Eureka Math™
A Story of Units

Name _____ Date _____

1. Estimate the length of your pencil to the nearest inch. _____

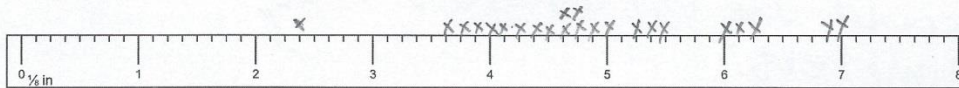2. Using a ruler, measure your pencil strip to the nearest $\frac{1}{2}$ inch and mark the measurement with an X above the ruler below. Construct a line plot of your classmates' pencil measurements.
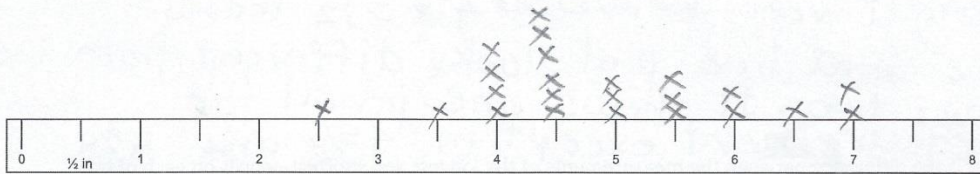
3. Using a ruler, measure your pencil strip to the nearest $\frac{1}{4}$ inch and mark the measurement with an X above the ruler below. Construct a line plot of your classmates' pencil measurements.
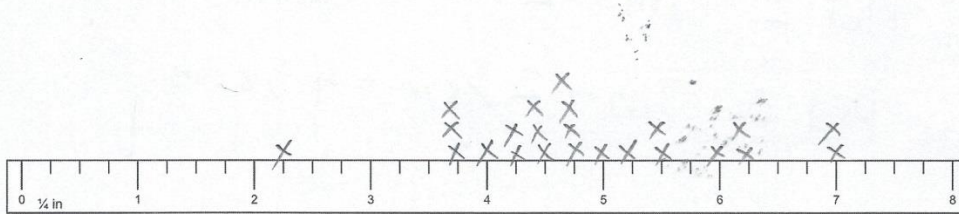
4. Using a ruler, measure your pencil strip to the nearest $\frac{1}{8}$ inch and mark the measurement with an X above the ruler below. Construct a line plot of your classmates' pencil measurements.

EUREKA MATH

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.

1

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.

   The three line plots are alike because they show that the majority of the pencil lenght were between 4 & 5½ inches
   The third line plot looks different from the other two. It shows one pencil for measur measurement except in 45/8 and 43/4

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

   Line Plot 1 $7 \text{in} - 2\frac{1}{2} \text{in} = 4\frac{1}{2} \text{in}.$

   Line Plot 2 $7 \text{in} - 2\frac{1}{4} \text{in} = 4\frac{3}{4} \text{in}.$

   Line Plot 3 $7 \text{in} - 2\frac{3}{8} \text{in} = 4\frac{5}{8} \text{in}.$

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

   I could use eights of an inch.
          or
   I could use centimeters and milimeters

Name _____   Date _____

A meteorologist set up rain gauges at various locations around a city and recorded the rainfall amounts in the table below. Use the data in the table to create a line plot using $\frac{1}{8}$ inches.
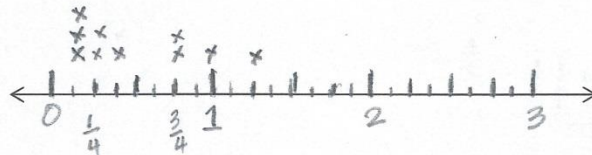
a. Which location received the most rainfall?

     Location 6

b. Which location received the least rainfall?

     Locations 1, 7, and 10.∙
     received only 1/8 of rain each.

c. Which rainfall measurement was the most frequent?

     $\frac{1}{8}$

d. What is the total rainfall in inches?

$$\frac{1}{8} \quad \frac{3}{8} \quad \frac{1}{8} \quad \frac{1}{8} \quad 1 = 1\frac{6}{8}$$

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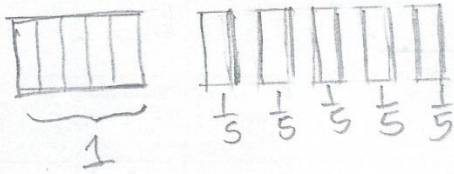
$$1\frac{3}{4} + 3\frac{1}{4} = 4 + \frac{4}{4} = 5$$

The total rainfall is 5 inches

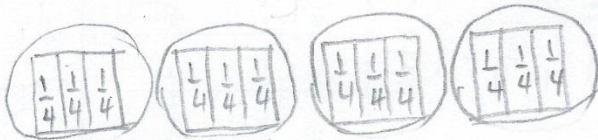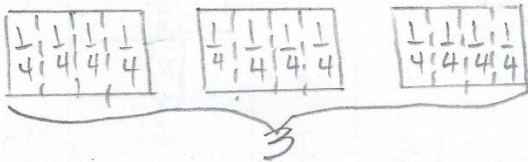| Location	Rainfall Amount (inches)
1	$\frac{1}{8}$
2	$\frac{3}{8}$
3	$\frac{3}{4}$
4	$\frac{3}{4}$
5	$\frac{1}{4}$
6	$1\frac{1}{4}$
7	$\frac{1}{8}$
8	$\frac{1}{4}$
9	1
10	$\frac{1}{8}$

Name _____   Date _____

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. $1 \div 5 = 5 \text{ fifths} \div 5 = 1 \text{ fifth} = \frac{1}{5}$
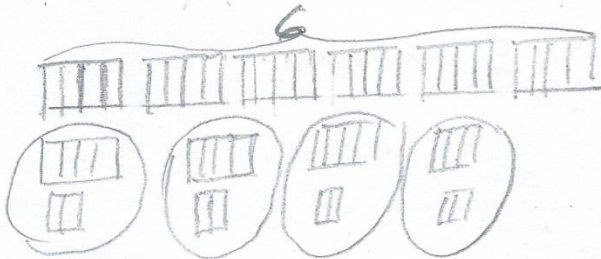
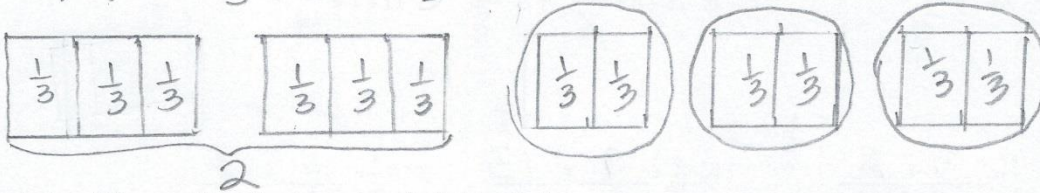b. $3 \div 4$ $12/4 \div 4 = \frac{3}{4}$

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

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

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

| $\frac{1}{3}$ | $\frac{1}{3}$ | $\frac{1}{3}$ |

| $\frac{1}{3}$ | $\frac{1}{3}$ | $\frac{1}{3}$ |

| $\frac{1}{3}$ | $\frac{1}{3}$ |

| $\frac{1}{3}$ | $\frac{1}{3}$ |

| $\frac{1}{3}$ | $\frac{1}{3}$ |

2

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.

7 cereal bars

7 cereal boxes
all in thirds
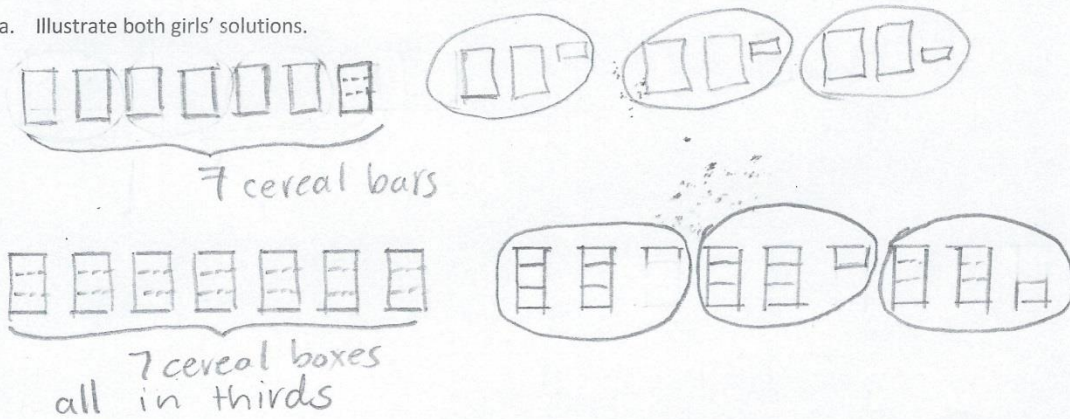
b. Explain why they are both right.

They are both right because $2\frac{1}{3} = \frac{7}{3}$.
Two wholes and one third is the same as seven thirds

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

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

b. $15 \div 8 = \dfrac{15}{8} = 1\dfrac{7}{8}$

c. $11 \div 4 = \dfrac{11}{4} = 2\,3/4$

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

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

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

Name _____   Date _____

1. Draw a picture to show the division. Express your answer as a fraction.

a. $1 \div 4$ $\frac{1}{4}$

b. $3 \div 5$ $\frac{3}{5}$

c. $7 \div 4$ $\frac{7}{4} = 1\frac{3}{4}$

2. Using a picture, show how six people could share four sandwiches. Then, write an equation and solve.

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

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

a. $2 \div 7 = \dfrac{2}{7}$

b. $39 \div 5 = \dfrac{39}{5} = 7\dfrac{4}{5}$

c. $13 \div 3 = \dfrac{13}{3} \quad 4\dfrac{1}{3}$

d. $\dfrac{9}{5} = 1\dfrac{4}{5} \div 5$

e. $\dfrac{19}{28} = 19 \div 28$

f. $1\dfrac{3}{5} = 8 \div 5$

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 = 5 fourths	$\frac{5}{4}$	$1\frac{1}{4}$	$4\overline{)\,5\,}$ with quotient $1\frac{1}{4}$, -4, 1. 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. $3 \div 2$	$\frac{3}{}$ halves ÷ 2 = $\underline{3}$ halves	$\frac{3}{2}$	$1\frac{1}{2}$	$2\overline{)\,3\,}$ $1\frac{1}{2}$ $2 \times 1\frac{1}{2} =$ $2\frac{2}{2} =$ 3
c. $\underline{6} \div \underline{4}$	24 fourths ÷ 4 = 6 fourths	$\frac{6}{4}$	$1\frac{2}{4} =$	$4\overline{)\,6\,}$ $1\frac{2}{4}$ $4 \times 1\frac{2}{4} =$ $4 \times \frac{8}{4} =$ 6
d. $5 \div 2$	5 halves ÷ 2 = 5 halves	$\frac{5}{2}$	$2\frac{1}{2}$	$2\overline{)\,5\,}$ $2\frac{1}{2}$ $2 \times 2\frac{1}{2} =$ $4\frac{2}{2} =$ 5

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.

   $6 \div 8 = 6/8 = 3/4$
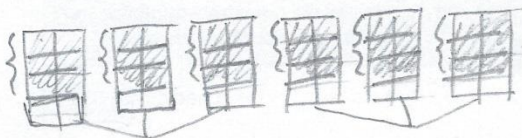
   b. If there were twice as many reams of paper and half as many teachers, how would the amount each teacher receives change? Explain how you know using pictures, words, or numbers.

   $12 \div 4 = 3$

   Twelve reams of paper for four teachers give three reams for teacher.

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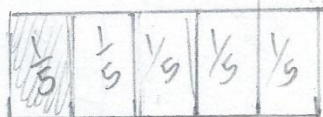
   $16 \div 5 = \frac{16}{5} = 3\frac{1}{5}$

   $5 \overline{\smash{)}16}$ → $3\frac{1}{5}$

   The caterer needs four boxes to hold 16 trays. Three full and one for a tray.

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

   The last box will be $4/5$ empty.

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

Name _____   Date _____

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

Division Expression	Unit Forms	Improper Fractions	Mixed Numbers	Standard Algorithm (Write your answer in whole numbers and fractional units. Then check.)
a. $4 \div 3$	12 thirds ÷ 3 = 4 thirds	$\frac{4}{3}$	$1\frac{1}{3}$	$3 \overline{)4}$ quotient $1\frac{1}{3}$, -3, 1 Check. $3 \times 1\frac{1}{3} = 1\frac{1}{3} + 1\frac{1}{3} + 1\frac{1}{3}$ $= 3 + \frac{3}{3}$ $= 3 + 1$ $= 4$
b. $7 \div 5$	$\frac{35}{}$ fifths ÷ 5 = 7 fifths	$\frac{7}{5}$	$1\frac{2}{5}$	$5\overline{)7}$ ... $1\frac{2}{5}$ $5 \times 1\frac{2}{5} =$ $5 \frac{10}{5} =$ 7
c. $7 \div 2$	$\frac{14}{}$ halves ÷ 2 = 7 halves	$\frac{7}{2}$	$3\frac{1}{2}$	$2\overline{)7}$ ... $3\frac{1}{2}$ $2 \times 3\frac{1}{2} =$ $6\frac{2}{2} =$ 7
d. $7 \div 4$	28 fourths ÷ 4 = 7 fourths	$\frac{7}{4}$	$1\frac{3}{4}$	$4\overline{)7}$ ... $1\frac{3}{4}$ $4 \times 1\frac{3}{4} =$ $4\frac{12}{4} =$ 7

2. A coffee shop uses 4 liters of milk every day.

   a. If there are 15 liters of milk in the refrigerator, after how many days will more milk need to be purchased? Explain how you know.

   $$15 \div 4 = {}^{15}/_4 = 3\,{}^3/_4$$

   $$4\overline{\smash{\big)}\,15} \quad \begin{array}{r} 3 \\ \underline{12} \\ 3 \end{array} \qquad \boxed{3\,{}^3/_4}$$

   The owner has to shop for milk after 3 days. It will not be enough for the next day.

   b. If only half as much milk is used each day, after how many days will more milk need to be purchased?

   $$15 \div 2 = {}^{15}/_2 = 7\,{}^1/_2$$

   $$2\overline{\smash{\big)}\,15} \quad \begin{array}{r} 7 \\ \underline{14} \\ 1 \end{array}$$

   The owner would have to buy milk after seven days. He will need another liter of milk for the next day.

