TOPIC 4

# Ratios

**Lesson 4.1a/b**
It's All Relative:
Introduction to Ratio and Rate Reasoning
6.RP.1

**Lesson 4.2**
Going Strong:
Comparing Ratios to Solve Problems
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6.RP.3

**Lesson 4.3a/b/c**
Oh, Yes, I Am the Muffin Man:
Determining Equivalent Ratios
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**Lesson 4.4a/b**
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TOPIC 4

LESSON 4.1a

# It's All Relative

6.RP.1

**Objective** Introduction to Ratio and Rate Reasoning

## Warm-Up

Write a fraction to represent each situation.

1. the number of boys in your math class compared to the number of students in the class

2. the number of girls in your math class compared to the number of students in the class

# GETTING STARTED

Predict the Score

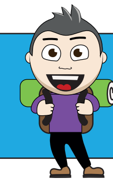
The Crusaders and the Blue Jays just finished the first half of their basketball game.

| | Halftime Score | Final Score |
|---|---|---|
| **Crusaders** | 30 | ? |
| **Blue Jays** | 20 | ? |

1. Predict the final score. Explain your reasoning.

EXPLORE 1

## Additive and Multiplicative Reasoning



Robena and Eryn each predicted the final score of a basketball game between the Crusaders and the Blue Jays.

1. Analyze each prediction.
a. Describe the reasoning that Robena and Eryn used to make each statement.

**Robena**

| | Halftime Score | Final Score |
|---|---|---|
| Crusaders | 30 | 60 |
| Blue Jays | 20 | 40 |

I think the final score will be double the score at halftime.

**Eryn**

| | Halftime Score | Final Score |
|---|---|---|
| Crusaders | 30 | 50 |
| Blue Jays | 20 | 40 |

I think the Crusaders will play hard enough to stay 10 points ahead of the Blue Jays.

b. Which team had a better second half in each prediction?

One of the students used additive reasoning to make her comparison and the other used multiplicative reasoning. Additive reasoning focuses on the use of addition and subtraction for comparisons. Multiplicative reasoning focuses on the use of multiplication and division.

c. Which student used additive reasoning and which used multiplicative reasoning?

Vicki and her nephew Benjamin share the same birthday. They were both born on March 4.

Vicki: "Today I'm 40 years old, and you're 10. I'm 4 times as old as you are!"

Benjamin: "Wow, you're old!"

Vicki: "Yeah, but in 5 years, I'll be 45, and you'll be 15. Then I will only be three times as old as you."

Benjamin: "I'm catching up to you!"

Vicki: "And 15 years after that, I'll be 60 and you'll be 30. Then I'll only be twice as old as you!"

Benjamin: "In enough time, I'll be older than you, Aunt Vicki!"

2. Is Vicki correct about how their ages change? Is Benjamin correct in thinking that he will eventually be older than his aunt?

3. The table represents the different statements from this problem situation. Let V represent Vicki's age and B represent Benjamin's age.

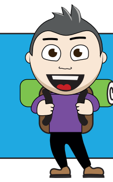
a. Copy the table and complete the last column by identifying each relationship as either **additive** or **multiplicative**.

| Verbal | Numeric | Relationship | |
|---|---|---|---|
| Today I'm 40 years old, and you're 10. | $V = 40$, $B = 10$ | $V = B + 30$ | |
| I'm 4 times as old as you are! | $V = 40$, $B = 10$ | $V = 4B$ | |
| Yeah, but in 5 years, I'll be 45, and you'll be 15. | $V = 45$, $B = 15$ | $V = B + 30$ | |
| Then I will only be three times as old as you. | $V = 45$, $B = 15$ | $V = 3B$ | |
| And 15 years after that, I'll be 60 and you'll be 30. | $V = 60$, $B = 30$ | $V = B + 30$ | |
| Then I'll only be twice as old as you! | $V = 60$, $B = 30$ | $V = 2B$ | |

b. At any point in this age scenario, which relationship does not change?

