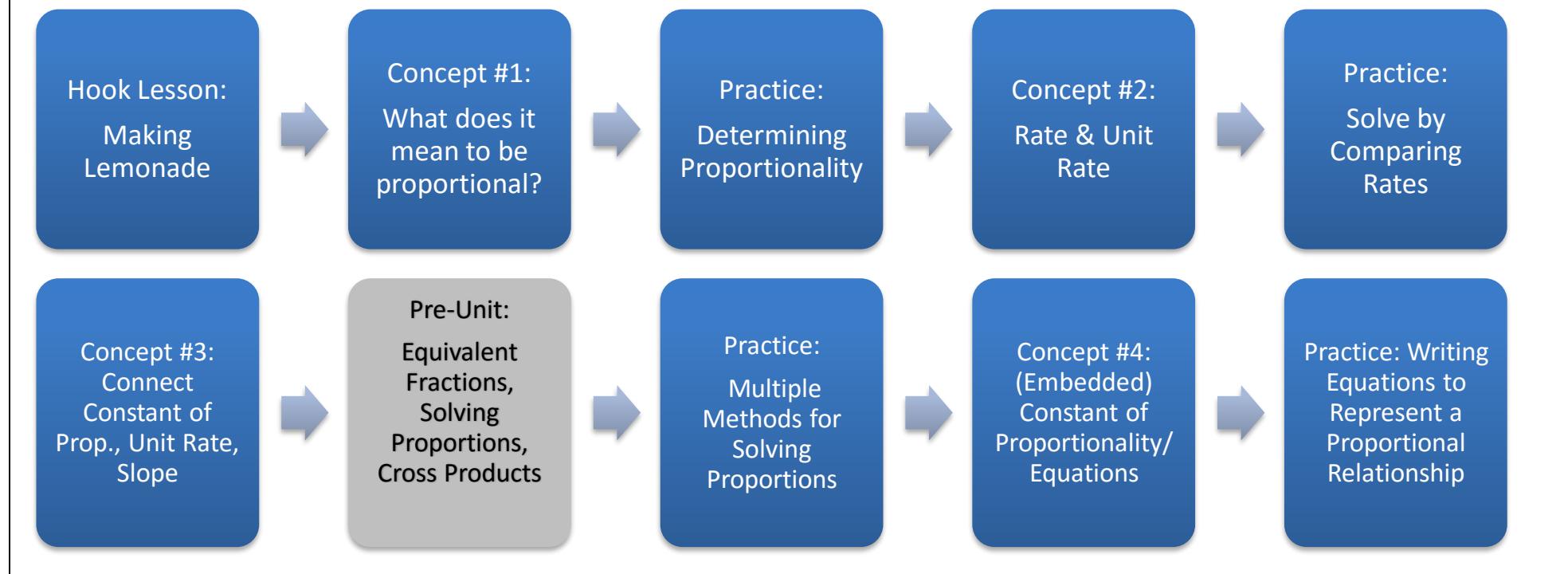
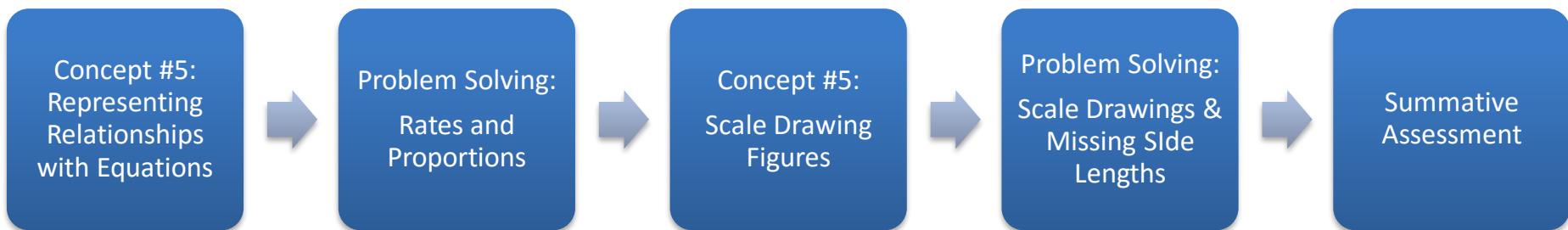




|                   |  |                          |                            |
|-------------------|--|--------------------------|----------------------------|
| <b>Unit Name:</b> | Proportional Relationships   | <b>Course:</b> CC Math 7 | <b>Time Frame:</b> 6 weeks |
| <b>Sub-Topics</b> | <ul style="list-style-type: none"><li>• Unit rates (including with complex fractions)</li><li>• Understanding the constant of proportionality in tables, graphs, equation, diagrams and verbal descriptions</li><li>• Connecting constant of proportionality, unit rate, and slope in representations</li><li>• Understanding what proportional means</li><li>• Application problems involving proportions</li><li>• Scale drawings with figures</li></ul> |                          |                            |
| <b>Big Idea</b>   | Ratio is a multiplicative comparison of two quantities. Proportions allow us to scale up or scale down data while keeping the ratio intact.  |                          |                            |