3. Polly buys 14 cupcakes for a party. The bakery puts them into boxes that hold 4 cupcakes each.

   a. How many boxes will be needed for Polly to bring all the cupcakes to the party? Explain how you know.

   $$14 \div 4 = {}^{14}/_4 = 3\,{}^2/_4 = \boxed{3\,{}^1/_2}$$

   $$4\overline{\smash{\big)}\,14} \quad \begin{array}{r} 3 \\ \underline{12} \\ 2 \end{array} \quad 3\,{}^2/_4 = \boxed{3\,{}^1/_2}$$

   Polly will need four boxes. Polly needs three boxes for 12 cupcakes, and one more for 2 cupcakes.

   b. If the bakery completely fills as many boxes as possible, what fraction of the last box is empty? How many more cupcakes are needed to fill this box?

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

   The last box will be ½ empty.
   Two more cupcakes are needed to fill it.

EUREKA MATH™   Lesson 3:   Interpret a fraction as division.

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Name _____   Date _____

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 units = 1

1 unit = 1 ÷ 3

$= \frac{1}{3}$

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

$= \frac{3}{3}$

$= 1$

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

3 units = 1

1 unit = 2 ÷ 3 = $\frac{2}{3}$

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

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

7 units = 1

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

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

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

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

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

14 units = 1

1 unit = $\frac{14}{5}$

$2\frac{4}{5}$

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

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

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	$\begin{array}{r} 4\ \tfrac{1}{3} \\ 3\,\overline{)\,13\,} \\ \underline{-12} \\ 1 \end{array}$
b. $6 \div 7$	$\dfrac{6}{7}$	0 and 1	$\begin{array}{r} 0.\tfrac{6}{7} \\ 7\,\overline{)\,6\,} \\ \underline{-0} \\ 6 \end{array}$
c. $55 \div 10$	$\dfrac{55}{10}$	5 and 6	$\begin{array}{r} 5\ \tfrac{5}{10} \\ 10\,\overline{)\,55\,} \\ \underline{50} \\ 5 \end{array}$
d. $32 \div 40$	$\dfrac{32}{40}$	0 and 1	$\begin{array}{r} 0\ \tfrac{32}{40} \\ 40\,\overline{)\,32\,} \end{array}$

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

$4 — 5 packs   or 4/5

$$5\overline{)4.0} \quad 0.8$$
40
0

Greg paid $0.80 per 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 packs   or 2/10

$$10\overline{)2.0} \quad 0.2$$
20
0

Greg paid $0.20 per pack. Half as much is $2; twice as much is 10 packs.

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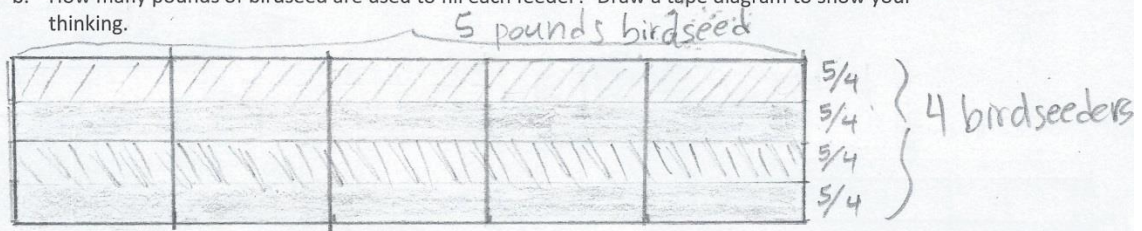   a. What fraction of the birdseed will be needed to fill each feeder?

5 lb — 4 birdseeders   5/4

$$4 \times 1\tfrac{1}{4}$$
$$4\overline{)5} \quad \tfrac{5}{4}$$
1

1¼ lb will be needed.

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

5 pounds birdseed

5/4
5/4 } 4 birdseeders
5/4
5/4

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

$$\frac{5}{4}+\frac{5}{4}+\frac{5}{4}=\frac{15}{4}=\boxed{3\tfrac{3}{4}\text{ lb}}=$$
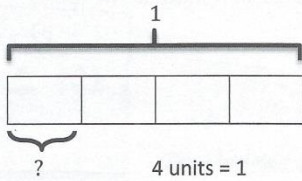
3 pounds and 12 ounces = 60 ounces

| 1 lb = 16 oz |
| ½ lb = 8 oz |
| ¼ lb = 4 oz |

60 ounces of birdseed are used

EUREKA MATH™   Lesson 4:   Use tape diagrams to model fractions as division.

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Name _____   Date _____

1. Draw a tape diagram to solve. Express your answer as a fraction. Show the addition sentence to support your answer. The first one is done for you.
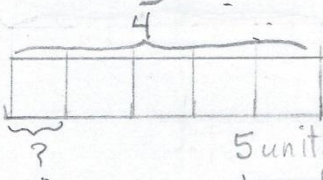
a. $1 \div 4 = \frac{1}{4}$

? ᴖ 4 units = 1

1 unit = 1 ÷ 4

$= \frac{1}{4}$

Check:

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

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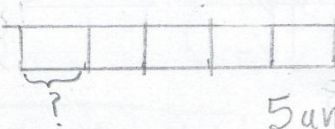
$= \frac{4}{4}$

$= 1$

b. $4 \div 5 = \frac{4}{5}$

5 units = 4

1 unit = 4 ÷ 5

$= 4/5$

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

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

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

c. $8 \div 5 = \frac{8}{5}$
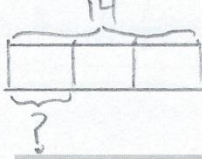
5 units = 8

1 unit = 8 ÷ 5

$= 8/4$

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

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

$5 + 3 = 8$

d. $14 \div 3 = \frac{14}{3}$

3 units = 14

1 unit = 14 ÷ 3

$= 14/3$

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

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

$12 + \frac{6}{3} = 14$

EUREKA MATH

Lesson 4:   Use tape diagrams to model fractions as division.

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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. $16 \div 5$	$\dfrac{16}{5}$	3 and 4	$\begin{array}{r} 3\ \frac{1}{5} \\ 5\,\overline{)\,16\,} \\ -15 \\ \hline 1 \end{array}$
b. $3 \div 4$	$\dfrac{3}{4}$	0 and 1	$4\,\overline{)\,3\,}\;\;0\ \tfrac{3}{4}$
c. $7 \div 2$	$\dfrac{7}{2}$	3 and 4	$\begin{array}{r} 3\tfrac{1}{2} \\ 2\,\overline{)\,7\,} \\ -6 \\ \hline 1 \end{array}$
d. $81 \div 90$	$\dfrac{81}{90}$ or $\tfrac{9}{10}$	0 and 1	$90\,\overline{)\,81\,}\;\;0\tfrac{81}{90}$

9/10

EUREKA MATH™ | Lesson 4:   Use tape diagrams to model fractions as division.

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3. Jackie cut a 2-yard spool into 5 equal lengths of ribbon.
    a. What is the length of each ribbon in yards? Draw a tape diagram to show your thinking.

$$\frac{2}{5}$$

$$5\overline{\smash{)}20} \quad \times 0.4$$
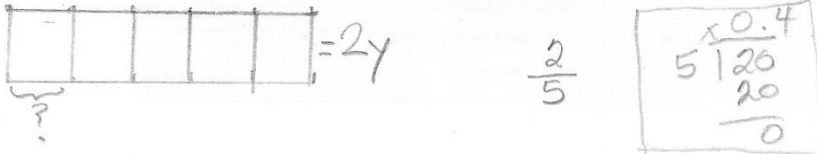
Each ribbon is $0.4y$

    b. What is the length of each ribbon in feet? Draw a tape diagram to show your thinking.

$$1y = 3ft$$

$$0.4 \times 3 = 1.2$$
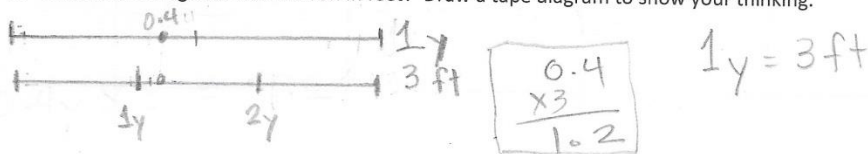
Each ribbon is 1.2 feet

4. Baa Baa, the black sheep, had 7 pounds of wool. If he separated the wool equally into 3 bags, how much wool would be in 2 bags?
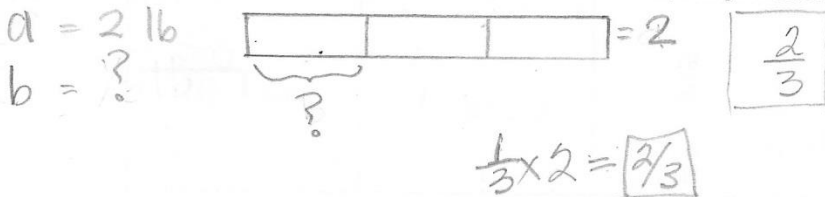
$$7 \div 3 = 2\frac{1}{3}$$

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

$$3\overline{\smash{)}7} \quad \times 2$$

There would be $4\frac{2}{3}$ pounds in 2 bags.

5. An adult sweater is made from 2 pounds of wool. This is 3 times as much wool as it takes to make a baby sweater. How much wool does it take to make a baby sweater? Use a tape diagram to solve.

$$a = 2\,lb$$
$$b = ?$$

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

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

It takes $\frac{2}{3}$ lb of wool to make a baby sweater.

Name _____   Date _____

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

Pillows   fabric $\frac{2}{5}$
5 — 2y

$$5\overline{)20}^{\,0.4}$$
$$\underline{20}$$
$$0$$

Each pillow uses 0.4 y 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?

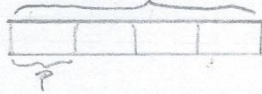Ice-cream sundaes $\frac{4}{6}$ or $\boxed{\frac{2}{3}}$
    4p   6

$$6\overline{)40}^{\,0.66}$$
$$\underline{36}$$
$$40$$
$$\underline{36}$$
$$4$$

$$3\overline{)20}^{\,0.66}$$
$$\underline{18}$$
$$20$$
$$\underline{18}$$
$$2$$

Each sundae uses ⅔ pints of ice cream, or
0.66 pints.

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.

bananas   sundaes $\frac{6}{4} = \frac{3}{2} = \boxed{1\frac{1}{2}}$
   6   4

$$4\overline{)6}^{\,1.5}$$
$$\underline{4}$$
$$20$$
$$\underline{20}$$
$$0$$

or $2\overline{)3}^{\,1.5}$
$$\underline{2}$$
$$10$$

Each sundae uses 1½ or 1.5 bananas

EUREKA
MATH™   Lesson 5:   Solve word problems involving the division of whole numbers with
                          answers in the form of fractions or whole numbers.

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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.

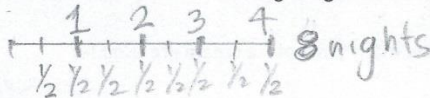   a. How many articles will he have to read per night?

   articles   nights $\frac{4}{8}$ or $\frac{1}{2}$ $8\overline{)40}$ $\underline{40}$ 0 0.5

   48

   Julian will read $\frac{1}{2}$ or 0.5 of an article each night

   b. What fraction of the reading assignment will he read each night?

   $\frac{1}{1}$ $\frac{2}{1}$ $\frac{3}{1}$ $\frac{4}{1}$ 8 nights
   ½ ½ ½ ½ ½ ½ ½

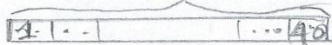 $\frac{1}{2} \div 4 = \frac{1}{2} \div \frac{4}{1} =$

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

   Each night he will read $\frac{1}{8}$ of the assignment

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

   students   pizzas $\frac{5}{40} = \boxed{\frac{1}{8}}$
   40   5

   Each student will receive $\frac{1}{8}$ 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.

   liter-bottles   glasses $\frac{4}{10} = \boxed{\frac{2}{5}}$
   4   10

   Each glass had $\frac{2}{5}$ of a liter

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

$$\frac{2}{5}$$

$$5\overline{)20}$$ with 0.4 above, 20 subtracted, remainder 0

Each glass had 0.4 liters

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

0.4 liters = 400 mililiters

1 L = 1000 mL

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.

days   miles
 3 ~ 14

$$\frac{14}{3}$$

$$3\overline{)14}$$ with 4 above, 12 subtracted, remainder 2

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

tape diagram with 3 sections = 14, ?
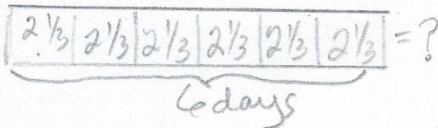
They travelled 4⅔ miles each day.

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?

days — miles
           per day
  6   2⅓

6 × 2⅓ = 12 ⁶⁄₃ = 12+2 = 14
        or
2⅓ + 2⅓ + 2⅓ + 2⅓ + 2⅓ + 2⅓ = 14

tape diagram: | 2⅓ | 2⅓ | 2⅓ | 2⅓ | 2⅓ | 2⅓ | = ?
                          6 days

They would travel 14 miles as well.

EUREKA MATH™

Lesson 5:   Solve word problems involving the division of whole numbers with answers in the form of fractions or whole numbers.

21

Name _____ Date _____

1. When someone donated 14 gallons of paint to Rosendale Elementary School, the fifth-grade decided to use it to paint murals. They split the gallons equally among the four classes.

   a. How much paint did each class have to paint their mural?

   gallons   classes
     14   4

   $\frac{14}{4}$

   $4\overline{)\begin{array}{c}3\\14\\12\\\hline 2\end{array}}$ $\boxed{3\frac{2}{4}}$

   Each class has $3\frac{2}{3}$ gallons of paint.

   b. How much paint will three classes use? Show your thinking using words, numbers, or pictures.

   classes   gallons
      3        $3\frac{2}{4}$

   | $3\frac{2}{4}$ | $3\frac{2}{4}$ | $3\frac{2}{4}$ | = ?

