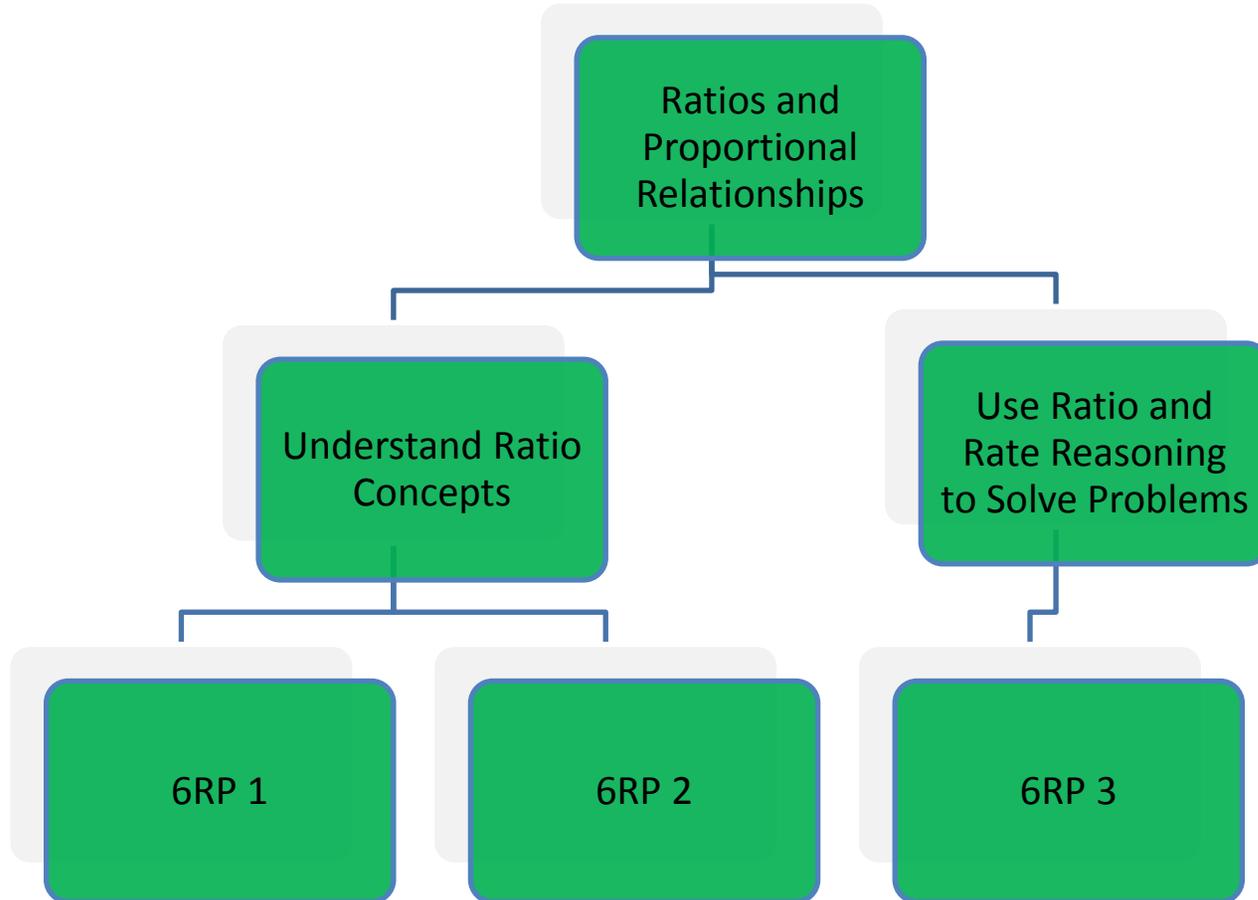


Grade 6  
Unit 1  
Understand the Concept of Ratio and Reason with Ratio



**GRADE 6 – UNIT 1**

**Understand the Concept of Ratio and Reason with Ratio**

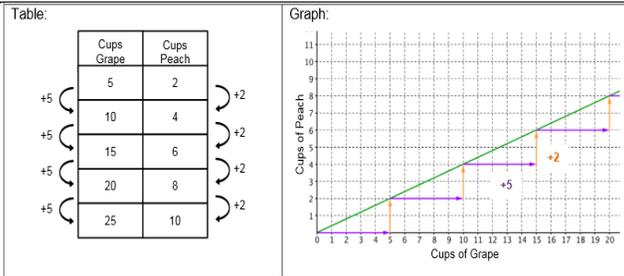
**Critical Area:** Students use reasoning about multiplication and division to solve ratio and rate problems about quantities. By viewing equivalent ratios and rates as deriving from, and extending, pairs of rows (or columns) in the multiplication table, and by analyzing simple drawings that indicate the relative size of quantities, students connect their understanding of multiplication and division with ratios and rates. Thus students expand the scope of problems for which they can use multiplication and division to solve problems, and they connect ratios and fractions. Students solve a wide variety of problems involving ratios and rates.

CLUSTERS	COMMON CORE STATE STANDARDS
<p><b>(m)<sup>1</sup> Understand ratio concepts and use ratio reasoning to solve problems.</b></p>	<p><b>6.RP.1.</b> Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. <i>For example, “The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak.” “For every vote candidate A received, candidate C received nearly three votes.”</i></p> <p><b>6.RP.2.</b> Understand the concept of a unit rate <math>a/b</math> associated with a ratio <math>a:b</math> with <math>b \neq 0</math>, and use rate language in the context of a ratio relationship. <i>For example, “This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is <math>3/4</math> cup of flour for each cup of sugar.” “We paid \$75 for 15 hamburgers, which is a rate of \$5 per hamburger.”<sup>1</sup></i></p> <p><b>6.RP.3.</b> Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.</p> <ul style="list-style-type: none"> <li>a. Make tables of equivalent ratios relating quantities with whole number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios.</li> <li>b. Solve unit rate problems including those involving unit pricing and constant speed. <i>For example, if it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed?</i></li> <li>c. Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent.</li> <li>d. Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.</li> </ul>
