

Richmond Public Schools

Curriculum Framework

7th Grade Math

Strand: Computation and Estimation

SOL 7.3 The student will solve single-step and multistep practical problems, using proportional reasoning.

Suggested Pacing

Second Nine Weeks- 10 Instructional Days

Spiraling Standards

Spiraling Down:

6.1 The student will represent relationships between quantities using ratios, and will use appropriate notations, such as a to b , a to b , and $a:b$.

6.12 The student will

- a) represent a proportional relationship between two quantities, including those arising from practical situations;
- a) determine the unit rate of a proportional relationship and use it to find a missing value in a ratio table;
- b) determine whether a proportional relationship exists between two quantities; and
- c) make connections between and among representations of a proportional relationship between two quantities using verbal descriptions, ratio tables, and graphs.

Spiraling Up:

8.4 The student will solve practical problems involving consumer applications.

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Essential Questions	Common Misconceptions
<p>What is a rate?</p> <p><i>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.</i></p> <p>How are weight and mass different?</p> <p><i>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?").</i></p>	<ul style="list-style-type: none">• Corresponding ratios and proportions that are supposed to be aligned with unknown variables are typically written in the numerator but depending on the ratios variables can also be in the denominator.• Corresponding line segments are often predicated by the rotation of the similar figure before writing proportions.• Similar figures having congruent angles.
Understanding the Standard	Essential Knowledge and Skills
<ul style="list-style-type: none">• A proportion is a statement of equality between two ratios. A proportion can be written as $a/b = c/d$, $a:b = c:d$, 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.	<p>The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to</p> <ul style="list-style-type: none">• 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.

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- 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:
- 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.
- Using 10% as a benchmark, compute 5%, 10%, 15%, or 20% of a given whole number.
- Using 10% as a benchmark, compute 5%, 10%, 15%, or 20% in a practical situation such as tips, tax, and discounts.
- Solve problems involving tips, tax, and discounts. Limit problems to only one percent computation per problem.

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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?

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

$$2.54x = 1 \cdot 16$$

$$2.54x = 16$$

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

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$$x = 6.299 \text{ or about } 6.3 \text{ inches}$$

- 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 \approx 1.6 km or 1 mile \approx 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:

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

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Vocabulary	Instructional Activities Organized by Learning Objective
<p>Corresponding Cross Products Equivalent Ratio Ratio Table Proportion Product of the Means Product of the Extremes Proportional Tax Tip Discount Conversion US Customary System Metric System Non-proportional Unit Rate Scale Model Scale Factor Percent Percent Proportion Similar</p>	<p>Virginia Department of Education Proportion Grid Cards and Missing Terms Sales Tax Tip Activity</p> <p>Textbook Virginia Math Connects, Course 2, ©2012, Glencoe/McGraw-Hill page(s) 265 – 303; 332 – 336; 404; 639 – 640;</p> <p>Notes Guided Notes- Proportions Interactive Reading and Notetaking- Proportions</p> <p>Resources</p> <ul style="list-style-type: none"> ● Print: Virginia Coach New SOL Edition Mathematics Grade 7; page(s) 59 - 65 ● Technology-based <ul style="list-style-type: none"> ○ Brain Pop <ul style="list-style-type: none"> ▪ Proportions <p>Station Activities Ratio and Proportion Method Notes and Practice Rates Ratios Percent Cards</p>
Assessment	
Cross-Curricular Connections	Tiered Differentiations

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Sculpting: Students are given ratios that make concrete sculptures possible. They're to use the ratios to figure out proportions and finally the size of their sculpture for an art exhibit.

(Tier 1) Students are given examples of proportional and non-proportional relationships and students are to give written explanations as to how they can tell the difference between the two.
(Tier 3) Students are given prices of items and attempt to figure out bulk orders to save money; understanding that when the unit price of bulk items is less than the unit price for a small order, the rates are nonproportional.