*Handout*

**RATES: Problem Solving Questions to Improve Multiplicative, Proportional, and Algebraic Reasoning**
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<http://www.wiu.edu/users/mfjro1/wiu/RATES/>

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*First Samples:*

1. Jackie and Sallie buy 120 craft beads for 6 dollars. (Objective 2.a)
	1. Jackie takes 120 ÷ 6 and gets 20. Explain what the 20 means.
	2. Sallie takes 6 ÷ 120 and gets .05. Explain what the .05 means.
2. Chocolate covered raisins cost $4.35 per pound. You have $3. How much (in pounds) can you buy? Round your answer to two decimal places. (Objective 6.a)
3. Robin mowed three yards. At the first yard Robin was paid $6 per hour and it took 2 hours to mow the yard. The second yard also took 2 hours to mow, but the pay was $5 per hour. The third yard took 4 hours to mow and the pay was $8 per hour. What is Robin’s average pay per hour? (Objective 8.d)

**RATES Project
Real-world Applications Teaching Everyday Solutions**

The purpose of this project is to increase student understanding of rates and students’ ability to use rates flexibly to solve real-world problems. Our goal is to help teachers and students realize the importance of teaching and learning about rates and provide them with curriculum materials for teaching and learning about rates in the classroom.

This handout includes information about our RATES Project and some sample worksheets. The entire curriculum is available on the Internet at the following **web site:** <http://www.wiu.edu/users/mfjro1/wiu/RATES/> (a printoutof the web site front page is attached).

This is a **14-week, Problem-of-the-Day curriculum** designed for eighth grade students. It is designed to be done **three days per week**. Worksheets are designed to be done in 10 minutes or less per day. The quizzes take about 15 minutes. The Pretest and Posttest take about 50 minutes. The Pretest and Posttest contain a no-calculator and calculator-allowed portions.

**The following are included in this handout:**

* This cover sheet.
* Rate Objectives.
* Printout of the web site which lists the components of the curriculum.
* Sample worksheets and the Post Test.

**Rate Objectives**

*The student should be able to*

1. Find a rate.
	1. Given two change amounts - using the language “per”
	2. Given two change amounts - using the language “for each” or “for one”
	3. Given two change amounts – find unit rate *(both directions)*
	4. Given two amounts and a time (or other *amount* for "the denominator") (including finding unit rate)
	5. From a graph
	6. From a table
	7. Given two ordered pairs (including finding unit rate)
	8. Find the reciprocal rate, given the rate.
2. Understand the meaning of rates
	1. Interpreting the meaning of a rate (in real world settings).
	2. Comparing rates. (which hot chocolate is more chocolaty?, which is the better buy?) Including comparison shopping (using rates or reciprocal of rates)
3. Multiply a rate times an amount (to get an amount).
	1. Proportion-type problems solved using rates
	2. Converting units.
	3. Scale drawings and map scales.
4. Multiply rates (to get a rate).
	1. Problem solving.
	2. Converting units (which are rates).
5. Solve problems using proportions.
	1. Doubling or halving method
	2. Factor of change and use a simplified form (“equivalent fractions method” – including higher terms and lower terms)
	3. Unit rate method
	4. Cross multiplication
6. Use reciprocals, or divide (to get an amount or rate).
	1. Amount ÷ rate. (I have $5. Gas is $3.09 per gallon. How much gas can I buy?)
	2. Rate ÷ rate
7. Use a combination of the above.
	1. Rate × rate × amount
	2. Rate ÷ rate × amount
	3. Other combinations
8. Weighted average
	1. Average rate of change for two portions of a trip, when the distances and times are given.
	2. Average rate of change for two portions of a trip, when the rates and times are given.
	3. Average rate of change from a graph
	4. Weighted average problems
9. Solve problems involving a starting amount and rates (involving linear functions).
	1. Given a “linear model,” answer questions