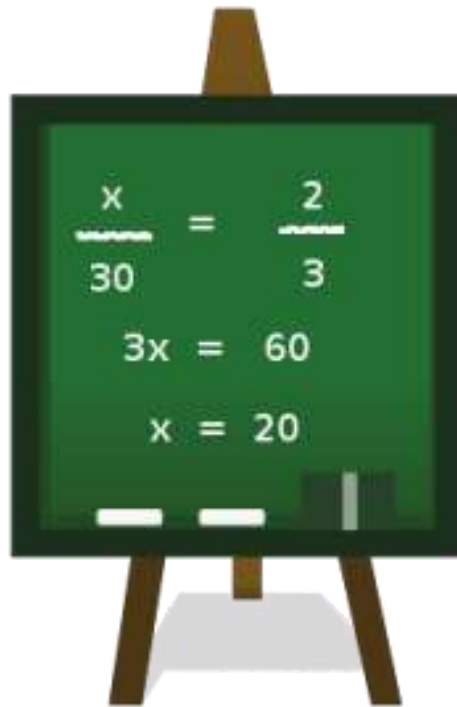# Number Sense & Numeration Unit 2

Ratios, Rates and Fractions
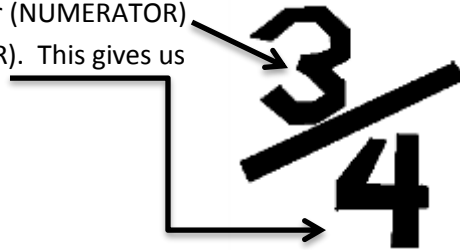
Mr. D. Leavitt

2012-13

Fractions to Decimals to Percentages

So, we are already aware of the relationship between numerators and denominators, but let's refresh to be sure, ok?

The top number (NUMERATOR)   gets divided by the bottom number (DENOMINATOR). This gives us   a division problem, which will give us a **decimal**.

Therefore, if we take ¾ = 3 ÷ 4, then we get 0.75 as an equivalent, or equal, value. That allows us to create a percentage by taking the decimal and multiplying it by 100. So, if we take 0.75 X 100 = 75%.

What changes now, is that we must begin to recognize equivalent fractions as also be equal to the same percentage. Sounds tricky, but really, it's not that hard.

Let's take 6/8 as our fraction. If we apply the same rules as above, we can see if it is an equivalent fraction to 3/4.

Original Fraction	Operational View	Decimal	Percentage
3/4	3 ÷ 4	0.75	75%
6/8	6 ÷ 8	0.75	75%

The trick is to do the fraction as an operation, in this case, division and see if the decimal is the same. If it is, then you have yourself a pair of equivalent fractions, or a matched set. Complete the chart below to see if you can identify the equivalent fractions. Put a star next to all the equivalent fractions.

| Original Fraction	Operational View	Decimal	Percentage
2/3			
16/24			
5/8			
9/21			
3/5			
1600/2400			
7/10			

Proportional Relationships Word Problems - Step-by-Step Lesson

Lesson 1 Proportional Relationship:

a) The price of oranges at store can be determined by the equation:

P = $0.35n , where P is the price and n is the number of pounds of oranges.

What is the constant of proportionality (unit rate)?
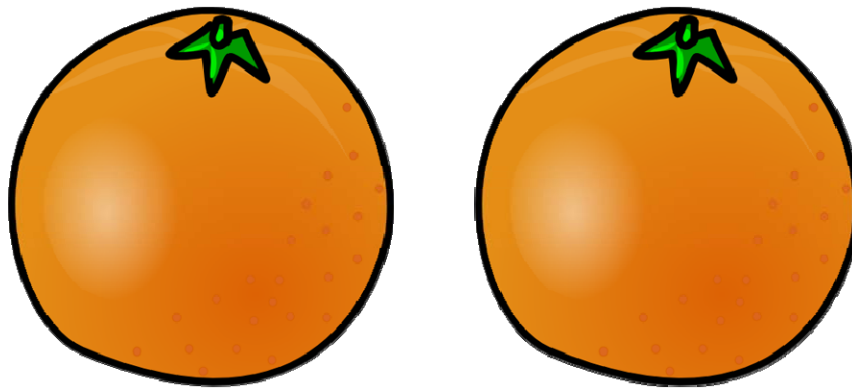
Explanation:

Step 1) Proportional quantities have a constant ratio and can be described by the equation $y = kx$, where k is a constant ratio. The constant of proportionality is the coefficient of x or the independent variable.

