Richmond Public Schools
Curriculum Framework
Grade 6 Honors (6/7)

Strand:	
6.1 The student will represent relationships between quantities using ratios, and will use appropriate notations, such as $\frac{a}{b}$, *a* to *b*, and *a*:*b*. **7.3 The student will solve single-step and multi-step practical problems, using proportional reasoning**	
Suggested Pacing	
First Nine Weeks – 8 Instructional Days SOL 6.1 – 4 days SOL 7.3 – 4 days	
Related Standards	
Spiral Down:	Spiral Up: • SOL 8.4
Essential Questions	**Common Misconceptions**
• What is a ratio? • Why is proportional reasoning important?	• Students may not understand that 8:4 and 2:1 represent the same ratios; • Students understanding that order matters in a ratio. For example, students may believe that 3:1 and 1:3 are the same ratios; • Students see little difference between fractions and ratios, believing that all ratios express part-to-whole relationships • Students may misinterpret or misrepresent ratios expressed in words.
Understanding the Standard	**Essential Knowledge and Skills**
SOL 6.1	SOL 6.1

- A ratio is a comparison of any two quantities. A ratio is used to represent relationships within a quantity and between quantities. Ratios are used in practical situations when there is a need to compare quantities.
- In the elementary grades, students are taught that fractions represent a part-to-whole relationship. However, fractions may also express a measurement, an operator (multiplication), a quotient, or a ratio. Examples of fraction interpretations include:
  - Fractions as parts of wholes: $\frac{3}{4}$ represents three parts of a whole, where the whole is separated into four equal parts.
  - Fractions as measurement: the notation $\frac{3}{4}$ can be interpreted as three one-fourths of a unit.
  - Fractions as an operator: $\frac{3}{4}$ represents a multiplier of three-fourths of the original magnitude.
  - Fractions as a quotient: $\frac{3}{4}$ represents the result obtained when three is divided by four.
  - Fractions as a ratio: $\frac{3}{4}$ is a comparison of 3 of a quantity to the whole quantity of 4.
- A ratio may be written using a colon (a:b), the word *to* (a to b), or fraction notation ($\frac{a}{b}$).
- The order of the values in a ratio is directly related to the order in which the quantities are compared.
  - Example: In a certain class, there is a ratio of 3 girls to 4 boys (3:4). Another comparison that could represent the relationship between these quantities is the ratio of 4 boys to 3 girls (4:3). Both ratios give the same information about the number of girls and boys in the class, but they are distinct ratios. When you switch the order of comparison (girls to boys vs. boys to girls), there are different ratios being expressed.
- Fractions may be used when determining equivalent ratios.
  - Example: The ratio of girls to boys in a class is 3:4, this can be interpreted as:

    number of girls = $\frac{3}{4}$ • number of boys.

    In a class with 16 boys, number of girls = $\frac{3}{4}$ • (16) = 12 girls.

- Represent a relationship between two quantities using ratios.
- Represent a relationship in words that makes a comparison by using the notations $\frac{a}{b}$, a:b, and *a to b.*
- Create a relationship in words for a given ratio expressed symbolically.

SOL 7.3

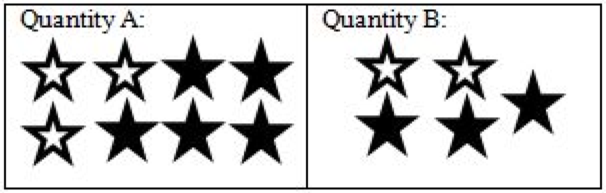
- Given a proportional relationship between two quantities, create and use a ratio table to determine missing values.
- Write and solve a proportion that represents a proportional relationship between two quantities to find a missing value.
- Apply proportional reasoning to convert units of measurement within and between the U.S. Customary System and the metric system when given the conversion factor.
- Apply proportional reasoning to solve practical problems, including scale drawings. Scale factors shall have denominators no greater than 12 and decimals no less than tenths.

- Example: A similar comparison could compare the ratio of boys to girls in the class as being 4:3, which can be interpreted as:
  number of boys = $\frac{4}{3}$ • number of girls.
  In a class with 12 girls, number of boys = $\frac{4}{3}$ • (12) = 16 boys.

- A ratio can compare two real-world quantities (e.g., miles per gallon, unit rate, and circumference to diameter of a circle).
- Ratios may or may not be written in simplest form.
- A ratio can represent different comparisons within the same quantity or between different quantities.

Ratio	Comparison
part-to-whole (within the same quantity)	compare part of a whole to the entire whole
part-to-part (within the same quantity)	compare part of a whole to another part of the same whole
whole-to-whole (different quantities)	compare all of one whole to all of another whole
part-to-part (different quantities)	compare part of one whole to part of another whole

- Examples: Given Quantity A and Quantity B, the following comparisons could be expressed.



