Grade Level	**Content Area**	**Course Title** *(For 9-12 Samples Only)*	**Unit Title**
Grade 6	Mathematics		Ratios! Ratios!

Length of Unit	**Time of Year Taught**	**Expected Prior Knowledge**
8 Days (each lesson is approximately 2 days in length)	1st quarter of first semester	Students are capable of multiplying and dividing three digit numbers. Students are familiar with fractions and fraction terminology (numerator and denominator), Students are able to reduce fractions and identify equivalent fractions, Students are familiar with the strategies to determine if whole number 2, 3, 5, 9, and 11 are factors of two numbers, i.e.: 2 is a factor of 10 and 34 because they are both even numbers. Students understand the concepts of parts of a whole and solving problems with these concepts. Students are able to identify the greatest common factor between two and/or three 2-digit whole numbers. Students are able to read a table and extract information displayed in a table.

Unit Description

The Unit begins by exploring the concept of ratio and how to write ratios (three methods). Building upon students' prior knowledge of reducing fractions, students will be able to calculate a given ratio into its lowest terms. Finally, the unit ends by beginning to exploring more difficult ratio word problems such as, "Shirley and Jack share 15 marbles in a ratio of 3:2. How many marbles will Shirley receive and how many marbles will Jack receive?" The focus in this portion of the unit is to treat the "shares" as parts of the whole. Identifying that there are five "shares" (3 + 2), then the problem becomes easier solve.

Bloom's taxonomy target: Analysis. Upon reaching comprehension and application, the intent is to promote analysis: breaking material into constituent parts, determining how the parts relate to one another and to the overall structure through analyzing. Take concepts apart, break them down, analyze structure, recognize concepts and evaluate.

Standards: Common Core **Domain:** Ratios and Proportional Relationships **Cluster:** Understand ratio concepts and use ratio reasoning to solve problems **Standard #1:**	**Standard #1:** Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. *For example, "The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 sings there was 1 beak." "For every vote candidate A received, candidate C received nearly three votes."*

Summative Assessment	Students will be assessed based on teacher observation and their ability to • Compare two or more quantities to write a ratio • Write ratios in three ways: a to b, a:b, and a/b • Simplify ratios • Solve word problems using ratio concepts • Be able to use data in a table to write ratio relationships
Assessment Scoring	Students will be assessed on the following scale: A (90 – 100%), B (80 – 89%), C (70 – 79%), D (60 – 69%), and F (59% and below). The summative assessment is worth 20 points. A total of 16 points or more (80% or higher) received on the summative assessment represents unit mastery. 18 – 20 points = A, 16 – 17 points = B, 14 – 15 points = C, 12 – 13 points = D, 11 points and below = F
Materials/Resources Needed	In-class computer; projector; PowerPoint presentation "Ratios !!;" **Saxon Math 7/6** textbook; **Saxon Math 7/6** Lesson 23 "Ratio;" "Teaching Ratios with M&M's" lesson plan, M&M's "Writing Ratios from Pictures" worksheet; "Writing Ratios" worksheet; "The Greatest Common Factor" worksheet; "Reducing Ratios to Lowest Terms" worksheet; individual computers for each student (or one computer for every student pair); internet access; "Ratio Word Problems" worksheet, Ratio Relationships Summative Assessment

This table is consistent with the methods of instruction and assessment described in the narrative.

	Lesson 1	Lesson 2	Lesson 3	Lesson 4
Instruction and Timeline	Lesson: Show the PowerPoint presentation, "Ratios!!" Have the students provide oral answers when cued to provide the ratio, when cued to simplify the ratio, and when cued to solve the ratio problem. Provide additional examples on the board as necessary such that students are confident in ratio terminology and problems. Guided Practice: Review the	Complete the "Teaching Ratios with M&M's" lesson plan. Opening: Begin by asking the students, "What do you do with your Halloween candy after Halloween?" Allow several students to share their answers. Explain that when you were little, you would sort your candy. Tell them how you would separate gum from hard candy, and how you would put chocolates in the refrigerator. Main Lesson: Explain that today we	Lesson: Show the videos, "Simplifying Ratios" and "Module 3: Ratio Simplifying" using the in-class computer and projector. These videos can be found at *http://www.youtube.com/watch?v=H1EW3V-LAts* and *http://www.youtube.com/watch?v=mikIMAWiZXo*	Practice identifying ratios, reducing ratios, and solving ratio problems using computer interactive math games. Use the in-class computer and projector, go to websites: Identifying Ratios Interactive Game: "Ratio Martian" *http://www.arcademicskillbuilders.com/games/ratio-martian/ratio-martian.html* and Reducing Ratios Interactive