<p><b>(s/a)<sup>2</sup> Solve real-world and mathematical problems involving area, surface area, and volume.</b></p>	<p>6.G.1. Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.</p> <p>6.G.2. Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas <math>V = lwh</math> and <math>V = bh</math> to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.</p> <p>6.G.4. Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world</p>

	and mathematical problems.
<b>MATHEMATICAL PRACTICES</b>	
<ol style="list-style-type: none"> <li>1. <b>Make sense of problems and persevere in solving them.</b></li> <li>2. Reason abstractly and quantitatively.</li> <li>3. <b>Construct viable arguments and critique the arguments of others.</b></li> <li>4. Model with mathematics.</li> <li>5. Use appropriate tools strategically.</li> <li>6. Attend to precision.</li> <li>7. Look for and make use of structure.</li> <li>8. Look for and express regularity in repeated reasoning.</li> </ol>	As you begin the year, it is advised that you start with MP1 and MP 3 to set up your expectations of your classroom. This will help you and your students become proficient in the use of these practices. All other practices may be evident based on tasks and classroom activities.
<b>LEARNING PROGRESSIONS</b>	
6-7, Ratios and Proportional Relationships <a href="http://commoncoretools.files.wordpress.com/2012/02/ccss_progression_rp_67_2011_11_12_corrected.pdf">http://commoncoretools.files.wordpress.com/2012/02/ccss_progression_rp_67_2011_11_12_corrected.pdf</a>  CDE Progress to Algebra K-8 <a href="http://www.cde.ca.gov/be/cc/cd/documents/updateditem12catt3.doc">www.cde.ca.gov/be/cc/cd/documents/updateditem12catt3.doc</a>	

