Group Activity – Multiplicative Comparison

Solve the given word problem by answering the questions below.

► Today is Sally's birthday. She is 7 years old. At some time in the future, John will have his 39th birthday. At that time, he will be 3 times as old as Sally. How old is John now?[2] ◄

A. Identify all the quantities in the situation, including those whose values are not known.

B. What does the 3 in the problem refer to? What quantities are being compared?

C. How would you as a teacher respond to a student who says that since John is 3 times as old as Sally, and Sally is 7 years old, John must be 21 years old now?

D. How much time will elapse between now and the time when John is 39 years old?

E. How old is John now?

F. What is the difference between Sally's and John's ages when John is 39? Twenty-five years from now? Now?

G. What can you conclude about the difference between John's and Sally's ages as time goes by?

H. As long as John is alive, will he always be 3 times as old as Sally? Explain.

Ratio Activity – Candy Bars

Below are diagrams of regions. Consider each region as a candy bar that is being shared between two people. For each candy bar, cut the bar into two pieces, A and B, so that it represents the given description of Part A and Part B.

a. Part A is $\frac{1}{2}$ as large as Part B.
b. Part B is ___ times as large as Part A.
c. Part A is how much of the bar?
d. What is the ratio of Part A to Part B?

a. Part A is $\frac{1}{4}$ as large as Part B.
b. Part B is ___ times as large as Part A.
c. Part A is how much of the bar?
d. What is the ratio of Part B to Part A?

a. Part A is $\frac{2}{3}$ as large as Part B.
b. Part B is ___ times as large as Part A.
c. Part A is how much of the bar?
d. What is the ratio of Part A to Part B?

a. The ratio of Part A to Part B is 3:2.
b. Part A is ___ times as large as Part B.
c. Part B is how much of the bar?
d. Part B is how many times as large as Part A?

a. The ratio of Part A to Part B is 3:4.
b. Part B is ___ times as large as Part A.
c. Part A is how much of the bar?
d. Part A is how many times as large as Part B?

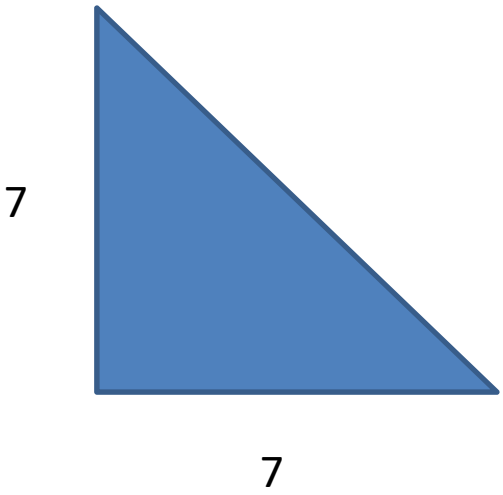
More Ratio Examples

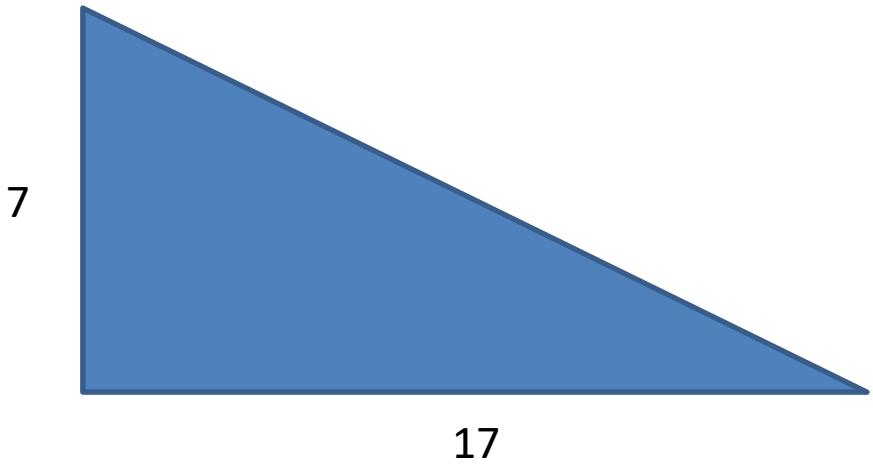
1. Which of the following rectangles is "most square?"
   a. 75 feet by 114 feet

   b. 455 feet by 508 feet

   c. 185 feet by 245 feet

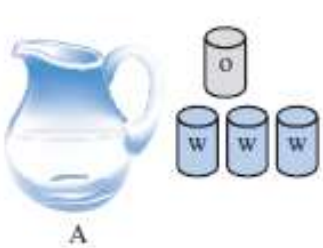
2. Which of the following traingles are the "steepest?"