EXPLORE 2

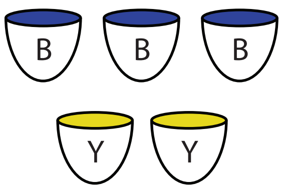
## Comparing Quantities



The school colors at Riverview Middle School are a shade of bluish green and white. The art teacher, Mr. Raith, knows to get the correct color of bluish green it takes 3 parts blue paint to every 2 parts yellow paint.

There are different ways to think about this relationship and make comparisons. One way is to draw a picture or model.

From the model, you can make comparisons of the different quantities.




- blue parts to yellow parts
- yellow parts to blue parts
- blue parts to total parts
- yellow parts to total parts

Each comparison is called a ratio. A ratio is a comparison of two quantities that uses division. The first two comparisons are **part-to-part** ratios because you are comparing the individual quantities.

The last two comparisons are **part-to-whole** ratios because you are comparing one of the parts (either blue or yellow) to the total number of parts.

**Suppose** Mr. Raith needs 2 parts blue paint and 5 parts yellow paint to make green paint.

1. Compare the quantities of blue and yellow paint in Mr. Raith's mixture by writing all possible ratios for each type.

a. part-to-part ratios

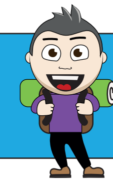
What is the difference between the part-to-part ratios that you wrote?

b. part-to-whole ratios

What is the difference between the part-to-whole ratios that you wrote?

EXPLORE 3

## Ratio Hunt



Ratios can be found all around you, even in your classroom!
Just consider two different quantities.

For example, how many students in your class are wearing sneakers?
How many students in your class are wearing another type of shoe?

1. Use a ratio to describe the relationship given.

a. Write a part-to-part ratio comparing the number of students wearing sneakers to the number of students wearing a different type of shoe.

b. Write a part-to-part ratio comparing the number of students wearing a shoe other than sneakers to the number of students wearing sneakers.

c. Write a part-to-whole ratio comparing the number of students wearing sneakers to the total number of students in the class.

d. Write a part-to-whole ratio comparing the number of students wearing a type of shoe other than sneakers to the total number of students in the class.

2. Search around your classroom for at least 3 pairs of quantities to compare. For each pair:

- Identify the two quantities that are being compared using ratios.
- Write all possible part-to-part and/or part-to-whole comparisons of the quantities.
- Identify each ratio as part-to-part or as part-to-whole.
- Be prepared to share your treasures from the Ratio Hunt with the class.

a. Quantities being compared:
Ratio(s):

b. Quantities being compared:
Ratio(s):

c. Quantities being compared:

Name: ______________________________ Date: ______________ Class: ____________

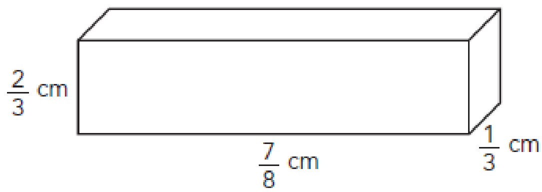
Homework HW

# LESSON 4.1a
# It's All Relative

Objective: Introduction to Ratio and Rate Reasoning

## Review

1. A right rectangular prism is shown.




a. Determine the volume of the prism.

b. Determine the surface area of the prism.

2. Estimate each sum or difference to the nearest whole number. Then calculate each sum or difference.

a. Cristina wants to purchase four items at the sporting goods store. The items she wants to buy are soccer cleats for \$24.99, shin guards for \$12.99, soccer socks for \$4.49, and a soccer ball for \$19.95. How much will the four items cost?

b. Jada and Tonya ran a 400-meter race. Jada ran the race in 75.2 seconds. Tonya ran the race in 69.07 seconds. How much faster did Tonya run the race?

3. Determine each product.

a. $\frac{3}{8} \times \frac{4}{5}$

b. $2\frac{9}{10} \times \frac{2}{5}$