Step 2) We have the constant of proportionality as

p = .35n

We can conclude that .35 is the coefficient of variable 'n'

Ratio Worksheet

Compare the following ratios: (Use >, < or = sign in the place holders)

Work Space

2:3 ☐ 4:1

1:2 ☐ 3:6

3:5 ☐ 2:4

6:7 ☐ 4:8

5:1 ☐ 7:9

4:6 ☐ 7:6

1:8 ☐ 4:11

5:2 ☐ 10:4

4:3 ☐ 2:4

7:2 ☐ 10:3

Write the Fractions as Ratio

Example:

$$\frac{4}{5} = \color{red}{4:5}$$

$$\frac{3}{4} = \text{_____}$$

$$\frac{5}{9} = \text{_____}$$

$$\frac{11}{15} = \text{_____}$$

$$\frac{7}{12} = \text{_____}$$

$$\frac{7}{10} = \text{_____}$$

$$\frac{8}{5} = \text{_____}$$

$$\frac{9}{11} = \text{_____}$$

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

$$\frac{2}{5} = \text{_____}$$

$$\frac{4}{7} = \text{_____}$$

Equivalent Ratios

1)   1 : 3 = 2 : __ = __ : 9 = __ :12 = __ :15 = 6 : __

2)   1 : 6 = __ :12 = __ :18 = __ :24 = 5 : __ = __ :36

3)   5 : 6 = 10 : __ = 15 : __ = 20 : __ = __ :30 = __ :36

4)   3 : 8 = 6 : __ = 9 : __ = __ :32 = 15 : __ = __ :48

5)   3 : 4 = __ : 8 = 9 : __ = 12 : __ = __ :20 = __ :24

6)   2 : 5 = 4 : __ = 6 : __ = __ :20 = 10 : __ = __ :30

7)   1 : 2 = 2 : __ = __ : 6 = __ : 8 = 5 : __ = __ :12

8)   8 : 9 = __ :18 = 24 : __ = __ :36 = __ :45 = __ :54

9)   3 : 5 = 6 : __ = 9 : __ = 12 : __ = __ :25 = 18 : __

10)   5 : 7 = __ :14 = 15 : __ = __ :28 = 25 : __ = __ :42

Recognizing Proportional Relationships - Step-by-Step Lesson

The table below gives the shipping price for different numbers of soccer balls. Do the numbers in the table represent a proportional relationship?

Number of Balls	Price (In Dollars)
1	2
2	4
3	6
4	7

Explanation:

Step 1) We could do this in two ways:

a) by testing for an equivalent ratios in the table

b) by graphing the table to see if it creates a straight line through the origin.

Step 2 a) we can examine the numbers to determine that the price is the number of balls multiplied by 2, except for 4 balls. The row with 4 balls costs $7. This is not proportional to the other amounts in the table; therefore, the table does not represent a proportional relationship.

 Step 2 b) we can graph relationships to determine if two quantities are in a proportional relationship and to interpret the ordered pairs. If the amounts from the table above are graphed (number of balls, price), the pairs (1, 2), (2, 4), and (3, 6) will form a straight line through the origin (0 balls, 0 dollars), indicating that these pairs are in a proportional relationship. The ordered pair (3, 6) means that 3 balls cost $6. However, the ordered pair (4, 7) would not be on the line, indicating that it is not proportional to the other pairs.

