining cookies to the students working at the sale. How many cookies did she have left?

60

| 20 | 20 | 20 |
|----|----|----|

sold

| 5 | 5 | 5 | 5 |
|---|---|---|---|

given   ?
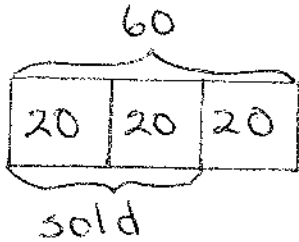
3 units = 60 cookies

1 unit = 20 cookies

20 ÷ 4 = 5 cookies
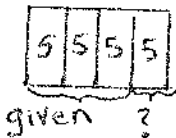
Mrs. Onusko had 5 cookies left.

2. Joakim is icing 30 cupcakes. He spreads mint icing on $\frac{1}{5}$ of the cupcakes and chocolate on $\frac{1}{2}$ of the remaining cupcakes. The rest will get vanilla icing. How many cupcakes have vanilla icing?

30

mint                    24

| 12 | 12 |
|----|----|

chocolate  vanilla
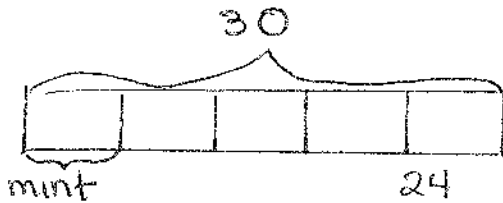
5 units = 30 cupcakes

1 unit = 6 cupcakes

24 ÷ 2 = 12 cupcakes

Twelve cupcakes have vanilla icing.

3. The Booster Club sells 240 cheeseburgers. $\frac{1}{4}$ of the cheeseburgers had pickles, $\frac{1}{2}$ of the remaining burgers had onions, and the rest had tomato. How many cheeseburgers had tomato?

240

| 60 | 60 | 60 | 60 |
|----|----|----|----|

pickles

180

| 90 | 90 |
|----|----|

onions  tomatoes
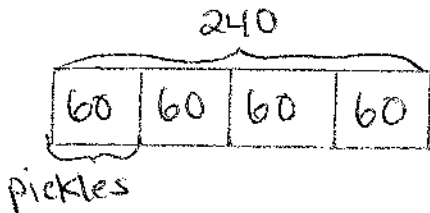
4 units = 240

1 unit = 60

180 ÷ 2 = 90
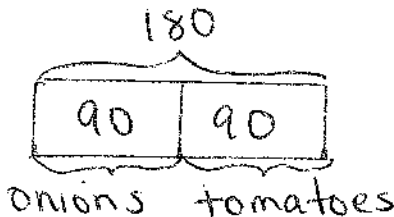
Ninety cheeseburgers had tomato.

4. DeSean is sorting his rock collection. $\frac{2}{3}$ of the rocks are metamorphic and $\frac{3}{4}$ of the remainder are igneous rocks. If the 3 rocks left over are sedimentary, how many rocks does DeSean have?
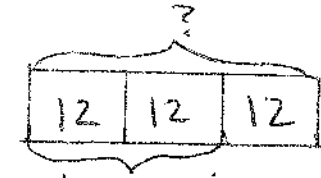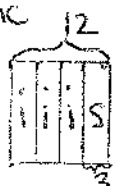
1 unit = 12 rocks
3 units = 36 rocks

| 12 | 12 | 12 |
metamorphic

3 × 4 = 12

De Sean has 36 rocks

5. Milan puts $\frac{1}{4}$ of her lawn-mowing money in savings and uses $\frac{1}{2}$ of the remaining money to pay back her sister. If she has $15 left, how much did she have at first?

| $10 | $10 | $10 | $10 |
savings          $30
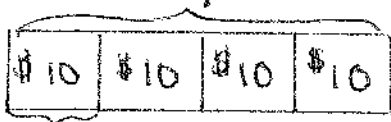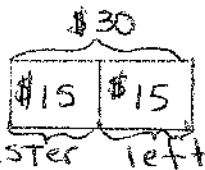
| $15 | $15 |
sister  left

$15 × 2 = $30

3 units = $30
1 unit = $10
4 units = $40

Milan had $40 at first.

6. Parks is wearing several rubber bracelets. $\frac{1}{3}$ of the bracelets are tie-dye, $\frac{1}{6}$ are blue, and $\frac{1}{3}$ of the remainder are camouflage. If Parks wears 2 camouflage bracelets, how many bracelets does he have on?

| 2 | 2 | 2 | 2 | 2 | 2 |
tie-dye   blue          6

2 × 3 = 6 bracelets

| 2 | 2 | 2 |
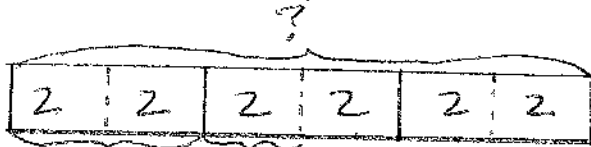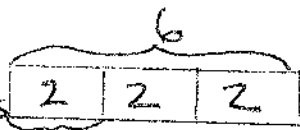
3 units = 6 bracelets
1 unit = 2 bracelets
6 units = 12 bracelets

Parks has 12 bracelets on.

7. Ahmed spent $\frac{1}{3}$ of his money on a burrito and a water bottle. The burrito cost 2 times as much as the water. The burrito cost $4, how much money does Ahmed have left?

| $6 | $6 | $6 |

| $4 | $2 |
| b | b | w |

?
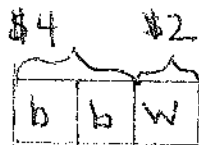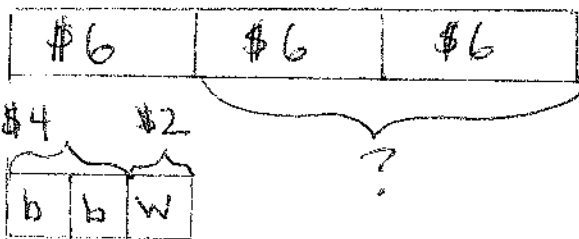
$6 × 2 = $12

2 units = $4
1 unit = $2

Ahmed has $12 left.

Name _____          Date _____

1. Multiply and model. Rewrite each expression as a multiplication sentence with decimal factors. The first one is done for you.

a. $\frac{1}{10} \times \frac{1}{10}$

$= \frac{1 \times 1}{10 \times 10}$

$= \frac{1}{100}$
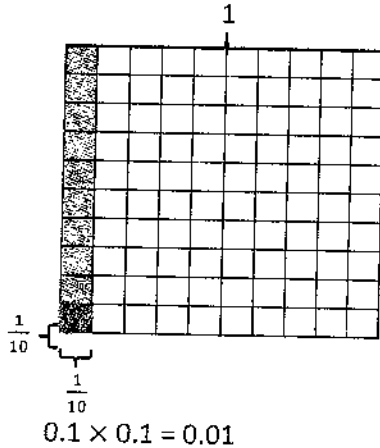
$0.1 \times 0.1 = 0.01$

b. $\frac{4}{10} \times \frac{3}{10}$

$= \frac{4 \times 3}{10 \times 10}$

$= \frac{12}{100}$
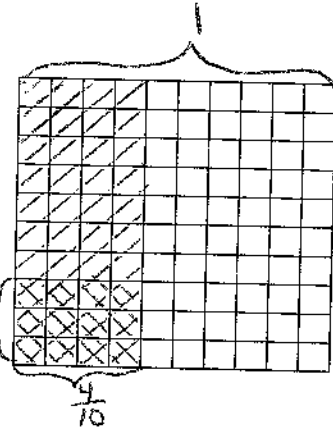
$0.4 \times 0.3 = 0.12$

c. $\frac{1}{10} \times 1.4$

$= \frac{1}{10} \times \frac{14}{10}$

$= \frac{1 \times 14}{10 \times 10}$

$= \frac{14}{100}$
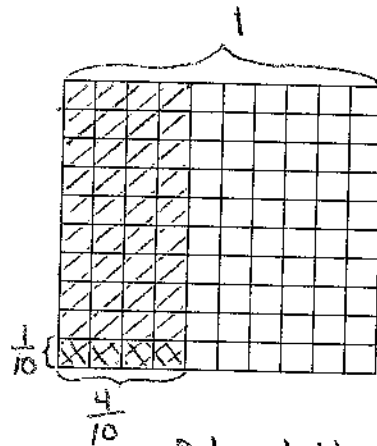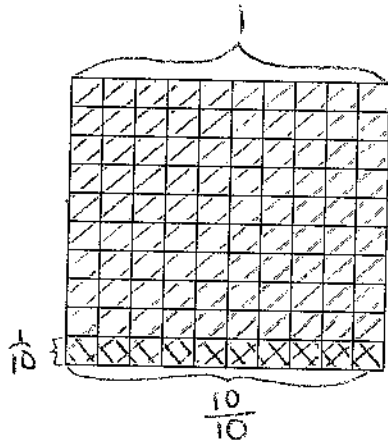
$0.1 \times 1.4 = 0.14$

d. $\frac{6}{10} \times 1.7$

$= \frac{6}{10} \times \frac{17}{10}$

$= \frac{6 \times 17}{10 \times 10}$

$= \frac{102}{100} = 1\frac{2}{100}$

$0.6 \times 1.7 = 1.02$

COMMON CORE    Lesson 17:   Relate decimal and fraction multiplication.
               Date:        9/18/14

engage^ny    4.E.70
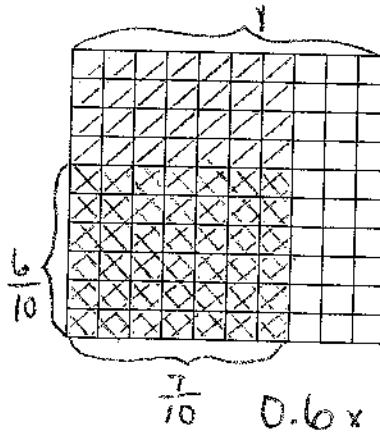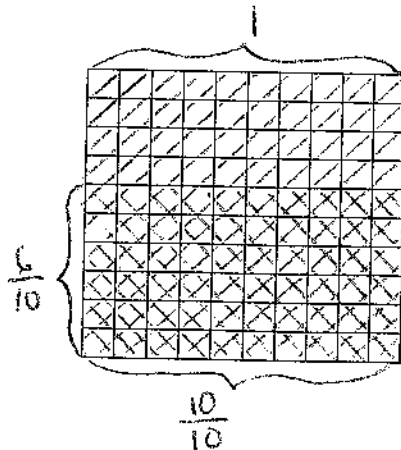
2. Multiply. The first few are started for you.

a. $5 \times 0.7 = \underline{3.5}$

$$= 5 \times \frac{7}{10}$$

$$= \frac{5 \times 7}{10}$$

$$= \frac{35}{10}$$

$$= 3.5$$

b. $0.5 \times 0.7 = \underline{0.35}$

$$= \frac{5}{10} \times \frac{7}{10}$$

$$= \frac{5 \times 7}{10 \times 10}$$

$$= \frac{35}{100}$$

$$= 0.35$$

c. $0.05 \times 0.7 = \underline{0.035}$

$$= \frac{5}{100} \times \frac{7}{10}$$

$$= \frac{5 \times 7}{100 \times 10}$$

$$= \frac{35}{1,000}$$

$$= 0.035$$

d. $6 \times 0.3 = \underline{1.8}$

$$= 6 \times \frac{3}{10}$$

$$= \frac{6 \times 3}{10}$$

$$= \frac{18}{10}$$

e. $0.6 \times 0.3 = \underline{0.18}$

$$= \frac{6}{10} \times \frac{3}{10}$$

$$= \frac{6 \times 3}{10 \times 10}$$

$$= \frac{18}{100}$$

f. $0.06 \times 0.3 = \underline{0.018}$

$$= \frac{6}{100} \times \frac{3}{10}$$

$$= \frac{6 \times 3}{100 \times 10}$$

$$= \frac{18}{1,000}$$

g. $1.2 \times 4 = \underline{4.8}$

$$= \frac{12}{10} \times 4$$

$$= \frac{12 \times 4}{10}$$

$$= \frac{48}{10}$$

h. $1.2 \times 0.4 = \underline{0.48}$

$$= \frac{12}{10} \times \frac{4}{10}$$

$$= \frac{12 \times 4}{10 \times 10}$$

$$= \frac{48}{100}$$

i. $0.12 \times 0.4 = \underline{0.048}$

$$= \frac{12}{100} \times \frac{4}{10}$$

$$= \frac{12 \times 4}{100 \times 10}$$

$$= \frac{48}{1,000}$$

3. A boy scout has a length of rope measuring 0.7 meter. He uses 2 tenths of the rope to tie a knot at one end. How many meters of rope are in the knot?

$$2 \text{ tenths of } 0.7$$

$$= \frac{2}{10} \times 0.7$$

$$= \frac{2}{10} \times \frac{7}{10} = \frac{14}{100}$$

$\frac{14}{100}$ meters of rope are in the knot.

4. After just 4 tenths of a 2.5 mile race was completed, Lenox took the lead and remained there until the end of the race.

a. How many miles did Lenox lead the race?

$$2.5 - 1 = 1.5$$

$$4 \text{ tenths} \times 2.5 \text{ mi}$$

$$= \frac{4}{10} \times \frac{25}{10} = \frac{100}{100} = 1 \text{ mi}$$

Lenox led for 1.5 miles.

b. Reid, the second place finisher, developed a cramp with 3 tenths of the race remaining. How many miles did Reid run without a cramp?

$$3 \text{ tenths of } 2.5 \text{ mi}$$

$$= \frac{3}{10} \times \frac{25}{10} = \frac{75}{100} = 0.75 \text{ mi}$$

$$\begin{array}{r} 2.50 \\ - 0.75 \\ \hline 1.75 \end{array}$$

Reid ran 1.75 miles without a cramp.

| 1,000,000 | 100,000 | 10,000 | 1,000 | 100 | 10 | 1 | $\frac{1}{10}$ | $\frac{1}{100}$ | $\frac{1}{1000}$ |
|---|---|---|---|---|---|---|---|---|---|
| Millions | Hundred Thousands | Ten Thousands | Thousands | Hundreds | Tens | Ones | Tenths | Hundredths | Thousandths |
| | | | | | | . | | | |
| | | | | | | . | | | |
| | | | | | | . | | | |
| | | | | | | . | | | |
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| | | | | | | . | | | |
| | | | | | | . | | | |
| | | | | | | . | | | |

millions through thousandths place value chart

Lesson 17:    Relate decimal and fraction multiplication.
Date:         9/18/14

engageny

4.E.75

Name _____     Date _____

1.  Multiply using both fraction form and unit form.  Check your answer by counting the decimal places.
    The first one is done for you.

    a.  $2.3 \times 1.8 = \frac{23}{10} \times \frac{18}{10}$

              $= \frac{23 \times 18}{100}$

              $= \frac{414}{100}$

              $= 4.14$

    ```
          2  3 tenths
       ×     1  8 tenths
          1  8  4
       +  2  3  0
          4  1  4 hundredths
    ```

    b.  $2.3 \times 0.9 =$

    $\frac{23}{10} \times \frac{9}{10}$

    $= \frac{23 \times 9}{10 \times 10}$

    $= \frac{207}{100}$

    $\doteq 2.07$

    ```
          2  3 tenths
       ×        9 tenths
    ```
    207 hundredths

    $= 2.07$

    c.  $6.6 \times 2.8 =$

    $\frac{66}{10} \times \frac{28}{10}$

    $= \frac{66 \times 28}{10 \times 10}$

    $= \frac{1,848}{100}$

    $= 18.48$

    66 tenths
    × 28 tenths
    528
    + 1320
    1,848 hundredths

    d.  $3.3 \times 1.4 =$

    $\frac{33}{10} \times \frac{14}{10}$

    $= \frac{33 \times 14}{10 \times 10}$

    $= \frac{462}{100}$

    $= 4.62$

    33 tenths
    × 14 tenths
    132
    + 330
    462 hundredths

2.  Multiply using fraction form and unit form.  Check your answer by counting the decimal places.
    The first one is done for you.