   $3 \times 3\frac{2}{4} = 9\frac{6}{4} =$
   $9 + 1\frac{2}{4} = 10\frac{2}{4}$
   $10\frac{2}{4}$ $\boxed{10\frac{1}{2}}$

   Three classes use $10\frac{1}{2}$ gallons.

   c. If 4 students share a 30 square foot wall equally, how many square feet of the wall will be painted by each student?

   students   square ft
      4   30

   $\frac{30}{4}$

   $4\overline{)\begin{array}{c}7.5\\30\\28\\\hline 20\\20\\\hline 0\end{array}}$ $\boxed{7.5}$

   Each student will paint 7.5 square feet.

   d. What fraction of the wall will each student paint?

   $7.5 = \boxed{7\frac{1}{5}}$

Lesson 5:   Solve word problems involving the division of whole numbers with answers in the form of fractions or whole numbers.

2. Craig bought a 3-foot long baguette, and then made 4 equally sized sandwiches with it.

   a. What portion of the baguette was used for each sandwich? Draw a visual model to help you solve this problem.

   baguette   sandwiches $\frac{3}{4}$ ▯▯▯▯ = 3 ft
      3'   4   ?
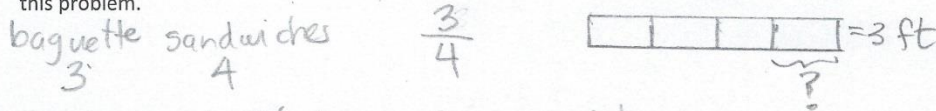
   Craig used 3/4 for each sandwich

   b. How long, in feet, is one of Craig's sandwiches?

   $\frac{3}{4}$ ft = .75 ft

   $$\begin{array}{r} 0.75 \\ 4\overline{)30} \\ 28 \\ \hline 20 \\ 20 \\ \hline 0 \end{array}$$

   c. How many inches long is one of Craig's sandwiches?

   .75 ft × 12 inches

   Each sandwich is 9 inches long.

   $$\boxed{1 ft = 12 in}$$

   $$\begin{array}{r} .75 \\ \times 12 \\ \hline 150 \\ 75 \\ \hline 9.00 \end{array}$$

3. Scott has 6 days to save enough money for a $45 concert ticket. If he saves the same amount each day, what is the minimum amount he must save each day in order to reach his goal? Express your answer in dollars.
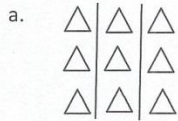
   days $ $\frac{45}{6}$ $\begin{array}{r} 7.5 \\ 6\overline{)45} \\ 42 \\ \hline 30 \\ 30 \end{array}$
     6   45

   Scott needs to save $7.50 a day.

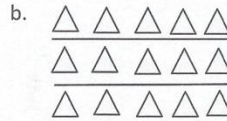Name _____   Date _____

1. Find the value of each of the following.
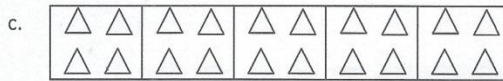
a.

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

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

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

b.
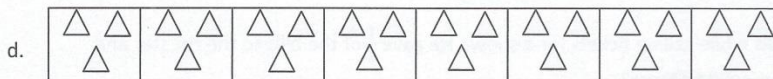

$\frac{1}{3}$ of 15 = 5

$\frac{2}{3}$ 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
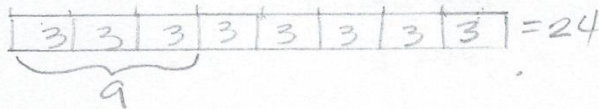
$\frac{6}{8}$ of 24 = 18

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

EUREKA MATH™ | Lesson 6:   Relate fractions as division to fraction of a set.

25

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

$$\frac{4}{7} \times 14 = \frac{4}{7} \times \frac{14}{1} = \frac{56}{7} = 8$$

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

$\frac{1}{8}$ of 24 is 3. So 3/8 of 24 is 9

| 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | =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?

$$\frac{3}{8} \times 32 = \frac{3}{8} \times \frac{32}{1} = \frac{96}{8} = 12$$

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?

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

$$18 - 3 = 15$$

Jack Kept $150

EUREKA MATH | Lesson 6:   Relate fractions as division to fraction of a set.

26

Name _____   Date _____

1. Find the value of each of the following.

   a.

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

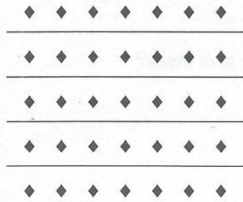 $\frac{2}{3}$ of 12 = 8

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

   b.

   $\frac{1}{4}$ of 20 = 5 $\frac{3}{4}$ of 20 = 15

   $\frac{2}{4}$ of 20 = 10 $\frac{4}{4}$ of 20 = 20

   c.

   $\frac{1}{5}$ of 35 = 7 $\frac{3}{5}$ of 35 = 21 $\frac{5}{5}$ of 35 = 35

   $\frac{2}{5}$ of 35 = 14 $\frac{4}{5}$ of 35 = 28 $\frac{6}{5}$ of 35 = 42

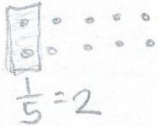EUREKA MATH™   Lesson 6:   Relate fractions as division to fraction of a set.

27

2. Find $\frac{2}{3}$ of 18. Draw a set and shade to show your thinking.

$$\frac{2}{3} \times 18 = \frac{2}{3} \times \frac{18}{1} = \frac{36}{3} = \boxed{12}$$

3. How does knowing $\frac{1}{5}$ of 10 help you find $\frac{3}{5}$ of 10? Draw a picture to explain your thinking.

$\frac{1}{5}$ of 10 is 2. So 3/5 of 10 is 2×3 = 6.

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

4. Sara just turned 18 years old. She spent $\frac{4}{9}$ of her life living in Rochester, NY. How many years did Sara live in Rochester?

$$18 \times \frac{4}{9} = \frac{18}{1} \times \frac{4}{9} = \frac{72}{9} = 8$$

Sara lived 8 years in Rochester

5. A farmer collected 12 dozen eggs from her chickens. She sold $\frac{5}{6}$ of the eggs at the farmers' market, and gave the rest to friends and neighbors.

a. How many dozens did the farmer give away? How many eggs did she give away?

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

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

She gave away 2 dozens.

b. She sold each dozen for $4.50. How much did she earn from the eggs she sold?

dozens $
10   4.50

$4.50
×10
_____
45.00

$\frac{5}{6} \times 12 = \frac{60}{6} = \boxed{10}$

She earned $45.

Name _____   Date _____

1. Solve using a tape diagram.

a. $\frac{1}{3}$ of 18 $\frac{18}{3} = \boxed{6}$

= 18

$\frac{1}{3}$

b. $\frac{1}{3}$ of 36 $\frac{36}{3} = \boxed{11}$

= 36

$\frac{1}{3}$

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

24

$\frac{3}{4}$

$\frac{24}{1} \times \frac{3}{4} =$

$\frac{72}{4} = \boxed{18}$

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

24

$\frac{3}{8}$

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

$\frac{72}{8} = \boxed{9}$

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

25

$\frac{4}{5}$

$\frac{4}{5} \times \frac{25}{1} =$

$\frac{100}{5} = \boxed{20}$

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

140

$\frac{1}{7}$

$\frac{1}{7} \times \frac{140}{1} =$

$\frac{140}{7} = \boxed{20}$

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

9

$\frac{1}{4}$

$\frac{1}{4} \times \frac{9}{1} =$

$\frac{9}{4} = \boxed{2\frac{1}{4}}$

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

12

$\frac{2}{5}$

$\frac{2}{5} \times \frac{12}{1} =$

$\frac{24}{5} = \boxed{4\frac{4}{5}}$

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

10

| 5 | 5 | 5 |

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

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

$10 \times \frac{3}{2} = \frac{30}{2}$

$= \boxed{15}$

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

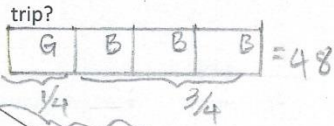| 8 | 8 | 8 | 8 |

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

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

$24 \times \frac{4}{3} = \frac{96}{3}$

$= \boxed{32}$

EUREKA MATH™   Lesson 7:   Multiply any whole number by a fraction using tape diagrams.

29
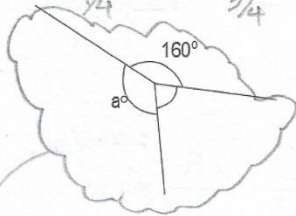
2. Solve using tape diagrams.

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

   $\frac{1}{4} \times 48 = \frac{1}{4} \times \frac{48}{1} =$

   $\frac{48}{4} = \boxed{12}$ $12 \times 3 = \boxed{36}$

   36 boys are going to 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.
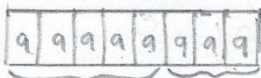
   $160 \times \frac{3}{8} = \frac{480}{8} = \boxed{60}$

   $160 + 60 = \boxed{220}$
   $360 - 220 = \boxed{140}$

   Angle a is 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?

   $45 \div \frac{5}{8} = 45 \times \frac{8}{5} = \frac{360}{5} = \boxed{72}$

   $45 = \frac{5}{8}$ save

   Abbie had $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?

   frosting   brownies   = 16 ounces
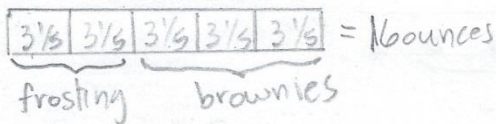
   $16 \times \frac{1}{5} = \frac{16}{5} = \boxed{3\frac{1}{5}}$

   Mrs Harrison use $3\frac{1}{5}$ more chocolate for the brownies

Name _____   Date _____

1. Solve using a tape diagram.

a. $\frac{1}{4}$ of 24 $\frac{1}{4} \times 24 = \frac{24}{4} = \boxed{6}$

6

b. $\frac{1}{4}$ of 48 $\frac{1}{4} \times 48 = \frac{48}{4} = \boxed{12}$

12

c. $\frac{2}{3} \times 18$ $\frac{2}{3} \times \frac{18}{1} = \frac{36}{3} = \boxed{12}$

12

d. $\frac{2}{6} \times 18$ $\frac{2}{6} \times \frac{18}{1} = \frac{36}{6} = \boxed{6}$

6

e. $\frac{3}{7} \times 49$ $\frac{3}{7} \times \frac{49}{1} = \frac{147}{7} = \boxed{21}$

7 7 7
21

f. $\frac{3}{10} \times 120$ $\frac{3}{10} \times \frac{120}{1} = \frac{360}{10} = \boxed{36}$

12 12 12
36

g. $\frac{1}{3} \times 31$ $\frac{1}{3} \times \frac{31}{1} = \frac{31}{3} = \boxed{10\frac{1}{3}}$

$10\frac{1}{3}$

h. $\frac{2}{5} \times 20$ $\frac{2}{5} \times \frac{20}{1} = \frac{40}{5} = \boxed{8}$

4 4
8

i. $\frac{1}{4} \times 25$ $\frac{1}{4} \times \frac{25}{1} = \frac{25}{4} = \boxed{6\frac{1}{4}}$

$6\frac{1}{4}$

j. $\frac{3}{4} \times 25$ $\frac{3}{4} \times \frac{25}{1} = \frac{75}{4} = \boxed{18\frac{3}{4}}$

$6\frac{1}{4}$ $6\frac{1}{4}$ $6\frac{1}{4}$
$18\frac{3}{4}$

k. $\frac{3}{4}$ of a number is 27. What's the number?

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

$\frac{108}{3} = \boxed{36}$

l. $\frac{2}{5}$ of a number is 14. What's the number?

7 7 7 7 7 = 35
$\frac{2}{5} = 14$ $14 \div \frac{2}{5} = 14 \times \frac{5}{2}$

$\frac{70}{2} = \boxed{35}$

EUREKA MATH

Lesson 7:   Multiply any whole number by a fraction using tape diagrams.

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2. Solve using tape diagrams.

a. A skating rink sold 66 tickets. Of these, $\frac{2}{3}$ were children's tickets, and the rest were adult tickets. What total number of adult tickets were sold?
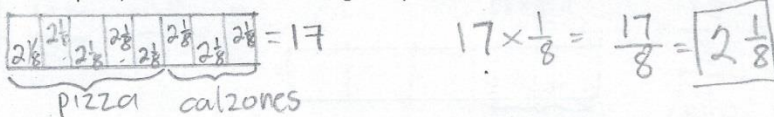
$$66 \div \frac{1}{3} = \frac{66}{3} = \boxed{22}$$

| 22 | 22 | 22 | = 66 tickets

$\frac{2}{3}$ children
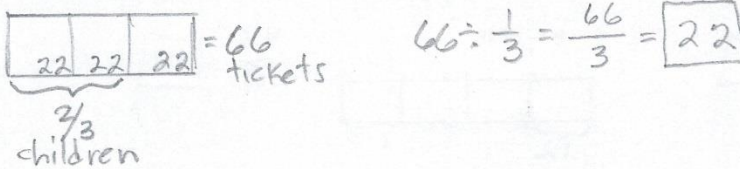
22 adult tickets were sold

b. A straight angle is split into two smaller angles as shown. The smaller angle's measure is $\frac{1}{6}$ that of a straight angle. What is the value of angle a?

= 90

smaller angle

$$90 \times \frac{1}{6} = \frac{90}{6} = \boxed{15}$$

straight angle = 180°
right angle = 90°

$$180 - 15 = \boxed{165°}$$
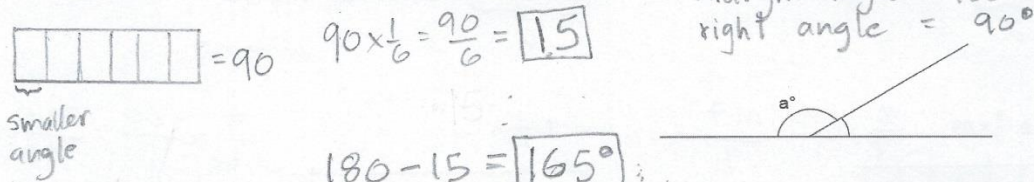
The value of a is 165°

c. Annabel and Eric made 17 ounces of pizza dough. They used $\frac{5}{8}$ of the dough to make a pizza and used the rest to make calzones. What is the difference between the amount of dough they used to make pizza, and the amount of dough they used to make calzones?

| $2\frac{1}{8}$ | $2\frac{1}{8}$ | $2\frac{1}{8}$ | $2\frac{1}{8}$ | $2\frac{1}{8}$ | $2\frac{1}{8}$ | $2\frac{1}{8}$ | $2\frac{1}{8}$ | = 17

pizza   calzones

$$17 \times \frac{1}{8} = \frac{17}{8} = \boxed{2\frac{1}{8}}$$

d. The New York Rangers hockey team won $\frac{3}{4}$ of their games last season. If they lost 21 games, how many games did they play in the entire season?