ENDURING UNDERSTANDINGS	ESSENTIAL QUESTIONS	KEY VOCABULARY
<ul style="list-style-type: none"> <li>• Relations between two quantities can often be expressed as ratios and can be explained using ratio language.</li> <li>• Multiplication and division can be used to solve ratio and rate problems.</li> <li>• Ratios and rates apply to real life situations.</li> <li>• Percent is a rate of the number of units per 100.</li> <li>• Multiplication and division can be used to generate equivalent ratios and rates.</li> <li>• Double number line diagrams and tape diagrams can show ratio relationships and be used to reason and solve real-world problems.</li> <li>• Graphical representation of an equivalent ratio will be linear.</li> </ul>	<ol style="list-style-type: none"> <li>1. What is a ratio and how does it describe a relationship between two quantities?</li> <li>2. What is a unit rate and how do you use it in the context of a ratio relationship?</li> <li>3. How would you use ratio and rate reasoning in real world situations?</li> <li>4. How would you describe percent of a quantity as a rate per 100?</li> <li>5. How can double line diagrams and tape diagrams used to reason about solutions to real-world problems?</li> <li>6. Why is equivalent ratio linear when it is graphed?</li> </ol>	<ul style="list-style-type: none"> <li>• Constant of proportionality</li> <li>• Equivalent</li> <li>• Linear</li> <li>• Part to part</li> <li>• Part to whole</li> <li>• Percent</li> <li>• Per</li> <li>• Proportional relationship</li> <li>• Quantity</li> <li>• Rate</li> <li>• Ratio</li> <li>• Relationship</li> <li>• Scale factor</li> <li>• Unit</li> </ul>

RESOURCES	INSTRUCTIONAL STRATEGIES	ASSESSMENT
<p>Materials:  <a href="#">California Revised Mathematics Framework: Supporting Teachers with Deep Understanding of Math Content</a>            NCTM, <i>Making Sense Fractions, Ratios and Proportions</i>, 64th Yearbook (2002)</p> <p><b>Other Resources</b>  <a href="#">Thinking Blocks: Ratios</a>  <a href="#">Enrich Math: Once Upon a Time</a></p> <p><b>LAUSD Adopted Textbooks</b></p> <ul style="list-style-type: none"> <li><a href="#">California Mathematics</a></li> <li><a href="#">College Preparatory Mathematics</a></li> <li><a href="#">Go Math</a></li> </ul> <p>Click on each list above for Textbook Alignment</p> <p><b>Illustrative Mathematics Resources:</b></p> <ul style="list-style-type: none"> <li><a href="#">6.RP Voting for Two, Variation 4</a></li> <li><a href="#">6.RP Ratio of boys to girls</a></li> <li><a href="#">6.RP Voting for Two, Variation 1</a></li> <li><a href="#">6.RP Voting for Two, Variation 2</a></li> <li><a href="#">6.RP Voting for Two, Variation 3</a></li> <li><a href="#">6.RP, 7.RP.3 Climbing the steps of El Castillo</a></li> <li><a href="#">6.RP, 6.EE Fruit Salad</a></li> <li><a href="#">6.RP Riding at a Constant Speed, Assessment Variation</a></li> <li><a href="#">6.EE,NS,RP; 8.EE,F Pennies to heaven</a></li> </ul> <p><b>NCTM Illuminations</b></p> <ul style="list-style-type: none"> <li><a href="#">Highway Robbery:</a></li> </ul>	<p>Have students work with models to develop their understanding of ratios. (MP.2, MP.6) Help students see that initially they do not express ratios using fraction notation so that ratios can be differentiated from fractions and from rates. Later, students understand that ratios can be expressed in fraction notation, but that ratios are different from fractions in several ways.</p> <p><b>Journal / Quick Write Prompts:</b> Compare and contrast expressing a relationship between quantities as a ratio, fraction and percent.            Create a ratio problem for your classmates using a different context (situation) than the ones you have worked on in class. The most important thing to remember when solving ratio and percent problems is....            Some good test questions for ratio and percent are...</p> <p>Use tape diagrams (bar model) to model problems where both quantities have the same units.</p> <p>Use double number lines to model problems where both quantities have different units.</p> <p>Use the multiplication table to help students find equivalent ratios.</p> <p>Have students scale quantities up or down by using a rate table.</p> <p>Use tables and graphs to point out to students the additive and multiplicative structure of ratios.</p>	<p><b>Formative Assessment</b>            PARCC - Slider Ruler to explore the relationship between the number of inches and the number of centimeters.  <a href="http://parcconline.org/samples/mathematics/grade-6-slider-ruler">http://parcconline.org/samples/mathematics/grade-6-slider-ruler</a></p> <p>Proportion of Instruments  <a href="http://www.parcconline.org/sites/parcc/files/Grade6-ProportionofInstruments.pdf">http://www.parcconline.org/sites/parcc/files/Grade6-ProportionofInstruments.pdf</a></p> <p><b>LAUSD Assessments</b></p> <p>District assessments can be accessed through:  <a href="http://achieve.lausd.net/math">http://achieve.lausd.net/math</a>  <a href="http://achieve.lausd.net/ccss">http://achieve.lausd.net/ccss</a></p> <p>Use your Single Sign On to access the Interim Assessments</p> <p><b>State Assessments</b></p> <p>California will be administering the SMARTER Balance Assessment as the end of course for grades 3-8 and 11. The 11th grade assessment will include items from Algebra 1, Geometry, and Algebra 2 standards. For examples, visit the SMARTER Balance Assessment at:            SBAC - <a href="http://www.smarterbalanced.org/">http://www.smarterbalanced.org/</a></p>



