

Ratio Tables and Unit Rates

Strand: Patterns, Functions, and Algebra

Topic: Determining whether a proportional relationship exists between two quantities and making connections between and among representations of a proportional relationship. Representing proportional relationships, including practical situations, determining unit rates, and determining missing values in a ratio table.

Primary SOL: 6.12 The student will

- a) represent a proportional relationship between two quantities, including those arising from practical situations;
- b) determine the unit rate of a proportional relationship and use it to find a missing value in a ratio table.

Related SOL: 6.1

Materials

- Linking cubes
- Chart paper (optional)
- Determining Proportional Relationships and Unit Rates activity sheet (attached)
- Creating a Table of Ratios and Determining the Existence of Proportional Relationships activity sheet (attached)

Vocabulary

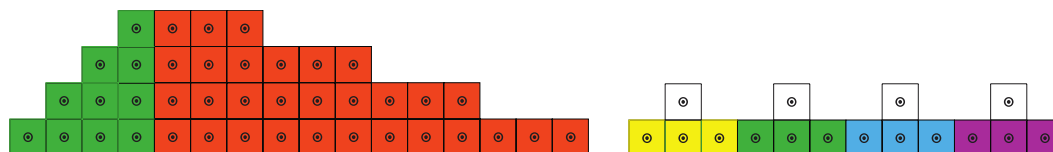
additive relationship, multiplicative relationship, proportion, proportional relationship, ratio, ratio table, unit rate (6.12)

Student/Teacher Actions: What should students be doing? What should teachers be doing?

1. Discuss the term *ratio*. Make sure that students understand that a ratio is a comparison of any two quantities and that it is used to represent a relationship within a quantity and between quantities. Students must first understand the concept of ratios in order to recognize and determine the existence of equivalent ratios. Equivalent ratios arise by multiplying each value in a ratio by the same constant value. For example, the ratio of 8:4 would be equivalent to the ratio 16:8, since each value in the first ratio could be multiplied by 2 to obtain the second ratio.
2. Share with students that a proportional relationship consists of two quantities where there exists a constant number (constant of proportionality) such that each measure in the first quantity multiplied by this constant gives the corresponding measure in the second quantity. Provide students with additional examples that will allow them to identify the constant of proportionality.
3. Use the Determining Proportional Relationships and Unit Rates activity sheet to as a means of practical application and discovery of the following concepts:
 - Understanding the difference between a multiplicative relationships and additive relationships.

Understanding that a rate is a ratio that involves different units and how they relate to each other. A unit rate describes how many units of the first quantity of a ratio correspond to one unit of the second quantity.

- An example of using the linking cubes to demonstrate the relationship 1:3 and unit rates:



4. Use the Creating a Table of Ratios and Determining the Existence of Proportional Relationships activity sheet to help students understand that a ratio table is a table of values representing a proportional relationship that includes pairs of values that represent equivalent rates or ratios. A constant exists that can be multiplied by the measure of one quantity to get the measure of the other quantity for every ratio pair. The same proportional relationship exists between each pair of quantities in a ratio table.

Assessment

- **Questions**
 - What is a ratio?
 - What is a unit rate?
 - How are equivalent ratios created? Explain your reasoning and provide an example.
- **Journal/writing prompts**
 - Given the following scenario, find the missing values using a ratio table and the unit rate: “A store advertises the price of \$24 for six specialty candles. What would be the cost to purchase two candles? Three candles? Four candles? Five candles?”
 - Use the same scenario to create a double-number line. Discuss how both the ratio table and double-number line are constructed and how the same data is represented.
- **Other Assessments (include informal assessment ideas)**
 - Allow students to create at least two examples of equivalent ratios on an index card. Then have them to engage in a “give one, get one” exchange, where they find the constant of proportionality of the given ratios. Collect all index cards at the end of the activity and review as an exit ticket.
 - Ask students to create their own ratio table of missing values. Pair students to allow them to try to find the missing values. Make sure to specify with students that they are to create a ratio table demonstrating a proportional relationship.

Extensions and Connections (for all students)

- Use think-pair-share and whole-class discussion to provide students with opportunities to reflect on the meaning of a ratio and a unit rate.

- Provide students with the following practical application problems. Allow them to work with a partner or small group and then place their work on chart paper. Allow students to present their findings to the class.

- Mrs. Sweets provided cookies for her class of 24 students. She purchased 72 cookies to make sure that each student receives the same number of cookies. Complete the table below to determine the number of cookies per student.

Number of Students	24	12	6	2	1
Number of Cookies	72				

- Jacob worked 5 days a week, and 6 hours each day. This week he earned \$337.50. What was his hourly rate of pay?
- Use unit rate to determine which of the following is the best deal:
 - \$4.08 for a 16-ounce box of cereal
 - \$4.50 for an 18-ounce box of cereal
 - \$5.39 for a 22-ounce box of cereal

Strategies for Differentiation

- Use two-color counters to represent unit rates and manipulate ratios to create equivalent ratios.
- Create a graphic organizer to show the connections between ratios, unit rates, equivalent ratios, ratio tables, and proportional relationships.
- Allow students to work with a partner for all learning activities and permit them to collaborate to complete the attached activity sheets.

Note: The following pages are intended for classroom use for students as a visual aid to learning.

Determining Proportional Relationships and Unit Rates

Julia is going to an amusement arcade to play games with her friends. Julia’s arcade charges \$4 per game and no entrance fee. Lauren is going to a different arcade that charges an entrance fee of \$5 plus \$1 per game. The tables below represent the cost per number of games played for Julia and Lauren.

Julia

No. of games	Cost
1	\$4
2	\$8
3	\$12
4	\$16

Lauren

No. of games	Cost
1	\$6
2	\$7
3	\$8
4	\$9

- What is a ratio?
- Do the tables represent the same relationship?
- Use the linking cubes to model the ratio of cost to number of games played for Julia. What do you notice with Julia’s growing pattern?
- What is the cost for one game in Julia’s table?
- Build Julia’s unit rate with linking cubes. Show how the unit rate model is repeated within all the other ratio models that you have built for Julia’s table.
- The ratio of $\frac{\text{cost}}{1 \text{ game}}$ is known as _____
- Using any two of the $\frac{\text{cost}}{\text{number of games}}$ ratios within Julia’s table, determine whether they are equivalent.
- Use the linking cubes to model the ratio of cost to number of games played for Lauren. What do you notice with Lauren’s growing pattern?
- Using any two of the $\frac{\text{total cost}}{\text{number of games}}$ ratios within Lauren’s table, determine whether they are equivalent.
- Based on the tables above, who has the better bargain? Explain your thinking.
- After eight games, who would spend the most money? Explain your thinking based on the unit rate developed in question 6.

Creating a Table of Ratios and Determining the Existence of Proportional Relationships

Jasmine would like to buy a sweater that costs \$36. Because she has not saved any money, Jasmine’s parents are willing to pay her for chores completed around the house. They agree to pay Jasmine \$3 for every two chores she completes but will also pay her for completing single chores.

Complete the ratio table below to show how many chores Jasmine would have to do in order to save enough money to buy the game.

X chores	1	2	4		9		20	
Y money earned		\$3		\$12		\$27		\$36

1. Does the situation above represent a proportional relationship? Use ratios from the table to explain your thinking.
2. What is the unit rate of cost per chore for Jasmine’s situation?
3. Create a double-number line to demonstrate the given relationship.
4. How could you change Jasmine’s situation to represent a nonproportional relationship between money earned and chores completed?