= ?

$\frac{3}{4}$ won   21 games lost

$$21 \div \frac{1}{4} = 21 \times \frac{4}{1} = \boxed{84}$$
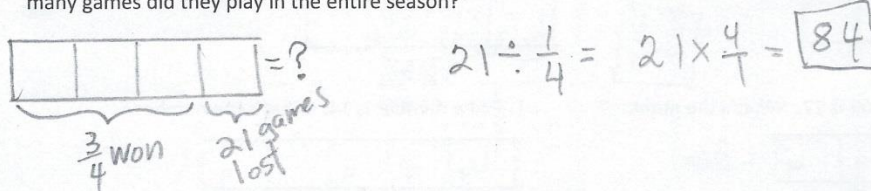
The New York Rangers played 84 games

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.

    Laura figures that is easy to calculate by using $\frac{4}{3}$, which is one third of 4, twice. So 4/3 + 4/3 or 2×4/3 seems adequate. Sean goes for using four groups of 2/3, which is one fourth. This seems easier.

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

3. Solve and model each problem as a fraction of a set and as repeated addition.
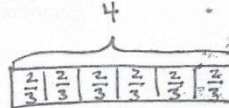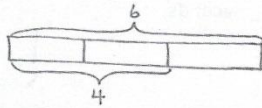
    Example: $\frac{2}{3} \times 6 = 2 \times \frac{6}{3} = 2 \times 2 = 4$. $6 \times \frac{2}{3} = \frac{6 \times 2}{3} = 4$
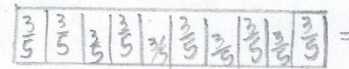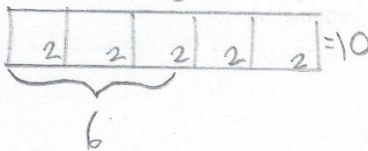
    a. $\frac{1}{2} \times 8 = \frac{8}{2} = 4$ $8 \times \frac{1}{2} = \frac{8}{2} = 4$
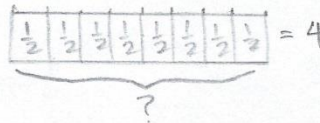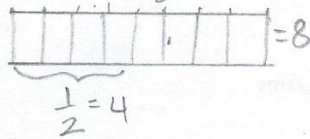
    b. $\frac{3}{5} \times 10 = \frac{30}{5} = 6$ $10 \times \frac{3}{5} \quad \frac{30}{5} = 6$

4. Solve each problem in two different ways as modeled in the example.

   Example: $6 \times \frac{2}{3} = \frac{6 \times 2}{3} = \frac{3 \times 2 \times 2}{3} = \frac{3 \times 4}{3} = 4$ $6 \times \frac{2}{3} = \frac{\cancel{6}^{2} \times 2}{\cancel{3}_{1}} = 4$

   a. $14 \times \frac{3}{7} = \frac{14 \times 3}{7} = \frac{7 \times 2 \times 3}{7} = \frac{7 \times 6}{7} = 6$ $14 \times \frac{3}{7}$ $\frac{\cancel{14}^{2} \times 3}{\cancel{7}_{1}} = 6$

   b. $\frac{3}{4} \times 36 = \frac{3 \times 36}{4} = \frac{3 \times 4 \times 9}{4} = \frac{4 \times 27}{4} = 27$ $\frac{3}{4} \times 36$ $\frac{3 \times \cancel{36}^{9}}{\cancel{4}_{1}} = 27$

   c. $30 \times \frac{13}{10} = \frac{30 \times 13}{10} = \frac{3 \times 10 \times 13}{10} = \frac{10 \times 39}{10} = 39$ $30 \times \frac{13}{10}$ $\frac{\cancel{30}^{3} \times 13}{\cancel{10}} = 39$

   d. $\frac{9}{8} \times 32 = \frac{9 \times 32}{8} = \frac{9 \times 8 \times 4}{8} = \frac{8 \times 36}{8} = 36$ $\frac{9}{8} \times 32$ $\frac{9 \times \cancel{32}^{4}}{\cancel{8}_{1}} = 36$

5. Solve each problem any way you choose.

   a. $\frac{1}{2} \times 60$ $\frac{60}{2} = 30$ $\frac{1}{2}$ minute = ___30___ seconds

   b. $\frac{3}{4} \times 60$ $\frac{180}{4} = 45$ $\frac{3}{4}$ hour = ___45___ minutes

   c. $\frac{3}{10} \times 1000$ $\frac{3000}{10} = 300$ $\frac{3}{10}$ kilogram = ___300___ grams

   d. $\frac{4}{5} \times 100$ $\frac{400}{5} = 80$ $\frac{4}{5}$ meter = ___80___ centimeters

EUREKA MATH | Lesson 8:   Relate a fraction of a set to the repeated addition interpretation of fraction multiplication.

Name _____   Date _____

1. Rewrite the following expressions 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. $\frac{5}{3} + \frac{5}{3} + \frac{5}{3}$ $\frac{5 \times 3}{3} = \frac{15}{3}$ b. $\frac{13}{5} + \frac{13}{5} = \frac{2 \times 13}{5} = \frac{26}{5}$ c. $\frac{9}{4} + \frac{9}{4} + \frac{9}{4}$ $\frac{9 \times 3}{4} = \frac{27}{4}$

2. Solve each problem in two different ways as modeled in the example.

    Example: $\frac{2}{3} \times 6 = \frac{2 \times 6}{3} = \frac{12}{3} = 4$ $\frac{2}{3} \times 6 = \frac{2 \times \overset{2}{\cancel{6}}}{\cancel{3}_1} = 4$

    a. $\frac{3}{4} \times 16$ $\frac{3 \times 16}{4} = \frac{48}{4} = 12$ $\frac{3}{4} \times 16$ $\frac{3 \times \overset{4}{\cancel{16}}}{\cancel{4}_1} = 12$

    b. $\frac{4}{3} \times 12$ $\frac{4 \times 12}{3} = \frac{48}{3} = 16$ $\frac{4}{3} \times 12$ $\frac{4 \times \overset{4}{\cancel{12}}}{\cancel{3}_1} = 16$

    c. $40 \times \frac{11}{10}$ $\frac{40 \times 11}{10} = \frac{440}{10} = 44$ $40 \times \frac{11}{10}$ $\frac{\overset{4}{\cancel{40}} \times 11}{\cancel{10}_1} = 44$

    d. $\frac{7}{6} \times 36$ $\frac{7 \times 36}{6} = \frac{252}{6} = 42$ $\frac{7}{6} \times 36$ $\frac{7 \times \overset{6}{\cancel{36}}}{\cancel{6}_1} = 42$

    e. $24 \times \frac{5}{8}$ $\frac{24 \times 5}{8} = \frac{120}{8} = 15$ $24 \times \frac{5}{8}$ $\frac{\overset{3}{\cancel{24}} \times 5}{\cancel{8}_1} = 15$

f. $18 \times \frac{5}{12}$ $\dfrac{\overset{3}{\cancel{18} \times 5}}{\underset{2}{\cancel{12}}} = \dfrac{15}{2}$ $18 \times \frac{5}{12}$ $\dfrac{\overset{3}{\cancel{18} \times 5}}{\underset{2}{\cancel{12}}}$ $\dfrac{15}{2}$

g. $\frac{10}{9} \times 21$ $\dfrac{10 \times \overset{7}{\cancel{21}}}{\underset{3}{\cancel{9}}} = \dfrac{70}{3}$ $\frac{10}{9} \times 21$ $\dfrac{\overset{7}{\cancel{21}} \times 10}{\underset{3}{\cancel{9}}} = \dfrac{70}{3}$

3.   Solve each problem any way you choose.

a. $\frac{1}{3} \times 60$ $\dfrac{60}{3} = 20$ $\frac{1}{3}$ minute = ____20____ seconds

b. $\frac{4}{5} \times 60$ $\dfrac{240}{5} = 48$ $\frac{4}{5}$ hour = ____48____ minutes
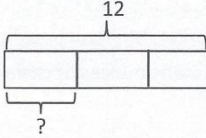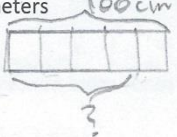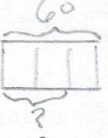
c. $\frac{7}{10} \times 1000$ $\dfrac{1000}{10} = 700$ $\frac{7}{10}$ kilogram = ____700____ grams

d. $\frac{3}{5} \times 100$ $\dfrac{300}{5} = 60$ $\frac{3}{5}$ meter = ____60____ 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 = $\frac{1}{2}$ × 1 yard

   $= \frac{1}{2}$ × 3 feet

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

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

b. $\frac{1}{3}$ foot = _____ 4 _____ inches

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

   $= \frac{1}{3}$ × 12 inches

   $= 4$

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

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

   $= \frac{5}{6}$ × 12 months

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

   $= 10$ months

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

   $\frac{4}{5}$ meters = $\frac{4}{5}$ × 1

   $= \frac{4}{5}$ × 100 cm

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

   $= 80$ cm

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

   $\frac{2}{3}$ hour = $\frac{2}{3}$ × 1 h

   $= \frac{2}{3}$ × 60 min

   $= \frac{120}{3}$

   $= 40$ min

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

   $\frac{3}{4}$ yards = $\frac{3}{4}$ × 1 y

   $= \frac{3}{4}$ y × 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 × 12 in $\frac{1}{4} \times 12 = \frac{12}{4} = 3$
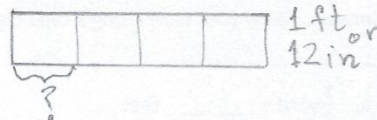
The hamster is 3 inches long

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 × 16 oz $\frac{7}{8} \times 16 = \frac{112}{8} = 14$

Mr Paul bought 14 oz of cashews

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

$\frac{3}{4}$ lb × 16 oz $\frac{3}{4} \times 16 = \frac{48}{4} = 12$

Mr. Paul bought 12 oz of walnuts

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

14 oz cashews $\begin{array}{r} 14 \\ -12 \\ \hline 2 \end{array}$
12 oz walnuts

He bought 2 more ounces of cashews

    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?

$1\frac{1}{2}$ lb × 16 oz = $\frac{3}{2} \times 16 = \frac{48}{2} = 24$ $\begin{array}{r} 26 \\ -24 \\ \hline 2 \end{array}$

Mr. Paul bought 2 ounces more

4. A jewelry maker purchased 20 inches of gold chain. She used $\frac{3}{8}$ of the chain for a bracelet. How many inches of gold chain did she have left?
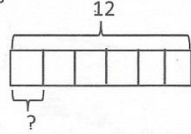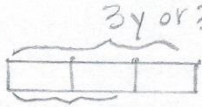
20 inches × $\frac{5}{8}$ = $\frac{100}{8}$ = $12\frac{4}{8}$ = $12\frac{1}{2}$

The jewelry uses 12 ½ inches

EUREKA MATH™   Lesson 9:   Find a fraction of measurement, and solve word problems.

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Name _____   Date _____

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

a. $\frac{1}{4}$ yard = ___9___ inches	b. $\frac{1}{6}$ foot = ___2___ inches
$\frac{1}{4}$ yard = $\frac{1}{4}$ × 1 yard $= \frac{1}{4}$ × 36 inches $= \frac{36}{4}$ inches = 9 inches	$\frac{1}{6}$ foot = $\frac{1}{6}$ × 1 foot $= \frac{1}{6}$ × 12 inches = 2
c. $\frac{3}{4}$ year = ___9___ months	d. $\frac{3}{5}$ meter = ___60___ centimeters
$\frac{3}{4}$ year × 1 year $\frac{3}{4}$ year × 12 months $\frac{3}{4}$ × 12 = $\frac{36}{4}$ = 9	$\frac{3}{5}$ meter × 1 meter $\frac{3}{5}$ m × 100 cm $\frac{3}{5}$ × 100 = $\frac{300}{5}$ = 60
e. $\frac{5}{12}$ hour = ___25___ minutes	f. $\frac{2}{3}$ yard = _____ inches
$\frac{5}{12}$ hour × 1 hour $\frac{5}{12}$ hour × 60 min $\frac{5}{12}$ × 60 = $\frac{300}{12}$ = 25	$\frac{2}{3}$ yards × 1 y $\frac{2}{3}$ y × 36 $\frac{2}{3}$ × 36 = $\frac{72}{3}$ = 24 3 y or 36 inches

2. Michelle measured the length of her forearm. It was $\frac{3}{4}$ of a foot. How long is her forearm in inches?

$\frac{3}{4}$ × 12 inches $\frac{3}{4}$ × 12 = $\frac{36}{4}$ = 9 in

Her arm is 9 inches long

3. At the market, Ms. Winn bought $\frac{3}{4}$ lb of grapes and $\frac{5}{8}$ lb of cherries.

   a. How many ounces of grapes did Ms. Winn buy?

$$\frac{3}{4} \times 16 = \frac{48}{4} = \boxed{12}$$

Ms Winn bought 12 ounces of grapes

   b. How many ounces of cherries did Ms. Winn buy?

$$\frac{5}{8} \times 16 = \frac{80}{8} = \boxed{10}$$

Ms. Winn bought 10 ounces of grapes

   c. How many more ounces of grapes than cherries did Ms. Winn buy?

grapes 12 oz
cherries 10 oz

$$\boxed{\begin{array}{r} 12 \\ -10 \\ \hline 2 \end{array}}$$

She bought 2 ounces more of grapes

   d. If Mr. Phillips bought $1\frac{3}{4}$ pounds of raspberries, who bought more fruit, Ms. Winn or Mr. Phillips? How many ounces more?

$$1\frac{3}{4} \times 16 \text{ oz} = \frac{7}{4} \times 16 = \frac{112}{4} = \boxed{28}$$

$$\begin{array}{r} 28 \\ -22 \\ \hline 6 \end{array}$$

$$\boxed{\begin{array}{r} 12 \\ +10 \\ \hline 22 \end{array}}$$

Mr Phillips bought 6oz more

4. A gardener has 10 pounds of soil. He used $\frac{5}{8}$ of the soil for his garden. How many pounds of soil did he use in the garden? How many pounds did he have left?

$$\frac{3}{8} \times 10 = \frac{30}{8} = 3\frac{6}{8} = \boxed{3\frac{3}{4}}$$
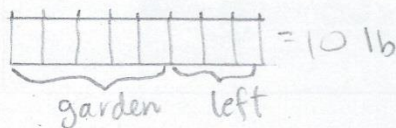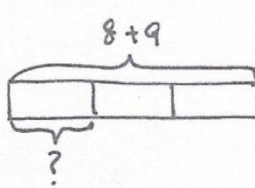
$$\frac{5}{8} \times 10 = \frac{50}{8} \quad 6\frac{2}{8} = \boxed{6\frac{1}{4}}$$

garden   left   = 10 lb

He used 6¼ in the garden, and has 3¾ left.
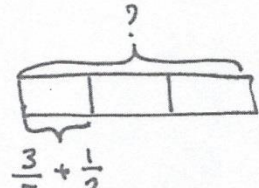
EUREKA MATH | Lesson 9:   Find a fraction of measurement, and solve word problems.