    a.  $2.38 \times 1.8 = \frac{238}{100} \times \frac{18}{10}$

        $= \frac{238 \times 18}{1,000}$

        $= \frac{4,284}{1,000}$

        $= 4.284$

    ```
          2  3  8 hundredths
       ×     1  8 tenths
          1  9  0  4
       +  2  3  8  0
          4, 2  8  4 thousandths
    ```

    b.  $2.37 \times 0.9 =$

    $\frac{237}{100} \times \frac{9}{10}$

    $= \frac{237 \times 9}{100 \times 10}$

    $= \frac{2,133}{1,000}$

    $= 2.133$

    ```
          2  3  7 hundredths
       ×        9 tenths
    ```
    2,133 thousandths

    c.  $6.06 \times 2.8 = \frac{606}{100} \times \frac{28}{10}$

    $= \frac{606 \times 28}{100 \times 10}$

    $= \frac{16,968}{1,000}$

    $= 16.968$

    606 hundredths
    × 28 tenths
    4848
    + 12120
    16,968 thousandths

    d.  $3.3 \times 0.14 = \frac{33}{10} \times \frac{14}{100}$

    $= \frac{33 \times 14}{10 \times 100}$

    $= \frac{462}{1,000}$

    $= 0.462$

    33 tenths
    × 14 hundredths
    132
    + 330
    462 thousandths

    $= .462$

3. Solve using the standard algorithm. Show your thinking about the units of your product. The first one is done for you.

a. $3.2 \times 0.6 = 1.92$

```
  3 2 tenths
×   6 tenths
  1 9 2 hundredths
```

$$\frac{32}{10} \times \frac{6}{10} = \frac{32 \times 6}{100}$$

b. $3.2 \times 1.2 = \underline{3.84}$

```
    3 2 tenths
×   1 2 tenths
      64
+   3 2 0
    3 8 4 hundredths
```

$$\frac{32}{10} \times \frac{12}{10} = \frac{384}{100}$$

c. $8.31 \times 2.4 = \underline{19.944}$

```
  8 3 1 hundredths
×   2 4 tenths
  3 3 2 4
+1 6 6 2 0
 19,944 thousandths
```

$$\frac{831}{100} \times \frac{24}{10} = \frac{19,944}{1,000}$$

d. $7.50 \times 3.5 = \underline{26.25}$

```
  7 5 0 hundredths
×   3 5 tenths
  3 7 5 0
+2 2 5 0 0
 26,250 thousandths
```

$$\frac{750}{100} \times \frac{35}{10} = \frac{26,250}{1,000}$$

4. Carolyn buys 1.2 pounds of chicken breast. If each pound of chicken breast costs $3.70, how much will she pay for the chicken breast?

1 unit costs 3.70
1.2 units cost 1.2 × 3.70
= 4.44

```
  3 7 0 hundredths
×   1 2 tenths
    7 4 0
  3 7 0 0
  4,440 thousandths
```

She will pay $4.44 for the chicken.

5. A kitchen measures 3.75 meters by 4.2 meters.

a. Find the area of the kitchen.

Area = Length × Width
3.75 × 4.2
= 15.750

```
  3 7 5 hundredths
×   4 2 tenths
    7 5 0
1 5 0 0 0
1 5,7 5 0 thousandths
```

The area of the Kitchen is 15.750 m².

b. The area of the living room is one and a half times that of the kitchen. Find the total area of the living room and the kitchen.

1.5 × 15.750 = 23.625
15750 + 23.625 = 39.375

```
  1 5 7 5 hundredths
×     1 5 tenths
    7 8 7 5
+ 1 5 7 5 0
  23,625 thousandths
```

```
  23.625
+ 15.75
  39.375
```

The total area is 39.375 m².

Name _____          Date _____

1.  Convert. Express your answer as a mixed number, if possible. The first one is done for you.

| | |
|---|---|
| a.   2 ft = $\dfrac{2}{3}$ yd  <br><br> 2 ft = 2 × 1 ft <br><br> = 2 × $\dfrac{1}{3}$ yd <br><br> = $\dfrac{2}{3}$ yd | b.   4 ft = $1\dfrac{1}{3}$ yd <br><br> 4 ft = 4 × 1 ft <br><br> = 4 × $\dfrac{1}{3}$ yd <br><br> = $\dfrac{4}{3}$ yd <br><br> = $1\dfrac{1}{3}$ yd. |
| c.   7 in = $\dfrac{7}{12}$ ft <br><br> = 7 × 1 in. <br> = 7 × $\dfrac{1}{12}$ ft. <br> = $\dfrac{7}{12}$ ft. | d.   13 in = $1\dfrac{1}{12}$ ft <br><br> = 13 × 1 in. <br> = 13 × $\dfrac{1}{12}$ ft. <br> = $\dfrac{13}{12}$ ft. <br> = $1\dfrac{1}{12}$ ft. |
| e.   5 oz = $\dfrac{5}{16}$ lb <br><br> = 5 × 1 oz. <br> = 5 × $\dfrac{1}{16}$ lb. <br> = $\dfrac{5}{16}$ lb. | f.   18 oz = $1\dfrac{1}{8}$ lb <br><br> = 18 × 1 oz. <br> = 18 × $\dfrac{1}{16}$ lb. <br> = $\dfrac{18}{16}$ lb. <br> = $1\dfrac{2}{16}$ lb = $1\dfrac{1}{8}$ lb. |

2. Regina buys 24 inches of trim for a craft project.
   a. What fraction of a yard does Regina buy?

$24 \text{ in} = \underline{\hspace{1cm}} \text{yd}$

$24 \text{ in} = 24 \times 1 \text{ in.}$
$= 24 \times \frac{1}{36} \text{ yd.}$
$= \frac{24}{36} \text{ yd.}$
$= \frac{2}{3} \text{ yd.}$

Regina buys $\frac{2}{3}$ yard.

   b. If a whole yard of trim costs $6, how much did Regina pay?

$6



$\frac{2}{3} = ?$
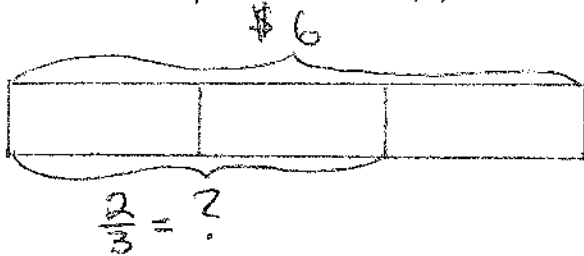
$\frac{2}{3} \text{ of } 6$
$= \frac{2}{3} \times \frac{6^2}{1}$
$= 4$

Regina paid $4.

3. At Yo-Yo Yogurt, the scale says that Sara has 8 ounces of vanilla yogurt in her cup. Her father's yogurt weighs 11 ounces. How many pounds of frozen yogurt did they buy altogether? Express your answer as a mixed number.

Sara   | 8 oz. |
Father | 11 oz. |   } ?

$8 + 11 = 19$
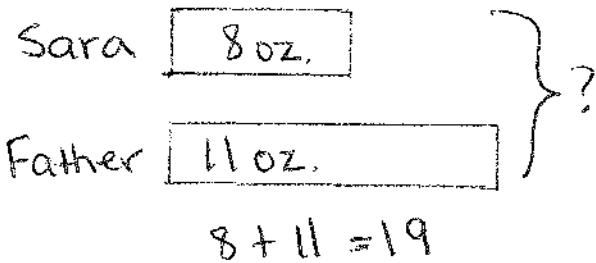
$19 \text{ oz} = \underline{\hspace{1cm}} \text{lb.}$
$= 19 \times 1 \text{ oz.}$
$= 19 \times \frac{1}{16} \text{ lb.}$
$= \frac{19}{16} \text{ lb.}$
$= 1\frac{3}{16} \text{ lb.}$

They bought $1\frac{3}{16}$ pounds of frozen yogurt altogether.

4. Pheng-Xu drinks 1 cup of milk every day for lunch. How many gallons of milk does he drink in 2 weeks?

1 week = 7 days
2 weeks = 2 × 7 = 14 days

1 day = 1 cup
14 days = 14 cups

$14 \text{ cups} = \underline{\hspace{1cm}} \text{gallons}$
$= 14 \times 1 \text{ cup}$
$= 14 \times \frac{1}{16} \text{ gallon}$
$= \frac{14}{16} \text{ gallon}$
$= \frac{7}{8} \text{ gallon}$

He drank $\frac{7}{8}$ gallon of milk in 2 weeks.

Name _____   Date _____

1.  Convert.  Show your work.  Express your answer as a mixed number.  (Draw a tape diagram if it helps you.)  The first one is done for you.

| | |
|---|---|
| a.  $2\frac{2}{3}$ yd = __8__ ft | b.  $1\frac{1}{2}$ qt = ___$\frac{3}{8}$___ gal |
| $2\frac{2}{3}$ yd $= 2\frac{2}{3} \times 1$ yd | $1\frac{1}{2}$ qt $= 1\frac{1}{2} \times 1$ qt |
| $= 2\frac{2}{3} \times 3$ ft | $= 1\frac{1}{2} \times \frac{1}{4}$ gal |
| $= \frac{8}{3} \times 3$ ft | $= \frac{3}{2} \times \frac{1}{4}$ gal |
| $= \frac{24}{3}$ ft | $= \frac{3}{8}$ gal. |
| $= 8$ ft | |
| c.  $4\frac{2}{3}$ ft = ___56___ in | d.  $9\frac{1}{2}$ pt = ___$4\frac{3}{4}$___ qt |
| $4\frac{2}{3}$ ft $= 4\frac{2}{3} \times 1$ ft. | $9\frac{1}{2}$ pt $= 9\frac{1}{2} \times 1$ pt. |
| $= 4\frac{2}{3} \times 12$ in. | $= 9\frac{1}{2} \times \frac{1}{2}$ qt. |
| $= \frac{14}{3} \times 12$ in. | $= \frac{19}{2} \times \frac{1}{2}$ qt. |
| $= \frac{168}{3}$ in. | $= \frac{19}{4}$ qt. |
| $= 56$ in. | $= 4\frac{3}{4}$ qt. |
| e.  $3\frac{3}{5}$ hr = ___216___ min | f.  $3\frac{2}{3}$ ft = ___$1\frac{2}{9}$___ yd |
| $3\frac{3}{5}$ hr $= 3\frac{3}{5} \times 1$ hr. | $3\frac{2}{3}$ ft $= 3\frac{2}{3} \times 1$ ft. |
| $= 3\frac{3}{5} \times 60$ min. | $= 3\frac{2}{3} \times \frac{1}{3}$ yd. |
| $= \frac{18}{5} \times 60$ min | $= \frac{11}{3} \times \frac{1}{3}$ yd. |
| $= \frac{1080}{5}$ min | $= \frac{11}{9}$ yd. |
| $= 216$ min. | $= 1\frac{2}{9}$ yd. |

(long division work shown for e:)
$\begin{array}{r} 216 \\ 5\overline{)1080} \\ -10\phantom{00} \\ \hline 08\phantom{0} \\ -5\phantom{0} \\ \hline 30 \\ -30 \\ \hline 0 \end{array}$

COMMON CORE

Lesson 20:  Convert mixed unit measurements, and solve multi-step word problems.
Date:  9/18/14

engage^ny   4.E.110

2. Three dump trucks are carrying topsoil to a construction site. Truck A carries 3,545 lb, Truck B carries 1,758 lb, and Truck C carries 3,697 lb. How many tons of topsoil are the 3 trucks carrying altogether?
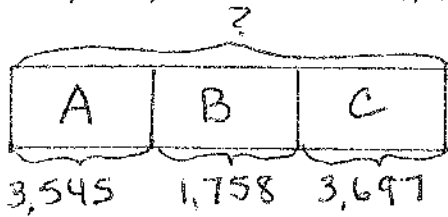
$$\begin{array}{r} 3\,545 \\ 1\,758 \\ +\,3\,697 \\ \hline 9,000 \end{array}$$

$9,000 \text{ lbs} = \underline{\quad} \text{ tons}$

$= 9,000 \times 1 \text{ lb.}$

$= 9,000 \times \frac{1}{2,000} \text{ ton}$

$= \frac{9,000}{2,000} \text{ tons}$

$= 4\frac{1}{2} \text{ tons}$

Altogether the trucks are carrying $4\frac{1}{2}$ tons.

3. Melissa buys $3\frac{3}{4}$ gallons of iced tea. Denita buys 7 quarts more than Melissa. How much tea do they buy altogether? Express your answer in quarts.
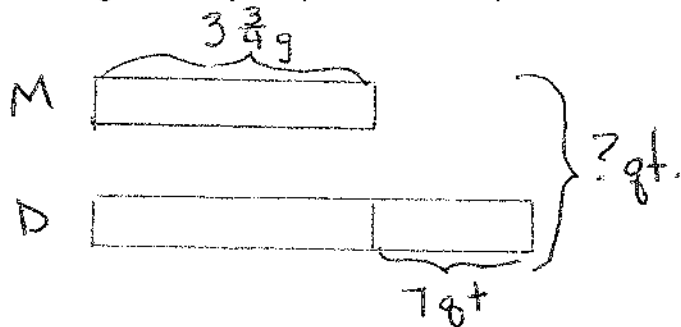
$3\frac{3}{4} \text{ gal} = \underline{\quad} \text{ qt}$

$= 3\frac{3}{4} \times 1 \text{ gal.}$

$= 3\frac{3}{4} \times 4 \text{ qt.}$

$= \frac{15}{4} \times 4 \text{ qt.}$

$= 15 \text{ qt.}$

$$\begin{array}{r} 15 \text{ qt.} \\ 15 \text{ qt.} \\ +\,7 \text{ qt.} \\ \hline 37 \text{ qt.} \end{array}$$

Melissa and Denita buy 37 quarts of tea altogether.

4. Marvin buys a hose that is $27\frac{3}{4}$ feet long. He already owns a hose at home that is $\frac{2}{3}$ the length of the new hose. How many total yards of hose does Marvin have now?
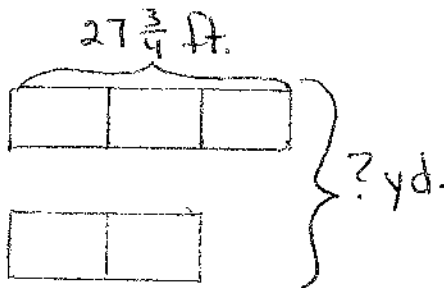
$$\begin{array}{r} 27\frac{3}{4} \text{ ft.} \\ +\,18\frac{1}{2} \text{ ft.} \\ \hline 45\frac{5}{4} \text{ ft.} \\ = 46\frac{1}{4} \text{ ft.} \end{array}$$

$46\frac{1}{4} \text{ ft} = \underline{\quad} \text{ yd.}$

$= 46\frac{1}{4} \times 1 \text{ ft.}$

$= 46\frac{1}{4} \times \frac{1}{3} \text{ yd.}$

$= \frac{185}{4} \times \frac{1}{3} \text{ yd.}$

$= 15\frac{5}{12} \text{ yd.}$

$\frac{2}{3} \times 27\frac{3}{4} \text{ ft.}$

$= \frac{2}{3} \times \frac{111}{4} \text{ ft.}$

$= \frac{37}{2} \text{ ft} = 18\frac{1}{2} \text{ ft.}$

Marvin now has $15\frac{5}{12}$ yards of hose.