Ratio Worksheet

Create proportion from the given set of numbers:

Example: 1, 6, 2, 3

Proportion is **1:2=3:6**

3, 6, 7, 14

Proportion is _____

2, 6, 5, 15

Proportion is _____

7, 2, 14, 4

Proportion is _____

2, 2, 1, 4

Proportion is _____

10, 5, 8, 4

Proportion is _____

3, 12, 8, 2

Proportion is _____

Proportion Worksheet

State whether the following ratios are proportional: Work Space

2:3 and 4:6

_____

1:4 and 6:18

_____

3:5 and 1:3

_____

2:5 and 8:20

_____

4:9 and 12:27

_____

6:15 and 2:5

_____

Student Name: _____   Score:

Find the Ratio of the Given Statements

8 apples to 4 apples

_____

3 chocolates to 9 chocolates

_____

6 ml to 9 ml

_____

70 m to 100 m

_____

16 gallons to 28 gallons

_____

26 yards to 13 yards

_____

Write the Ratios as Fraction

Example:

$2:3 = \dfrac{2}{3}$

$5:7 =$ _____

$9:10 =$ _____

$4:9 =$ _____

$15:13 =$ _____

$6:11 =$ _____

$1:5 =$ _____

$3:8 =$ _____

$2:9 =$ _____

Name _____   Date _____

Unit Rates and Ratios of Fractions - Step-by-Step Lesson

Lesson 1 Fractions Problem:

If 1/3 of a gallon of paint covers 1/9 of a gate, then how many gallons of paint is needed to cover the entire gate?

Explanation:

Divide the total amount of amount of paint given (1/3 of a gallon) by the amount gate that was covered (1/9).

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

To complete a fractional division problem, we will write 1/9 as an improper fraction. Turn this from a division problem into a multiplication problem by multiply by the reciprocal.

$$\frac{1}{3} \div \frac{1}{9} = \frac{1}{3} \times \frac{9}{1}$$

Now we will multiply:

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

So the answer is 3 gallons of paint.

Multistep Ratio and Percent Word problems- Step-by-Step Lesson

1. Andrea has a recipe that needs $\frac{5}{4}$ teaspoon of cream for every 2 cups of milk. If Andrea increases the amount of milk to 8 cups of milk, how many teaspoons of cream are needed?

Explanation #1:

Step 1) First we need to know what is being asked of us.

"How many teaspoons of cream are needed and what is the projected cost of a gallon of gas for May 2013?

Step 2 a) We can use these numbers to find the unit rate.

For every 2 cups of milk, teaspoon of cream required = $\frac{5}{4}$

For every 1 cup of milk, teaspoon of cream required = $\frac{5}{4} \div \frac{2}{1}$

For every 8 cup of milk, teaspoon of cream required = $\frac{5}{4} \times \frac{1}{2} \times 8$

So 5 teaspoons of cream are needed.   = 5

----

2. Gas prices are projected to increase by 115% by the end of next year. A gallon of gas currently costs $2.50. What is the projected cost of a gallon of gas for May 2013?

Explanation #2:

The original cost of a gallon of gas is $2.50. An increase of 100% means that the cost will double. Another 15% will need to be added to figure out the final projected cost of a gallon of gas.

$2.50 + 2.50 + (0.15 x2.50) = 5 + (0.15 x2.50) = $5.375

100%	100%	15%
$2.50	$2.50	$0.375

So the projected cost of a gallon of gas for the end of next year is $5.375

Rates and Ratios 1

1. The ratio of goldfish to gallons of water is 7 to 2.
   a. For every _____ goldfish, there are _____ gallons of water.

   b. How many goldfish can you get if you have 16 gallons of water?

   c. How many gallons of water do you need to keep 28 fish?

2. The price of apples is 3 for $2.00.
   a. For every _____ apples, you pay _____.

   b. How much do you pay for 30 apples?

   c. How many apples can you buy for $10?

3. You are taking a test in science. There are 20 questions and 45 minutes.
   a. For every _____ questions, you have _____ minutes.

   b. How much time do you have for 10 questions?

   c. How much time do you have for 5 questions?

   d. How much time do you have for 1 question?

