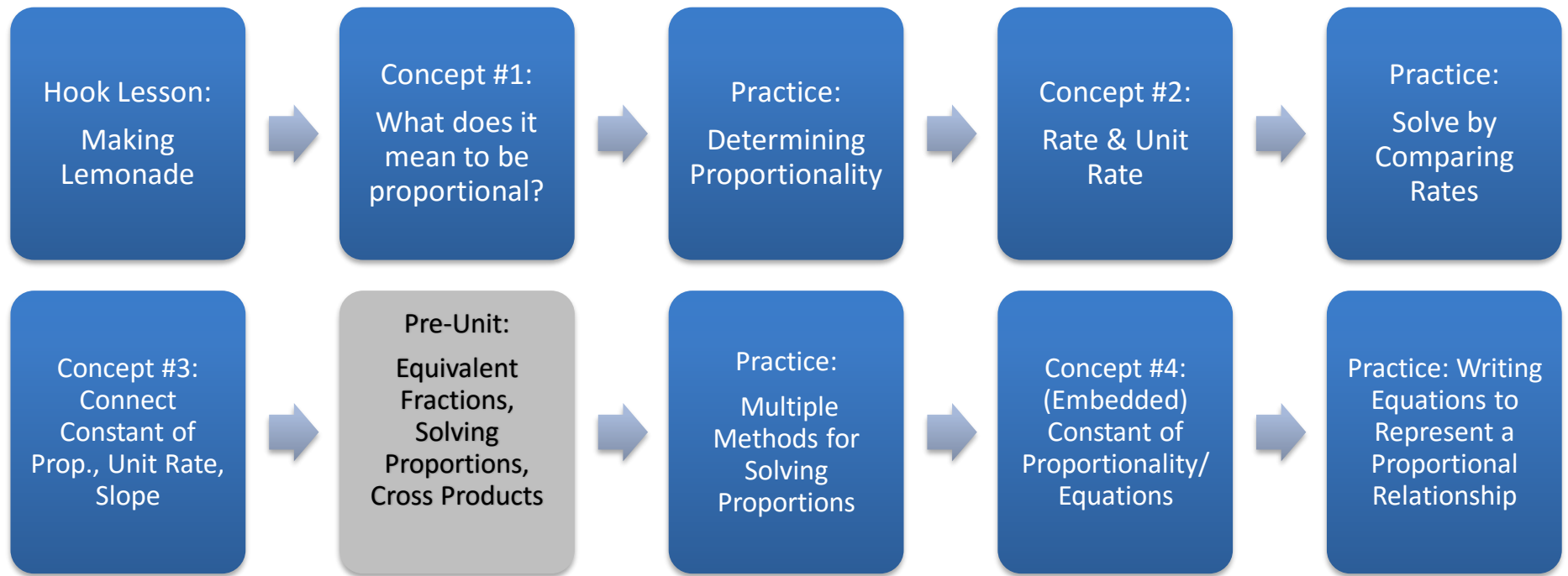
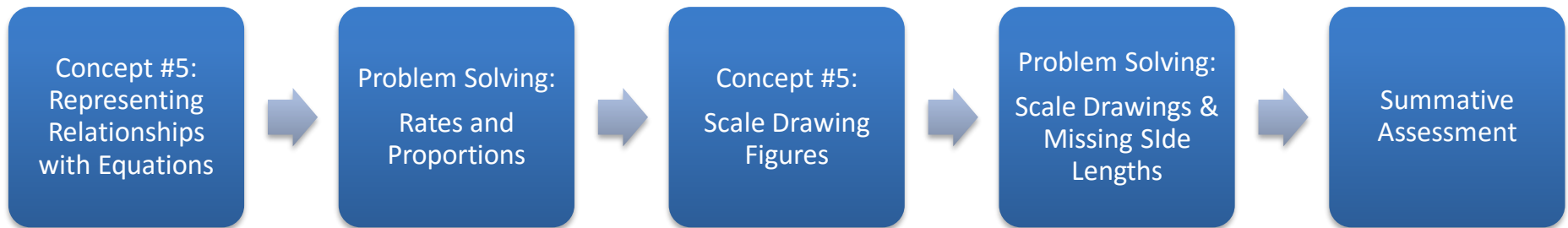




Unit Name:	Proportional Relationships	Course: CC Math 7	Time Frame: 6 weeks
Sub-Topics	<ul style="list-style-type: none"> • Unit rates (including with complex fractions) • Understanding the constant of proportionality in tables, graphs, equation, diagrams and verbal descriptions • Connecting constant of proportionality, unit rate, and slope in representations • Understanding what proportional means • Application problems involving proportions • Scale drawings with figures 		
Big Idea	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

- What is a unit rate?
- Are these data proportional?
- Which method is most helpful to solve in each situation?
- What is the constant of proportionality?
- What has a better unit rate?
- When do I use proportional comparisons?