Name _____    Date _____

1. Fill in the blanks. The first one has been done for you.

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

   b. $\frac{3}{4} \times 1 = \frac{3}{4} \times \frac{7}{7} = \frac{21}{28}$

   c. $\frac{7}{4} \times 1 = \frac{7}{4} \times \frac{5}{5} = \frac{35}{20}$

   d. Use words to compare the size of the product to the size of the first factor.

   Each time, the first factor is being multiplied by a fraction equal to 1, so the product is equal to the first factor.

2. Express each fraction as an equivalent decimal.

   a. $\frac{1}{4} \times \frac{25}{25} = \frac{25}{100}$

   $= 0.25$

   b. $\frac{3}{4} \times \frac{25}{25} = \frac{75}{100}$

   $= 0.75$

   c. $\frac{1}{5} \times \frac{2}{2} = \frac{2}{10}$

   $= 0.2$

   d. $\frac{4}{5} \times \frac{2}{2} = \frac{8}{10}$

   $= 0.8$

   e. $\frac{1}{20} \times \frac{5}{5} = \frac{5}{100}$

   $= 0.05$

   f. $\frac{27}{20} \times \frac{5}{5} = \frac{135}{100}$

   $= 1.35$

   g. $\frac{7}{4} \times \frac{25}{25} = \frac{175}{100}$

   $= 1.75$

   h. $\frac{8}{5} \times \frac{2}{2} = \frac{16}{10}$

   $= 1.6$

   i. $\frac{24}{25} \times \frac{4}{4} = \frac{96}{100}$

   $= 0.96$

   j. $\frac{93}{50} \times \frac{2}{2} = \frac{186}{100}$

   $= 1.86$

   k. $2\frac{6}{25} \times \frac{4}{4} = 2\frac{24}{100}$

   $= 2.24$

   l. $3\frac{31}{50} \times \frac{2}{2} = 3\frac{62}{100}$

   $= 3.62$

3. Jack said that if you take a number and multiply it by a fraction, the product will always be smaller than what you started with. Is he correct? Why or why not? Explain your answer, and give at least two examples to support your thinking.

Jack is right some of the time, but not always. If you multiply by a fraction equal to 1 (like $\frac{2}{2}$) the product is equal to what you started with.

Ex. 1

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

same number

Ex. 2

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

same number

4. There is an infinite number of ways to represent 1 on the number line. In the space below, write at least four expressions multiplying by 1. Represent *one* differently in each expression.

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

$12 \times \frac{2}{2} = \frac{24}{2} = 12$

$5 \times \frac{10}{10} = \frac{50}{10} = 5$

$100 \times \frac{100}{100} = \frac{10,000}{100} = 100$

5. Maria multiplied by 1 to rename $\frac{1}{4}$ as hundredths. She made factor pairs equal to 10. Use her method to change one-eighth to an equivalent decimal.

Maria's way: $\frac{1}{4} = \frac{1}{2 \times 2} \times \frac{5 \times 5}{5 \times 5} = \frac{5 \times 5}{(2 \times 5) \times (2 \times 5)} = \frac{25}{100} = 0.25$

$\frac{1}{8} = \frac{1}{2 \times 2 \times 2} = \frac{5 \times 5 \times 5}{5 \times 5 \times 5} = \frac{5 \times 5 \times 5}{(2 \times 5)(2 \times 5)(2 \times 5)} = \frac{125}{1,000} = 0.125$

Paulo renamed $\frac{1}{8}$ as a decimal, too. He knows the decimal equal to $\frac{1}{4}$, and he knows that $\frac{1}{8}$ is half as much as $\frac{1}{4}$. Can you use his ideas to show another way to find the decimal equal to $\frac{1}{8}$?

$\frac{1}{4} = 0.25 = 0.250 = 250$ thousandths

$\frac{1}{8}$ is half of $\frac{1}{4}$. Half of 250 thousandths is 125 thousandths

$\frac{1}{8} = 0.125$

COMMON CORE

Lesson 21: Explain the size of the product, and relate fraction and decimal equivalence to multiplying a fraction by 1.

Date: 9/18/14

engage^ny

4.F.13

Name _____     Date _____

1. Solve for the unknown. Rewrite each phrase as a multiplication sentence. Circle the scaling factor and put a box around the number of meters.
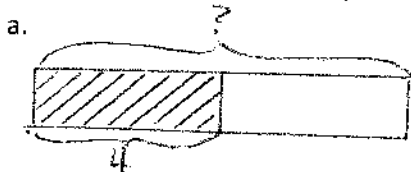
    a. $\frac{1}{2}$ as long as 8 meters = ___4___ meters
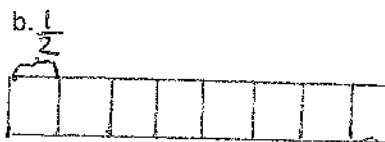
$$\left(\frac{1}{2}\right) \times \boxed{8} = 4$$

    b. 8 times as long as $\frac{1}{2}$ meter = ___4___ meters

$$\left(8\right) \times \boxed{\frac{1}{2}} = 4$$

2. Draw a tape diagram to model each situation in Problem 1, and describe what happened to the number of meters when it was multiplied by the scaling factor.

    a.



    The scale factor is less than 1, so the # of meters decreased.

    b. $\frac{1}{2}$



    The scaling factor is greater than 1, so the # of meters increased.

3. Fill in the blank with a numerator or denominator to make the number sentence true.

    a. $7 \times \frac{3}{4} < 7$

    b. $\frac{7}{2} \times 15 > 15$

    c. $3 \times \frac{5}{5} = 3$

4. Look at the inequalities in each box. Choose a single fraction to write in all three blanks that would make all three number sentences true. Explain how you know.

    a.

| $\frac{3}{4} \times \frac{5}{2} > \frac{3}{4}$ | $2 \times \frac{5}{2} > 2$ | $\frac{7}{5} \times \frac{5}{2} > \frac{7}{5}$ |
| --- | --- | --- |

    Multiply by a fraction greater than 1 will make the product larger than the other factor.

    b.

| $\frac{3}{4} \times \frac{1}{2} < \frac{3}{4}$ | $2 \times \frac{1}{2} < 2$ | $\frac{7}{5} \times \frac{1}{2} < \frac{7}{5}$ |
| --- | --- | --- |

    Multiply by a fraction less than 1 will make the product less than the other factor.

5. Johnny says multiplication always makes numbers bigger. Explain to Johnny why this isn't true. Give more than one example to help him understand.

Multiplication does __not__ always make numbers bigger. Multiplying a number (like 2) by a fraction less than 1 will result in a product less than 2. Watch...

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

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

6. A company uses a sketch to plan an advertisement on the side of a building. The lettering on the sketch is $\frac{3}{4}$ inch tall. In the actual advertisement, the letters must be 34 times as tall. How tall will the letters be on the building?

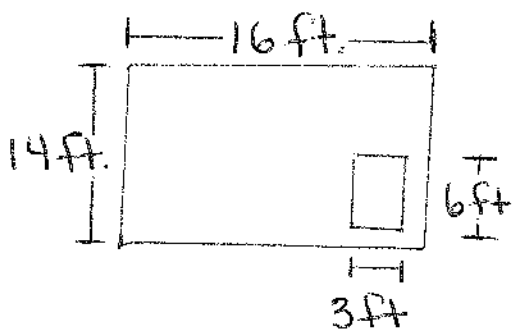34 times taller than $\frac{3}{4}$ in.

$$34 \times \frac{3}{4} = \frac{34 \times 3}{4}$$
$$= \frac{102}{4}$$
$$= 25\frac{2}{4} = 25\frac{1}{2}$$

The letter will be $25\frac{1}{2}$ inches tall.

7. Jason is drawing the floor plan of his bedroom. He is drawing everything with dimensions that are $\frac{1}{12}$ of the actual size. His bed measures 6 ft by 3 ft, and the room measures 14 ft by 16 ft. What are the dimensions of his bed and room in his drawing?



$$\frac{1}{12} \text{ of } 16 \text{ ft.} = \frac{16}{12} \text{ ft.} = 1\frac{1}{3} \text{ ft.}$$
$$\frac{1}{12} \text{ of } 14 \text{ ft.} = \frac{14}{12} \text{ ft.} = 1\frac{1}{6} \text{ ft.}$$
Room: $1\frac{1}{3}$ ft. by $1\frac{1}{6}$ ft.

$$\frac{1}{12} \text{ of } 6 \text{ ft.} = \frac{6}{12} \text{ ft.} = \frac{1}{2} \text{ ft.}$$
$$\frac{1}{12} \text{ of } 3 \text{ ft.} = \frac{3}{12} \text{ ft.} = \frac{1}{4} \text{ ft.}$$
Bed: $\frac{1}{2}$ ft. by $\frac{1}{4}$ ft.

COMMON CORE | Lesson 22: Compare the size of the product to the size of the factors.
Date: 9/19/14

engage^ny    4.F.27

Name _____    Date _____

1. Fill in the blank using one of the following scaling factors to make each number sentence true.

| 1.021 | 0.989 | 1.00 |

a. $3.4 \times \underline{1.00} = 3.4$

b. $\underline{1.021} \times 0.21 > 0.21$

c. $8.04 \times \underline{0.989} < 8.04$

2.

a. Sort the following expressions by rewriting them in the table.

| The product is less than the boxed number: | The product is greater than the boxed number: |
|---|---|
| $0.3 \times 0.069$ | $13.89 \times 1.004$ |
| $602 \times 0.489$ | $0.72 \times 1.24$ |
| $0.2 \times 0.1$ | $102.03 \times 4.015$ |

$\boxed{13.89} \times 1.004$       $\boxed{602} \times 0.489$       $\boxed{102.03} \times 4.015$

$\boxed{0.3} \times 0.069$       $\boxed{0.72} \times 1.24$       $\boxed{0.2} \times 0.1$

b. Explain your sorting by writing a sentence that tells what the expressions in each column of the table have in common.

In the first column, the boxed number is multiplied by a scaling factor less than 1, so the products will be less than the boxed number. In the second column, the boxed number is multiplied by a scaling factor greater than 1

3. Write a statement using one of the following phrases to compare the value of the expressions. Then, explain how you know.

   **is slightly more than**     **is a lot more than**     **is slightly less than**     **is a lot less than**

   a. $4 \times 0.988$ _is slightly less than_ 4 because 0.988 is slightly less than one.

   b. $1.05 \times 0.8$ _is slightly more than_ 0.8 because 1.05 is a little more than one.

   c. $1,725 \times 0.013$ _is a lot less than_ 1,725 because 0.013 is a lot less than one.

   d. $989.001 \times 1.003$ _is a lot more than_ 1.003 because 989.001 is a lot more than one.

   e. $0.002 \times 0.911$ _is slightly less than_ 0.002 because 0.911 is a little less than one.

4. During science class, Teo, Carson, and Dhakir measure the length of their bean sprouts. Carson's sprout is 0.9 times the length of Teo's, and Dhakir's is 1.08 times the length of Teo's. Whose bean sprout is the longest? The shortest? Explain your reasoning.

   0.9 times the length of Teo's

   Carson [　　　]
   Teo [　　　]
   Dhakir [　　　　]
   1.08 times the length of Teo's
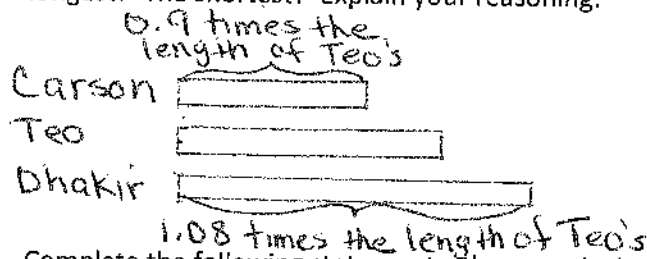
   Dhakir's bean sprout is the longest because it is slightly more than 1 times the length of Teo's bean sprout. Carson's bean sprout is the shortest because it's a little less than 1 times the length of Teo's.

5. Complete the following statements, then use decimals to give an example of each.

   • $a \times b > a$ will always be true when $b$ is... greater than one.
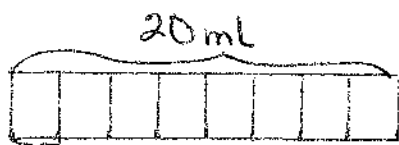
   $$3.14 \times 1.2 = 3.768 \qquad 3.768 > 3.14$$

   • $a \times b < a$ will always be true when $b$ is...

   $$3.14 \times 0.85 = 2.669 \qquad 2.669 < 3.14$$

Lesson 23: Compare the size of the product to the size of the factors.
Date: 10/17/14

engage<sup>ny</sup>

4.F.39

Name _____     Date _____

1. A vial contains 20 mL of medicine. If each dose is $\frac{1}{8}$ of the vial, how many mL is each dose? Express your answer as a decimal.
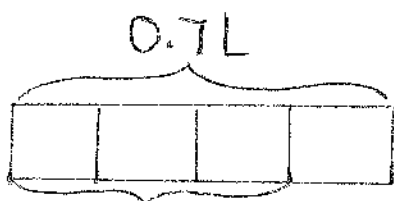
20 mL

$\frac{1}{8}$ of vial

1 dose = ?

$\frac{1}{8}$ of 20 ml

$= \frac{1}{8} \times 20$ ml

$= \frac{20^5}{{}_2\,\cancel{8}}$ ml

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

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

$2\frac{1}{2}$ ml $\times \frac{5}{5} = 2\frac{5}{10}$ ml

$= 2.5$ ml

Each dose is $2\frac{1}{2}$ ml or 2.5 ml

2. A container holds 0.7 liters of oil and vinegar. $\frac{3}{4}$ of the mixture is vinegar. How many liters of vinegar are in the container? Express your answer as both a fraction and a decimal.
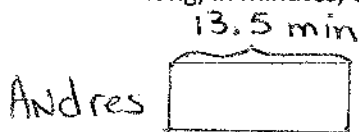
0.7 L

Vinegar

$\frac{3}{4}$ of 0.7 L

$= \frac{3}{4} \times \frac{7}{10}$ L

$= \frac{21}{40}$ L
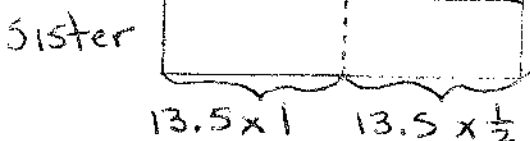
$\frac{21}{40} \times \frac{25}{25} = \frac{525}{1,000}$

$= 0.525$

There are $\frac{21}{40}$ L or 0.525 L of vinegar in the container.

3. Andres completed a 5-km race in 13.5 minutes. His sister's time was $1\frac{1}{2}$ times longer than his time. How long, in minutes, did it take his sister to run the race?

13.5 min

Andres

13.5 × 1½

Sister

13.5 × 1    13.5 × ½

$\frac{1}{2}$ of 13.5 $= \frac{1}{2}$ of 12 $+ \frac{1}{2}$ of 1.5

$= 6 + 0.75$

$= 6.75$

135 tenths
×  5 tenths
675 tenths

13.5
+ 6.75
20.25

His sister ran the race in 20.25 minutes.