### Story Board/ Unit Flow





### Rationale:

In grade seven students extend their reasoning about ratios and proportional relationships in several ways. They identify unit rates in representations of proportional relationships. They work with equations in two variables to represent and analyze proportional relationships. In grade seven students extend their understanding of multiplicative reasoning to proportions. Students determine if two quantities are in a proportional relationship and they represent proportional relationships. Students use various methods to model, explain and solve ratio problems with fractions. Grade seven students identify unit rates in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships. As students work with proportional relationships, they write equations of the form  $y = cx$ , where  $c$  is a constant of proportionality (i.e., a unit rate.). They recognize the unit rate as the vertical increase in a “unit rate triangle” or “slope triangle”. Students compute lengths and reproduce a scale drawing at a different scale

| Essential Questions   | Key Vocabulary  | Prior Knowledge   |
|---|---|---|
| <ul style="list-style-type: none"> <li>• What is a unit rate?</li> <li>• Are these data proportional?</li> <li>• Which method is most helpful to solve in each situation?</li> <li>• What is the constant of proportionality?</li> <li>• What has a better unit rate?</li> <li>• When do I use proportional comparisons?</li> </ul> | <b>Key Vocabulary</b> <ul style="list-style-type: none"> <li>Absolute</li> <li>Cross-products</li> <li>Unit Rate</li> <li>Relative</li> <li>Speed</li> <li>Slope</li> <li>Constant of Proportionality</li> </ul> <ul style="list-style-type: none"> <li>Equivalent Fractions</li> <li>Multiplicative</li> <li>Proportion</li> <li>Per</li> <li>Rate</li> <li>Similar</li> </ul> | <b>Prior Knowledge</b> <ul style="list-style-type: none"> <li>• Equivalent Fractions (Pre-Unit)</li> <li>• Multiply and Divide Fractions (Prior to Solving)</li> <li>• Solving One-Step Equations (Prior to Equations)</li> <li>• Ratios in Tables (Pre-Unit)</li> <li>• Use Ratio Concepts (Reviewed in Hook Lesson)</li> <li>• Unit Conversions (Not necessary for this unit, but related)</li> </ul> |



Common Core Math Standards Taught and Assessed (M indicates Major standard, A/S indicates Additional or Supporting standard)

## 7 Ratio and Proportional Relationships

Analyze proportional relationships and use them to solve real-world and mathematical problems.

1. Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. *For example, if a person walks  $1/2$  mile in each  $1/4$  hour, compute the unit rate as the complex fraction  $1/2 / 1/4$  miles per hour, equivalently  $2$  miles per hour.* (M)
2. Recognize and represent proportional relationships between quantities. (M)
  - a. Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin. (M)
  - b. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships. (M)
  - c. Represent proportional relationships by equations. *For example, if total cost  $t$  is proportional to the number  $n$  of items purchased at a constant price  $p$ , the relationship between the total cost and the number of items can be expressed as  $t = pn$ .* (M)
  - d. Explain what a point  $(x, y)$  on the graph of a proportional relationship means in terms of the situation, with special attention to the points  $(0, 0)$  and  $(1, r)$  where  $r$  is the unit rate. (M)
3. Use proportional relationships to solve multistep ratio and percent problems. *Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.* (M)

## 7 Geometry

Draw, construct, and describe geometrical figures and describe the relationships between them.

1. Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale. (A/S)



