

Got Math?

Southern Nevada
Regional Professional
Development Program



A Newsletter from the Secondary Mathematics Team www.rpd.net

Ratios, Proportions, and Proportional Reasoning (Grades 6-8)



Math Resources
www.rpd.net

As we begin to integrate the Common Core State Standards (CCSS) into our math classes, we should be mindful that students need to see a variety of models, in addition to procedures, to assist with their learning. In the 6th and 7th grade mathematics curriculum the domain of Ratio and Proportions is a great place to demonstrate the meaning of “*modeling*”. Below you will see several types of models identified in the CCSS.

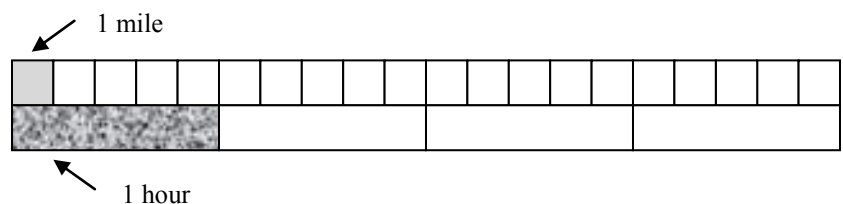
A typical unit on ratio and proportion shows students different ways to write ratios and then defines proportion as two equivalent ratios. Then students solve proportions by using cross-multiplication. Does this method promote a deep understanding of proportions? Reasoning techniques for understanding are critical for the expectations in Common Core State Standards. Examples of making sense of problems include iteration (repeating) of the ratio. For example, 30 miles uses 2 gallons of fuel, extends to 60 miles for 4 gallons, and so on. Or, splitting the ratio into partitions, 15 miles uses 1 gallon of fuel. Another method utilizes strategies of finding unit rates. For example 30 is 15 times greater than 2, or 2 is 1/15 times as great as 30.

Understanding ratios and proportions can take on different relationships. As an example, we may consider an original unit is an egg. There are 12 eggs. But conventionally, we put eggs into groups of 12, even putting them in a special container. And when we do, we have created a *composed unit* - a dozen eggs. We can count these new units instead of counting the individual eggs. So we can buy 2 dozen eggs, or 3 dozen eggs or even 1½ dozen eggs. There seems to be nothing special about a dozen eggs, except that we have agreed to group eggs in twelves. A dozen eggs is a *conventional* unit. A pair of shoes is a *natural* unit. Shoes come in pairs because people have two feet. If cats wore shoes, they would need a different composed unit to count them. And how about centipedes? We also compose units in other ways. A *family* is a composed unit, but there is no agreed upon number of subunits that go into a family. One family may have three people, but another family has four. Common units include miles per hour, income per hour (or income per month), and percent.

Teachers should work to understand the models below in order to facilitate and implement increasingly effective instruction for the standard for mathematical practice, *Model With Mathematics*.

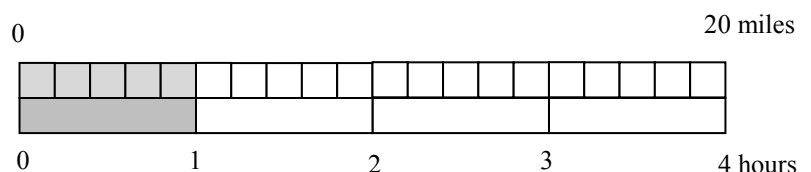
TAPE DIAGRAMS

On a bicycle you can travel 20 miles in 4 hours. What are the unit rates in this situation, (the distance you can travel in 1 hour and the amount of time required to travel 1 mile)?



Using a model we could show....

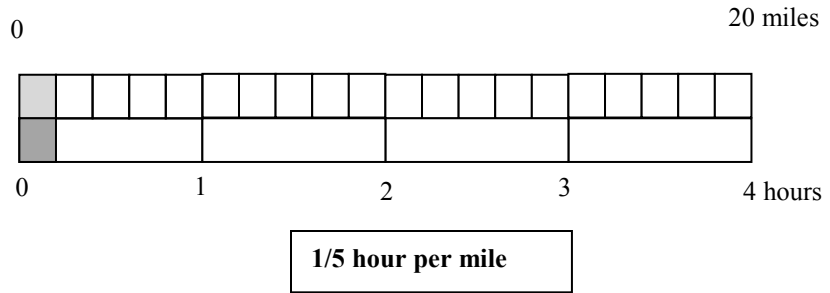
Solution 1: (the distance you can travel in 1 hour)