4. A clothing factory uses 1,275.2 meters of cloth a week to make shirts. How much cloth is needed to make $3\frac{3}{5}$ times as many shirts?

Now

1,275.2

$3 \times 1,275.2$

$\frac{3}{5} \times 1,275.2$

12752 tenths
$\times\ \ \ 3$
38256 tenths

3825.6
765.12
4,590.72

$\frac{1}{5} \times 1275.2$

$\frac{1}{5}$ | 1,000 + 200 + 70 + 5 + 20 hundredths

$\frac{1}{5}$ | 200 | 40 | 14 | 1 | 4 hundredths

25,504 hundred
$\times\ \ \ 3$
76,512 hundredth

$\frac{3}{5}$ of 1275.2 = 3 × 255.04 = 765.12

The factory needs 4,590.72 m of cloth to make $3\frac{3}{5}$ times as many shirts.
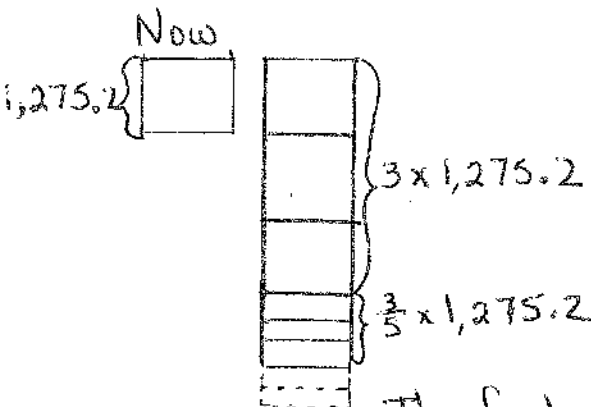
5. There are $\frac{3}{4}$ as many boys as girls in a class of fifth-graders. If there are 35 students in the class, how many are girls?

G

B
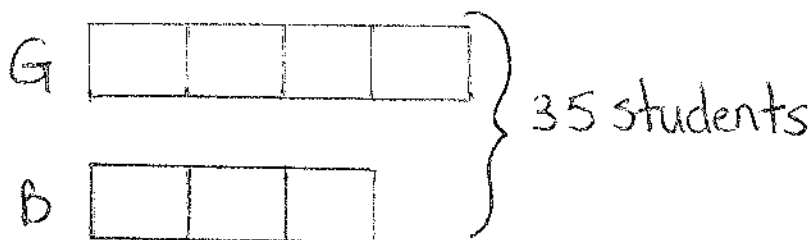
} 35 students

7 units = 35

1 unit = $\frac{35}{7}$ = 5

4 units = 20

20 students are girls.

6. Ciro purchased a concert ticket for $56. The cost of the ticket was $\frac{4}{5}$ the cost of his dinner. The cost of his hotel was $2\frac{1}{2}$ times as much as his ticket. How much did Ciro spend altogether for the concert ticket, hotel, and dinner?

Dinner

Ticket

56

Hotel

56    56    $\frac{1}{2}$ of 56
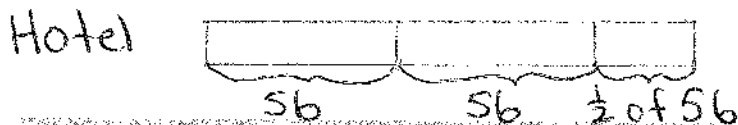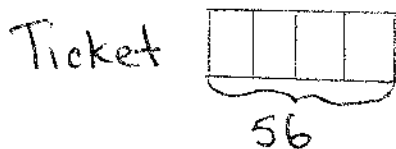
4 units = 56

1 unit = $\frac{56}{4}$ = 14

Dinner = 5 units = 70
Hotel = 56 × 2.5 = 140

70 + 56 + 140 = 266

Altogether Ciro spent $266

Name _____    Date _____

1.  Draw a tape diagram and a number line to solve. You may draw the model that makes the most sense to you. Fill in the blanks that follow. Use the example to help you.
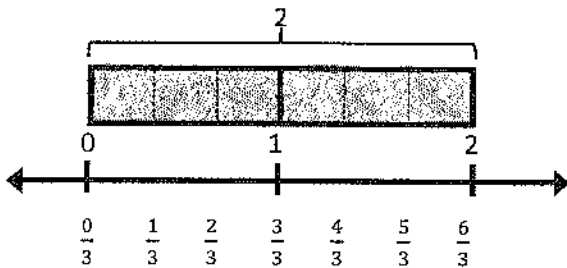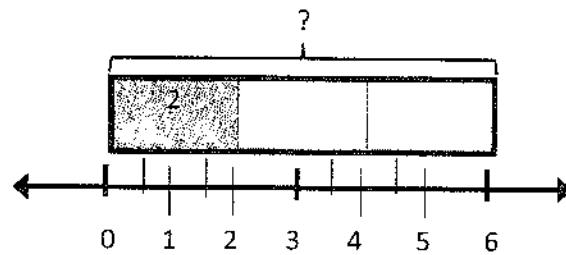
Example:     $2 \div \frac{1}{3} =$ __6__



There are __3__ thirds in 1 whole.

There are __6__ thirds in 2 wholes.

If 2 is $\frac{1}{3}$, what is the whole? __6__

a.  $4 \div \frac{1}{2} =$ __8__

There are __2__ halves in 1 whole.
There are __8__ halves in 4 wholes.

If 4 is $\frac{1}{2}$, what is the whole? __8__
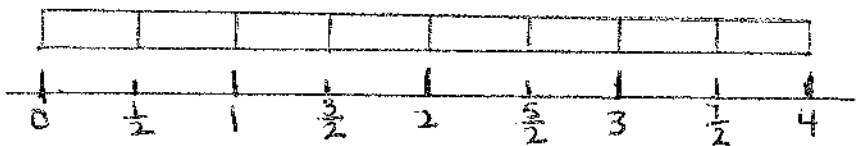


b.  $2 \div \frac{1}{4} =$ __8__

There are __4__ fourths in 1 whole.
There are __8__ fourths in 2 wholes.

If 2 is $\frac{1}{4}$, what is the whole? __8__
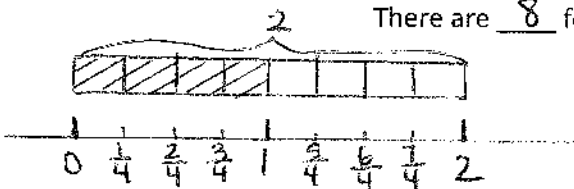


c.  $5 \div \frac{1}{3} =$ __15__

There are __3__ thirds in 1 whole.
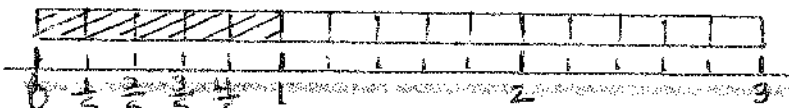There are __15__ thirds in 5 wholes.

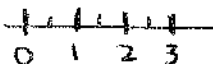If 5 is $\frac{1}{3}$, what is the whole? __15__
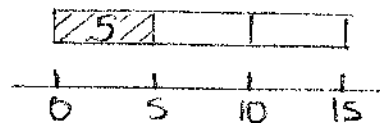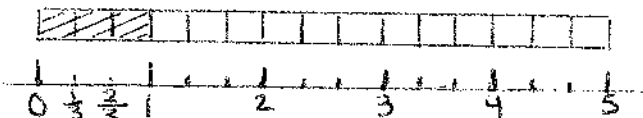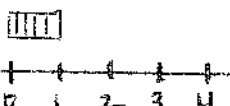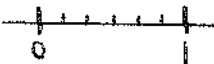


d.  $3 \div \frac{1}{5} =$ __15__

There are __5__ fifths in 1 whole.
There are __15__ fifths in 3 wholes.

If 3 is $\frac{1}{5}$, what is the whole? __15__



COMMON CORE    | Lesson 25:  Divide a whole number by a unit fraction.
               | Date:       9/19/14

engage^ny    4.G.13

2.  Divide. Then, multiply to check.

| a.  $5 \div \frac{1}{2}$ | b.  $3 \div \frac{1}{2}$ | c.  $4 \div \frac{1}{5}$ | d.  $1 \div \frac{1}{6}$ |
|---|---|---|---|
| $5 \div \frac{1}{2} = 5 \times 2 = 10$ $\frac{1}{2} \times 10 = \frac{10}{2} = 5 \checkmark$ | $3 \div \frac{1}{2} = 3 \times 2 = 6$ $\frac{1}{2} \times 6 = \frac{6}{2} = 3 \checkmark$ | $4 \div \frac{1}{5} = 4 \times 5 = 20$ $\frac{1}{5} \times 20 = \frac{20}{5} = 4 \checkmark$ | $1 \div \frac{1}{6} = 1 \times 6 = 6$ $\frac{1}{6} \times 6 = \frac{6}{6} = 1 \checkmark$ |
| e.  $2 \div \frac{1}{8}$ | f.  $7 \div \frac{1}{6}$ | g.  $8 \div \frac{1}{3}$ | h.  $9 \div \frac{1}{4}$ |
| $2 \div \frac{1}{8} = 2 \times 8 = 16$ $\frac{1}{8} \times 16 = \frac{16}{8} = 2 \checkmark$ | $7 \div \frac{1}{6} = 7 \times 6 = 42$ $\frac{1}{6} \times 42 = \frac{42}{6} = 7 \checkmark$ | $8 \div \frac{1}{3} = 8 \times 3 = 24$ $\frac{1}{3} \times 24 = \frac{24}{3} = 8 \checkmark$ | $9 \div \frac{1}{4} = 9 \times 4 = 36$ $\frac{1}{4} \times 36 = \frac{36}{4} = 9 \checkmark$ |

3.  For an art project, Mrs. Williams is dividing construction paper into fourths. How many fourths can she make from 5 pieces of construction paper?

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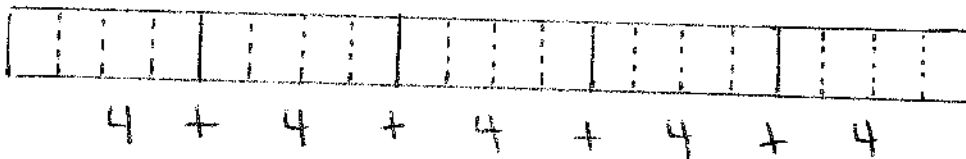
$5 \times 4 = 20$          $5 \div \frac{1}{4} = 2$

$\frac{1}{4} \times 20 = \frac{20}{4} = 5 \checkmark$

Mrs. Williams can make 20 fourths.

COMMON CORE          Lesson 25:     Divide a whole number by a unit fraction.
Date:          9/19/14

engage^ny          4.G.14

4. Use the chart below to answer the following questions.

**Donnie's Diner Lunch Menu**

| Food | Serving Size |
|---|---|
| Hamburger | $\frac{1}{3}$ lb |
| Pickles | $\frac{1}{4}$ pickle |
| Potato chips | $\frac{1}{8}$ bag |
| Chocolate milk | $\frac{1}{2}$ cup |

a. How many hamburgers can Donnie make with 6 pounds of hamburger meat?

$6 \div \frac{1}{3} = 6 \times 3 = 18$ hamburgers.

Donnie can make 18 hamburgers with 6 pounds of hamburger meat.

b. How many pickle servings can be made from a jar of 15 pickles?

$15 \div \frac{1}{4} = 15 \times 4 = 60$ pickle servings

60 pickle servings can be made from a jar of 15 pickles.

c. How many servings of chocolate milk can he serve from a gallon of milk?

1 gallon = 16 cups    $16 \div \frac{1}{2} = 16 \times 2 = 32$ servings

He can serve 32 servings of chocolate milk from a gallon of milk.

5. Three gallons of water fills $\frac{1}{4}$ of the elephant's pail at the zoo. How much water does the pail hold?



$\frac{1}{4}$ pail { 3 gallons

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

$= 3 \times 4$
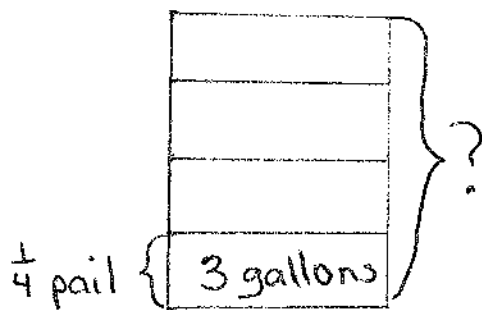
$= 12$ gallons

The pail holds 12 gallons.

Name _____     Date _____

1.  Draw a model or tape diagram to solve.  Use the thought bubble to show your thinking.  Write your quotient in the blank.  Use the example to help you.

Example:     $\frac{1}{2} \div 3$
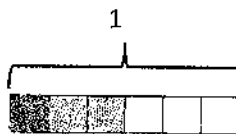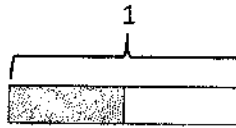
1 half ÷ 3

= 3 sixths ÷ 3

= 1 sixth

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

a.  $\frac{1}{3} \div 2 = \underline{\frac{1}{6}}$
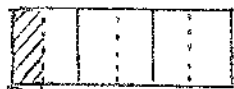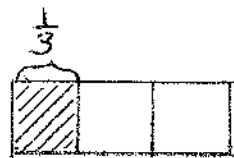
1 third ÷ 2

= 2 sixths ÷ 2

= 1 sixth

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

b.  $\frac{1}{3} \div 4 = \underline{\frac{1}{12}}$

1 third ÷ 4

= 4 twelfths ÷ 4

= 1 twelfth

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

c.  $\frac{1}{4} \div 2 =$ ___$\frac{1}{8}$___

$\frac{1}{4}$
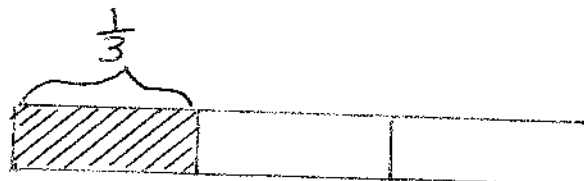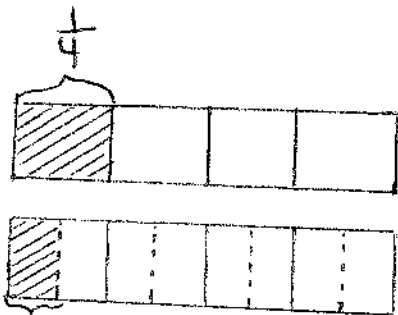
1 fourth ÷ 2
= 2 eighths ÷ 2
= 1 eighth

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

d.  $\frac{1}{4} \div 3 =$ ___$\frac{1}{12}$___

1 fourth ÷ 3
= 3 twelfths ÷ 3
= 1 twelfth

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

2.  Divide.  Then, multiply to check.

| a.  $\frac{1}{2} \div 7$ | b.  $\frac{1}{3} \div 6$ | c.  $\frac{1}{4} \div 5$ | d.  $\frac{1}{5} \div 4$ |
|---|---|---|---|
| $\frac{7}{14} \div 7 = \frac{1}{14}$ | $\frac{6}{18} \div 6 = \frac{1}{18}$ | $\frac{5}{20} \div 5 = \frac{1}{20}$ | $\frac{4}{20} \div 4 = \frac{1}{20}$ |
| $\frac{1}{14} \times 7 = \frac{7}{14} = \frac{1}{2} \checkmark$ | $\frac{1}{18} \times 6 = \frac{6}{18} = \frac{1}{3} \checkmark$ | $\frac{1}{20} \times 5 = \frac{5}{20} = \frac{1}{4} \checkmark$ | $\frac{1}{20} \times 4 = \frac{4}{20} = \frac{1}{5} \checkmark$ |
| e.  $\frac{1}{5} \div 2$ | f.  $\frac{1}{6} \div 3$ | g.  $\frac{1}{8} \div 2$ | h.  $\frac{1}{10} \div 10$ |
| $\frac{2}{10} \div 2 = \frac{1}{10}$ | $\frac{3}{18} \div 3 = \frac{1}{18}$ | $\frac{2}{16} \div 2 = \frac{1}{16}$ | $\frac{10}{100} \div 10 = \frac{1}{100}$ |
| $\frac{1}{10} \times 2 = \frac{2}{10} = \frac{1}{5} \checkmark$ | $\frac{1}{18} \times 3 = \frac{3}{18} = \frac{1}{6} \checkmark$ | $\frac{1}{16} \times 2 = \frac{2}{16} = \frac{1}{8} \checkmark$ | $\frac{1}{100} \times 10 = \frac{10}{100} = \frac{1}{10} \checkmark$ |

3. Tasha eats half her snack and gives the other half to her two best friends for them to share equally. What portion of the whole snack does each friend get? Draw a picture to support your response.