| Time        | Lesson Title                          | Knowledge Type, Claims, & Math Practices | Materials   | Lesson Overview  |
|-------------|---------------------------------------|--|---|--|
| 1-2 Periods | Hook Lesson: Making Lemonade          | KT: C, RK<br>Claim: 2, 3<br>MP: 5, 7     | <ul style="list-style-type: none"> <li>Lemonade powder</li> <li>Water Bottles</li> <li>Same-Size Spoons</li> <li>Straws</li> <li>Paper Towels</li> <li>Cups</li> <li>Taster Cups</li> </ul> | Students will use different ratios of powdered lemonade and water to make and test lemonade. Students will draw tape diagrams to represent the mixtures and to understand the idea of ratios.  |
| 1-2 Periods | Proportional Lab                      | KT: C<br>Claim: 1, 2, 3<br>MP: 1, 3, 8   | <ul style="list-style-type: none"> <li>Stop Watches</li> <li>Pretzel Sticks</li> <li>Cars (Matchbox or Hot Wheels)</li> <li>Rulers/measuring tape</li> <li>Tape</li> </ul>                  | Students participate in a series of activities where one task is proportional and one is not. For each activity, they will record the data in a t-chart and graph it.  |
| 1 Period    | What Does It Mean to Be Proportional? | KT: C<br>Claim: 1, 2, 3<br>MP: 1, 3, 8   | <ul style="list-style-type: none"> <li>Proportional Lab Student Pages</li> </ul>  | By comparing and contrasting the two tasks in Proportional Lab, students will see that Task 1 has a ratio and forms a straight line through (0,0). Then given two new scenarios, the students will have to determine if the data is proportional.  |
| 1 Period    | Understanding Proportions             | KT: C<br>Claim: 1, 2, 3<br>MP: 1, 3, 8   | <ul style="list-style-type: none"> <li>Posters (optional)</li> <li>Markers (optional)</li> </ul>  | Students will compare and contrast data that are proportional and data that are not proportional to come up with four big ideas about what it means to be proportional. Then given scenarios, tables, graphs or fractions, the student will determine if the information is proportional or not. |
| 1-2 Periods | Speed Racers                          | KT: C<br>Claim: 1<br>MP: 7               | <ul style="list-style-type: none"> <li>Chalk/tape for marking intervals on concrete/blacktop</li> <li>Measuring tape</li> </ul>   | Students will sprint for different set intervals of time and compare their results to gain a conceptual understanding of rate. They will then complete a ratio table and graph resulting pairs to discuss and analyze rate and where rate is seen in a table and a graph.                        |



|           |  |                                      |   |  |
|-----------|--|--------------------------------------|---|--|
| 1 Period  | Speed Racers Revisited   | KT: C<br>Claim: 1, 2, 3, 4<br>MP: 8  | <ul style="list-style-type: none"> <li>Speed Racers Activity pages</li> </ul>             | Students will revisit the <i>Speed Racers</i> activity. Given a new racer and his data presented in a table, students will have to find his speed which is also the slope of the data when graphed. Then they will find the slope of all the previous characters, compare slope to speed/unit rate and constant of proportionality, and write speed equations. |
| 1 Period  | Understanding Unit Rate  | KT: C<br>Claim: 1, 2, 4<br>MP: 7     | <ul style="list-style-type: none"> <li>Calculators (optional)</li> </ul>                  | Students will use ratio tables to calculate the value of “1” of something. Then they study the original and unit rates to describe a pattern and method to calculate unit rate.  |
| 2 Periods | (Optional) Which is the Better Deal Or Teachers Find or Create Practice with Unit Rate | KT: P<br>Claim: 1<br>MP: 3, 6        | <ul style="list-style-type: none"> <li>Calculators (optional)</li> </ul>                  | <p>Students will practice calculating unit price using their method of choice. Students will use unit rate in context to determine better deals, and analyze when a smaller or larger unit rate is most desirable.</p> <p>One period should deal with unit rate of complex fractions.</p>  |
| 1 Period  | Rate of Change on a Graph - Slope Triangles  | KT: C<br>Claim: 1, 3<br>MP: 5, 6     | <ul style="list-style-type: none"> <li>Rulers</li> </ul>                                  | Students will learn to draw triangles on graphs on lines to understand slope as a constant ratio and as a means to calculate slope.  |
| 1 Period  | Proportional Lab Revisited   | KT: RK<br>Claim: 1, 2, 3, 4<br>MP: 7 | <ul style="list-style-type: none"> <li><i>Proportional Lab</i> activity sheets</li> </ul> | Students go back to <i>Proportional Lab</i> to find the slopes of the data using slope triangles. Then they will find unit rates and compare them to slopes to discover that proportional relationships have a constant slope which is equal to the unit rate (constant of proportionality).   |
| 1 Period  | Teachers Find or Create Practice 7.2d  | KT: P<br>Claim: 1<br>MP: 3, 6        | <ul style="list-style-type: none"> <li>None</li> </ul>                                    | Students should practice analyzing graphs that correspond to real world scenarios. Students should identify the slope as well as the contextual meaning of a given point (emphasizing connection to unit rate). See <i>Robot Races</i> for sample.   |