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Name _____   Date _____

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

$8 + 9$

$\frac{1}{3} \times 17 = \frac{17}{3}$

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

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

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

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

$\frac{11}{10} \times 3 = \frac{33}{10} =$

$3\frac{3}{10}$

2. Write an expression to match, then evaluate.

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

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

$= \frac{36}{6}$

$= 6$

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 $\frac{2}{6}$.

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

$= 3 \times \frac{13}{12} = \frac{39}{12} = 3\frac{3}{12}$

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

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

$\frac{2}{5} \times \left(\frac{5}{6} \times 42\right) = \frac{2}{5} \times \frac{210}{6} =$

$\frac{2}{5} \times 35 = \frac{70}{5} = 14$

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

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

$8 \times 3\frac{1}{3} = 8 \times \frac{10}{3} = \frac{80}{3}$

$= 26\frac{2}{3}$

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

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

$4 \times \frac{8}{3} = \frac{32}{3} = 10\frac{2}{3}$

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

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

$\frac{4}{5} \times 7 = \frac{28}{5} = 3\frac{3}{5}$

$7 \times \frac{4}{5} = \frac{28}{5} = 3\frac{3}{5}$

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

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

$4 \times 2 + 4 = 10$
$10 > 3$

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

$\frac{2}{5} > \frac{2}{7}$ so the final number will be greater

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

$3 \times 4\frac{3}{12}$ $9 + \frac{15}{12}$

Here 3×3 is 9, then added to 15/12. But $3 \times (3 + 15/12)$ is $3 \times 4\frac{3}{12}$ which is more : $12\frac{9}{12}$ or $12\frac{3}{4}$

EUREKA MATH   Lesson 10:   Compare and evaluate expressions with parentheses.

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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.

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

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

3
2
1   ¼
1   ½
1   ¾
    ½
2
1
3   ¾
    ¼
‾‾‾‾
14   3

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

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

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.

J   F   M   A   May   Jun   Jul   Aug   Sep   Oct
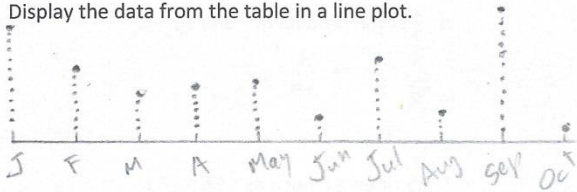
e. How many gallons of milk did Collette buy from January to October? $3 + 2 + 1 + 1 + 1 + 2 + 1 + 3 = 14$

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

She bought 17 gallons

EUREKA MATH™   Lesson 10:   Compare and evaluate expressions with parentheses.

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Name _____   Date _____

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

17+4

$\frac{1}{4} \times (17+4)$

$\frac{1}{4} \times 21 = \frac{21}{4}$

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

$\frac{1}{4} \times (17+4)$

?

$2 \times (4/7 + 8/3)$

$2 \times (\frac{12}{21} + \frac{56}{21})$

$2 \times \frac{68}{21} = \frac{136}{21} =$

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

$2(4/7 + 8/3)$

$6\frac{10}{21}$

2. Circle the expression(s) that give the same product as $6 \times \frac{3}{8}$. Explain how you know.

$8 \div (3 \times 6)$ $3 \div 8 \times 6$ $(6 \times 3) \div 8$ $(8 \div 6) \times 3$ $6 \times \frac{8}{3}$ $\boxed{\frac{3}{8} \times 6}$

$6 \times \frac{3}{8} = \frac{18}{8} = 2\frac{2}{8} = 2\frac{1}{4}$

$\frac{3}{8} \times 6 = \frac{18}{8} = 2\frac{2}{8} = 2\frac{1}{4}$

3. Write an expression to match, and then evaluate.

   a. $\frac{1}{8}$ the sum of 23 and 17.

   $\frac{1}{8} \times (23+17)$

   b. Subtract 4 from $\frac{1}{6}$ of 42.

   $(\frac{1}{6} \times 42) - 4$

   c. 7 times as much as the sum of $\frac{1}{3}$ and $\frac{4}{5}$.

   $7 \times (\frac{1}{3} + \frac{4}{5})$

   d. $\frac{2}{3}$ of the product of $\frac{3}{8}$ and 16.

   $\frac{2}{3} \times (\frac{3}{8} \times 16)$

   e. 7 copies of the sum of 8 fifths and 4.

   $7 \times (\frac{8}{5} + 4)$

   f. 15 times as much as 1 fifth of 12.

   $15 \times (\frac{1}{5} \times 12)$

EUREKA MATH™   Lesson 10:   Compare and evaluate expressions with parentheses.

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

a. $\frac{2}{3} \times (9 + 12)$ ◯ $15 \times \frac{2}{3}$ $9+12 = 21 ; 21 > 15$

b. $\left(3 \times \frac{5}{4}\right) \times \frac{3}{5}$ ◯ $\left(3 \times \frac{5}{4}\right) \times \frac{3}{8}$ $\frac{3}{5} > \frac{3}{8} ;$ the other factor, $(3 \times 5/4),$ is the same.

c. $6 \times \left(2 + \frac{32}{16}\right)$ ◯ $(6 \times 2) + \frac{32}{16}$ $\frac{32}{16}$ is 2, so $2+2=4.$ Then the 6×4 is greater

5. Fantine bought flour for her bakery each month and recorded the amount in the table to the right. For (a–c), write an expression that records the calculation described. Then, solve to find the missing data in the table.

Month	Amount (in pounds)
January	3
February	2
March	$1\frac{1}{4}$
April	$1\frac{3}{4}$
May	$\frac{9}{8}$
June	$3\frac{1}{4}$
July	$1\frac{1}{4}$
August	$2\frac{1}{4}$
September	$\frac{11}{4}$
October	$\frac{3}{4}$

a. She bought $\frac{3}{4}$ of January's total in August.

$3 \times 3/4 = 9/4 = 2\frac{1}{4}$

b. She bought $\frac{7}{8}$ as much in April as she did in October and July combined.

$\frac{7}{8} \times (1\frac{1}{4} + 3/4) = \frac{7}{8} \times 2$

$= \frac{14}{8} = 1\frac{6}{8}$

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

EUREKA
MATH™   Lesson 10:   Compare and evaluate expressions with parentheses.

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c. In June, she bought $\frac{1}{8}$ pound less than three times as much as she bought in May.

$$\left(3 \times \frac{9}{8}\right) - \frac{1}{8} = \frac{27}{8} - \frac{1}{8} = \frac{26}{8} = 3\frac{2}{8} = \boxed{3\frac{1}{4}}$$

d. Display the data from the table in a line plot.
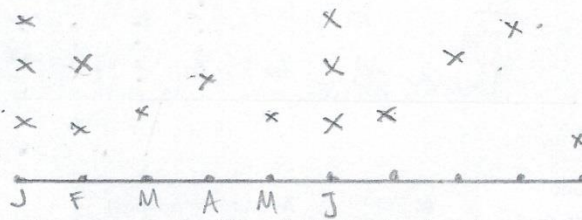
e. How many pounds of flour did Fantine buy from January to October?

$3 ; 2 ; 1\frac{1}{4} ; 1\frac{3}{4} ; \frac{9}{8} ; 3\frac{1}{4} ; 1\frac{1}{4} ; 2\frac{1}{4} ; \frac{4}{4} ; \frac{3}{4}$

$3 ; 2 ; 1\frac{1}{4} ; 1\frac{3}{4} ; 1\frac{1}{8} ; 3\frac{1}{4} ; 1\frac{1}{4} ; 2\frac{1}{4} ; 2\frac{3}{4} ; \frac{3}{4}$

$16 + \frac{1}{4} + \frac{3}{4} + \frac{1}{8} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{3}{4} + \frac{3}{4} =$

$16 + \frac{13}{4} + \frac{1}{8} =$

$16 + 2\frac{3}{4} + \frac{1}{8} =$

$18 + \frac{3}{4} + \frac{1}{8} = 18 + \frac{6}{8} + \frac{1}{8} =$

$18 \frac{7}{8}$

EUREKA MATH™   Lesson 10:   Compare and evaluate expressions with parentheses.

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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?

cereal 16oz
box

Courtney ate ¼   Kim ate $\frac{3}{8}$ left
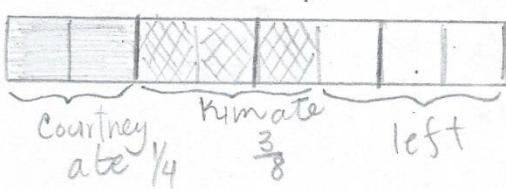
$\frac{3}{8} + \frac{1}{4} = \frac{3}{8} + \frac{2}{8} = \frac{5}{8}$

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

$\frac{3}{8}$ of the box is left

$\frac{3}{8} \times 16oz = \frac{48}{8} = 6\ oz$

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?

2 2 2 = 20 pints

$\frac{2}{5}$ $\frac{3}{10}$? left

$\frac{2}{5}$ or $\frac{4}{10}$
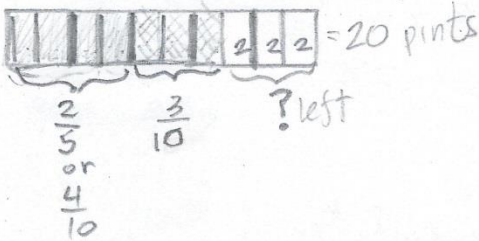
$2/5 + 3/10 = 4/10 + 3/10 = 7/10$

$1 - 7/10 = 10/10 - 7/10 = 3/10$

$3/10 \times 20 = \frac{60}{10} = 6\ pints$

$14 - 6 = \boxed{8}$

Mathilde will need to buy 8 pints

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 3/4 × 48   1/4×48   48/4=12   40
Jill   2/3 × 48   1/3×48   48/3=16   +16
Bill   1/6 × 48   5/6×48   240/6=40   12
                                                68

They spilled 68 ounces altogether

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?

$\frac{1}{9}×27 = \frac{27}{9} = 3$ 27-3=24

5×12=60

60÷24 = $\frac{60÷12}{24÷12} = \frac{5}{2} = 2\frac{1}{2}$

Each student will get 2½ cookies

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

84
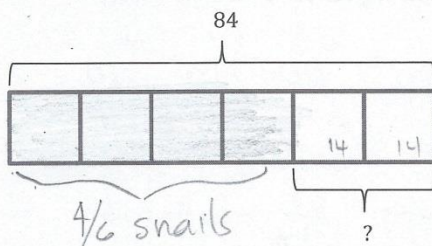
4/6 × 84 = $\frac{336}{6}$ = 56

84 - 56 = 28

4/6 snails   ?

At the pet store, a customer bought 4/6 of their 84 snails. How many snails do they have left?

Name _____   Date _____

1. Jenny's mom says she has an hour before it's bedtime. Jenny spends $\frac{1}{3}$ of the hour texting a friend and $\frac{1}{4}$ of the time brushing her teeth and putting on her pajamas. She spends the rest of the time reading her book. How many minutes did Jenny read?