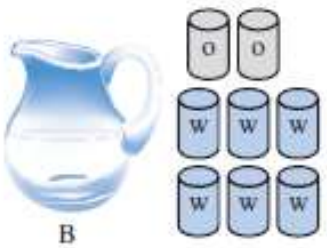




ACTIVITY 1 Orange Juicy

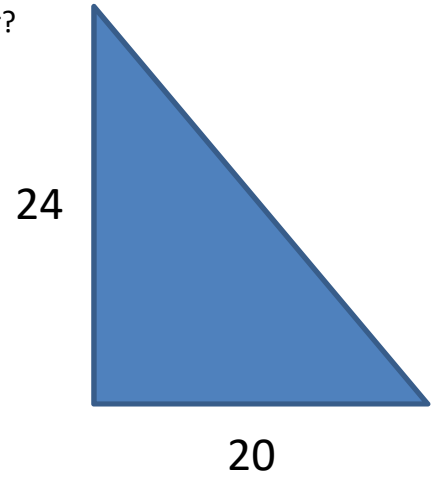
The orange drink in Pitcher A is made by mixing 1 can of orange concentrate with 3 cans of water. The mixture in Pitcher B is made by mixing 2 cans of orange concentrate with 6 cans of water. Which will taste more "orangey": the mixture in Pitcher A or the mixture in Pitcher B?[4]

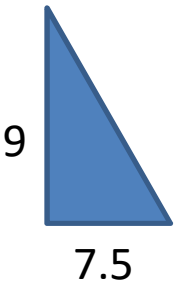




Chapter 9 – Proportional Reasoning

Which is steeper?





- A proportion is a statement that two ratios are equal to one another. The quantities are said to be **proportional.**
    - We often say a is to b as c is to d which insinuates an equal set of ratios

$$a:b = c:d \quad \text{or} \quad \frac{a}{b} = \frac{c}{d}$$

- A **unit ratio** is a ratio where the <u>second value is one</u>. Convert the following into unit ratios.

5:1	8:2	100:10
59:49	1:4	2:5
30:100		

We use what we call "proportional reasoning" when it is appropriate to apply a proportion to solve a problem. In the following problems, determine whether or not we should use **proportional reasoning**. Explain why or why not and **use a rate** to describe the quantities in these problems.

1. Blazer drove 72 miles during the first hour of his trip. How long will it take him to drive the entire 720 miles of his trip?

2. In a pie eating contest, McLovin ate two pies in the first 5 minutes. How many pies can he eat in 2 hours?

3. It took Nacho 20 minutes to complete the first 10 problems of his 30 problem exam. How long will it take him to finish?

4. Dr. Phil can mow the lawn in 45 minutes. If Mrs. Phil helps him, how long will it take them together?

- A "**percent"** is a ratio for which the value of the second quantity is understood to be 100

Write the following ratios as percent, fraction, and decimals.

4:100

11:25

10:100

4:1

1:4

2:9

- Percentages are more commonly used and understood than ratios which is why they are so important.

Suppose you got 15.5 out of 20 on your first test. Suppose you got 59 out of 75 on your second test. Which test did you do better on?

- Percentage problems can be weird sometimes (due to the fact they are using **multiplicative reasoning**).

Your boss says, "You remember when business was bad last year, I had to cut everyone's pay by 15%? Well, business is better, so I can raise your pay by 15% now. That will put you back to where you were before the cut." Is he/she correct?

Activity – Solving Percentage Problems Multiplicatively

For each of the following, consider what single percentage describes the multiplicative comparison.

1. Say you scored 63 out of 75 points on a history test. What percentage of the test did you get correct?

2. A pair of pants is marked on sale for 30% off. If its original price was $59.99, what is its sale price?

3. A newspaper says that the population of squirrels in a local park has increased by 150% over the past year. If there were 600 squirrels in the park last year, how many are there now?

4. The sale price of a laptop is $782. If it is marked at 15% off, what was its price before the sale?

5. At work you started with a salary of $50,000. Last year, you got a 5% raise. Then this year, you got another 10% raise. What is your salary today? Would it have been the same as a single 15% raise?

The following problem[5] is from an SAT exam, and very few students solved it. Can you solve this problem?

A flock of geese on a pond were being observed continuously.
At 1:00 PM, $\frac{1}{5}$ of the geese flew away.
At 2:00 PM, $\frac{1}{8}$ of the geese that remained flew away.
At 3:00 PM, 3 times as many geese as had flown away at 1:00 PM flew away, leaving 28 geese on the pond. At no other time did any geese arrive, fly away, or die. How many geese were in the original flock? ◄