**LANGUAGE GOALS for low achieving, high achieving, students with disabilities and English Language Learners**

- Students will summarize the steps in setting up and solving a problem involving ratio relationships using conditional and sequence words such as *if-then*, *first*, *next*, *therefore*.  
*Example:* “.For every vote candidate A received, candidate C received nearly three votes. The ratio of candidate A to Candidate C is 1 to 3. Therefore, if candidate A received 1500 votes, how many votes will Candidate C receive.  
 I solved for the variable by \_\_\_\_\_. This means that I will multiply 1500 by 3 to get the number of votes Candidate C received.
- Students will write a constructed response to a word problem using logically ordered reasons that are supported by facts and details and using the appropriate mathematic vocabulary.  
*Example:* The unknown variable is \_\_\_\_\_ because \_\_\_\_\_. This solution demonstrates that \_\_\_\_\_.
- Students will explain how they use a specific mathematical concept in their lives, using the following specific set of words: *miles per gallon*, miles per hour, feet per second, *cents/pound*, “*the ratio of a to b*”  
*Example:* “This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is 3/4 cup of flour for each cup of sugar.” “We paid \$75 for 15 hamburgers, which is a rate of \$5 per hamburger.” For every \_\_\_\_\_ of \_\_\_\_\_ there are \_\_\_\_\_ of \_\_\_\_\_.

**PERFORMANCE TASKS**

**Illustrative Mathematics**

- [6.RP.1 Games at Recess](#)
- [6.RP Mangos for Sale](#)
- [6.RP Price per pound and pounds per dollar](#)
- [6.RP Riding at a Constant Speed, Assessment Variation](#)
- [6.RP The Escalator, Assessment Variation](#)
- [6.RP Hippos Love Pumpkins](#)

**LAUSD Concept Lessons – [math.lausd.net](http://math.lausd.net)**

- [The Candy Bar Task](#)
- [The Caterpillar Task Part 1](#)
- [The Caterpillar Task Part 2](#)

**Mathematics Assessment Project**

- [6.RP.3 : Sharing Costs](#)
- [6.G.4 : Designing : Candy Cartons](#)
- [6.RP.3 : Snail Pace](#)
- [6.RP.1, 6.RP.3 : Candies](#)
- [6.RP.3c : Percent Cards](#)

**NCTM Illuminations Lessons**

- [Bean Counting and Ratios](#)
- [Hay Bale Farmer](#)