Texting
$$\frac{1}{3} \times 60 = \frac{60}{3} = 20 \text{ min}$$

brushing
$$\frac{1}{4} \times 60 = \frac{60}{4} = 15 \text{ min}$$

$$\begin{array}{r} 20 \\ +15 \\ \hline 35 \end{array} \qquad \begin{array}{r} 60 \\ -35 \\ \hline 25 \end{array}$$

Jenny read 25 minutes

2. A-Plus Auto Body is painting designs on a customer's car. They had 18 pints of blue paint on hand. They used $\frac{1}{2}$ of it for the flames, and $\frac{1}{3}$ of it for the sparks. They need $7\frac{3}{4}$ pints of blue paint to paint the next design. How many more pints of blue paint will they need to buy?

$$\frac{1}{2} \times 18 = 18/2 = 9$$

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

$$7\frac{3}{4} - 3 = 4\frac{3}{4}$$

$$\begin{array}{r} 9 \\ +6 \\ \hline 15 \end{array} \qquad \begin{array}{r} 18 \\ -15 \\ \hline 3 \end{array}$$

They need $4\frac{3}{4}$ blue paint

3. Giovanna, Frances, and their dad each carried a 10-pound bag of soil into the backyard. After putting soil in the first flower bed, Giovanna's bag was $\frac{5}{8}$ full, Frances' bag was $\frac{2}{5}$ full, and their dad's was $\frac{3}{4}$ full. How many pounds of soil did they put in the first flower bed altogether?

$$\frac{5}{8} \times 10 =$$

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

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

$$3/8 \times 10 = 30/8 = 3\frac{6}{8} = 3\frac{3}{4}$$

$$3/5 \times 10 = 30/5 = 6$$
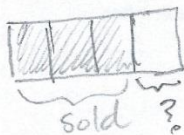
$$1/4 \times 10 = 10/4 = 2\frac{2}{4} = 2\frac{1}{2}$$

$$6 + 3\frac{3}{4} + 2\frac{1}{2} = 11\frac{3}{4} + \frac{1}{2} = 11\frac{3}{4} + \frac{2}{4} = 11\frac{5}{4} = \boxed{12\frac{1}{4}}$$

They put $12\frac{1}{4}$ pounds

4. Mr. Chan made 252 cookies for the Annual Fifth Grade Class Bake Sale. They sold $\frac{3}{4}$ of them, and $\frac{3}{9}$ of the remaining cookies were given to P.T.A. members. Mr. Chan allowed the 12 student helpers to divide the cookies that were left equally. How many cookies will each student get?
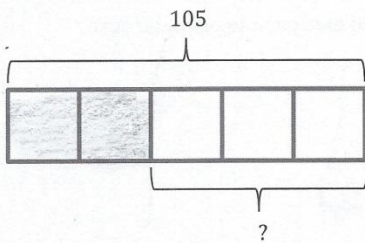
252     $252 \times 1/4 = \frac{252}{4} =$ 「63 left」

$63 \times 6/9 = \frac{378}{9} = 42$

$\frac{42}{12} = 3\frac{6}{12} = 3\frac{1}{2}$

Each student will get 3½ cookies

5. Using the tape diagram below, create a story problem about a farm. Your story must include a fraction.

105

$105 \times \frac{3}{5} = \frac{315}{5} = 63$

?
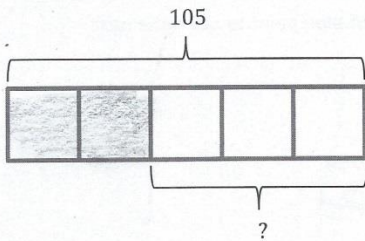
Farmer John has 105 cows. 2/5 of them have already eaten. How many need to be feed?

63 cows need to be feed

4. Mr. Chan made 252 cookies for the Annual Fifth Grade Class Bake Sale. They sold $\frac{3}{4}$ of them, and $\frac{3}{9}$ of the remaining cookies were given to P.T.A. members. Mr. Chan allowed the 12 student helpers to divide the cookies that were left equally. How many cookies will each student get?

252    $252 \times \frac{1}{4} = \frac{252}{4} = \boxed{63 \text{ left}}$

sold ?

$63 \times \frac{6}{9} = \frac{378}{9} = 42$

$\frac{42}{12} = 3\frac{6}{12} = 3\frac{1}{2}$

Each student will get 3½ cookies

5. Using the tape diagram below, create a story problem about a farm. Your story must include a fraction.

105

$105 \times \frac{3}{5} = \frac{315}{5} = 63$

?

Farmer John has 105 cows. 2/5 of them have already eaten. How many need to be feed?

63 cows need to be feed

EUREKA MATH   Lesson 11:   Solve and create fraction word problems involving addition, subtraction, and multiplication..

50

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?

   40 games   32 wins   8 loses

   $\frac{32 \div 8}{40} = \boxed{\frac{4}{5}}$

   The team won 4/5 of its games

   b. In how many games did Katy play catcher?

   $\frac{5}{8} \times 32 = \frac{160}{8} = \boxed{20}$

   Katy played in 20 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?

   r   P   pink
   $\frac{1}{8} + \frac{1}{4} = \frac{1}{8} + \frac{2}{8} = \frac{3}{8}$ $\frac{8}{8} - \frac{3}{8} = \frac{5}{8}$

   $\frac{5}{8} \times 128 = \frac{640}{8} = \boxed{60}$

   There are 60 pink flowers

EUREKA MATH™   Lesson 12:   Solve and create fraction word problems involving addition, subtraction, and multiplication.

51

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.

D $\frac{3}{5} \times 60$ $\frac{180}{5} = \boxed{36 \text{ min}}$ $\frac{6}{6} - \frac{5}{6} = \frac{1}{6}$ remaining

L $\frac{1}{6} \times 60$ $\frac{60}{6} = \boxed{10 \text{ min}}$ $36 - 10 = \boxed{26}$

Lilian completes her homework in 10 min. She is faster by $\boxed{26}$ minutes

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 has 3 liters of vanilla and get 5 liters more. He uses ¼ of them to bake the cakes and pastries for the day. How much vanilla does he have left?

$\frac{1}{4} \times (3+5) = \frac{1}{4} \times 8 = \frac{8}{4} = \boxed{2}$

$8 - 2 = \boxed{6}$

He has 6 liters left.

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

?
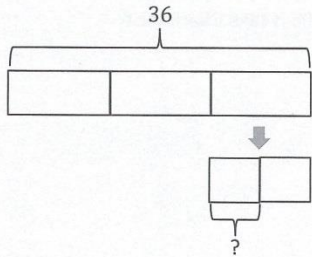
$\frac{1}{3} \times 36 = \frac{36}{3} = \boxed{12}$

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

A baker uses ⅓ of his 36 kg of flour to bake pastries. If he uses ½ of that to make chocolate eclairs, how much flour does he use for the rest of the pastries?

The baker uses 6 kg flour for the rest of his pastries.

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 $4 \div \frac{1}{3} = 4 \times 3 = \boxed{12}$
Mrs. Jacobs $4 \div \frac{2}{5} = 4 \times 5 \div 2 = 20 \div 2 = \boxed{10}$

|4| 4 | 4 | = ?
4
4+4+4=12

|2|2|2|2|2| =?
4
4+4+2=10
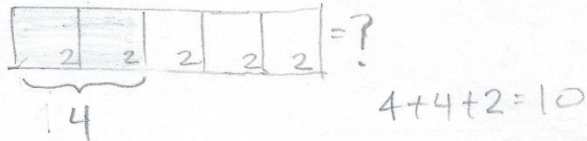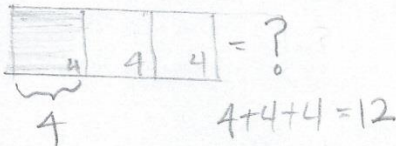
Mr. Smith has 12, and Mrs. Jacobs has 10 students

EUREKA MATH   Lesson 12:   Solve and create fraction word problems involving addition, subtraction, and multiplication.

53

Name _____   Date _____

1. Terrence finished a word search in $\frac{3}{4}$ the time it took Frank. Charlotte finished the word search in $\frac{2}{3}$ the time it took Terrence. Frank finished the word search in 32 minutes. How long did it take Charlotte to finish the word search?

T $3/4 \times 32$ = $96/4$ = $\boxed{24}$

Ch $2/3 \times 24$ = $48/3$ = $\boxed{16}$

F = 32m

Terrence

| 8 | 8 | 8 | 8 | = 32

charlotte

| 8 | 8 | 8 | = 24
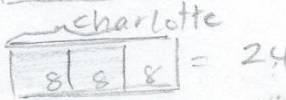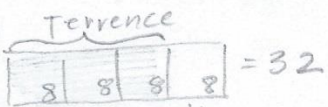
Charlote took 16 minutes to finish.

2. Ms. Phillips ordered 56 pizzas for a school fundraiser. Of the pizzas ordered, $\frac{2}{7}$ of them were pepperoni, 19 were cheese, and the rest were veggie pizzas. What fraction of the pizzas was veggie?

P – $56 \times 2/7$ = $112/7$ = $\boxed{16}$

Ch – 19

V – 21 ÷ 56 $\frac{21}{56}$ = $\boxed{\frac{3}{8}}$

19 + 16 = 35
56 – 35 = 21

Pepperoni

=56

?

veggie

| 21 | =56

3/8 were veggie

Lesson 12:   Solve and create fraction word problems involving addition, subtraction, and multiplication.
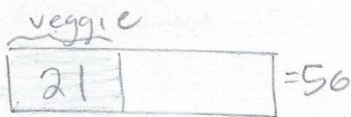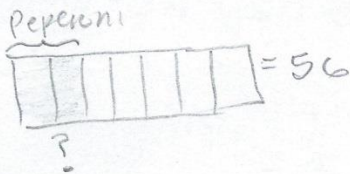
3. In an auditorium, $\frac{1}{6}$ of the students are fifth graders, $\frac{1}{3}$ are fourth graders, and $\frac{1}{4}$ of the remaining students are second graders. If there are 96 students in the auditorium, how many second graders are there?

5th 1/6   1/6 + 1/3 = 1/6 + 2/6 = 3/6 ⟹ 1/2
4th 1/3
2nd 1/4 × 18   96 × 1/2 = 96/2 = 48
                  48 × 1/4 = 48/4 = 12

5th [▨││││] = 96   4th [▨│││] = 96   2nd [▨│││] = 48

There are 12 students in 2nd grade

※ 4. At a track meet, Jacob and Daniel compete in the 220-m hurdles. Daniel finishes in $\frac{3}{4}$ of a minute. Jacob finishes with $\frac{5}{12}$ of a minute remaining. Who ran the race in the faster time?

Daniel 3/4   3/4 × 60 = 180/4 = 45   3/4 [▨▨▨▨▨▨▨│]
Jacob 5/12
                    5/12 × 60 = 300/12 = 25   7/12   5/12
                    60 - 25 = 35   remaining
                                                [││││││││││││]

Jacob ran in 35 seconds, Daniel in 45. Jacob won!

Bonus: Express the difference in their times as a fraction of a minute.

D 45 min   45 - 35 = 10 seconds
J 35 min
                    $\frac{10}{60}$ = $\frac{1}{6}$

The difference between their times is 1/6.

EUREKA MATH   Lesson 12:   Solve and create fraction word problems involving addition, subtraction, and multiplication.

55

5. Create and solve a story problem about a runner who is training for a race. Include at least one fraction in your story.
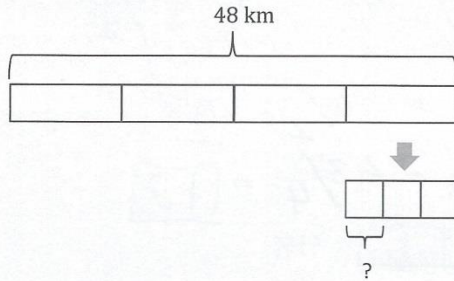
48 km

$$48 \times \frac{1}{4} = \frac{48}{4} = \boxed{12}$$

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

$$48 + 4 = 52 \text{ Km}$$
Dan will run 52 Km.

?

Dan runs 48 Kms a week. He practices 4 days a week. His goal is to run ⅓ more in the last day. How many Kms will Dan run when he reach his goal?

6. Create and solve a story problem about two friends and their weekly allowance whose solution is given by the expression $\frac{1}{5} \times (12 + 8)$.

Sam has $12. Pat has $8. They decided to donate ⅕ of their money for the school library. How much did they donate altogether.
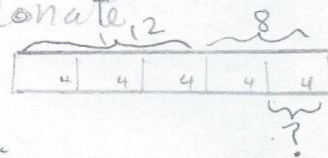
Sam $12
Pat $ 8

$$\frac{1}{5} \times (12+8) = \frac{1}{5} \times 20 =$$

$$\frac{20}{5} = \boxed{4}$$

They donated $4 altogether

EUREKA MATH

Lesson 12: Solve and create fraction word problems involving addition, subtraction, and multiplication.

56

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

$$\frac{1}{2} \times \frac{1}{4} = \frac{1}{8}$$
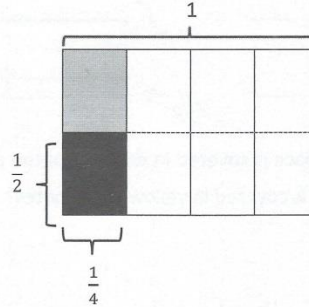
b. Half of $\frac{1}{3}$ pan of brownies = ___$\frac{1}{6}$___ pan
    of brownies
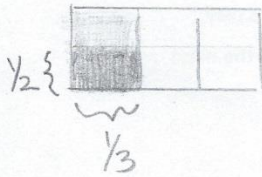
c. A fourth of $\frac{1}{3}$ pan of brownies = ___$\frac{1}{12}$___
    pan of brownies

d. $\frac{1}{4}$ of $\frac{1}{4}$ $\frac{1}{16}$

e. $\frac{1}{2}$ of $\frac{1}{6}$ $\frac{1}{12}$

EUREKA
MATH™   Lesson 13:   Multiply unit fractions by unit fractions.

57
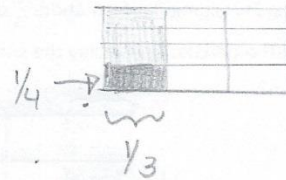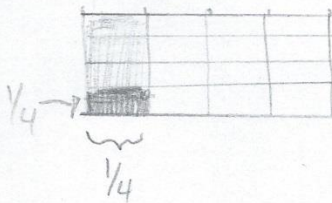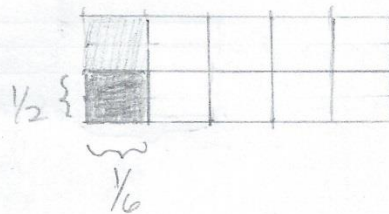
2. Draw rectangular fraction models of $3 \times \frac{1}{4}$ and $\frac{1}{3} \times \frac{1}{4}$. Compare multiplying a number by 3 and by 1 third.

$3 \times \frac{1}{4} = \frac{3}{4}$ $\frac{1}{3} \times \frac{1}{4} = \boxed{\frac{1}{12}}$
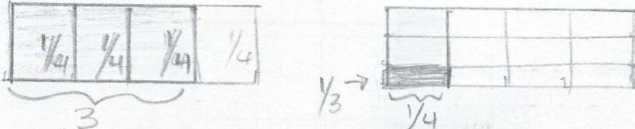
3. $\frac{1}{2}$ of Ila's workspace is covered in paper. $\frac{1}{3}$ of the paper is covered in yellow sticky notes. What fraction of Ila's workspace is covered in yellow sticky notes? Draw a picture to support your answer.

$\frac{1}{3} \times \frac{1}{2} = \boxed{\frac{1}{6}}$
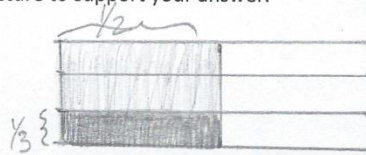
$\frac{1}{6}$ of Ila's workplace is covered in yellow notes.