Key Vocabulary

- | | |
|-----------------------------|----------------------|
| Absolute | Equivalent Fractions |
| Cross-products | Multiplicative |
| Unit Rate | Proportion |
| Relative | Per |
| Speed | Rate |
| Slope | Similar |
| Constant of Proportionality | |

Prior Knowledge

- Equivalent Fractions (Pre-Unit)
- Multiply and Divide Fractions (Prior to Solving)
- Solving One-Step Equations (Prior to Equations)
- Ratios in Tables (Pre-Unit)
- Use Ratio Concepts (Reviewed in Hook Lesson)
- Unit Conversions (Not necessary for this unit, but related)



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 $\frac{1}{2}$ mile in each $\frac{1}{4}$ hour, compute the unit rate as the complex fraction $\frac{1/2}{1/4}$ 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 Claim: 2, 3 MP: 5, 7	<ul style="list-style-type: none"> Lemonade powder Water Bottles Same-Size Spoons Straws Paper Towels Cups Taster Cups 	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 Claim: 1, 2, 3 MP: 1, 3, 8	<ul style="list-style-type: none"> Stop Watches Pretzel Sticks Cars (Matchbox or Hot Wheels) Rulers/measuring tape Tape 	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 Claim: 1, 2, 3 MP: 1, 3, 8	<ul style="list-style-type: none"> Proportional Lab Student Pages 	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 Claim: 1, 2, 3 MP: 1, 3, 8	<ul style="list-style-type: none"> Posters (optional) Markers (optional) 	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 Claim: 1 MP: 7	<ul style="list-style-type: none"> Chalk/tape for marking intervals on concrete/blacktop Measuring tape 	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 Claim: 1, 2, 3, 4 MP: 8	<ul style="list-style-type: none"> Speed Racers Activity pages 	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 Claim: 1, 2, 4 MP: 7	<ul style="list-style-type: none"> Calculators (optional) 	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 Claim: 1 MP: 3, 6	<ul style="list-style-type: none"> Calculators (optional) 	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. One period should deal with unit rate of complex fractions.
1 Period	Rate of Change on a Graph - Slope Triangles	KT: C Claim: 1, 3 MP: 5, 6	<ul style="list-style-type: none"> Rulers 	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 Claim: 1, 2, 3, 4 MP: 7	<ul style="list-style-type: none"> <i>Proportional Lab</i> activity sheets 	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 Claim: 1 MP: 3, 6	<ul style="list-style-type: none"> None 	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	Pre-Unit: Solving Proportions	KT: C Claim: 1 MP: 3, 8	<ul style="list-style-type: none"> • None 	Students will discover that proportions are comprised of equivalent fractions. Students use equivalent fractions to solve problems involving proportions.
1-2 Periods	Pre Unit: Cross Products	KT: C Claim: 1 MP:	<ul style="list-style-type: none"> • 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	Pre Unit: Practice Solving Proportions	KT: P Claim: 1 MP: 3, 6	<ul style="list-style-type: none"> • Calculators 	Students will practice solving proportions by using either equivalent fractions or cross products.
1-2 Periods	Pre Unit: Rates on a Double-Sided Number Line	KT: C Claim: 1 MP: 7	<ul style="list-style-type: none"> • Two Handballs • 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 Claim: 2 MP: 1, 6	<ul style="list-style-type: none"> • 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 Claim: 1, 2, 3, MP: 2, 3, 7, 8	<ul style="list-style-type: none"> • Rulers • 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	Choose One or more for RK: Art Class Robot Races Leaky Faucets Amusement Parks	KT: RK Claim: 2, 3, 4 MP: 7	<ul style="list-style-type: none"> • 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 Claim: 1, 2 MP: 8	<ul style="list-style-type: none"> TBD 	<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</i>, <i>Art Class</i>, <i>Robot Races</i>, or <i>Amusement Park</i> and writing equations for the tasks.</p>
1 Period	<p>Choose One: The Super-Sizer Or Desmos: Marcellus the Giant</p>	KT: C Claim: 1 MP: 7	<ul style="list-style-type: none"> Blank Paper Scotch Tape Rubber Bands Rulers or cm grid paper Calculators <p>OR</p> <ul style="list-style-type: none"> Computer/Tablet (1 per student) 	<p>Super Sizer: This activity is concrete and hands-on creating a scale drawing. 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>Desmos: Marcellus the Giant: 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 Claim: 1 MP: 1, 3	<ul style="list-style-type: none"> Posters Glue Scissors 	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 Claim: 1 MP: 1, 3	<ul style="list-style-type: none"> TBD 	
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.