4. All of the following rectangle's width to length ratio is 2 to 3. Fill in the missing lengths.
   (Hint: The width is the shorter side; the length is the longer side.)
   a. For every _____ inches in the width, there are _____ inches in the length.
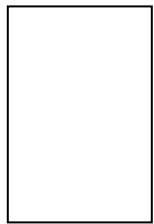
2 inches

4 inches

6 inches
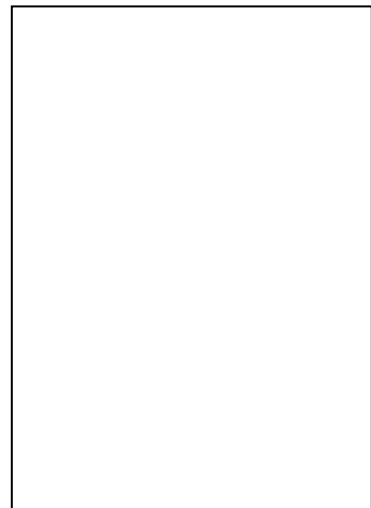
8 inches

Rates and Ratios 2

1. The ratio of goldfish to gallons of water is 9 to 4.

   a. For every _____ goldfish, there are _____ gallons of water.

   b. Fill in the table.

Fish	Gallons of Water
9	4
18	

   c. How many goldfish can you get if you have 12 gallons of water?

   d. How many gallons of water do you need to keep 36 fish?

2. The price of oranges is 4 for $3.00.

   a. For every _____ oranges, you pay _____.

   b. Fill in the table.

Oranges	$
4	3
8	

   c. How much do you pay for 24 oranges?

   d. How many apples can you buy for $15?

3. You are taking a test in science. For every 3 questions, you have 5 minutes.
    a. Fill in the table.

Questions	Time (minutes)
3	5
6	

    b. If you have 30 questions, how much time do you have to take the test?

    c. If you have 21 questions, how much time do you have to take the test?

    d. If the test is 20 minutes long, how many questions do you have?

    e. If the test is 30 minutes long, how many questions do you have?

4. You are taking a test for your math class. You have 10 questions and 10 minutes,
    a. How much time do you have for 1 question?

    b. How much time do you have for 2 questions?

    c. How much time do you have for 7 questions?

5. You are taking a test for your English class. You have 20 minutes and 10 questions.
   a. Fill in the table.

Questions	Time (minutes)
10	20
9	
8	
7	
6	
5	
4	
3	
2	
1	

   b. How much time do you have for 10 questions?

   c. How much time do you have for 5 questions?

   d. How much time do you have for 2 questions?

   e. How much time do you have for 1 question?

6. 15 cars enter the mall parking lot every 5 minutes.
   a. How many cars enter the parking lot in 10 minutes?

   b. How many cars enter the parking lot in 25 minutes?

   c. Circle the correct answer. What is the fast way to get the answers?
      Multiply   Divide

7. 15 cars enter the mall parking lot every 5 minutes.

   a. How many cars enter the parking lot in 1 minute?

   b. How many cars enter the parking lot in 2 minutes?

   c. How many cars enter the parking lot in 3 minutes?

   d. How many cars enter the parking lot in 4 minutes?

   e. Circle the correct answer. What is the fast way to get the answers?
      Multiply   Divide

Rates and Ratios 3

1. For every 5 yards you run, Jill runs 6 yards.
   a. If you have run 30 yards, then how far has Jill run?

   b. If Jill has run 54 yards, then how far have you run?

2. 570 people die from smoking related diseases every day. (www.thetruth.com)
   a. How many people die from smoking related diseases every hour?

   b. How many people die from smoking related diseases every week?

   c. How many people die from smoking related diseases every year?
      (Hint: There are 365 days in a year.)

3. You type 200 words in 5 minutes. Brenda types 240 words in 6 minutes.
   a. How many words you type in 1 minute?

   b. How many words does Brenda type in a minute?

   c. Who types the fastest?

4. The width to length ratio of the rectangles is 3 to 5. Fill in the missing lengths. (Hint: The width is the shorter side; the length is the longer side.)

6 inches

30 inches

Percent Equations

In this next section, you are to use the following equation to help you set up and solve the missing equations.

"a is % (p) of b"

$$\frac{a}{b} = \frac{p}{100}$$

For problems 1-3, *SET UP* the problems using the percent equation. Please _do not_ solve.

1) 20 is what % of 140?   2) What is 30% of 60? 3) 40 is 10 % of what?

For problems 4-12, set up the problems using the percent equation, and then solve.

4) 34 is 50 % of what? 5) 5 is 20 % of what?   6) What is 15% of 90?

7) What is 25 % of 120?   8) 150 is 300% of what?   9) 30 is 5 % of what?

