

DOINGWHATWORKS



SAMPLE MATERIAL

Focus on Ratios

RMC Denver Professional Development, Colorado

Topic: Developing Effective Fractions Instruction for K-8

Practice: Ratio, Rate, Proportion

As part of a week-long professional development workshop provided by RMC Denver, teachers spend a session focusing on issues related to working with ratios. The media piece *Understanding Ratios* is from this session.



Focus on Ratios

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Big Ideas for Ratios



A ratio is an ordered pair of numbers or measurements that expresses a comparison between the numbers or measures.

- Reasoning with ratios involves attending to and coordinating two quantities.
Forming a ratio involves isolating one attribute from other attributes.
- A ratio is a multiplicative comparison of two quantities or it is a joining of two quantities in a composed unit.



Ratios



- **Ratios are expressed in fraction notation.**
Ratios and fractions do not have identical meaning. Ratios and fractions can be thought about with overlapping sets.
- **Fractions are ratios, but not all ratios are fractions.**
Some ratios make “part-part” comparisons or relate more than two parts.
- **Rates are ratios, but not all ratios are rates.**

Ratios are building blocks for proportions and proportional reasoning.



Types of Ratios



- **Part-to-Whole Ratios**
Compare two measures of same type
Nonfiction books to all books in library, percentages, probabilities
- **Part-to-Part Ratios**
Compare two measures of same type
Fiction books to nonfiction books in library, odds of an event
- **Rates as Ratios**
Comparison of measures of two different things / quantities
Prices, time and distance, miles per gallon, inches per foot
- **Special Ratios**
Golden ratio, π , slope of line, geometric similarity, trigonometric functions from right triangles

Ratios: Student Thinking

Two weeks ago, two flowers were measured at 8 inches and 12 inches. Today they are 11 inches and 15 inches tall, respectively.



Which flower grew more – the 8-inch or 12-inch flower?

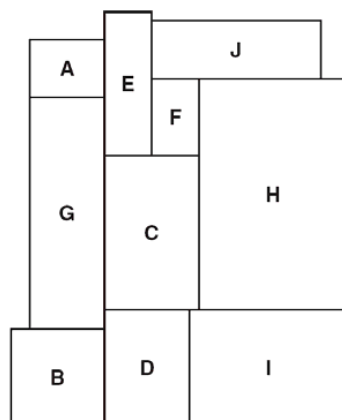
Defend two different answers to this problem.

Additive Versus Multiplicative Reasoning

Comparing Ratios

Equivalent ratios

Visual and numeric formats





Comparing Ratios

Unit rate

Distinguish equivalency between two or more ratios



Comparing Ratios



Two camps of Scouts are having pizza parties. The Bear Camp ordered enough so that every 3 campers will have 2 pizzas. The leader of the Raccoons ordered enough so that there would be 3 pizzas for every 5 campers.

Did the Bear campers or the Raccoon campers have more pizza to eat?

● ● ● | **Unit Rate**

Fractional parts for each →
sharing “pizzas per camper”



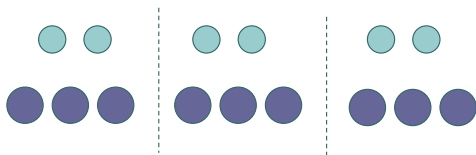
Each of the 3 campers
will get $\frac{1}{2}$ and $\frac{1}{6}$.



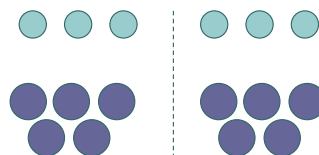
Each of the 5 campers
will get $\frac{1}{2}$ and $\frac{1}{10}$.

● ● ● | **Unit Rate**

Fractional parts for each →
sharing “pizzas per camper”



6 pizzas for 9 campers



6 pizzas for 10 campers



Comparing Ratios

Ratio table

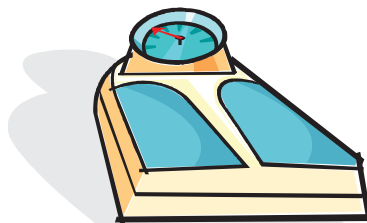
Relationship of two variable quantities



Ratio Tables

A person who weighs 160 pounds on Earth will weigh 416 pounds on the planet Jupiter.

How much will a person weigh on Jupiter who weighs 120 pounds on earth?



Ratio Table

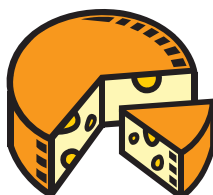
		2	2	X 3
Earth weight	160	80	40	120
Jupiter weight	416	208	104	312
Earth weight	160	80	40	120
Jupiter weight	416	208	104	312

Add

Ratio Table

Cheese is \$4.25 per pound.

How much will 12.13 pounds cost?



	Lbs	Cost	Notes
A	1	4.25	Given
B	10	42.50	Ax10
C	2	8.50	Ax2
D	0.1	0.425	A 10
E	12.1	51.125	B+C+D
F	0.01	0.0425	D 10
G	0.03	0.1275	Fx3
H	12.13	51.5525	E+G

● ● ● | Comparing Ratios

Multiplicative comparison

Link to proportional reasoning and algebra



● ● ● | Multiplicative Comparisons

$3/4$ and $4/3$ are multiplicative comparisons.

$3/4$ → "What part of the length of the base is the height?"

$4/3$ → "How many times greater is the length of the base than its height?"

Using multiplicative comparisons is a powerful proportional reasoning strategy.

Height (cm)	Length of base (cm)
3	4
12	16
1.5	2
1	$4/3$
$3/4$	1