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?

$\frac{1}{2} \times \frac{1}{5} = \boxed{\frac{1}{10}}$
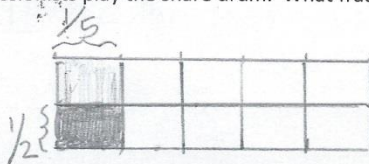
$\frac{1}{10}$ of the band members play the snare drum

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?

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

$\frac{2}{3}$
race cars $\frac{1}{3}$ striped
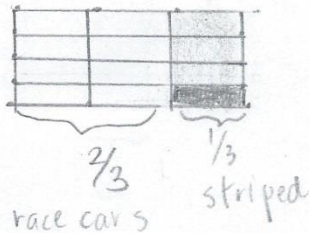
Name _____   Date _____

1. Solve. Draw a rectangular fraction model to show your thinking.

   a.   Half of $\frac{1}{2}$ cake = __$\frac{1}{4}$__ cake
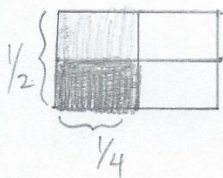
   b.   One-third of $\frac{1}{2}$ cake = __$\frac{1}{6}$__ cake
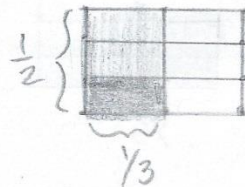
   c. $\frac{1}{4}$ of $\frac{1}{2}$ $\frac{1}{8}$
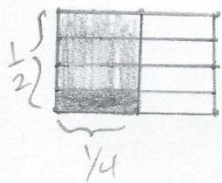
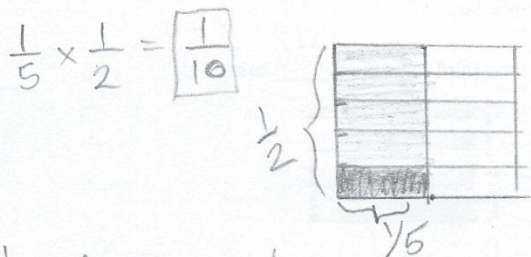   d. $\frac{1}{2} \times \frac{1}{5}$ $\frac{1}{10}$
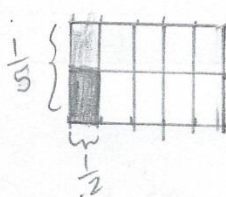
   e. $\frac{1}{3} \times \frac{1}{3}$ $\frac{1}{9}$
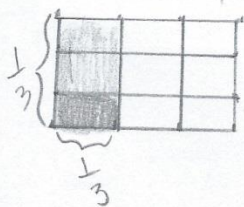
   f. $\frac{1}{4} \times \frac{1}{3}$ $\frac{1}{12}$
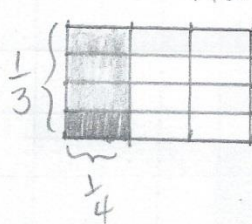
2. Noah mows $\frac{1}{2}$ of his property and leaves the rest wild. He decides to use $\frac{1}{5}$ of the wild area for a vegetable garden. What fraction of the property is used for the garden? Draw a picture to support your answer.

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

$\frac{1}{10}$ ish garden

3. Fawn plants $\frac{2}{3}$ of the garden with vegetables. Her son plants the remainder of the garden. He decides to use $\frac{1}{2}$ of his space to plant flowers, and in the rest, he plants herbs. What fraction of the entire garden is planted in flowers? Draw a picture to support your answer.

$\frac{1}{2} \times \frac{1}{3} = \boxed{\frac{1}{6}}$
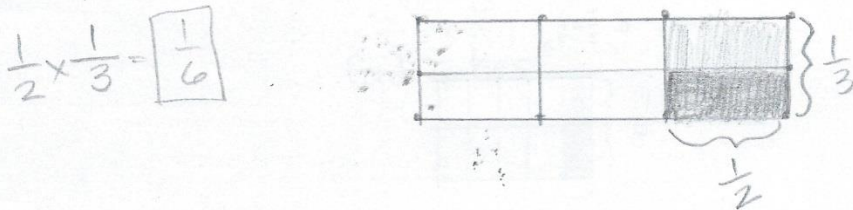
$\frac{1}{6}$ of the garden is planted in flowers.

4. Diego eats $\frac{1}{5}$ of a loaf of bread each day. On Tuesday, Diego eats $\frac{1}{4}$ of the day's portion before lunch. What fraction of the whole loaf does Diego eat before lunch on Tuesday? Draw a rectangular fraction model to support your thinking.
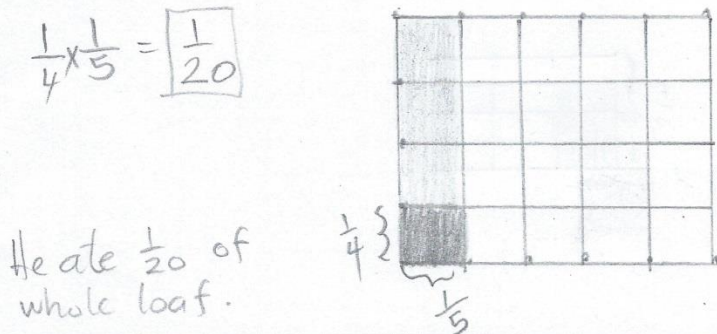
$\frac{1}{4} \times \frac{1}{5} = \boxed{\frac{1}{20}}$

He ate $\frac{1}{20}$ of whole loaf.

EUREKA MATH   Lesson 13:   Multiply unit fractions by unit fractions.

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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:

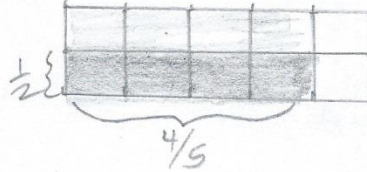$\frac{1}{2}$ of $\frac{2}{5}$ = $\frac{1}{2}$ of 2 fifths = 1 fifth
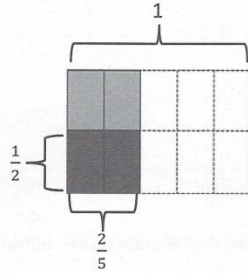
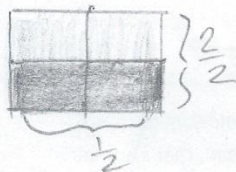$\frac{1}{2} \times \frac{2}{5} = \frac{2}{10} = \frac{1}{5}$

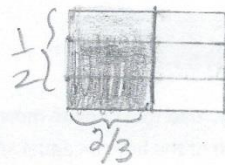a. $\frac{1}{3}$ of $\frac{3}{4}$ = $\frac{1}{3}$ of __3__ fourths = __1__ fourth
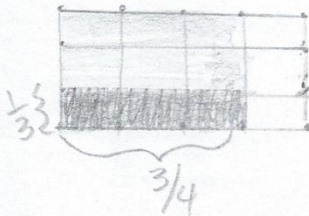
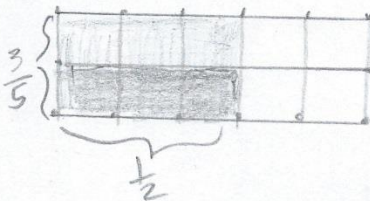b. $\frac{1}{2}$ of $\frac{4}{5}$ = $\frac{1}{2}$ of __4__ fifths = __2__ fifths

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

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

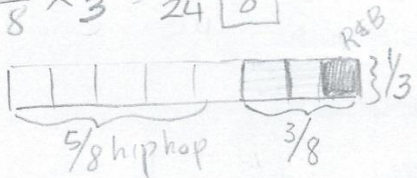e. $\frac{1}{2} \times \frac{3}{5}$ = $\frac{3}{10}$

f. $\frac{2}{3} \times \frac{1}{4}$ = $\frac{2}{12} = \frac{1}{6}$

EUREKA MATH™   Lesson 14:   Multiply unit fractions by non-unit fractions.

61
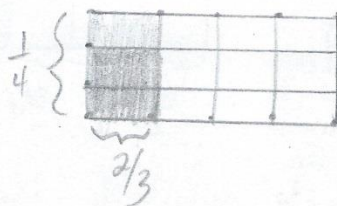
2. $\frac{5}{8}$ of the songs on Harrison's music player are hip-hop. $\frac{1}{3}$ of the remaining songs are rhythm and blues.

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

$\frac{3}{8} \times \frac{1}{3} = \frac{3}{24} = \boxed{\frac{1}{8}}$

⅛ of the songs are R & B.

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?

   $\frac{1}{3} \times \frac{3}{5} = \frac{3}{15} = \boxed{\frac{1}{5}}$

   $\frac{1}{5}$ are blond

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

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

   $\frac{1}{5}$ are boys with 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.
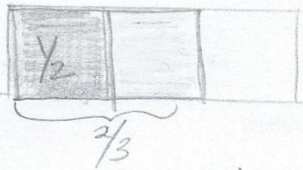
$\frac{1}{3} \times \frac{3}{4} = \frac{3}{12} = \boxed{\frac{1}{4}}$
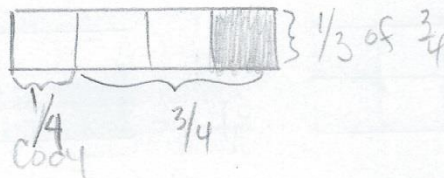
Cody and Sam each mowed ¼ of the yard.

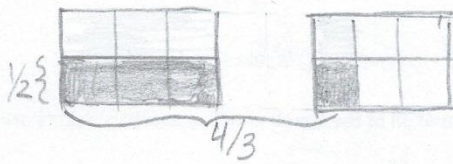EUREKA MATH™   Lesson 14:   Multiply unit fractions by non-unit fractions.

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Name _____   Date _____

1. Solve. Draw a rectangular fraction model to explain your thinking.
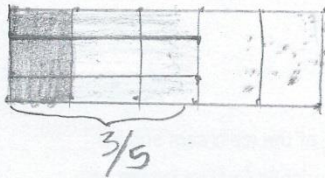
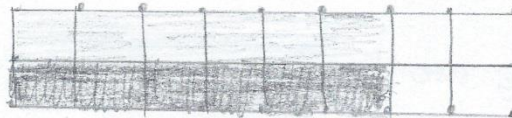a. $\frac{1}{2}$ of $\frac{2}{3}$ = $\frac{1}{2}$ of __2__ thirds = __1__ thirds

b. $\frac{1}{2}$ of $\frac{4}{3}$ = $\frac{1}{2}$ of __4__ thirds = __2__ thirds
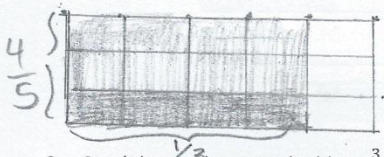

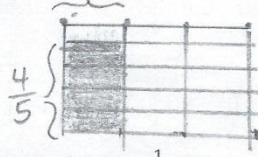c. $\frac{1}{3}$ of $\frac{3}{5}$ = $\frac{3}{15}$ = $\frac{1}{5}$

d. $\frac{1}{2}$ of $\frac{6}{8}$ = $\frac{6}{16}$ = $\frac{3}{8}$

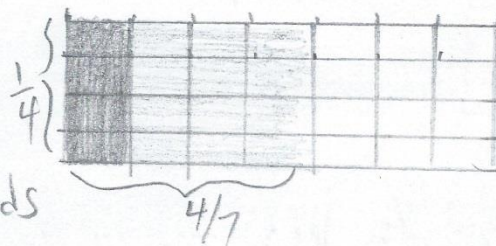e. $\frac{1}{3} \times \frac{4}{5}$ = $\frac{4}{15}$

f. $\frac{4}{5} \times \frac{1}{3}$ = $\frac{4}{15}$

2. Sarah has a photography blog. $\frac{3}{7}$ of her photos are of nature. $\frac{1}{4}$ of the rest are of her friends. What fraction of all Sarah's photos is of her friends? Support your answer with a model.

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

$\frac{1}{7}$ is of her friends

3. At Laurita's Bakery, $\frac{3}{5}$ of the baked goods are pies, and the rest are cakes. $\frac{1}{3}$ of the pies are coconut. $\frac{1}{6}$ of the cakes are angel-food.

    a. What fraction of all of the baked goods at Laurita's Bakery are coconut pies?

$$\frac{1}{3} \times \frac{3}{5} = \frac{3}{15} = \boxed{\frac{1}{5}}$$

$\frac{1}{5}$ are coconut pies.

    b. What fraction of all of the baked goods at Laurita's Bakery are angel-food cakes?

$$\frac{1}{6} \times \frac{2}{5} = \frac{2}{30} = \boxed{\frac{1}{15}}$$

$\frac{1}{15}$ are angel-food cakes

4. Grandpa Mick opened a pint of ice cream. He gave his youngest grandchild $\frac{1}{5}$ of the ice cream and his middle grandchild $\frac{1}{4}$ of the remaining ice cream. Then, he gave his oldest grandchild $\frac{1}{3}$ of the ice cream that was left after serving the others.

    a. Who got the most ice cream? How do you know? Draw a picture to support your reasoning.

