Grade Level	**Content Area**	**Course Title** *(9-12 Only)*	**Unit Title**
7	Mathematics	N/A	Understanding Ratios and Proportions
Length of Unit	**Time of Year Taught**	**Expected Prior Knowledge**	
1 week	Quarter 2 (November)	Converting between fractions and decimals; multiplying and dividing decimals; solving equations by multiplying or dividing; comparing and ordering rational numbers and fractions; simplifying fractions; using addition, subtraction, multiplication and division to solve problems with fractions.	
Unit Description			
In this unit, students will learn to find equivalent ratios and see if ratios can form a proportion. Students will use unit rates to solve proportions involving variables, and they will use proportions to solve problems involving scale. They will solve proportions to find missing lengths in similar figures. They will also solve problems using proportions and equations.			

Strand(s), Concept(s), and PO(s)
List and define the required Strand(s), Concept(s), and PO(s) for each lesson included in this sample.
	Common Core Domain: Ratios of Proportional Relationships (7.RP)
	• CC Cluster: Analyze proportional relationships and use them to solve real-world and mathematical problems.
	  ○ CC Standard 7.RP.1: Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units.
	  ○ CC Standard 7.RP.2. Recognize and represent proportional relationships between quantities.

Summative Assessment
Describe a cumulative and comprehensive activity that allows students to demonstrate mastery of stated POs.
	Students will demonstrate mastery of objectives on the following assessments:
	• Checkpoint Quiz 1
	  ○ A 10-question assessment that measures level of mastery for CC Standard 7.RP.1
	• Checkpoint Quiz 2
	  ○ A 10-question assessment that measures level of mastery for CC Standard 7.RP.2
	• Please refer to "Appendix A" for a copy of the summative assessments and answer keys

Assessment Scoring *Explain how each assessment is scored, to include points per question, total points possible, criteria, and grading scale.*	Assessment Scoring: • The checkpoint quizzes feature 10 questions scored at 1 point each. • Please refer to "Appendix A" for a copy of the summative assessments and answer keys Criteria for Mastery: • All assessments will be converted to a percentage score and assigned a grade based on the following scale: 90-100=A; 80-89=B; 70-79=C; 60-69=D; 59 and below=F • The minimum score for student mastery is 80% (8/10 correct items). Students who do not achieve mastery will receive additional instruction, then re-assessed to determine if the material has been mastered.

Materials/Resources Needed *Include all items for unit.*	Overhead projector, piano keyboard transparency, nutrition label transparency, flagpole transparency, white board, markers, pencils, paper, mathematics textbook, skills puzzles, and activity labs.

Lesson Activities				
Lesson 1	**Lesson 2**	**Lesson 3**	**Lesson 4**	**Lesson 5**
Objective: To write ratios and use them to compare quantities (7.RP.1) Anticipatory Set: • Review concept: simplifying fractions • Write on board, "Simplify the following fractions: 12/16, 15/30, 19/57" • Allow time to solve, then discuss results Input: • Introduce *ratios* as a comparison of two quantities • Explain expression of a ratio as a fraction • Introduce 3 ways of writing ratios • Explain equivalent ratios	Objective: To find unit rates and unit costs using proportional reasoning (7.RP.1) Anticipatory Set: • Review writing ratios, finding equivalent ratios, simplifying ratios, and solving word problems. Input: • Introduce the concepts of *quantities, rates*, and *unit rates* • Give examples of unit rates and unit costs Model: • Put graphic of food nutrition label on the overhead • Demonstrate how to find the unit rate of grams of fat per serving	Objective: To test whether ratios form a proportion by using equivalent ratios and cross products (7.RP.2) Anticipatory Set: • Take a survey of how many girls saw a movie over the previous weekend, then how many boys saw a movie. • Record responses on the board as "number of girls, number of girls who saw movies, number of boys, number of boys who saw movies, and total number" Input: • Explain ratio as a "math phrase" and proportion as a "math sentence" • Discuss how simplifying can be used to test for a	Objective: To solve proportions using unit rates, mental math, and cross products (7.RP.2) Anticipatory Set: • Review ratios and proportions, solving problems using proportional reasoning. Input: • Review checking if two ratios form a proportion using *equivalent fractions* or *cross products*. • Explain how proportion problems can be translated into an equation Model: • Demonstrate turning the following proportion	Objective: To use proportions to find missing lengths in similar figures (7.RP.2) Anticipatory Set: • Review unit rates, using mental math, cross products, and solving word problems. Input: • Introduce concept of similar figures that have the same shape but not the same size. • Explain how figures must have corresponding sides and corresponding angles to be similar • Introduce concept of "indirect measurement" Model: • Put graphic of flagpole