	Saxon Math 7/6 Lesson 23, "Ratio" using the **Saxon Math 7/6** textbook. Guide students through the process of writing ratios and the different ways in which a ratio can be written. Insure that the students understand which number comes first (or in the numerator) and which number comes second (or in the denominator) in a ratio. Practice: Have the students practice writing ratios by completing **Saxon Math 7/6** Lesson 23, practice problems a – c, and mixed practice 1 – 30 (odd). Note to the Teacher: This is the student's first introduction to the lessons in the **Saxon Math 7/6** textbook. The concepts of ratio and proportion will continue to be taught with increasing difficulty in Saxon Lessons 58, 80, 83, 85, 88, 101, and 105.	will be sorting objects. Show a bag of M&M's. Tell the students that you have 15 brown, 10 blue, 5 red, 6 orange, 12 yellow, and 12 green (write on the board as you tell them). Ask them to tell you how many you have all together (60). Then I asked the class to tell me the ratio of orange to total M&M's. This ratio is recorded in fraction format beside the color on the blackboard chart. Then I asked the students to reduce this ratio to lowest terms, and this is recorded on the board. Keep repeating until all ratios of color to total are complete. Independent Practice: Have students work in pairs at their desks. Distribute the baggies with 40 M&Ms in each one. Have students copy a chart like the blackboard chart into their notebooks. They will be filling the charts in with their own data from their M&Ms bags. Next have the students eat 5 random M&M's. Then have them calculate the new ratios. Independent Practice: Have students practice writing ratios using the "Writing Ratios from Pictures" and "Writing Ratios" worksheets.	Once the videos are complete, write a ratio on the board and ask the students to reduce it. Focus on how the reduction is completed; that is, by finding the greatest common factor of the ratio numbers. Independent Practice: Have students access prior knowledge by first reviewing the greatest common factor between two whole numbers. Have students complete the worksheet, "The Greatest Common Factor." Students will list the factor of each number and then declare the greatest common factor. Independent Practice: Have students practice reducing ratios using the "Reducing Ratios to Lowest Terms" worksheet.	Practice: "Reduce Ratios to Lowest Terms" *http://aaamath.com/rat62b-findratios.html#section2* and Solving Ratio Problems Interactive Game: "Spy Guys Interactive - Ratio" *http://www.learnalberta.ca/content/mesg/html/math6web/index.html?page=lessons&lesson=m6lessonshell03.swf* Model how to use the program games. Arrange for students to have their own computer (or two students for every one computer) such that each student (or pairs of students) can play on their own game. Independent Practice Assessment: Hand out to the students the "Ratio Word Problems" worksheet. Review the first problem together and then have the children complete the remainder on their own. Monitor the student's progress and provide individual help as necessary. Have the students take the "Ratio Relationships Summative Assessment" (80% represents mastery)

Student Activities and Timeline	Students will participate by giving oral answers during the PowerPoint presentation, "Ratios !!" Oral answers will be corrected and evaluated. Students will practice writing ratios in the three methods "a to b, a:b, and a/b. Students will complete the **Saxon** Lesson 23.	Students will participate in the lesson, "M&M Ratios," by sorting M&M's and writing the corresponding color to total ratio for each type of M&M color. Students will practice writing ratios given pictures. Students will complete the worksheet, "Writing Ratios."	Students with complete the worksheets: "The Greatest Common Factor" and "Reducing Ratios to Lowest Terms."	Students will play the three on-line games to practice ratio concepts. Students will complete the worksheet, "Ratio Word Problems." Students will complete the summative assessment, "Ratio Relationships Summative Assessment"

6th Grade Math: Ratio Relationships Summative Assessment

1. Given: 8 black marbles, 4 blue marbles, and 15 brown marbles. What is the ratio of brown marbles to all the marbles? Write the ratio in three different formats. Be sure the ratio has been simplified. (3 points)
2. The chef grilled 54 burgers. Twenty-one of the burgers were hamburgers. The remaining burgers were cheeseburgers. What is the ratio of hamburgers to cheeseburgers? Write the simplified ratio in three different formats. (3 points)
3. Explain why the ratio of dog legs to dog eyes in the dog pen at the animal shelter was 2:1. (4 points)

Use the table below to answer question #4, and #5.

Survey of Favored Food Items for the Holiday Party

Food Type	Grade 5 Responses	Grade 6 Responses	Grade 7 Responses	Total All Grades Responses
pizza	8	10	12	**30**
fruit	5	4	6	**15**
ice cream	3	0	0	**3**
chips	4	4	2	**10**
Total responses of all food types	**20**	**18**	**20**	***58***

4. Write, in words, the relationship between the Grade 5 responses received for chips as compared to the Grade 5 responses received for pizza (in simplest units). (2 points)

5. Write in ratio format and simplified the number of Grade 7 responses for chips as compared to the total Grade 7 responses. Write the ratio in three different formats. Be sure to simplify the ratio. (3 points)

6. Write in ratio format and simplified the number of Grade 5 responses for fruit as compared to the total All Grade responses for fruit. Write the ratio in three different formats. Be sure to simplify the ratio. (3 points)

7. Alice and her little brother John share 20 candies in a ratio of 4:1. How many candies will Alice receive and how many candies will John receive? (2 points)

6th Grade Math: Ratio Relationships Summative Assessment Answer Key

1. 15:28; $\frac{15}{28}$; 15 out of 28
2. 54 – 21 = 33 cheeseburgers. 21:33 → 7:11; $\frac{7}{11}$; 7 out of 11
3. The ratio of legs to eyes in the dog pen at the animal shelter was 2:1. That is, for every 4 legs on a dog, there are 2 ears on a dog. Hence, the relationship is 4:2, which can be simplified to 2:1. Therefore, the ratio of legs to eyes in the dog pen at the animal shelter is 2:1. (Accept reasons in kind)
4. For every 4 responses chips received, pizza received 8 responses → in simplest units → "for every response chips received, pizza received 2 responses." (Accept words in kind)
5. 2 chips responses compared to 20 total responses → 1:10; $\frac{1}{10}$; 1 out of 10
6. 5 fruit compared to 15 total for fruit → 1:3; $\frac{1}{3}$; 1 out of 3
7. The ratio is 4:1, for a total of 5. 5 total → 20 total (actual) requires multiplication by 4. Hence, 4:1 = 4 x 4 : 1 x 4 = 16:4. Hence, Alice got 16 candies and John got 4 candies.

Grading for 6th Grade Math: The summative assessment has a total of 20 points. There are seven questions, each is has a different point value depending upon the number of answers required for each problem.

Grade	Number of Answers correct
A	18 - 20
B	16 - 17
C	14 - 15
D	12 - 13
F	11 and below

Mastery is at 80% and above (16 points or greater)