A.5. CURRICULUM SAMPLE – Sixth Grade Math

Grade Level	Content Area	Course Title	Unit Title
Sixth Grade	**Mathematics**	**N/A**	**Ratios**

Length of Unit	Time of Year Taught	Expected Prior Knowledge
5 Lessons	**4th Quarter**	Every student should understand and use all concepts and skills from the previous grade levels with regard to Mathematics, according to Common Core State Standards. Students will already know about how to simplify and compare fractions.

Unit Description

In this unit, students use models and real-world scenarios to investigate ratios as comparisons. Students generate comparisons relevant to their experiences and learn multiple ways of describing ratios in words and symbols (except for fractional notation). They will describe differences between a 2:1 ratio and a 1:2 ratio. Students use informal methods to find ratios that represent the same comparison such as 2:4 is the same as 8:16.
Essential Questions: What are the different ways to compare things? What is a ratio? Are there different ways to write ratios? What are the real life applications of ratios? Enduring Understanding: Ratios are ways to compare things and can be written in many different ways. Ratios have real life applications that include recipes, maps, and finances.

Common Core Standards	**6.RP.1.** Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.
Summative Assessment	Students will complete a 20-point quiz on which they must calculate and compare ratios. They will also be asked to solve word problems involving ratios. Students must achieve a 16 out of possible 20 points to achieve an 80%, thus indicating mastery.
Assessment Scoring	The assessment for this objective includes 16 questions. Numbers 1 through 6 are worth 1 point each. These ask students to solve simple ratio and proportion problems. Numbers 7 and 8 are have 2 blanks. Each blank is worth 1 point. Students need to take basic information to make ratios for these problems. Numbers 9 through 13 are word problems that involve a practiced application of the skill of ratios. Students must achieve 16 out of 20 points to achieve a mastery level of 80%.
Materials/Resources Needed	Bags of color cubes. Place three red cubes, four yellow cubes, and two green cubes in each bag. Prepare one bag for every 3 students. Math Journals, Chart Paper, Cookie Recipe, one map for every two students.

	Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5
Lesson Instruction	**Day 1: What is a Ratio?** **Objective:** Students will create 5 mathematical comparisons using ratios that can be made using ideas from class notes.	**Day 2: Writing Ratios Different Ways Objective:** Students will apply what they have learned about ratios to create ratios from a given set of objects.	**Day 3: Comparing Ratios** **Objective:** Students will practice comparing ratios to show a relationship between	**Day 4: Real Life Ratios** **Objective:** Students will use correct multiplication vocabulary as they solve multiplication problems in a game.	**Day 5:** **Objective:** Students will calculate and compare ratios on a summative assessment.

	Ask students if they know how to compare things. For example, for lunch, I have 5 pieces of cheese and 7 crackers. How can I compare these? Students should see that this is easily compared, there are more crackers than cheese, and if I eat them together, there would be 2 crackers left. Ask students what kinds of things we can compare. Make a list of ideas on chart paper. Write this example on the board: Four out of five dentists recommend Crest toothpaste. Have students discuss what that means. How is that a comparison? Ask them to compare in a similar way the number of girls in the classroom to the number of boys. (Example: 12 girls and 13 boys- There are more boys that girls, and so if we were making partners, it would not be even). Students should see that out of the 25 students, 12 are girls, and 13 are boys.	Remind students that a ratio is a comparison of two numbers. Ask students to explain how yesterday they compared quantities in two ways. Then explain that today we will be writing ratios the standard way. Tell students that we generally separate the two numbers in the ratio with a colon (:). Have students record this information in their math journals. "The numbers in a ratio are separated with a colon. For example 12:25." Suppose we want to write the ratio of 8 to 12. We can write this as 8:12 or as a fraction 8/12, and we say the ratio is *eight to twelve*. Have students record this information in their math journals, "Ratios can also be written as a fraction. For example 12/25." Model example ratio problems for students and show them how to solve and write the ratios. Example: Jenny has a bag with 3 DVDs, 7 books, and 1 granola bar. 1) What is the ratio of	quantities. Review with students what a ratio is. Ask students what the different ways to write ratios are. Tell students that today we will be comparing ratios. Tell students that when comparing ratios, we write them as fractions. The ratios are equal if they are equal when written as fractions. Ask students what they know about equivalent fractions. Tell students that the ratios 3 to 4 and 6:8 are equal. The ratios are equal because 3/4 = 6/8. These are equal if their cross products are equal; that is, if $3 \times 8 = 4 \times 6$. Since both of these products equal 24, the answer is yes, so the ratios are equal. Also, if we were to reduce 6/8 to simplest form, we would see that it is equal to 3/4. Have students take notes on this information in their math journals.	Review with students the ration concepts taught in the last 3 lessons. Tell students that today we are going to look at some "real life" ratios. Explain that ratios are everywhere, and that it is important to understand ratios to understand the world around us. Explain that all recipes are written to serve a certain number of people or yield a certain amount of food. For example, they might have a cookie recipe that makes 2 dozen cookies. What if you only want 1 dozen cookies? What if you want 4 dozen cookies? Understanding how to increase or decrease the amount made without spoiling the ratio of ingredients is a valuable skill for any cook. Share a cookie recipe with students: 1 cup flour 1/2 tsp. baking soda 1/2 tsp. salt 1/2 cup butter 1/3 cup brown sugar 1/3 cup sugar 1 egg 1/2	Teacher will administer a summative assessment.