Tasha     2 best friends
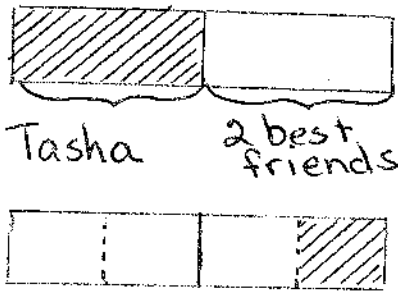
$\frac{1}{2} \div 2 = 1$ half $\div 2$

$= 2$ fourths $\div 2$

$= 1$ fourth

Each friend gets $\frac{1}{4}$ of the snack.

4. Mrs. Appler used $\frac{1}{2}$ gallon of olive oil to make 8 identical batches of salad dressing.

a. How many gallons of olive oil did she use in each batch of salad dressing?
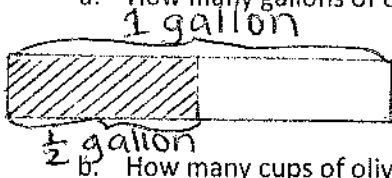


1 gallon

$\frac{1}{2}$ gallon

$\frac{1}{2}$ gallon $\div 8 = \frac{8}{16}$ gallon $\div 8 = 8$ sixteenths $\div 8$

$= \frac{1}{16}$ gallon olive oil in each batch

b. How many cups of olive oil did she use in each batch of salad dressing?



1 batch

1 gallon = 16 cups

$\frac{1}{16}$ gallon = 1 cup

She uses 1 cup of olive oil in each batch of salad dressing.

5. Mariano delivers newspapers. He always puts $\frac{3}{4}$ of his weekly earnings in his savings account, and then divides the rest equally into 3 piggy banks for spending at the snack shop, the arcade, and the subway.

a. What fraction of his earnings does Mariano put into each piggy bank?



savings

snack  arcade
   subway
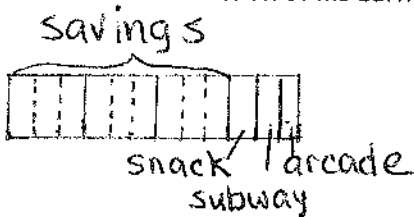
$\frac{1}{4} \div 3 = 1$ fourth $\div 3$

$= 3$ twelfths

$= 1$ twelfth

Mariano puts $\frac{1}{12}$ of his earnings in each piggy bank.

b. If Mariano adds $2.40 to each piggy bank every week, how much does Mariano earn per week delivering papers?
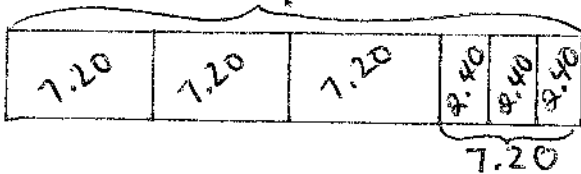


| 7.20 | 7.20 | 7.20 | 2.40 | 2.40 | 2.40 |

7.20

$2.40 × 3

| 3 | 2.00 | 40¢ |
|---|------|-----|
|   | 6.00 | 120¢ |

6.00 + 1.20 = $7.20

$7.20 × 4

| 4 | 7.00 | 20¢ |
|---|------|-----|
|   | 28.00 | 80¢ |

28.00 + 80¢ = $28.80

Mariano earns $28.80 each week.

COMMON CORE

Lesson 26: Divide a unit fraction by a whole number.
Date: 9/19/14

engage^ny

4.G.31

Name _____     Date _____

1.  Mrs. Silverstein bought 3 mini cakes for a birthday party.  She cuts each cake into quarters and plans to serve each guest 1 quarter of a cake.  How many guests can she serve with all her cakes?  Draw a picture to support your response.

3

$3 \div \frac{1}{4} = 12$
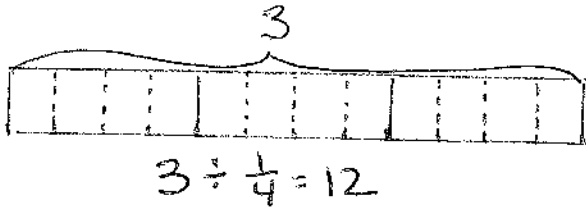
4 fourths in 1 whole
12 fourths in 3 wholes

Mrs. Silverstein can serve 12 guests a quarter of a cake.

2.  Mr. Pham has $\frac{1}{4}$ pan of lasagna left in the refrigerator.  He wants to cut the lasagna into equal slices so he can have it for dinner for 3 nights.  How much lasagna will he eat each night?  Draw a picture to support your response.

$\frac{1}{4} \div 3$
= 1 fourth ÷ 3
= 3 twelfths ÷ 3
= 1 twelfth

$\frac{1}{4}$

$\frac{1}{12}$
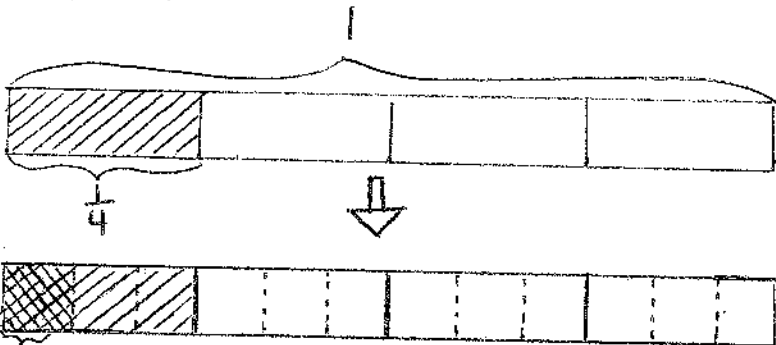
Mr. Pham will eat $\frac{1}{12}$ of the lasagna each night.

3.  The perimeter of a square is $\frac{1}{5}$ meter.
    a.  Find the length of each side in meters.  Draw a picture to support your response.

$P = \frac{1}{5} m$

$\frac{1}{5} \div 4 = 1$ fifth ÷ 4
= 4 twentieths
= 1 twentieth
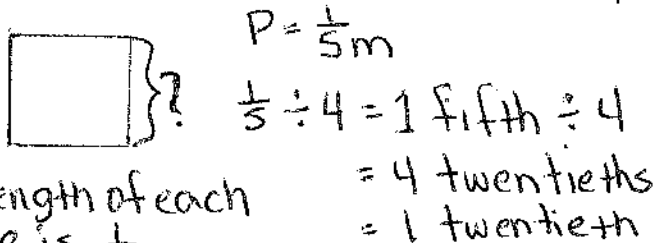
The length of each side is $\frac{1}{20}$ cm.

$\frac{1}{5}$

$\frac{1}{20}$

    b.  How long is each side in centimeters?

$\frac{1}{20} m = $ _____ cm
$= \frac{1}{20} \times 100$ cm
$= \frac{100}{20}$
$= 5$ cm
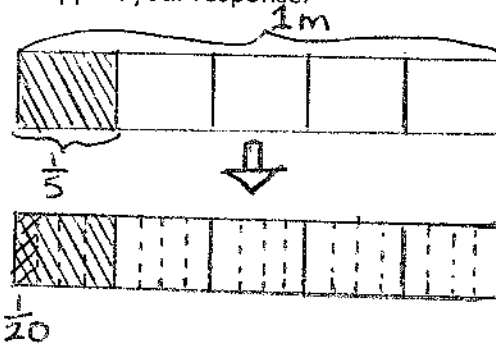
Each side is 5 cm

4. A pallet holding 5 identical crates weighs $\frac{1}{4}$ ton.

    a. How many tons does each crate weigh? Draw a picture to support your response.

    1 ton
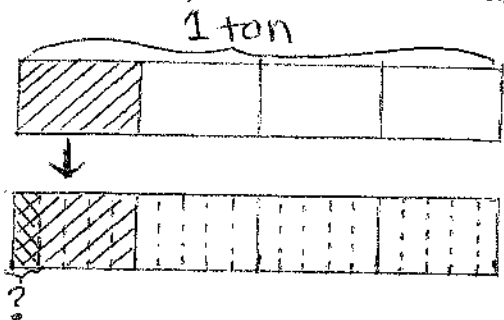
    $\frac{1}{4} \div 5$
    = 1 fourth ÷ 5
    = 5 twentieths ÷ 5
    = 1 twentieth

    Each crate weighs $\frac{1}{20}$ ton.

    b. How many pounds does each crate weigh?

    $\frac{1}{20}$ ton = _____ pounds
    $= \frac{1}{20} \times \frac{2000^{100}}{1}$
    = 100 pounds

    Each crate weighs 100 pounds.

5. Faye has 5 pieces of ribbon, each 1 yard long. She cuts each ribbon into sixths.

    a. How many sixths will she have after cutting all the ribbons?
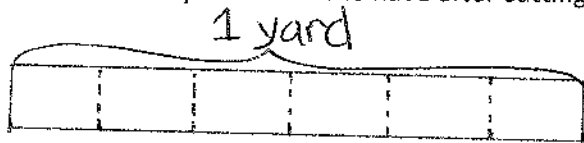
    1 yard

    $1 \div \frac{1}{6} = 6$
    6 sixths in 1 yard
    30 sixths in 5 yards

    Faye will have 30 sixths after cutting all the ribbons.

    b. How long will each of the sixths be in inches?

    $\frac{1}{6}$ yd. = _____ in.
    $= \frac{1}{6} \times 36$ in.
    $= \frac{1 \times 36^6}{1 6}$
    = 6 inches

    Each sixth is $\frac{1}{6}$ of a yard.
    Each sixth is 6 inches long.

6. A glass pitcher is filled with water. $\frac{1}{8}$ of the water is poured equally into 2 glasses.

   a. What fraction of the water is in each glass?
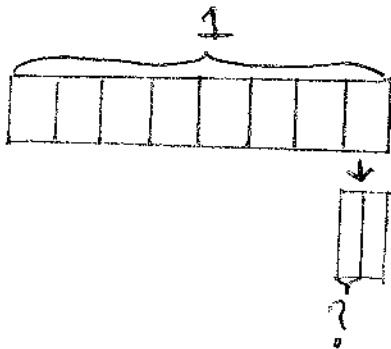
   

   $\frac{1}{2}$ of $\frac{1}{8} = \frac{1}{16}$

   or

   $\frac{1}{8} \div 2 = \frac{1}{16}$

   $\frac{1}{16}$ of the water is in each glass.

   b. If each glass has 3 fluid ounces of water in it, how many fluid ounces of water were in the full pitcher?
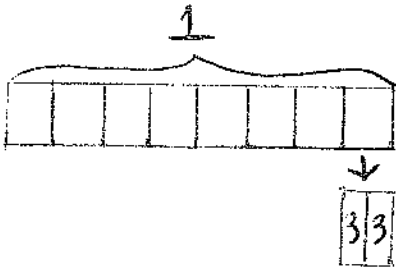
   

   $3 + 3 = 6$
   1 unit = 6
   8 units = 48

   There are 48 fluid ounces in the full pitcher.

   c. If $\frac{1}{4}$ of the remaining water is poured out of the pitcher to water a plant, how many cups of water are left in the pitcher?

   $48 - 6 = 42$
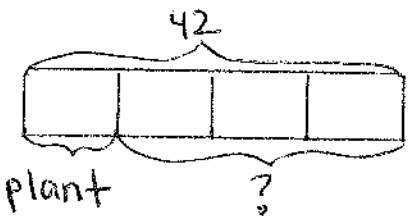
   

   $\frac{3}{4}$ of 42

   $= \frac{3}{4} \times 42$

   $= \frac{3 \times 42^{21}}{2 \times \cancel{2}}$

   $= \frac{63}{2} = 31\frac{1}{2}$

   $31\frac{1}{2}$ fl oz = _____ cups

   $= 31\frac{1}{2} \times 1$ fl oz = _____ cups

   $= 31\frac{1}{2} \times \frac{1}{8}c =$ ___ cups

   $= (31 \times \frac{1}{8}c) + (\frac{1}{2} \times \frac{1}{8}c) =$ _____ cups

   $= \frac{31}{8}c + \frac{1}{16}c =$ _____ cups

   $= \frac{62}{16}c + \frac{1}{16}c =$ _____ cups

   $\frac{63}{16}c = 3\frac{15}{16}$ cups

   $3\frac{15}{16}$ cups of water are left in the pitcher.

COMMON CORE

Lesson 27:　Solve problems involving fraction division.
Date:　　9/19/14

engage<sup>ny</sup>　　4.G.45

Name _____ Date _____

1. Create and solve a division story problem about 5 meters of rope that is modeled by the tape diagram below.
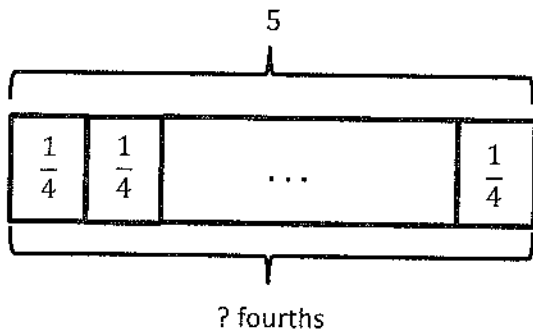


$$5 \div \tfrac{1}{4} = 20$$

He will have 20 fourths.

Diego has 5 meters of rope. He cuts each meter equally into fourths. How many fourths will he have altogether?

2. Create and solve a story problem about $\frac{1}{4}$ pound of almonds that is modeled by the tape diagram below.
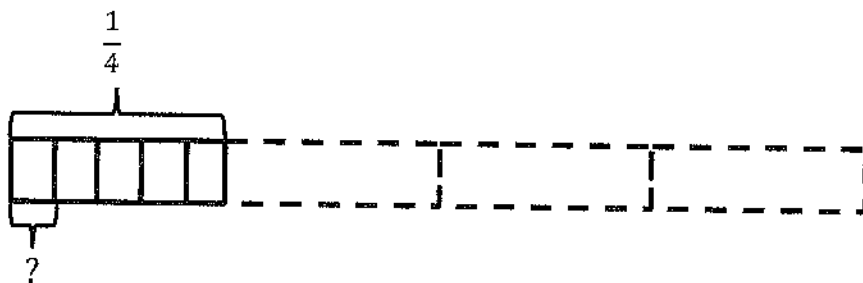


$$\tfrac{1}{4} \div 5$$
$$= 5 \text{ twentieths} \div 5$$
$$= 1 \text{ twentieth}$$

Aurelia bought $\frac{1}{4}$ pound of almonds. She splits the almonds equally into 5 bags. How many pounds of almonds are in each bag?