|             |   |   |  |   |
|-------------|---|---|--|---|
| 1-2 Periods | <b>Pre-Unit:</b><br>Solving Proportions   | KT: C<br>Claim: 1<br>MP: 3, 8               | • None                                       | Students will discover that proportions are comprised of equivalent fractions. Students use equivalent fractions to solve problems involving proportions.   |
| 1-2 Periods | <b>Pre Unit:</b><br>Cross Products  | KT: C<br>Claim: 1<br>MP:                    | • Calculators (optional)                     | Students will discover that the cross-products of proportions are equal. They will use that information to practice solving for the missing number in a proportion.   |
| 1 Period    | <b>Pre Unit:</b><br>Practice Solving Proportions  | KT: P<br>Claim: 1<br>MP: 3, 6               | • Calculators                                | Students will practice solving proportions by using either equivalent fractions or cross products.  |
| 1-2 Periods | <b>Pre Unit:</b><br>Rates on a Double-Sided Number Line   | KT: C<br>Claim: 1<br>MP: 7                  | • Two Handballs<br>• Meter Sticks            | Using a few scenarios such as measuring the rebound of a bouncing ball from a given drop height, counting claps over time or walking rates, students will solve proportions by creating double-number lines.  |
| 1-2 Periods | Proportion Match Up   | KT: P<br>Claim: 2<br>MP: 1, 6               | • Calculators                                | Students will practice building double-sided number lines from scenarios and set up a proportion to solve for the missing quantity.   |
| 1 Period    | Four Methods to Solve Proportions   | KT: RK<br>Claim: 1, 2, 3,<br>MP: 2, 3, 7, 8 | • Rulers<br>• Calculator (optional)          | Students will work out three problems in groups of 4. They are each responsible for one of four methods—double-sided number line, using unit rate, graphing, or writing an equation. Then they will share how they solved it in their groups and then compare and contrast the methods. They will brainstorm the benefits to using each method. |
| 2-3 Periods | <b>Choose One or more for RK:</b><br>Art Class<br>Robot Races<br>Leaky Faucets<br>Amusement Parks | KT: RK<br>Claim: 2, 3, 4<br>MP: 7           | • Varies (see lesson you select for details) | Students will make predictions, explain connections, and problem solve while using multiple representations of proportional relationships. Each relational knowledge tasks has a unique distinction and focus.  |



|             |   |                               |  |   |
|-------------|---|-------------------------------|--|---|
| 1 Period    | Writing Equations for Proportional Relationships                              | KT: C<br>Claim: 1, 2<br>MP: 8 | <ul style="list-style-type: none"> <li>TBD</li> </ul>  | <p>Students should write equations to model proportional relationships. Optionally, they can use the equations they write to solve proportional questions.</p> <p>Consider using previous activities such as <i>Proportional Lab, Art Class, Robot Races, or Amusement Park</i> and writing equations for the tasks.</p>  |
| 1 Period    | <b>Choose One:</b><br>The Super-Sizer<br>Or<br>Desmos:<br>Marcellus the Giant | KT: C<br>Claim: 1<br>MP: 7    | <ul style="list-style-type: none"> <li>Blank Paper</li> <li>Scotch Tape</li> <li>Rubber Bands</li> <li>Rulers or cm grid paper</li> <li>Calculators</li> </ul> <p>OR</p> <ul style="list-style-type: none"> <li>Computer/Tablet (1 per student)</li> </ul> | <p><b>Super Sizer:</b> This activity is concrete and hands-on creating a scale drawing.<br/>Students will use a double-rubber band to copy a figure and compare ratios of side lengths to understand that the side lengths of scale drawings are proportional.</p> <p><b>Desmos: Marcellus the Giant:</b> This activity gets at the same big idea of scale through the use of technology, where students can input different scale values and see the change immediately in the figure they are building.</p> |
| 1-2 Periods | Scale Figures Investigation   | KT: C<br>Claim: 1<br>MP: 1, 3 | <ul style="list-style-type: none"> <li>Posters</li> <li>Glue</li> <li>Scissors</li> </ul>  | Students will use proportions to calculate missing side lengths in figures that are scale drawings of one another.  |
| 1 Period    | Teachers Find or create Practice with Scale Figures                           | KT: P<br>Claim: 1<br>MP: 1, 3 | <ul style="list-style-type: none"> <li>TBD</li> </ul>  |   |
| 1 Period    | Summative Assessment  | ALL                           |  |   |



**Legend:**  
KT - Knowledge Type  
RK - Relational Knowledge  
M - Memorization  
P - Procedure  
C - Concept  
MP - Math Practice

**SBAC Claims**  
Claim 1 - Concepts/Procedure  
Claim 2 - Problem Solving  
Claim 3 - Communicating & Reasoning  
Claim 4 - Modeling and Data Analysis

**Mathematical Practices**  
1. Make sense of problems and persevere in solving them.  
2. Reason abstractly and quantitatively.  
3. Construct viable arguments and critique the reasoning of others.  
4. Model with mathematics.  
5. Use appropriate tools strategically.  
6. Attend to precision.  
7. Look for and make use of structure.  
8. Look for and express regularity in repeated reasoning.