Model: • Put graphic of piano keyboard on overhead • Show that the keys have a repeating pattern of 5 black and 7 white keys • Show ratios of black to white keys (5/7) and black to all keys (5/12) • Express these ratios in 3 different forms • Show equivalent forms of these ratios Check for Understanding: • Ask students to write the ratio of boys to girls in the classroom • Ask all students to share answers before revealing the correct answer to determine if more examples are needed. Guided Practice: • Divide students into pairs and have them complete the Skills Puzzle while monitoring and assisting • Review puzzle answers upon completion	by writing the number of fat grams over the number of the serving size, then dividing the first quantity by the second quantity. • With student input, find the unit rates of proteins and carbohydrates per serving Check for Understanding: • Checkpoint Quiz 1 (see Appendix A quiz and key) Guided Practice: • Divide students into small groups and have them complete the Activity Lab • Review the Activity Lab answers upon completion Closure: Discuss the following: • What is the relationship between a rate and a ratio? • What is a unit rate? • What is a unit price?	proportion • Introduce the use of equal cross products to test for a proportion Model: • Using the survey results, on the board determine the ratios of girls who saw movies to the total number of girls. • Determine the ratios of boys who saw movies to the total boys. • Use cross products to determine if there is a proportion. Check for Understanding: • Ask students to raise their hand if they think the following ratios form a proportion: 3/8, 6/16 (yes); 4/8, 5/9 (no). • Do more examples as a class if needed Guided Practice: • Divide students into pairs and have them complete the Skills Puzzle	problem into an equation: For each 5 pounds of body weight, about 2 pounds is muscle. How much of a 125-pound student is muscle? • x=2/5(125) • x=50 Check for Understanding: • Make a table with several weights listed on the board • Have students find the amount of muscle for each weight Guided Practice: • Divide students into small groups and have them complete the Activity Lab • Review the AL answers upon completion Closure: Give students the following equations. • 4/5=20/25 • 3/8=18/w	and person on overhead • Say that a 6-foot-tall person standing next to a flagpole casts a 4.5-foot long shadow. • If the flagpole casts a 15-foot shadow, how high is the flagpole? • With student input, write a proportion (x/6=15/4.5) and use cross products to solve (x=20). Check for Understanding: • Checkpoint Quiz 2 (see Appendix A for quiz and key) Guided Practice: • Divide students into pairs and have them complete the Skills Puzzle • Review puzzle answers upon completion Closure: • Discuss the three methods for solving proportions

Closure: Discuss the following: • What is a ratio? • What are three different ways to write the ratio "a to b"? Independent Practice: • Assign "Homework Exercises" 1-32	Independent Practice: • Assign "Homework Exercises" 1-29	• Review puzzle answers upon completion Closure: Discuss the following: • Define proportion. • Summarize the three methods for determining whether a pair of ratios can form a proportion. Independent Practice: • Assign "Homework Exercises" 1-39	Discuss the following: • Why is each equation a proportion? • How is the second proportion different from the first? Independent Practice: • Assign "Homework Exercises" 1-30	• Tell students to choose the method they think most appropriate and use it to solve 3/8=18/w Independent Practice: • Assign "Homework Exercises" 1-19

Student Activities				
Lesson 1	**Lesson 2**	**Lesson 3**	**Lesson 4**	**Lesson 5**
During this lesson, students will do the following activities to master Common Core Standard 7.RP.1: • Review and discuss the concept of simplifying fractions with teacher guidance and class input. • Learn about ratios through direct teacher instruction and modeling,	During this lesson, students will do the following activities to master Common Core Standard 7.RP.1: • Review and discuss writing ratios, finding equivalent ratios, simplifying ratios, and solving word problems with teacher guidance and class input.	During this lesson, students will do the following activities to master Common Core Standard 7.RP.2: • Apply knowledge of ratios to a real-world information scenario. • Through direct instruction and modeling, learn about simplifying and cross	During this lesson, students will do the following activities to master Common Core Standard 7.RP.2: • Review and discuss ratios and proportions, solving problems using proportional reasoning. • Learn about turning proportion problems into equations through	During this lesson, students will do the following activities to master Common Core Standard 7.RP.2: • Review and discuss unit rates, using mental math, cross products, and solving word problems. • Through direct and