There are $\frac{1}{20}$ pound of almonds in each bag.

COMMON CORE   |  Lesson 28:    Write equations and word problems corresponding to tape and number line diagrams.    engage^ny    4.G.55

Date:   9/19/14

3. Draw a tape diagram and create a word problem for the following expressions, and then solve.

a. $2 \div \frac{1}{3}$

$= 6$

She will have 6 slices.

Phung bought 2 pizzas. She wants to cut each pizza into thirds. How many slices will she have altogether?

b. $\frac{1}{3} \div 4$

$= 1$ third $\div 4$

$= 4$ twelfths $\div 4$
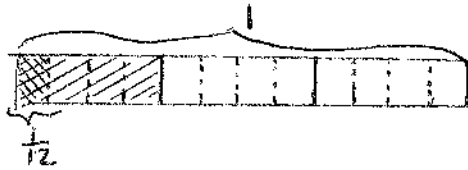
$= 1$ twelfth

Each container will have $\frac{1}{12}$ kg of flour.

Jacky bought $\frac{1}{3}$ kg of flour. He poured it equally into 4 containers. How many kg of flour will be in each container?

c. $\frac{1}{4} \div 3$

$= 1$ fourth $\div 3$

$= 3$ twelfths $\div 3$

$= 1$ twelfth
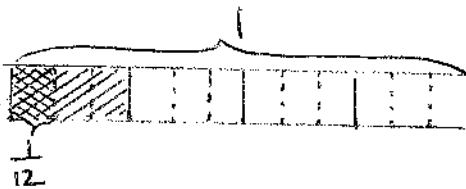
She will eat $\frac{1}{12}$ pound of sunflower seeds everyday.

Lisa bought $\frac{1}{4}$ pound of sunflower seeds. She wants to divide them equally over 3 days as a snack. How many pounds of sunflower seeds will she eat each day?

d. $3 \div \frac{1}{5}$

$= 15$

He will 15 fifths.

Thai bought 3m of ribbon. He cut each meter into fifths. How many fifths will he have altogether?

Name _____  Date _____

1. Divide. Rewrite each expression as a division sentence with a fraction divisor, and fill in the blanks. The first one is done for you.

Example:   $2 \div 0.1 = 2 \div \frac{1}{10} = 20$

There are __10__ tenths in 1 whole.

There are __20__ tenths in 2 wholes.

a. $5 \div 0.1 = 5 \div \frac{1}{10} = 50$

There are __10__ tenths in 1 whole.

There are __50__ tenths in 5 wholes.

b. $8 \div 0.1 = 8 \div \frac{1}{10} = 80$

There are __10__ tenths in 1 whole.

There are __80__ tenths in 8 wholes.

c. $5.2 \div 0.1 = 5.2 \div \frac{1}{10} = 52$

There are __50__ tenths in 5 wholes.

There are __2__ tenths in 2 tenths.

There are __52__ tenths in 5.2

d. $8.7 \div 0.1 = 8.7 \div \frac{1}{10} = 87$

There are __80__ tenths in 8 wholes.

There are __7__ tenths in 7 tenths.

There are __87__ tenths in 8.7

e. $5 \div 0.01 = 5 \div \frac{1}{100} = 500$

There are __100__ hundredths in 1 whole.

There are __500__ hundredths in 5 wholes.

f. $8 \div 0.01 = 8 \div \frac{1}{100} = 800$

There are __100__ hundredths in 1 whole.

There are __800__ hundredths in 8 wholes.

g. $5.2 \div 0.01 = 5.2 \div \frac{1}{100} = 520$

There are __500__ hundredths in 5 wholes.

There are __20__ hundredths in 2 tenths.

There are __520__ hundredths in 5.2

h. $8.7 \div 0.01 = 8.7 \div \frac{1}{100} = 870$

There are __800__ hundredths in 8 wholes.

There are __70__ hundredths in 7 tenths.

There are __870__ hundredths in 8.7

2. Divide.

| a. $6 \div 0.1$ | b. $18 \div 0.1$ | c. $6 \div 0.01$ |
|---|---|---|
| $= 6 \div \frac{1}{10}$  $= 60$ | $= 18 \div \frac{1}{10}$  $= 180$ | $= 6 \div \frac{1}{100}$  $= 600$ |
| d. $1.7 \div 0.1$ | e. $31 \div 0.01$ | f. $11 \div 0.01$ |
| $= 1.7 \div \frac{1}{10}$  $= 17$ | $= 31 \div \frac{1}{100}$  $= 3,100$ | $= 11 \div \frac{1}{100}$  $= 1,100$ |
| g. $125 \div 0.1$ | h. $3.74 \div 0.01$ | i. $12.5 \div 0.01$ |
| $= 125 \div \frac{1}{10}$  $= 1,250$ | $= 3.74 \div \frac{1}{100}$  $= 374$ | $= 12.5 \div \frac{1}{100}$  $= 1,250$ |

3. Yung bought $4.60 worth of bubble gum. Each piece of gum cost $0.10. How many pieces of bubble gum did Yung buy?

$$4.60 \div 0.10 = 4.6 \div \frac{1}{10} = 46$$

Yung bought 46 pieces of bubble gum.

4. Cheryl solved a problem: $84 \div 0.01 = 8,400$.

Jane said, "Your answer is wrong because when you divide, the quotient is always smaller than the whole amount you start with, for example, $6 \div 2 = 3$ and $100 \div 4 = 25$." Who is correct? Explain your thinking.

Cheryl solved the problem correctly. What Jane said is also correct, but not always true especially when dividing with decimals. Cheryl can help Jane understand by showing her a few examples: $84 \div 1 = 84$; $84 \div 100 = 0.84$; $84 \div 0.01 = 8,400$.

5. The U.S. Mint sells 2 ounces of American Eagle gold coins to a collector. Each coin weighs one-tenth of an ounce. How many gold coins were sold to the collector?

$$2 \div 0.1 = 2 \div \frac{1}{10} = 20$$

20 gold coins were sold to the collector.

Name _____          Date _____

1.  Rewrite the division expression as a fraction and divide.  The first two have been started for you.

| | |
|---|---|
| a.  $2.7 \div 0.3 = \dfrac{2.7}{0.3}$<br><br>$= \dfrac{2.7 \times 10}{0.3 \times 10}$<br><br>$= \dfrac{27}{3}$<br><br>$= 9$ | b.  $2.7 \div 0.03 = \dfrac{2.7}{0.03}$<br><br>$= \dfrac{2.7 \times 100}{0.03 \times 100}$<br><br>$= \dfrac{270}{3}$<br><br>$= 90$ |
| c.  $3.5 \div 0.5 = \dfrac{3.5}{0.5}$<br><br>$= \dfrac{3.5 \times 10}{0.5 \times 10}$<br><br>$= \dfrac{35}{5}$<br><br>$= 7$ | d.  $3.5 \div 0.05 = \dfrac{3.5}{0.05}$<br><br>$= \dfrac{3.5 \times 100}{0.05 \times 100}$<br><br>$= \dfrac{350}{5}$<br><br>$= 70$ |
| e.  $4.2 \div 0.7 = \dfrac{4.2}{0.7}$<br><br>$= \dfrac{4.2 \times 10}{0.7 \times 10}$<br><br>$= \dfrac{42}{7}$<br><br>$= 6$ | f.  $0.42 \div 0.07 = \dfrac{0.42}{0.07}$<br><br>$= \dfrac{0.42 \times 100}{0.07 \times 100}$<br><br>$= \dfrac{42}{7}$<br><br>$= 6$ |

g.  $10.8 \div 0.9 =$

$$\frac{10.8}{0.9}$$

$$= \frac{10.8 \times 10}{0.9 \times 10}$$

$$= \frac{108}{9}$$

$$= 12$$

h.  $1.08 \div 0.09 =$

$$\frac{1.08}{0.09}$$

$$= \frac{1.08 \times 100}{0.09 \times 100}$$

$$= \frac{108}{9}$$

$$= 12$$

i.  $3.6 \div 1.2 =$

$$\frac{3.6}{1.2}$$

$$= \frac{3.6 \times 10}{1.2 \times 10}$$

$$= \frac{36}{12}$$

$$= 3$$

j.  $0.36 \div 0.12 =$

$$\frac{0.36}{0.12}$$

$$= \frac{0.36 \times 100}{0.12 \times 100}$$

$$= \frac{36}{12}$$

$$= 3$$

k.  $17.5 \div 2.5 =$

$$\frac{17.5}{2.5}$$

$$= \frac{17.5 \times 10}{2.5 \times 10}$$

$$= \frac{175}{25}$$

$$= 7$$

l.  $1.75 \div 0.25 =$

$$\frac{1.75}{0.25}$$

$$= \frac{1.75 \times 100}{0.25 \times 100}$$

$$= \frac{175}{25}$$

$$= 7$$

2.  $15 \div 3 = 5$.  Explain why it is true that $1.5 \div 0.3$ and $0.15 \div 0.03$ have the same quotient.

They have the same quotient because I can rewrite them in unit forms to show they are all equal to 5.

$15 \div 3 = 5 \longrightarrow$ 15 wholes $\div$ 3 wholes $= 5 \longrightarrow \frac{15}{3} = 5$

$1.5 \div 0.3 = 5 \longrightarrow$ 15 tenths $\div$ 3 tenths $= 5 \longrightarrow \frac{1.5 \times 10}{0.3 \times 10} = \frac{15}{3} = 5$

$0.15 \div 0.03 = 5 \longrightarrow$ 15 hundredths $\div$ 3 hundredths $= 5 \longrightarrow \frac{0.15 \times 100}{0.03 \times 100} = \frac{15}{3} = 5$

3. Mr. Volok buys 2.4 kg of sugar for his bakery.

   a. If he pours 0.2 kg of sugar into separate bags, how many bags of sugar can he make?

   $$2.4 \div 0.2 = \frac{2.4}{0.2} = \frac{2.4 \times 10}{0.2 \times 10} = \frac{24}{2} = 12$$

   He can make 12 bags of sugar.

   b. If he pours 0.4 kg of sugar into separate bags, how many bags of sugar can he make?

   $$2.4 \div 0.4 = \frac{2.4}{0.4} = \frac{2.4 \times 10}{0.4 \times 10} = \frac{24}{4} = 6$$

   He can make 6 bags of sugar.

4. Two wires, one 17.4 meters long and one 7.5 meters long, were cut into pieces 0.3 meters long. How many such pieces can be made from both wires?

   Wire #1: $17.4 \div 0.3 = \frac{17.4}{0.3} = \frac{17.4 \times 10}{0.3 \times 10} = \frac{174}{3} = 58$

   Wire #2: $7.5 \div 0.3 = \frac{7.5}{0.3} = \frac{7.5 \times 10}{0.3 \times 10} = \frac{75}{3} = 25$

   $58 + 25 = 83$

   83 pieces can be made from both wires.

   $$\begin{array}{r} 58 \\ 3\overline{)174} \\ \underline{15}\downarrow \\ 24 \\ \underline{-24} \\ 0 \end{array}$$

   $$\begin{array}{r} 25 \\ 3\overline{)75} \\ \underline{-6}\downarrow \\ 15 \\ \underline{-15} \\ 0 \end{array}$$

5. Mr. Smith has 15.6 pounds of oranges to pack for shipment. He can ship 2.4 pounds of oranges in a large box and 1.2 pounds in a small box. If he ships 5 large boxes, what is the minimum number of small boxes required to ship the rest of the oranges?

   15.6 lb.

   | 2.4 | 2.4 | 2.4 | 2.4 | 2.4 | |
   |-----|-----|-----|-----|-----|--|

   large = ?        small = ?
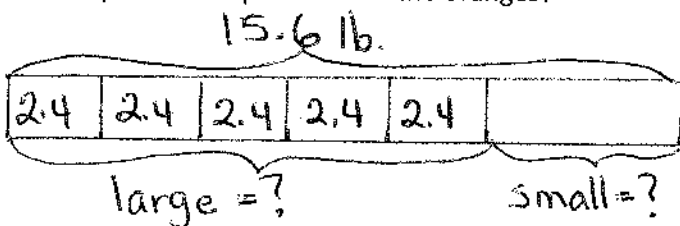
   $$\begin{array}{r} 2.4 \\ \times\ 5 \\ \hline 12.0\ \text{lb.} \end{array}$$

   $$\begin{array}{r} 15.6 \\ -12.0 \\ \hline 3.6\ \text{lb} \end{array}$$

   $3.6 \div 1.2 = \frac{3.6}{1.2}$

   $= \frac{3.6 \times 10}{1.2 \times 10}$

   $= \frac{36}{12}$

   $= 3$

   3 small boxes are required to ship the rest of the oranges.

Name _____　　Date _____

1. Estimate, and then divide. An example has been done for you.

$78.4 \div 0.7 \approx 770 \div 7 = 110$

$\div \dfrac{78.4}{0.7}$

$= \dfrac{78.4 \times 10}{0.7 \times 10}$

$\dfrac{}{}= \dfrac{784}{7}$

$= 112$

```
      1 1 2
  7 | 7 8 4
     -7
      8
     -7
      1 4
     -1 4
        0
```

a. $53.2 \div 0.4 \approx$

$= \dfrac{53.2}{0.4}$

$= \dfrac{53.2 \times 10}{0.4 \times 10}$

$= \dfrac{532}{4}$

$\boxed{= 133}$

```
      1 3 3
  4 | 5 3 2
     -4
      1 3
     -1 2
        1 2
       -1 2
          0
```

b. $1.52 \div 0.8 \approx$

$= \dfrac{1.52}{0.8}$

$= \dfrac{1.52 \times 10}{0.8 \times 10}$

$= \dfrac{15.2}{8}$

$\boxed{= 1.9}$

```
      1.9
  8 | 1 5 2
     -8
      7 2
     -7 2
        0
```

2. Estimate, and then divide. The first one has been done for you.

$7.32 \div 0.06 \approx 720 \div 6 = 120$

$\div \dfrac{7.32}{0.06}$

$= \dfrac{7.32 \times 100}{0.06 \times 100}$

$= \dfrac{732}{6}$

$= 122$

```
      1 2 2
  6 | 7 3 2
     -6
      1 3
     -1 2
        1 2
       -1 2
          0
```

a. $9.42 \div 0.03 \approx$

$= \dfrac{9.42}{0.03}$

$= \dfrac{9.42 \times 100}{0.03 \times 100}$

$= \dfrac{942}{3}$

$\boxed{= 314}$

```
      3 1 4
  3 | 9 4 2
     -9
      0 4
       -3
        1 2
        1 2
          0
```

b. $39.36 \div 0.96 \approx$

$= \dfrac{39.36}{0.96}$

$= \dfrac{39.36 \times 100}{0.96 \times 100}$

$= \dfrac{3936}{96}$

$= \boxed{41}$

```
        4 1
 96 | 3 9 3 6
     -3 8 4
         9 6
        -9 6
           0
```

COMMON CORE

Lesson 31: Divide decimal dividends by non-unit decimal divisors.
Date: 9/19/14

engage^ny

4.G.98

3. Solve using the standard algorithm. Use the thought bubble to show your thinking as you rename the divisor as a whole number.

a. $46.2 \div 0.3 =$ **154**

$= \dfrac{46.2}{0.3} = 154$

I multiplied each number by 10 to rename the divisor as a whole number

$$3\overline{)462}$$
154

b. $3.16 \div 0.04 =$ **79**

I had to multiply both number by 100 to make the divisor a whole number.

$$4\overline{)316}$$
79

c. $2.31 \div 0.3 =$ **7.7**

I multiplied both numbers by 10 to make the divisor a whole number.

$$3\overline{)23.1}$$
7.7

d. $15.6 \div 0.24 =$ **65**

I multiplied both numbers by 100 to make the divisor a whole number.

$$24\overline{)1560}$$
65

4. The total distance of a race is 18.9 km.
   a. If volunteers set up a water station every 0.7 km, including one at the finish line, how many stations will they have?

   $$\frac{18.9 \times 10}{0.7 \times 10} = \frac{189}{7}$$

   $$7\overline{)189}$$

   They will have 27 water stations.

   b. If volunteers set up a first aid station every 0.9 km, including one at the finish line, how many stations will they have?

   $$9\overline{)189}$$

   There will be 2 first aid stations.