Ratio	Example	Ratio Notation(s)
part-to-whole (within the same quantity)	compare the number of unfilled stars to the total number of stars in Quantity A	3:8; 3 to 8; or $\frac{3}{8}$
part-to-part [1] (within the same quantity)	compare the number of unfilled stars to the number of filled stars in Quantity A	3:5 or 3 to 5
whole-to-whole [1] (different quantities)	compare the number of stars in Quantity A to the number of stars in Quantity B	8:5 or 8 to 5
part-to-part [1] (different-quantities)	compare the number of unfilled stars in Quantity A to the number of unfilled stars in Quantity B	3:2 or 3 to 2

[1]Part-to-part comparisons and whole-to-whole comparisons are ratios that are not typically represented in fraction notation except in certain contexts, such as determining whether two different ratios are equivalent.

SOL 7.3

- A proportion is a statement of equality between two ratios. A proportion can be written as
  $\frac{a}{b} = \frac{c}{d}$, $a:b = c:d$, or a is to b as c is to d.
- Equivalent ratios arise by multiplying each value in a ratio by the same constant value. For example, the ratio of 3:2 would be equivalent to the

ratio 6:4 because each of the values in 3:2 can be multiplied by 2 to get 6:4.

- A ratio table is a table of values representing a proportional relationship that includes pairs of values that represent equivalent rates or ratios.
- A proportion can be solved by determining the product of the means and the product of the extremes. For example, in the proportion $a:b = c:d$, a and d are the extremes and b and c are the means. If values are substituted for a, b, c, and d such as 5:12 = 10:24, then the product of extremes ($5 \cdot 24$) is equal to the product of the means ($12 \cdot 10$).
- In a proportional relationship, two quantities increase multiplicatively. One quantity is a constant multiple of the other.
- A proportion is an equation which states that two ratios are equal. When solving a proportion, the ratios may first be written as fractions.
  - Example: A recipe for oatmeal cookies calls for 2 cups of flour for every 3 cups of oatmeal. How much flour is needed for a larger batch of cookies that uses 9 cups of oatmeal? To solve this problem, the ratio of flour to oatmeal could be written as a fraction in the proportion used to determine the amount of flour needed when 9 cups of oatmeal is used. To use a proportion to solve for the unknown cups of flour needed, solve the proportion: $\frac{2}{3} = \frac{x}{9}$.
    To use a table of equivalent ratios to find the unknown amount, create the table:

flour (cups)	2	4	?
oatmeal (cups)	3	6	9

    To complete the table, we must create an equivalent ratio to 2:3; just as 4:6 is equivalent to 2:3, then 6 cups of flour to 9 cups of oatmeal would create an equivalent ratio.
- A proportion can be solved by determining equivalent ratios.

- A rate is a ratio that compares two quantities measured in different units. A unit rate is a rate with a denominator of 1. Examples of rates include miles/hour and revolutions/minute.
- Proportions are used in everyday contexts, such as speed, recipe conversions, scale drawings, map reading, reducing and enlarging, comparison shopping, tips, tax, and discounts, and monetary conversions.
- A multistep problem is a problem that requires two or more steps to solve.
- Proportions can be used to convert length, weight (mass), and volume (capacity) within and between measurement systems. For example, if 1 inch is about 2.54 cm, how many inches are in 16 cm?

$$\frac{1\ inch}{2.54\ cm} = \frac{x\ inch}{16\ cm}$$

$$2.54x = 1 \cdot 16$$

$$2.54x = 16$$

$$x = \frac{16}{2.54}$$

$x = 6.299$ or about 6.3 inches

- Examples of conversions may include, but are not limited to:
  - Length: between feet and miles; miles and kilometers
  - Weight: between ounces and pounds; pounds and kilograms
  - Volume: between cups and fluid ounces; gallons and liters
- Weight and mass are different. Mass is the amount of matter in an object. Weight is determined by the pull of gravity on the mass of an object. The mass of an object remains the same regardless of its location. The weight of an object changes depending on the gravitational pull at its location. In everyday life, most people are actually interested in determining an object's mass, although they use the term *weight* (e.g., "How much does it weigh?" versus "What is its mass?").
- When converting measurement units in practical situations, the precision of the conversion factor used will be based on the accuracy required

within the context of the problem. For example, when converting from miles to kilometers, we may use a conversion factor of 1 mile ≈ 1.6 km or 1 mile ≈ 1.609 km, depending upon the accuracy needed.

- Estimation may be used prior to calculating conversions to evaluate the reasonableness of a solution.
- A percent is a ratio in which the denominator is 100.
- Proportions can be used to represent percent problems as follows:

$$\frac{percent}{100} = \frac{part}{whole}$$

Vocabulary

SOL 6.1

Ratio	Comparison	Simplest Form

SOL 7.3

Proportion	Equivalent	Scale Drawings
Tax	Tip	Discount

Instructional Activities Organized by Learning Objective

Textbook

Notes

Resources
Technology-based

Station Activities

Assessment

Formative Assessments –

Cross-Curricular Connections

Differentiations

English Language Learners

	Enrichment