1st $\frac{1}{5}$

$$\frac{1}{4} \times \frac{4}{5} = \frac{4}{20} = \boxed{\frac{1}{5}}\,\text{second}$$

$$\frac{1}{3} \times \frac{3}{5} = \frac{3}{15} = \boxed{\frac{1}{5}}\,\text{third}$$

$\frac{1}{5}$
$\frac{1}{4}$
$\frac{1}{3}$
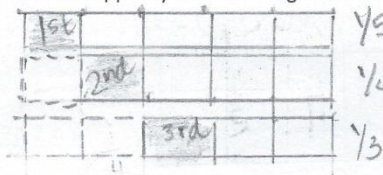
The three grandchildren got $\frac{1}{5}$ each

    b. What fraction of the pint of ice cream will be left if Grandpa Mick serves himself the same amount as the second grandchild?
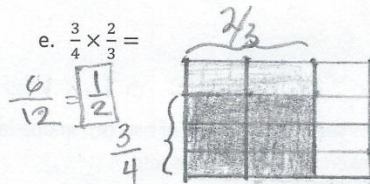
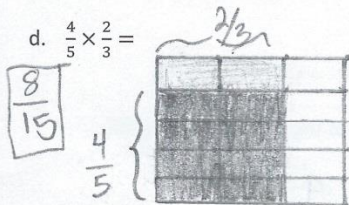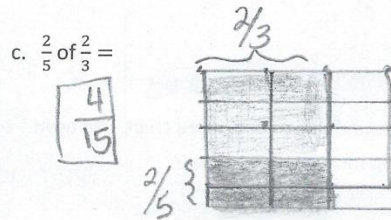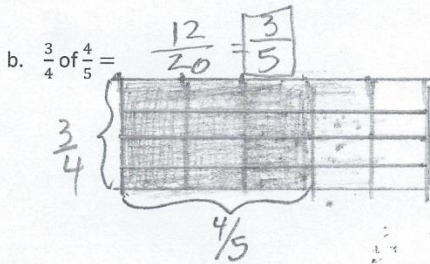$$\frac{2}{5} - \frac{1}{5} = \boxed{\frac{1}{5}}$$

There will be $\frac{1}{5}$ left

EUREKA MATH   Lesson 14:   Multiply unit fractions by non-unit fractions.
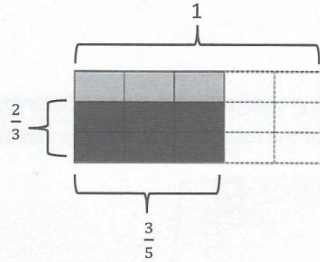
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Name _____   Date _____

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 $\frac{4}{5} =$ $\frac{12}{20} = \boxed{\frac{3}{5}}$

c. $\frac{2}{5}$ of $\frac{2}{3} =$ $\boxed{\frac{4}{15}}$

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

e. $\frac{3}{4} \times \frac{2}{3} =$ $\frac{6}{12} = \boxed{\frac{1}{2}}$

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

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

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

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

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?

$\frac{4}{7} \times \frac{7}{10} = \frac{\overset{2}{4} \times \overset{1}{7}}{\underset{1}{7} \times \underset{5}{10}} = \boxed{\frac{2}{5}}$

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

Saturday   Sunday

Phillip's family traveled $\frac{2}{5}$ of the distance

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?

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

Santino used $\frac{1}{2}$ lb of chocolate chips.

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?

$\frac{3}{4} \times \frac{4}{9} = \frac{\overset{1}{3} \times \overset{1}{4}}{\underset{1}{4} \times \underset{3}{9}} = \boxed{\frac{1}{3}}$

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

$\frac{1}{3}$ 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?

$\frac{5}{9} + \frac{1}{3} = \frac{5}{9} + \frac{3}{9} = \boxed{\frac{8}{9}}$

$\frac{9}{9} - \frac{8}{9} = \boxed{\frac{1}{9}}$

$18 \times \frac{1}{9} = \frac{18}{9} = \boxed{2}$

He took 2 tons to the market

Name _____ Date _____

1. Solve. Draw a rectangular fraction model to explain your thinking. Then, write a multiplication sentence.

   a. $\frac{2}{3}$ of $\frac{3}{4}$ = $\frac{2\times3}{3\times4_2}$ = $\boxed{\frac{1}{2}}$

   b. $\frac{2}{5}$ of $\frac{3}{4}$ =

   c. $\frac{2}{5}$ of $\frac{4}{5}$ = $\frac{2\times4}{5\times5}$ = $\boxed{\frac{8}{25}}$

   d. $\frac{4}{5}$ of $\frac{3}{4}$ = $\frac{4\times3}{5\times4}$ $\boxed{\frac{3}{5}}$

2. Multiply. Draw a rectangular fraction model if it helps you.

   a. $\frac{5}{6}\times\frac{3}{10}$ $\frac{5\times3}{6_2\times10_2}$ = $\boxed{\frac{1}{4}}$

   b. $\frac{3}{4}\times\frac{4}{5}$ $\frac{3\times4}{4\times5}$ = $\boxed{\frac{3}{5}}$

   c. $\frac{5}{6}\times\frac{5}{8}$ $\frac{5\times5}{6\times8}$ = $\boxed{\frac{25}{48}}$

   d. $\frac{3}{4}\times\frac{5}{12}$ $\frac{3\times5}{4\times12_4}$ = $\boxed{\frac{5}{16}}$

   e. $\frac{8}{9}\times\frac{2}{3}$ $\frac{8\times2}{9\times3}$ = $\boxed{\frac{16}{27}}$

   f. $\frac{3}{7}\times\frac{2}{9}$ $\frac{3\times2}{7\times9_3}$ = $\boxed{\frac{2}{21}}$

EUREKA MATH™

Lesson 15: Multiply non-unit fractions by non-unit fractions.

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3. Every morning, Halle goes to school with a 1 liter bottle of water. She drinks $\frac{1}{4}$ of the bottle before school starts and $\frac{2}{3}$ of the rest before lunch.

   a. What fraction of the bottle does Halle drink after school starts, but before lunch?

   $4/4 - 1/4 = \boxed{3/4}$ $\frac{2}{3} \times 3/4 = \frac{2 \times 3}{3 \times 4_2} \cdot \boxed{\frac{1}{2}}$

   He drinks ½ after school starts but before lunch

   b. How many milliliters are left in the bottle at lunch?

   $\frac{1}{2} \times 1,000 = \frac{1,000}{2} = \boxed{500}$

   There are 500 mililiters left.

4. Moussa delivered $\frac{3}{8}$ of the newspapers on his route in the first hour and $\frac{4}{5}$ of the rest in the second hour. What fraction of the newspapers did Moussa deliver in the second hour?

   $\frac{4}{5} \times \frac{5}{8} = \frac{4 \times 5}{5 \times 8_2} = \boxed{\frac{1}{2}}$

   Moussa delivered ½ of the newspapers

5. Rose bought some spinach. She used $\frac{3}{5}$ of the spinach on a pan of spinach pie for a party, and $\frac{3}{4}$ of the remaining spinach for a pan for her family. She used the rest of the spinach to make a salad.

   a. What fraction of the spinach did she use to make the salad?

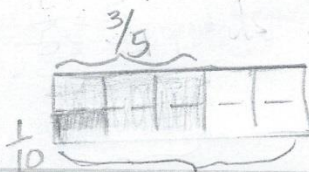 $\frac{3}{4} \times \frac{2}{5} = \frac{6}{20} = \boxed{\frac{3}{10}}$ $\frac{3}{5} + \frac{3}{10} = \frac{6}{10} + \frac{3}{10} = \boxed{\frac{9}{10}}$ $\frac{10}{10} - \frac{9}{10} = \boxed{\frac{1}{10}}$

   Rose used 1/10 to make a salad

   * b. If Rose used 3 pounds of spinach to make the pan of spinach pie for the party, how many pounds of spinach did Rose use to make the salad?

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

   If ⅗ is 3 pounds
   5/5 is 5 pounds
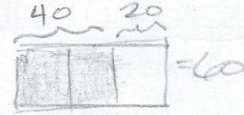

   ⅗

   1/10

   5 pounds

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?

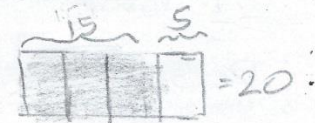$\frac{2}{3} \times 60 = \frac{120}{3} = 40$ $60 - 40 = \boxed{20}$

$\frac{3}{4} \times 20 = \frac{60}{4} = \boxed{15}$ $40 + 15 = 55$
$60 - 55 = \boxed{5}$

She has 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?

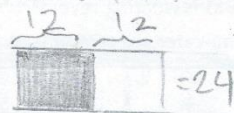$\frac{1}{5} \times 30 = \frac{30}{5} = 6$ $30 - 6 = \boxed{24}$

$\frac{1}{2} \times 24 = \frac{24}{2} = \boxed{12}$ $12 + 6 = 18$
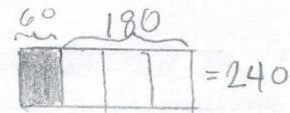$30 - 18 = \boxed{12}$

12 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?

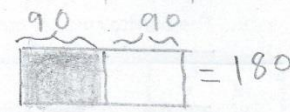$\frac{1}{4} \times 240 = \frac{240}{4} = 60$ $240 - 60 = \boxed{180}$

$\frac{1}{2} \times 180 = \frac{180}{2} = 90$ $90 + 60 = \boxed{150}$
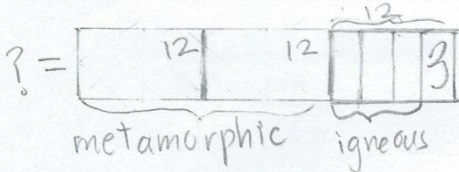$240 - 150 = \boxed{90}$

90 cheesburgers had tomatoes

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Lesson 16:   Solve word problems using tape diagrams and fraction-by-fraction multiplication

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?

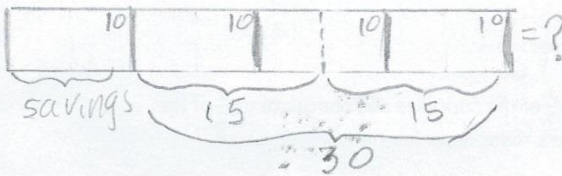$? = $ [tape diagram: boxes labeled 12, 12, and a bracketed section labeled 12 with 3]
metamorphic   igneous

De Sean has 36 rocks

$3 \times 4 = \boxed{12}$
$12 \times 3 = \boxed{36}$

$3 \div \frac{1}{4} = 3 \times 4 = \boxed{12}$
$12 \div \frac{1}{3} = 12 \times 3 = \boxed{36}$

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?

[tape diagram: boxes labeled 10, 10, 10, 10 = ?]
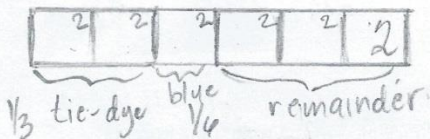savings   15   15
30

Milan had $40 at first

$15 \times 2 = 30$
$30 \div 3 = 10$
$4 \times 10 = \boxed{40}$

$15 \div \frac{1}{2} = 15 \times 2 = 30$
$30 \div \frac{3}{4} = 30 \times \frac{4}{3} = \frac{120}{3} = 40$

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?
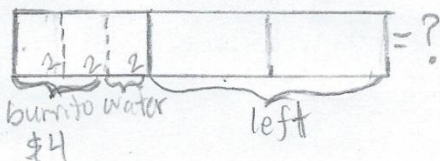
[tape diagram: boxes labeled 2, 2, 2, 2, 2, 2]
$\frac{1}{3}$ tie-dye   blue $\frac{1}{6}$ remainder

Parks has 12 bracelets now

$2 \times 3 = \boxed{6}$
$2 \times 6 = \boxed{12}$

$2 \div \frac{1}{3} = 2 \times 3 = 6$
$6 \div \frac{1}{2} = 6 \times 2 = 12$

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?

[tape diagram: small boxes labeled 2, 2 = ?]
burrito water   left
$4

Ahmed has $12 left

$4 \div 2 = 2$
$2 \times 3 = 6$
$6 \times 3 = 18$
$18 - 6 = \boxed{12}$

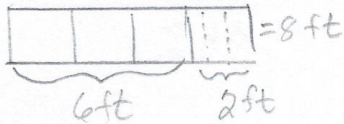$4 \div \frac{2}{3} = 4 \times \frac{3}{2} = \frac{12}{2} = 6$
$6 \times 3 = 18$
$18 - 6 = 12$

Name _____   Date _____

Solve and show your thinking with a tape diagram.

1. Anthony bought an 8-foot board. He cut off $\frac{3}{4}$ of the board to build a shelf, and gave $\frac{1}{3}$ of the rest to his brother for an art project. How many inches long was the piece Anthony gave to his brother?

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

=8 ft

6ft   2ft

1 ft = 12 inches

$\frac{2}{3}$ ft = $\boxed{8 \text{ inches}}$

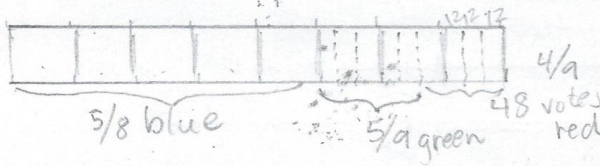$\frac{1}{3} \times \frac{1}{4} = \boxed{\frac{1}{12}}$

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

Anthony gave his brother 8 inches

2. Riverside Elementary School is holding a school-wide election to choose a school color. Five-eighths of the votes were for blue, $\frac{5}{9}$ of the remaining votes were for green, and the remaining 48 votes were for red.

a. How many votes were for blue?

180 voted blue

5/8 blue   5/9 green   4/9   48 votes red

$48 \div 4 = 12$
$12 \times 3 = 36$
$36 \times 5 = \boxed{180}$

$48 \div \frac{4}{3} = 48 \times \frac{3}{4}$
$= 144 \div 4 = 36$

b. How many votes were for green?

60 voted green

$12 \times 5 = \boxed{60}$

c. If every student got one vote, but there were 25 students absent on the day of the vote, how many
    students are there at Riverside Elementary School?

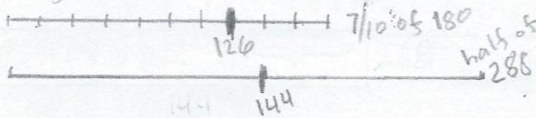$$180 + 60 + 48 + 25 = \boxed{313}$$
blue   green   red   absent

$$
\begin{array}{r}
^{2}180 \\
60 \\
+\ 48 \\
25 \\
\hline
313
\end{array}
$$

There are 313 students

d. Seven-tenths of the votes for blue were made by girls. Did girls who voted for blue make up more
    than or less than half of all votes? Support your reasoning with a picture.

$$\frac{7}{10} \times 180 = \frac{1260}{10} = \boxed{126}$$

$$180 + 60 + 48 = \boxed{288}$$

$$
\begin{array}{r}
144 \\
2\overline{)288} \\
2 \\
08 \\
8 \\
\hline
08 \\
0
\end{array}
$$

126   7/10 of 180

144   half of 288

The votes from the girls is less
than half of the total votes. 126 < 144 .

e. How many girls voted for blue?

126 girls voted for blue