5. In a laboratory, a technician combines a salt solution contained in 27 test tubes. Each test tube contains 0.06 liter of the solution. If he divides the total amount into test tubes that hold 0.3 liter each, how many test tubes will he need?

   $$\begin{array}{r} 27 \\ \times\ 6 \text{ hundredths} \\ \hline 162 \end{array} \rightarrow 1.62$$

   $$\frac{1.62 \times 10}{0.3 \times 10} = \frac{16.2}{3}$$

   $$3\overline{)16.2}$$
   5.4

   He will need 6 test tubes.

Name _____     Date _____

1. Circle the expression equivalent to *the sum of 3 and 2 divided by* $\frac{1}{3}$.

$$\frac{3+2}{3} \qquad\qquad 3 + \left(2 \div \frac{1}{3}\right) \qquad\qquad \boxed{(3+2) \div \frac{1}{3}} \qquad\qquad \frac{1}{3} \div (3+2)$$

2. Circle the expression(s) equivalent to *28 divided by the difference between* $\frac{4}{5}$ *and* $\frac{7}{10}$.

$$\boxed{28 \div \left(\frac{4}{5} - \frac{7}{10}\right)} \qquad \boxed{\frac{28}{\frac{4}{5} - \frac{7}{10}}} \qquad \left(\frac{4}{5} - \frac{7}{10}\right) \div 28 \qquad 28 \div \left(\frac{7}{10} - \frac{4}{5}\right)$$

3. Fill in the chart by writing an equivalent numerical expression.

| | | |
|---|---|---|
| a. | Half as much as the difference between $2\frac{1}{4}$ and $\frac{3}{8}$. | $\left(2\frac{1}{4} - \frac{3}{8}\right) \div 2$ |
| b. | The difference between $2\frac{1}{4}$ and $\frac{3}{8}$ divided by 4. | $\dfrac{2\frac{1}{4} - \frac{3}{8}}{4}$ |
| c. | A third of the sum of $\frac{7}{8}$ and 22 tenths. | $\frac{1}{3} \times \left(\frac{7}{8} + \frac{22}{10}\right)$ |
| d. | Add 2.2 and $\frac{7}{8}$, and then triple the sum. | $\left(2.2 + \frac{7}{8}\right) \times 3$ |

4. Compare expressions 3(a) and 3(b). Without evaluating, identify the expression that is greater. Explain how you know.

Expression 3(a) is greater than the expression 3(b).

$$\left(2\frac{1}{4} - \frac{3}{8}\right) \div 2 \quad > \quad \left(2\frac{1}{4} - \frac{3}{8}\right) \div 4$$

Both expressions have the same dividend.
Expression (a) is divided into 2 equal parts.
Expression (b) is divided into 4 equal parts.
Expression (a) must be greater.

COMMON CORE    Lesson 32:    Interpret and evaluate numerical expressions including the language of scaling and fraction division.    engage^ny    4.H.10

Date:   9/19/14

5. Fill in the chart by writing an equivalent expression in word form.

| a. | Three fourths times the sum of 1.75 and $\frac{3}{5}$. | $\frac{3}{4} \times (1.75 + \frac{3}{5})$ |
|---|---|---|
| b. | The difference between $\frac{7}{9}$ and the product of $\frac{1}{8}$ and 2 tenths. | $\frac{7}{9} - (\frac{1}{8} \times 0.2)$ |
| c. | Four thirds times the sum of 1.75 and $\frac{3}{5}$. | $(1.75 + \frac{3}{5}) \times \frac{4}{3}$ |
| d. | Two divided by the product of $\frac{1}{2}$ and $\frac{4}{5}$. | $2 \div (\frac{1}{2} \times \frac{4}{5})$ |

6. Compare the expressions in 5(a) and 5(c). Without evaluating, identify the expression that is less. Explain how you know.

I know the expression (c) is greater than expression (a). In (a), the sum of 1.75 and $\frac{3}{5}$ is multiplied by a number less than one. In (c), the same sum is multiplied by a number greater than one

7. Evaluate the following expressions.

a. $(9-5) \div \frac{1}{3}$

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

$= 12$

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

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

$= \frac{10}{2}$

$= \frac{5}{6}$

c. $\frac{1}{3} \div (1 \div \frac{1}{4})$

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

$= \frac{1}{12}$

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

$= \frac{1}{2} \times (\frac{3}{5} \times \frac{5}{3})$

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

$= \frac{1}{2}$

e. Half as much as $(\frac{3}{4} \times 0.2)$

$(\frac{3}{4} \times \frac{2}{10}) \div 2$

$= \frac{6}{40} \div 2$

$= \frac{3}{40}$

f. 3 times as much as the quotient of 2.4 and 0.6

$3 \times (2.4 \div 0.6)$

$= 3 \times 4$

$= 12$

8. Choose an expression below that matches the story problem, and write it in the blank.

$\frac{2}{3} \times (20 - 5)$  $(\frac{2}{3} \times 20) - (\frac{2}{3} \times 5)$  $\frac{2}{3} \times 20 - 5$  $(20 - \frac{2}{3}) - 5$

a. Farmer Green picked 20 carrots. He cooked $\frac{2}{3}$ of them, and then gave 5 to his rabbits. Write the expression that tells how many carrots he had left.

Expression: $\frac{2}{3} \times 20 - 5$

b. Farmer Green picked 20 carrots. He cooked 5 of them, and then gave $\frac{2}{3}$ to his rabbits. Write the expression that tells how many carrots the rabbits will get.

Expression: $\frac{2}{3} \times (20 - 5)$

**COMMON CORE** | Lesson 32: Interpret and evaluate numerical expressions including the language of scaling and fraction division.
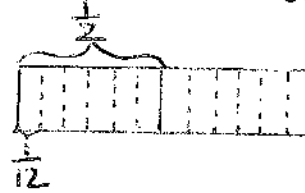Date: 9/19/14

engage<sup>ny</sup>  4.H.12

Name _____ Date _____

1. Ms. Hayes has $\frac{1}{2}$ liter of juice. She distributes it equally to 6 students in her tutoring group.

   a. How many liters of juice does each student get?

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

   $= \frac{1}{12}$ Liter

   Each student gets $\frac{1}{12}$ liter of juice.

   b. How many more liters of juice will Ms. Hayes need if she wants to give each of the 24 students in her class the same amount of juice found in Part (a)?

   $\frac{1}{12} \times 24$

   $= \frac{24}{12}$

   $= 2 L$

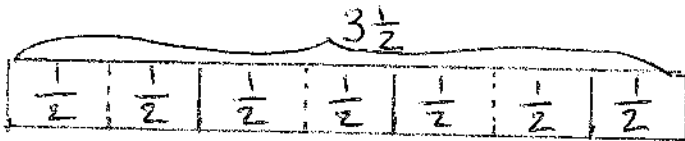   $2L - \frac{1}{2} L = 1\frac{1}{2} L$

   2L of juice needed for 24 students

   Ms. Hayes will need $1\frac{1}{2}$ liter more.

2. Lucia has 3.5 hours left in her workday as a car mechanic. Lucia needs $\frac{1}{2}$ of an hour to complete one oil change.

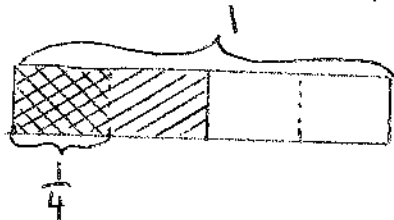   a. How many oil changes can Lucia complete during the rest of her workday?

   $3.5 \div \frac{1}{2} = 3\frac{1}{2} \div \frac{1}{2} = 7$ half hours

   She can complete 7 more oil changes.

   b. Lucia can complete two car inspections in the same amount of time it takes her to complete one oil change. How long does it take her to complete one car inspection?

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

   She can complete one car inspection in 15 minutes.

   c. How many inspections can she complete in the rest of her workday?

   $3.5 \div \frac{1}{4}$

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

   There are 12 fourths in 3
   There are 2 fourths in $\frac{2}{4}$
   There are 14 fourths in $3\frac{2}{4}$

   She can complete 14 inspections in the rest of her workday.

COMMON CORE | Lesson 33: Create story contexts for numerical expressions and tape diagrams, and solve word problems.
Date: 10/17/14
engage^ny   4.H.26

3. Carlo buys $14.40 worth of grapefruit. Each grapefruit costs $0.80.

   a. How many grapefruist does Carlo buy?

   $$\$14.40 \div \$0.80$$

   $$\frac{14.4 \times 10}{0.8 \times 10} = \frac{144}{8}$$

   $$\begin{array}{r} 18 \\ 8\overline{\smash{)}144} \\ -8\phantom{0}\downarrow \\ \hline 64 \\ -64 \\ \hline 0 \end{array}$$

   Carlo buys 18 grapefruit.

   b. At the same store, Kahri spends one-third as much money on grapefruits as Carlo. How many grapefruits does she buy?

   $$\begin{array}{r} 4.80 \\ 3\overline{\smash{)}14.40} \\ -12\phantom{.0}\downarrow \\ \hline 2\,4 \\ -24\phantom{} \\ \hline 00 \\ -00 \\ \hline 0 \end{array}$$

   $$\$4.80 \div \$0.80 =$$

   $$\frac{4.80 \times 10}{0.8 \times 10} = \frac{48}{8} = 6$$

   Kahri buys 6 grapefruit

4. Studies show that a typical giant hummingbird can flap its wings once in 0.08 of a second.

   a. While flying for 7.2 seconds, how many times will a typical giant hummingbird flap its wings?

   $$7.2 \div 0.08 = \frac{7.2 \times 100}{0.08 \times 100}$$

   $$= \frac{720}{8}$$

   $$= 90$$

   It can flap its wings 90 times in 7.2 seconds.

   b. A ruby-throated hummingbird can flap its wings 4 times faster than a giant hummingbird. How many times will a ruby-throated hummingbird flap its wings in the same amount of time?

   $$90 \times 4 = 360$$

   It can flap its wings 360 times in 7.2 seconds.

COMMON CORE | Lesson 33: Create story contexts for numerical expressions and tape diagrams, and solve word problems.
Date: 10/17/14
engage^ny    4.H.27

5. Create a story context for the following expression.

$$\frac{1}{3} \times (\$20 - \$3.20)$$

Chris had $20. He bought a bag of pens for $3.20, then spent $\frac{1}{3}$ of the rest on notebooks. How much did Chris spend on notebooks?

6. Create a story context about painting a wall for the following tape diagram.
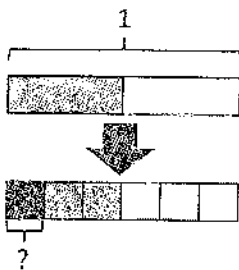
I painted the bottom half of my bedroom wall blue. I then painted $\frac{1}{3}$ of the blue wall red. What fraction of the wall is red?

COMMON CORE

Lesson 33:   Create story contexts for numerical expressions and tape diagrams,
             and solve word problems.
Date:        10/17/14

engage^ny     4.H.28
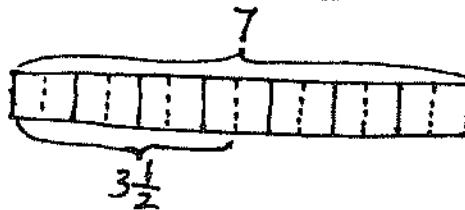
Name ___Hayley___         Date _____

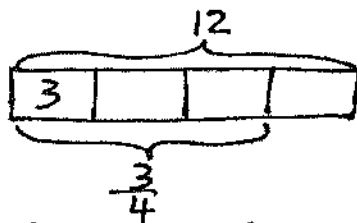1. Multiply or divide. Draw a model to explain your thinking.

a. $\frac{1}{2} \times 6 = 6 \div 2 = 3$
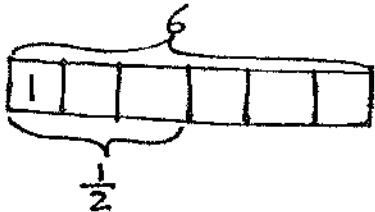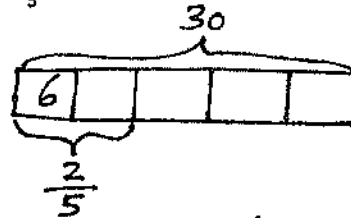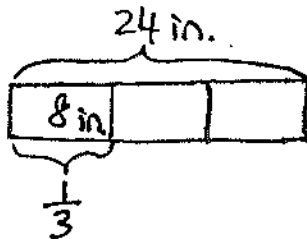


b. $\frac{1}{2} \times 7 = 7 \div 2 = 3\frac{1}{2}$



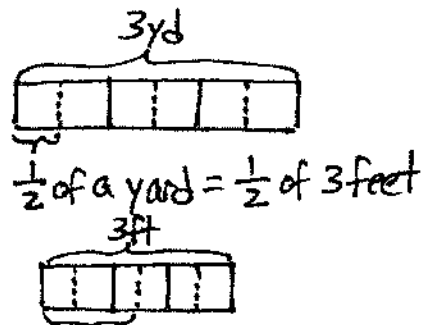c. $\frac{3}{4} \times 12 = 9$



d. $\frac{2}{5} \times 30 = 12$



e. $\frac{1}{3}$ of 2 feet = ___8___ inches

$2 \times 12 \text{ inches} = 24 \text{ inches}$



f. $\frac{1}{6}$ of 3 yards = ___$1\frac{1}{2}$___ feet



$\frac{1}{2}$ of a yard = $\frac{1}{2}$ of 3 feet



$1\frac{1}{2} ft$

g. $\left(3 + \frac{1}{2}\right) \times 14$

$= (3 \times 14) + \left(\frac{1}{2} \times 14\right)$

$= 42 + 7$

$= 49$

h. $4\frac{2}{3} \times 13$

$= (4 \times 13) + \left(\frac{2}{3} \times 13\right)$
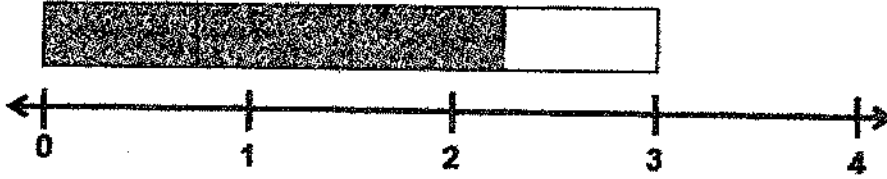
$= 52 + \frac{2 \times 13}{3}$

$= 52 + \frac{26}{3}$

$= 52 + 8\frac{2}{3}$

$= 60\frac{2}{3}$

2. If the whole bar is 3 units long, what is the length of the shaded part of the bar? Write a multiplication equation for the diagram, and then solve.



$$\frac{3}{4} \times 3 = \frac{3 \times 3}{4} = \frac{9}{4} = 2\frac{1}{4}$$

The shaded part of the bar is $2\frac{1}{4}$ units long.