5 miles per hour or 5 mph

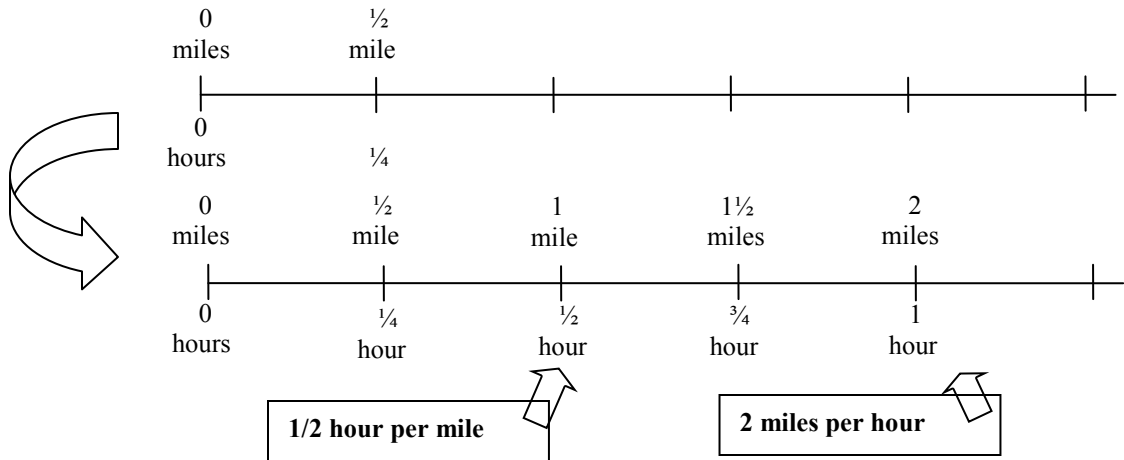
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Solution 2: (the amount of time required to travel 1 mile)



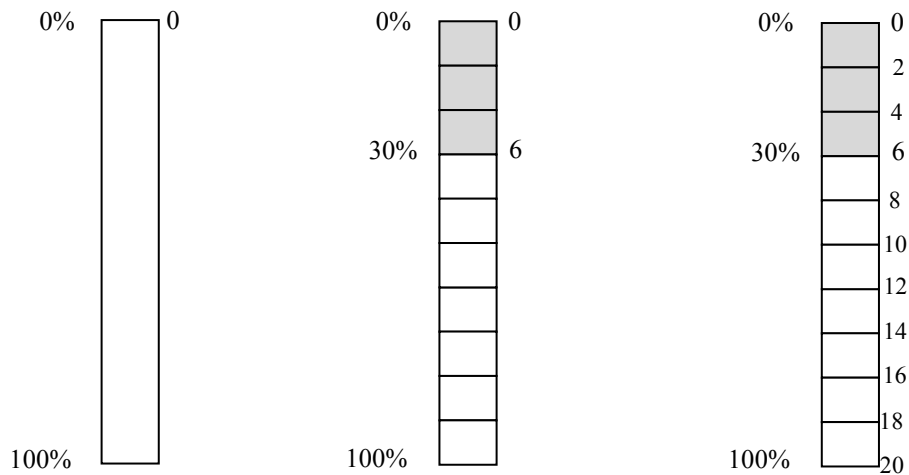
DOUBLE NUMBER LINE DIAGRAMS

If a person walks $\frac{1}{2}$ mile in each $\frac{1}{4}$ hour, compute the unit rates.



PERCENT GRAPHS

If 6 is 30% of a value, what is that value?



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TABLES

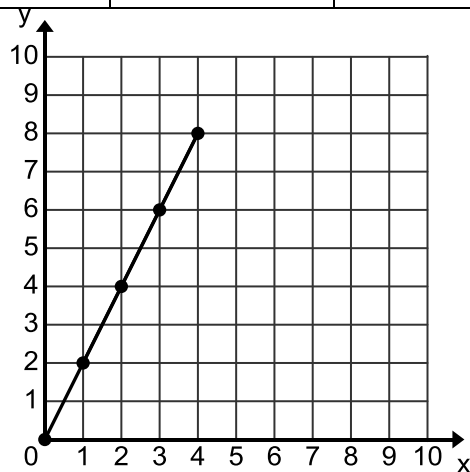
If it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were the lawns being mowed?

hours	7	14	21	28	35
lawns	4	8			

GRAPHS

A student is making trail mix. Using the information given in the table below, create a graph to determine if the quantities of nuts and fruit are proportional for each serving size. If the quantities are proportional, what is the constant of proportionality or unit rate that defines the relationship? Explain how you determined the constant of proportionality and how it relates to both the table and graph?

Serving Size	1	2	3	4
Cups of Nuts (x)	1	2	3	4
Cups of Fruit (y)	2	4	6	8



The relationship is proportional. For each of the other serving sizes there are 2 cups of fruit for every 1 cup of nuts (2:1). The constant of proportionality is shown in the first column of the table and by the slope of the line of the graph.

For more detailed examples and explanations for Math 6 see

www.rpd.net → Math → Resources → Middle → Math 6 Unit Resources → Unit 07 Notes.

For Math 7 resources see

www.rpd.net → Math → Resources → Middle → Math 7 Unit Resources → Unit 05 Notes.