10) What is 12 % of 130?   11) 40 is what % of 120?   12) 12 is 15% of what?

Taxes, Tips, and Sales

1) A store has a sale for 25 % off. You decide to buy a sweater that usually costs $30.
    a) How much money will you save?

    b) How much money will you spend on the sweater?

2) A store has a sale for 15 % off. You decide to buy a $45 jacket.
    a) How much money will you save?

    b) How much money will you spend on the sweater?

3) A restaurant requires customers to pay a 15% tip for the server. Your family spends $65 on the meal.
    a) How much money do you need to pay the server?

    b) How much money will you spend total?

4) Sales tax is 6% and you spend $42.
    a) How much money will you spend on tax?

    b) How much money will you spend total?

5) Sales tax is 6.5 % and you spend $58.50.
    a) How much money will you spend on tax?

b) How much money will you spend total?

6) A restaurant requires customers to pay a 15% tip for the server. Your family spends $45 on the meal.

a) How much money do you need to pay the server?

b) How much money will you spend total?

7) A store has a sale for 20 % off. You decide to buy a $15 t-shirt.

a) How much money will you save?

b) How much money will you spend on the t-shirt?

8) A store has a sale for 10 % off. You decide to buy a $17 DVD.

a) How much money will you save?

b) How much money will you spend on the DVD?

Ratio Worksheet

Fill in the blanks from the given statements:

There are 7 roses and 8 sunflowers in the garden.

Ratio of roses to sunflower is _____

Ratio of sunflowers to total flowers in the garden is _____

Ratio of roses to total flowers in the garden is _____

There are 19 girls and 14 boys in the bus.

Ratio of girls to boys is _____

Ratio of girls to total number of members in the bus is _____

Ratio of boys to total number of members in the bus is _____

There are 12 comic books and 5 novels in the shelf.

Ratio of novels to comic books is _____

Ratio of novels to total books in the shelf is _____

Ratio of comic books to total books in the shelf is _____

Simplify Ratio: Word Problems

Questions	Workspace
In a live concert, 425 boys and 300 girls participated. Find the ratio of boys to girls. Answer:	
An egg seller finds 432 eggs are either spoiled or broken and 1080 eggs are in good condition. Find the ratio of bad eggs to good eggs. Answer:	
Kathy scored 360 in first quarter and 420 in second quarter. Find the ratio of scores in the first quarter to the second quarter. Answer:	
An alloy is made up of 240 grams Nickel and 320 grams Copper. Find the ratio of nickel to copper. Answer:	

Simplify Ratio: Word Problems

Questions	Workspace
The ratio of boys to girls in a kindergarten is 2:3. If the number of boys is 12, find the number of girls. Answer:	
In a basket, there are 24 good oranges and rest are bad oranges. The ratio of good oranges to the bad oranges is 3 : 1, find the number of bad oranges. Answer:	
In a play school, there are 16 red balls and the rest are white balls. The ratio of red balls to white balls is 4 : 5. Find the number of white balls. Answer:	
The distance travelled by Ben and Tim is in the ratio 3 : 4. The distance travelled by Ben is 18 miles. Find the distance travelled by Tim. Answer:	

Rates, Ratios and Fraction Workbook

Teacher Name: **Mr. Leavitt**

Student Name: _____

CATEGORY	4	3	2	1
Mathematical Errors	90-100% of the steps and solutions have no mathematical errors.	Almost all (85-89%) of the steps and solutions have no mathematical errors.	Most (75-84%) of the steps and solutions have no mathematical errors.	More than 75% of the steps and solutions have mathematical errors.
Strategy/Procedures	Typically, uses an efficient and effective strategy to solve the problem(s).	Typically, uses an effective strategy to solve the problem(s).	Sometimes uses an effective strategy to solve problems, but does not do it consistently.	Rarely uses an effective strategy to solve problems.
Completion	All problems are completed.	All but one of the problems are completed.	All but two of the problems are completed.	Several of the problems are not completed.
Neatness and Organization	The work is presented in a neat, clear, organized fashion that is easy to read.	The work is presented in a neat and organized fashion that is usually easy to read.	The work is presented in an organized fashion but may be hard to read at times.	The work appears sloppy and unorganized. It is hard to know what information goes