3. Circle the expression(s) that are equal to $\frac{3}{5} \times 6$. Explain why the others are *not* equal using words, pictures, or numbers.

a. $3 \times (6 \div 5)$

b. $3 \div (5 \times 6)$

$= 3 \div 30$

$= 0.1$

c. $(3 \times 6) \div 5$

d. $3 \times \frac{6}{5}$

4. Write the following as expressions.

  a. One-third the sum of 6 and 3.

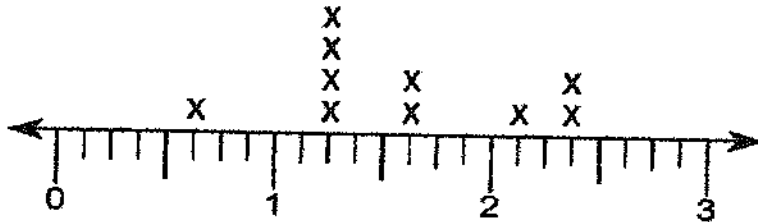$$\frac{1}{3} \times (6 + 3)$$

  b. Four times the quotient of 3 and 4.

$$4 \times (3 \div 4)$$

  c. One-fourth the difference between $\frac{2}{3}$ and $\frac{1}{2}$.

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

5. Mr. Schaum used 10 buckets to collect rainfall in various locations on his property. The following line plot shows the amount of rain collected in each bucket in gallons. Write an expression that includes multiplication to show how to find the total amount of water collected in gallons. Then solve your expression.



$$\frac{5}{8} + \left(4 \times 1\frac{2}{8}\right) + \left(2 \times 1\frac{5}{8}\right) + 2\frac{1}{8} + \left(2 \times 2\frac{3}{8}\right)$$

$$= \frac{5}{8} + 4 + \frac{4 \times 2}{8} + 2 + \frac{2 \times 5}{8} + 2\frac{1}{8} + 4 + \frac{2 \times 3}{8}$$

$$= 12 + \frac{5}{8} + \frac{8}{8} + \frac{10}{8} + \frac{1}{8} + \frac{6}{8}$$

$$= 13 + \frac{22}{8}$$

$$= 15\frac{6}{8} = 15\frac{3}{4}$$

Mr. Schaum collected $15\frac{3}{4}$ gallons of water.

6. Mrs. Williams uses the following recipe for crispy rice treats. She decides to make $\frac{2}{3}$ of the recipe.

   2 cups melted butter
   24 oz marshmallows
   13 cups rice crispy cereal

   a. How much of each ingredient will she need? Write an expression that includes multiplication. Solve by multiplying.

   Butter: $\frac{2}{3} \times 2$ cups $= \frac{2 \times 2}{3} = \frac{4}{3} = 1\frac{1}{3}$ cups

   Marshmallows: $\frac{2}{3} \times 24$ oz. $= \frac{2 \times 24}{3} = \frac{48}{3} = 16$ oz.

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

   She will need $1\frac{1}{3}$ cups of butter, 16 ounces of marshmallows, and $8\frac{2}{3}$ cups of rice crispy cereal.

   b. How many fluid ounces of butter will she use? (Use your measurement conversion chart if you wish.)

   1 Cup = 8 ounces

   She will use $10\frac{2}{3}$ fluid ounces of butter.

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

   c. When the crispy rice treats have cooled, Mrs. Williams cuts them into 30 equal pieces. She gives two-fifths of the treats to her son and takes the rest to school. How many treats will Mrs. Williams take to school? Use any method to solve.

   30
   | 6 | 6 | 6 | 6 | 6 |
   ?
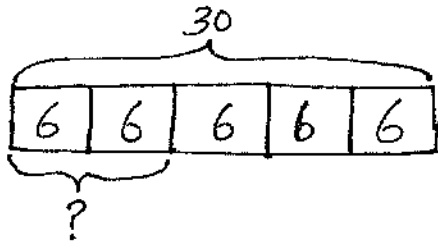
   $30 - 12 = 18$

   Mr. Williams will take 18 treats to school.

Name __Seth__      Date _____

1. Multiply or divide. Draw a model to explain your thinking.

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



b. $\frac{3}{4}$ of $\frac{1}{3} = \frac{3}{12}$



c. $2\frac{3}{4} \times \frac{8}{9}$

$= \frac{11}{4} \times \frac{8}{9}$

$= \frac{88}{36} = 2\frac{16}{36} = 2\frac{4}{9}$



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



e. $5 \div \frac{1}{4} = 20$



f. $\frac{1}{4} \div 5 = \frac{1}{20}$



2. Multiply or divide using any method.

a. $1.5 \times 32 = 48.0$

$$\begin{array}{r} 15\,(\text{tenths}) \\ \times\ 32 \\ \hline 30 \\ +450 \\ \hline 480\,(\text{tenths}) \end{array}$$

b. $1.5 \times 0.32$

$= (1 \times 0.32) + (0.5 \times 0.32)$

$= 0.32 + 0.16$

$= 0.48$

c. $12 \div 0.03$

$= (12 \times 100) \div (0.03 \times 100)$

$= 1,200 \div 3$

$= 400$

d. $1.2 \div 0.3$

$= (1.2 \times 10) \div (0.3 \times 10)$

$= 12 \div 3$

$= 4$

e. $12.8 \times \frac{3}{4}$

$= (12 \times \frac{3}{4}) + (\frac{8}{10} \times \frac{3}{4})$

$= 9 + \frac{24}{40}$

$= 9\frac{24}{40} = 9\frac{3}{5}$

f. $102.4 \div 3.2$

$= (102.4 \times 10) \div (3.2 \times 10)$

$= 1,024 \div 32$

$= 32$

$$\begin{array}{r} 32 \\ 32\overline{)1,024} \\ -96 \\ \hline 64 \\ -64 \\ \hline 0 \end{array}$$

3. Fill in the chart by writing an equivalent expression.

| a. | One-fifth the sum of one-half and one-third | $\frac{1}{5} \times \left( \frac{1}{2} + \frac{1}{3} \right)$ |
| b. | Two and one-half times the sum of nine and twelve | $2\frac{1}{2} \times (9 + 12)$ |
| c. | Twenty-four divided by the difference between $1\frac{1}{2}$ and $\frac{3}{4}$ | $24 \div \left( 1\frac{1}{2} - \frac{3}{4} \right)$ |

4. A castle has to be guarded 24 hours a day. Five knights are ordered to split each day's guard duty equally. How long will each knight spend on guard duty in one day?

a. Record your answer in hours.

$$
\begin{array}{r}
4.8 \\
5\overline{)24.0} \\
-20 \phantom{.0} \\
\hline
40 \\
-40 \\
\hline
0
\end{array}
$$

Each Knight will spend 4.8 hours on guard duty in one day.

b. Record it in hours and minutes.

$\frac{1}{10}$ of 60 min = 6 min

$\frac{8}{10}$ of 60 min = 48 min

4.8 hours = 4 hours 48 minutes

Each Knight will spend 4 hours and 48 minutes on guard duty in one day.

c. Record your answer in minutes.

1 hour = 60 minutes

4.8 hour = ____ min.
 = 4.8 × 1 hr
 = 4.8 × 60 min
 = 288.0 min

$$
\begin{array}{r}
48\,(\text{tenths}) \\
\times\ 60 \\
\hline
00 \\
+2880 \\
\hline
2{,}880\,(\text{tenths})
\end{array}
$$

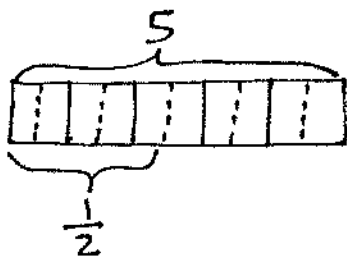Each Knight will spend 288 minutes on guard duty in one day.

5. On the blank, write a division expression that matches the situation.

a. $5 \div 2$    Mark and Jada share 5 yards of ribbon equally. How much ribbon will each get?
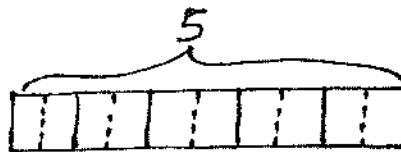
b. $5 \div \frac{1}{2}$    It takes half of a yard of ribbon to make a bow. How many bows can be made with 5 yards of ribbon?

c. Draw a diagram for each problem and solve.

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



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



d. Could either of the problems also be solved by using $\frac{1}{2} \times 5$? If so, which one(s)? Explain your thinking.

$$5 \div 2 = 5 \times \frac{1}{2}.$$

Dividing by 2 is the same as taking $\frac{1}{2}$ of something, which means multiplying.
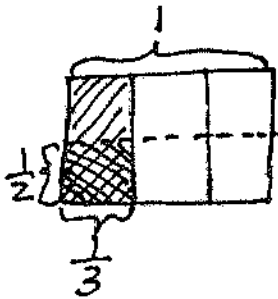
$\frac{1}{2} \times 5$ is the same as $5 \times \frac{1}{2}$.

6.  Jackson claims that multiplication always makes a number bigger.  He gave the following examples:

    - If I take 6, and I multiply it by 4, I get 24, which is bigger than 6.
    - If I take $\frac{1}{4}$, and I multiply it by 2 (whole number), I get $\frac{2}{4}$, or $\frac{1}{2}$ which is bigger than $\frac{1}{4}$.
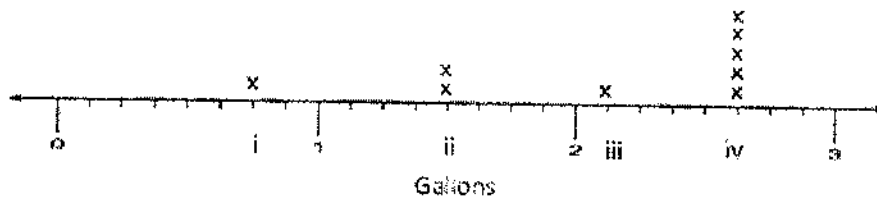
    Jackson's reasoning is incorrect.  Give an example that proves he is wrong, and explain his mistake using pictures, words, or numbers.

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

$\frac{1}{6}$ is smaller than $\frac{1}{2}$ and $\frac{1}{3}$.

7.  Jill collected honey from 9 different beehives, and recorded the amount collected, in gallons, from each hive in the line plot shown:



Gallons

a.  She wants to write the value of each point marked on the number line above (Points i–iv) in terms of the largest possible whole number of gallons, quarts, and pints.  Use the line plot above to fill in the blanks with the correct conversions.  (The first one is done for you.)

    i.    __0__ gal __3__ qt __0__ pt

    ii.   __1__ gal __2__ qt __0__ pt

    iii.  __2__ gal __0__ qt __1__ pt

    iv.   __2__ gal __2__ qt __1__ pt

b. Find the total amount of honey collected from the five hives that produced the most honey.

$$1 \text{ unit} = 2\tfrac{5}{8} \text{ gallons}$$

$$5 \text{ units} = 5 \times 2\tfrac{5}{8} \text{ gallons}$$

$$= (5 \times 2) + (5 \times \tfrac{5}{8})$$

$$= 10 + \tfrac{25}{8}$$

$$= 10 + 3\tfrac{1}{8}$$

$$= 13\tfrac{1}{8} \text{ gallons}$$

$13\tfrac{1}{8}$ gallons or 13 gallons and 1 pint were collected from the five hives that produced the most honey.

c. Jill collected a total of 19 gallons of honey. If she distributes all of the honey equally between 9 jars, how much honey will be in each jar?

$$19 \div 9 = \frac{19}{9} = 2\tfrac{1}{9}$$

There will be $2\tfrac{1}{9}$ gallons of honey in each jar.

d. Jill used $\frac{3}{4}$ of a jar for baking. How much honey did she use baking?

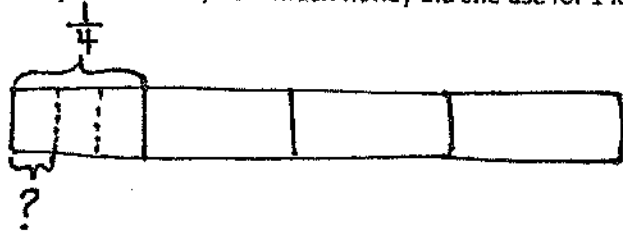$$\tfrac{3}{4} \text{ of } 2\tfrac{1}{9} \text{ gallons}$$

$$= \tfrac{3}{4} \times \tfrac{19}{9}$$

$$= \frac{\overset{1}{3} \times 19}{4 \times \underset{3}{9}}$$

$$= \tfrac{19}{12} = 1\tfrac{7}{12} \text{ gallons}$$

She used $1\tfrac{7}{12}$ gallons of honey for baking.

e.  Jill's mom used $\frac{1}{4}$ of a gallon of honey to bake 3 loaves of bread. If she used an equal amount of honey in each loaf, how much honey did she use for 1 loaf?

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

She used $\frac{1}{12}$ of a gallon of honey for 1 loaf.

f.  Jill's mom stored some of the honey in a container that held $\frac{3}{4}$ of a gallon. She used half of this amount to sweeten tea. How much honey, in cups, was used in the tea? Write an equation and draw a tape diagram.
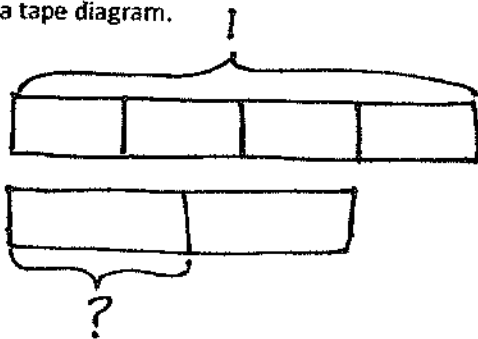
$$\frac{1}{2} \times \frac{3}{4} \text{ gallon} = \frac{3}{8} \text{ gallon}$$
$$\frac{3}{8} \text{ gallon} = \frac{3}{8} \times 1 \text{ gallon}$$
$$= \frac{3}{8} \times 16 \text{ cups}$$
$$= \frac{3 \times 16^{2}}{8}$$
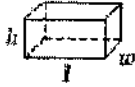$$= 6 \text{ cups}$$

She used 6 cups of honey in the tea.

g.  Jill uses some of her honey to make lotion. If each bottle of lotion requires $\frac{1}{4}$ gallon, and she uses a total of 3 gallons, how many bottles of lotion does she make?

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

She makes 12 bottles of lotion.

## Grade 5 Mathematics Reference Sheet

### FORMULAS



Right Rectangular Prism

Volume $= lwh$
Volume $= Bh$

### CONVERSIONS

1 centimeter = 10 millimeters

1 meter = 100 centimeters = 1,000 millimeters

1 kilometer = 1,000 meters

1 gram = 1,000 milligrams

1 kilogram = 1,000 grams

1 pound = 16 ounces

1 ton = 2,000 pounds

1 cup = 8 fluid ounces

1 pint = 2 cups

1 quart = 2 pints
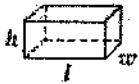
1 gallon = 4 quarts

1 liter = 1,000 milliliters

1 kiloliter = 1,000 liters

1 mile = 5,280 feet

1 mile = 1,760 yards

COMMON CORE

Lesson 8:    Relate a fraction of a set to the repeated addition interpretation of fraction multiplication.

Date:    9/17/14

engage<sup>ny</sup>

4.C.37