	Explain that the ratio of boys to girls is 13 to 12. Show students how this can be written on the board. Explain that we can also, like the dentist example, say 12 out of 25 students are girls. Tell students "ratio" is a term conveniently used for comparison of two numbers, or to tell how one number is related to another number. Give students the definition of ratio and have them write it in their math journals. Tell students that there are 2 kinds of ratios: part to part, and part to whole. When comparing the number of boys and girls in a class, we were comparing a part to part. When comparing the number of girls to the number of students, we were comparing part to whole. Lead a discussion of this concept. Elicit examples of each from students. Have them take notes on this in their notebooks. **Guided Practice:**	books to DVDs? Expressed as a fraction, with the numerator equal to the first quantity and the denominator equal to the second, the answer would be 7/3. Two other ways of writing the ratio are 7 to 3, and 7:3. 2) What is the ratio of DVDs to the total number of items in the bag? There are 3 DVDs, and 3 + 7 + 1 = 11 items total. The answer can be expressed as 3/11, 3 to 11, or 3:11. **Guided Practice:** Give students a few more examples and have them practice solving these ratios as you model on the whiteboard. Students should write their answers on personal whiteboards to participate in the lesson. Provide students with bags of cubes that have already been prepared. There should be one bag for every 3 students. Conduct a class discussion about the contents of the bags.	Tell students that when comparing rations the order is essential. A ratio of 1:7 is not the same as a ratio of 7:1. Therefore, 1:7 is NOT equal to 14:2. However, 1:7 is equal to 2:14. **Guided Practice:** Have students practice writing examples of equal and unequal ratios in their math journals. Give students sample problems to solve with teacher guidance. For example: Are the ratios 7:1 and 4:81 equal? Have students try the problem on individual whiteboards, and then work through the problem as a group. Give more problems, and make sure to give examples that are both equal and unequal. Explain the class that a ratio's "job" is to describe a relationship between quantities. **Independent Practice:** Give students a real life	tsp. vanilla 1 cup chocolate chips Explain to students that this recipe will yield (make) 3 dozen cookies. If you want to make 9 dozen cookies, you'll have to increase the amount of each ingredient listed in the recipe. You'll also need to make sure that the relationship between the ingredients stays the same. To do this, you'll need to understand proportion. A proportion exists when you have 2 equal ratios, such as 2:4 and 4:8. Two unequal ratios, such as 3:16 and 1:3, don't result in a proportion. The ratios must be equal. Have students stop to take notes here. They need to write that equal ratios make a proportion, but unequal ratios do not. For things to stay equal, you need a proportion. Going back to the cookie recipe, ask students how they will calculate how much more of each	

	Continue with examples using the students in the classroom. Examples: • Students with glasses to students without • Students with long pants to students with short Ask students to come up with their own comparisons/ratios for the students in the classroom. Now, have students refer back to the class notes on the chart paper at the beginning of the lesson. **Independent Practice:** Have students work with a partner to come up with 5 mathematical comparisons that can be made using ideas from the chart. Informal Assessment: Teacher Observation of Student Participation	a. Ask students to describe the contents of the bags. Expect responses that indicate the bags contain cubes, the cubes are different colors, there are three red cubes, four yellow cubes, and two green cubes in each bag. b. Ask several different students to describe the number of red cubes in relation to the whole bag. Listen to how students phrase their responses. Write on the board to summarize the individual students' responses. For example, there are 3 red cubes out of the 9 total cubes. Repeat this with the other colors. **Independent Practice:** c. Ask the groups to write down all the comparisons they can make for the cubes in the bag on large construction paper. Monitor student understanding. When student groups are ready, have them share their papers with the class. Write student responses on a large piece of chart paper	problem to compare ratios: *One morning, Julia and Mariah make lemonade for a lemonade stand. They plan to make the lemonade by mixing water and frozen lemonade concentrate. To find the mix that tastes best, they decide to test some mixes. Give examples of their mixing:* *Mix A: 2 cups concentrate, 3 cups water* *Mix B: 5 cups concentrate, 9 cups water* *Mix C: 1 cup concentrate, 2 cups water* *Mix D: 3 cups concentrate, 5 cups water* Give students an opportunity to think about and answer the following questions in their math journals: a. Which mix will make juice that is the most "lemony"?	ingredient is needed if they want to make 9 dozen cookies instead of 3 dozen? How many cups of flour will you need? How many eggs? Explain that students need to set up a proportion to decide how much of each ingredient to use. Tell students to start by figuring out how much flour they will need if they want to make 9 dozen cookies. Show students that we want to make 3 times more cookies, so we have to multiply all the ingredients times 3 to make the ratios stay the same. Instruct students in how to do this with the whole recipe. Have students try again with the same recipe, but this time they need to make only 1 dozen cookies. How can they do that? Have students work with a partner to find the correct proportion for the recipes this time.	

