

Figure 2.28

Sample Mathematical Practices Lesson-Planning Tool for Grade 7**Unit:** Rates and Ratios**Date:** Days 6 through 8 of the unit**Lesson:** Finding Unit Rates**Essential learning standard:** 7.RP—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.
2. Recognize and represent proportional relationships between quantities.
 - a. Decide whether two quantities are in a proportional relationship, for example, 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.
 - b. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.
 - 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 $t = pn$.
 - 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.

As a result of class today, students will be able to compute unit rates with ratios of fraction lengths and represent proportional relationships between quantities.

Formative assessment: How will students be expected to demonstrate mastery of the learning standard during in-class checks for understanding?

1. Communicate connections between ratios and graphing.
2. Recognize (orally, in writing, and/or by drawings) proportional relationships between quantities.
3. Describe (orally, in writing, and/or by drawings) differences between unit rates.

Probing Questions for Differentiation on Mathematical Tasks		
<p>Assessing Questions</p> <p>(Scaffold instruction for students who are stuck during the lesson or the tasks.)</p> <ol style="list-style-type: none"> 1. What is a unit rate? 2. Explain what 5:20 would be as a fraction—if a student uses 5.2 as a decimal. 3. How do you calculate a unit rate? 4. Why is a unit rate helpful? 5. How does graphing help you identify if two quantities have a proportional relationship? 6. How does the unit rate help you write an equation to represent the proportional relationship? 	<p>Advancing Questions</p> <p>(Further learning for students who are ready to advance beyond the standard during class.)</p> <ol style="list-style-type: none"> 1. Is the time of 5 minutes and 20 seconds equal to 5.2 as a decimal? Why or why not? 2. How does this type of problem help you to understand why unit rates are helpful? 3. Based on the data from the task that follows, create a graph to represent Mrs. Giuliano’s time for swimming. 4. What did you need to consider in order to build the scale on the graph? 5. How does graphing Mrs. Giuliano’s data help in this situation and future situations? 	
<p>Targeted Mathematical Practice</p> <p>Mathematical Practice 1: Make sense of problems and persevere in solving them.</p> <p>Mathematical Practice 3: Construct viable arguments and critique the reasoning of others.</p> <p>(NGA & CCSSO, 2010, p. 6)</p>		
<p>Activity or Task</p>	<p>What Will the Teacher Be Doing?</p> <p>The teacher will be observing, asking questions, responding to student questions, providing appropriate resources for students, and providing targeted support to students.</p>	<p>What Will Students Be Doing?</p> <p>The students will be actively engaged in the lesson by collaborating in small groups, responding to teacher and peer questions and comments, asking questions, using the learning tools, and recording their work as instructed.</p>
<p>Beginning-of-Class Routines</p> <p>Prior to this lesson, students have explored ratios and unit rates. The expectation is that students are already familiar with calculating unit rates and representing a unit rate on a graph.</p>	<p>The teacher will pass out pictures of different images for students to calculate the unit rate. For example, it may be a photo of a sign that says “4 packs/\$11.00 for Coca-Cola® products.” The directions will be to calculate the unit rate. The purpose of this warm-up is to help connect to sixth-grade content while also reviewing vocabulary.</p>	<p>Students will work in their small groups to calculate the unit rates, discussing among themselves how to make the calculations. Students will also be encouraged to identify when there may be more than one unit rate that is helpful. For example, the ratio 4 packs/\$11.00 could also be broken down to the cost per can if students know how many are in one pack.</p>

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<p>Activity or Task 1</p> <p>Students will engage in understanding the learning standard by providing information about their prior knowledge. Subsequently, the teacher will activate this prior knowledge as students discuss similarities and differences between the plane figures.</p>	<p>The teacher will distribute the task to groups of students who are seated heterogeneously. The teacher will instruct the students on how to work through the problems and the time frame, and remind students about group expectations.</p> <p>The teacher will introduce that the learning goal is for students to compute unit rates using fractions and apply unit rates to real-life scenarios.</p> <p>For groups or classes struggling to stay focused, the teacher will be prepared to scaffold the questions on the task.</p>	<p>Students will be discussing their thinking and asking each other questions as they work through each question in the task. If students are stuck or unsure of how to proceed, they will use their group for support first before seeking assistance from the teacher.</p>
<p>Activity or Task 2</p> <p>This task will develop student sense-making and reasoning ability by requiring students to consider the responses of other students and to use this information to check their own understanding.</p>	<p>As the students work on the task, which addresses the skill of calculating unit rates while also providing a real-life context, the teacher will be circulating around the room prepared to ask questions and facilitate a meaningful conversation in each group.</p>	<p>Students will be listening to each other and asking for clarification where needed. It will be less about the answer and more about understanding the process and learning target.</p>
<p>Activity or Task 3</p> <p>This task will require student conjectures and communication by promoting mathematical discourse that provides opportunities for debate and consensus.</p>	<p>As students wrap up their group work, the teacher will monitor group thinking and choose specific groups to share their thinking. As students are working, he or she may even ask certain students or groups to prepare their work on the board in preparation for the whole-group conversation.</p>	<p>Students will be accountable for communicating with each other in their groups, but they will also be accountable to attend to the group conversation and summary. This will allow groups to add or change thinking based on thinking from other groups.</p>
<p>Closure</p> <p>The teacher will elicit student questions and reflections in the summary of the lesson by using assessing and advancing questions.</p> <p>Students' understanding of the learning target will be determined by the teacher's assessment of students' interactions during group discourse and whole-class discourse.</p>	<p>The teacher will use the discussions she has observed to ask specific advancing questions of the class and assign homework for the night.</p> <p>The teacher will collect student self-reflections along with in-class tasks to look for concepts she will need to continue to build on during the next day.</p>	<p>Students will self-reflect on how they are doing in understanding how to calculate a unit rate in a real-life situation and why it is helpful to know how to do so.</p>