**DIFFERENTIATION** 

UDL/ FRONT LOADING	ACCELERATION	INTERVENTION
<p>Prerequisites:</p> <ul style="list-style-type: none"> <li>• Students apply their understanding of multiplication tables. Situations that give rise to columns or rows of a multiplication table can provide good initial context.</li> <li>• Students apply and extend their knowledge of common fractions, relationships and rules for multiplication and division of whole numbers as they apply to decimal fractions, Multiples and Factors and Divisibility Rules.</li> </ul>	<p>Acceleration for high achieving students:</p> <p>Provide students with opportunities to be recognized for their previous knowledge and to be allowed to avoid redundant learning by being encouraged to learn the sophisticated and advanced information and skills of the curriculum or related curriculums at their own rate. This also includes the opportunity for students to make personal meaning of the lesson. For example:</p> <p>Use ratio and rate reasoning, percent of quantity as a rate per 100, and solve problems involving finding the whole given a part and the percent to solve real-world and mathematical problems:</p> <p style="padding-left: 20px;">Students apply their math knowledge of ratio and rate by surveying all the students at their school on a current issue, students record their results in a contingency table below and make conclusions based on their results.</p>	<p>Intervention for low achieving students and students with disabilities:</p> <ul style="list-style-type: none"> <li>• Small teacher to student ratio discussion</li> <li>• Emphasize think-pair-share</li> </ul> <p>• Make connections to real life</p> <p>Students understand that Part-to-part ratios are used to compare two parts. For example, the number of girls in the class (12) compared to the number of boys in the class (16) is the ratio the ratio 12 to 16.</p> <p>– illustrate the concept of ratios and proportions using real life examples. Continuing with the use of a table, students can investigate and reason about proportions. Example of a juice mixture of juice A and B of a 5 to 2 and you want to know how m any cups of juice A to mix with juice B. Students make a ratio table to find the juice A entry that pairs with 12 cups of juice B in the table. Emphasis should be made to the important role of the multiplication table and division in how entries are related to each other.</p> <ul style="list-style-type: none"> <li>• Making explicit the type of relationships that exist between two values will minimize confusion between multiplicative and additive situations.</li> <li>• Use concrete manipulatives</li> </ul>

<sup>1</sup> Major Clusters – area of intensive focus where students need fluent understanding and application of the core concepts.

<sup>2</sup> Supporting/Additional Clusters – designed to support and strengthen areas of major emphasis/expose students to other subjects.

**References:**

1. National Governors Association Center for Best Practices, Council of Chief State School Officers. (2010). *Common Core State Standards (Mathematics)*. Washington D.C.: National Governors Association Center for Best Practices, Council of Chief State School Officers.
2. McCallum, W., Zimba, J., Daro, P. (2011, December 26 Draft). *Progressions for the Common Core State Standards in Mathematics*. Cathy Kessel ( Ed.). Retrieved from <http://ime.math.arizona.edu/progressions/#committee>.
3. Engage NY. (2012). New York Common Core Mathematics Curriculum. Retrieved from <http://engageny.org/sites/default/files/resource/attachments/a-story-of-ratios-a-curriculum-overview-for-grades-6-8.pdf>.
4. Mathematics Assessment Resource Service, University of Nottingham. (2007 - 2012). Mathematics Assessment Project. Retrieved from <http://map.mathshell.org/materials/index.php>.
5. Smarter Balanced Assessment Consortium. (2012). Smarter Balanced Assessments. Retrieved from <http://www.smarterbalanced.org/>.
6. Partnership for Assessment of Readiness for College and Career. (2012). PARCC Assessments. Retrieved from <http://www.parcconline.org/parcc-assessment>.
7. California Department of Education. (2013). Draft Mathematics Framework Chapters. Retrieved from <http://www.cde.ca.gov/be/cc/cd/draftmathfwchapters.asp>.
8. National Council of Teachers of Mathematics (NCTM) Illuminations. (2013). Retrieved from <http://illuminations.nctm.org/Weblinks.aspx>.
9. The University of Arizona. (2011-12). Progressions Documents for the Common Core Math Standards. Retrieved from <http://ime.math.arizona.edu/progressions>.