including different ways to write ratios and ratio equivalencies. • Apply knowledge by solving a classroom-based ratio problem with whole class and teacher input. • Participate in a cooperative learning puzzle activity that reinforces writing ratios and identifying equivalent ratios. • Complete homework to practice the following concepts independently: writing ratios, finding equivalent ratios, simplifying ratios, and solving word problems.	• Through direct and explicit instruction and modeling, learn about quantities, rates, unit rates, and unit costs. • Demonstrate understand on a formative assessment by taking a checkpoint quiz that directly measures knowledge of listed objectives. • Participate in a cooperative learning activity lab to solve problems using unit rates and proportional reasoning. • Complete homework to practice the following concepts independently: finding unit rates, finding unit costs and identifying better buys, and solving problems using proportional reasoning.	products to identify proportions. • Participate in a large group discussion about equivalent ratios. • Participate in a cooperative learning puzzle activity that reinforces understanding of proportions. • Complete homework to practice the following concepts independently: ratios and proportions, solving problems using proportional reasoning.	explicit instruction and modeling. • Apply using proportional reasoning to create an equation in order to solve a real world problem by determining ratio of muscle to weight. • Participate in a cooperative learning activity lab to solve problems requiring proportional decision-making. • Complete homework to practice the following concepts independently: unit rates, using mental math, cross products, and solving word problems.	explicit instruction and modeling, learn about similar figures with corresponding sides and angles and the concept of indirect measurement. • Demonstrate understand on a formative assessment by taking a checkpoint quiz that directly measures knowledge of listed objectives. • Participate in a cooperative learning puzzle activity that reinforces solving proportions. • Complete homework to practice the following concepts independently: similar figures, indirect measurement, and word problems.

Appendix A

Appendix A includes a copy of the summative assessments and answer keys used to measure the standards and objectives presented in the lessons.

Checkpoint Quiz 1

The following quiz measures the student's ability to perform operations described in CC Standard 7.RP.1: "Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units."

1. Write the ratio 7 : 52 in two other ways.

Write each ratio in simplest form.

2. 4/6
3. 16/48
4. 24 to 14
5. 18 : 27

Write a unit rate for each situation.

6. typing 126 words in 3 minutes
7. scoring 45 points in 5 games

Find each unit cost. Which is the better buy?

8. 3 for $.79, 4 for $.99
9. 5 for $39, 7 for $46

10. The last time you bought pizza, 3 pizzas were just enough for 7 people. At that rate, how many pizzas should you buy for a party for 35 people?

Checkpoint Quiz 1 Answers:

1. 7 to 52, 7/52	2. 2/3
3. 1/3	4. 12 to 7
5. 2 : 3	6. 42 words/min
7. 9 points/game	8. $.2633, $.2475; the second is the better buy
9. $7.80, $6.57; the second is the better buy	10. 15 pizzas

Grading Scale:

- This assessment will be converted to a percentage score and assigned a grade based on the following scale: 90-100=A; 80-89=B; 70-79=C; 60-69=D; 59 and below=F

Criteria for Mastery:

- The minimum score for student mastery is 80% (8/10 correct items).
- Students who do not achieve mastery will receive additional instruction for the objectives measured, then re-assessed to determine if the material has been mastered.

Checkpoint Quiz 2

The following quiz measures the student's ability to perform operations described in CC Standard 7.RP.2. "Recognize and represent proportional relationships between quantities."

Determine whether the ratios form a proportion

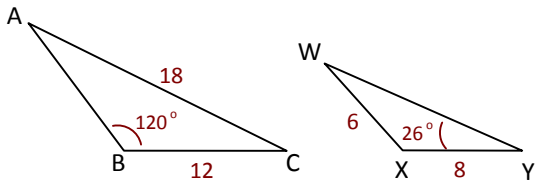
1. 5/8, 12/20 2. 4/10, 2/5 3. 24/15, 4/3 4. 8/3, 48/18

Solve each proportion using cross products

5. $\frac{8}{12} = \frac{y}{30}$ 6. $\frac{15}{33} = \frac{m}{32}$

△ ABC is similar to △ WXY. Find each measure.

7. ∠X
8. ∠C
9. length of $\overline{AB}$
10. length of $\overline{WY}$



Checkpoint Quiz 2 Answers:

1. no	2. yes
3. no	4. yes
5. 20	6. 10
7. 120°	8. 26°
9. 9	10. 12

Grading Scale:

- This assessment will be converted to a percentage score and assigned a grade based on the following scale: 90-100=A; 80-89=B; 70-79=C; 60-69=D; 59 and below=F

Criteria for Mastery:

- The minimum score for student mastery is 80% (8/10 correct items).
- Students who do not achieve mastery will receive additional instruction for the objectives measured, then re-assessed to determine if the material has been mastered.