		to make a class list. Make sure to record all of the different ways to write the ratios.	b. Which mix will make juice that is the least "lemony"? Ask students to discuss with a partner how they might compare the different ratios of water to the concentrate. Show students how to make ratios for each mix and how to properly compare them.	Show students other places they would find ratios. Provide each pair of students a map. Show them the scale on the map, explain that this scale is also written as a ratio. Have students share the ratios from their maps and tell what this represents. Talk to students about other real-life ratios such as a debt to income ratio when applying for a loan. Talk to students about how they will look at ratios of males to females when applying to colleges. Ask students if they can think of other real-life examples of ratios.	

	Lesson 1	**Lesson 2**	**Lesson 3**	**Lesson 4**	**Lesson 5**
Student Activities	**Day 1** Students will describe situations in which they might want to compare the quantity of one thing to the quantity of another. For example, how heavy one person's book bag is compared to another	**Day 2** Students will take notes in their math journals about the ways to write ratios. Students will write answers on personal whiteboards throughout the lesson to show understanding.	**Day 3** Students will participate in a short review of concepts from the previous days. Students will participate in a discussion of equivalent fractions.	**Day 4** Students will participate in a review of concepts from previous lessons. Students will take notes on proportions. Students will work with a partner to change a recipe	**Day 5** Students will complete a summative assessment.

	person's bag. Student ideas will be recorded on chart paper in a list. Students will discuss how 4 out of 5 dentists prefer Crest toothpaste is a comparison. Students will discuss and take notes on part-to-part and part to whole ratios. Students will participate in a discussion of classroom ratios and come up with their own ideas and ratios. Students will select ideas from the chart created at the beginning of the lesson and discuss how to write those mathematical comparisons. They are likely to write 72 inches to 63 inches .	Students will explore bags of cubes in groups of 3. They will write different ratios to represent the cubes in their bags to show how to compare them. Students will look at the lists presented. They will participate in the making of a class list. They will discuss the different ratios that were found and the different ways they can be represented.	Students will take notes on equal and unequal ratios in their math journals. Students will solve sample problems on individual white boards and fix problems with teacher direction. Students will participate in a discussion of comparing ratios with making lemonade.	to the correct amount and share their results with the class. Students will explore map scale to see how ratio is prevalent in life. Students will participate in a discussion of real-life ratios.	

Summative Assessment: Ratios

Compare the ratios using the greater than, less than, or equal to sign

1. 2:3 _____ 4:1
2. 1:2 _____ 3:6
3. 3:5 _____ 2:4

Tell whether the ratios are proportional

4. 2:3 and 4:6 _____

5. 1:4 and 6:18 _____

6. 6:15 and 2:5 _____

7. There are 12 comic books and 5 novels in the shelf.

   Ratio of novels to comic books is _____
   Ratio of novels to total books in the shelf is _____

8. There are 19 girls and 14 boys on the bus.

   Ratio of girls to total number of members on the bus is _____
   Ratio of boys to total number of members on the bus is _____

9. In an animal sanctuary, there are 48 deer and 64 monkeys. Find the ratio of deer to monkeys.

10. Fruit seller buys 75 mangoes and 125 apples from vendor. Find the ratio of number of mangoes to the number of apples bought.

11. An egg seller finds 432 eggs are either spoiled or broken and 1080 eggs are in good condition. Find the ratio of bad eggs to good eggs.

12. In a live concert, 425 boys and 300 girls are participated. Find the ratio of boys to girls.

13. In a basket there 24 good oranges and rest of them are bad oranges. The ratio of good oranges to the bad oranges is 3 : 1, find the number of bad oranges?

Answer Key:

1. Less than
2. Equal to
3. Greater than
4. Yes
5. No
6. Yes
7. 5:12; 5:17
8. 19:33; 14:33
9. 48:64
10. 75:200
11. 432:1080
12. 425:300