

LOS ANGELES UNIFIED SCHOOL DISTRICT, District 2
6TH GRADE IMMERSION LESSON -QUARTER 3
January-March, 2005

Lemonade Mix

Adapted from “*Lemonade Mix*”,
Classroom Activities For Making Sense of Fractions, Ratios, and Proportions Workbook, NCTM

TEACHER GUIDE/OUTLINE

Quarter 3 standards addressed in this activity:

AF1.1 Write and solve one-step linear equations in one variable.

AF2.2 Demonstrate the understanding that rate is a measure of one quantity per unit value of another quantity.

AF2.3 Solve problems involving rates, average speed, distance and time.

MR2.4 Use a variety of methods, such as words, numbers, symbols, charts, graphs, tables, diagrams, and models to explain mathematical reasoning.

MR2.5 Express the solution clearly and logically by using the appropriate mathematical notation and terms and clear language; support solutions with evident in both verbal and symbolic work.

Objectives:

- ❖ Develop algebraic thinking skills through exploration of patterns in a “real-life” situation.
- ❖ Develop mathematical reasoning through use of the “Four-Fold” Way, i.e. words, symbols, numbers, and pictures.

Materials Needed:

- 2 different-shaped counters, blocks, or other type of manipulative
- 4 page handout, “Choosing Lemonade Mix”
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TIME	ACTIVITIES	NOTES/QUESTIONS
A	<ul style="list-style-type: none"> ▪ Starting with Lemony Snickade, and perhaps some manipulatives, students explore the proportions and list them in the table. <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p>For kinesthetic and visual learners, using 2 different-shaped pieces, students can use 2 of one shape and 5 of another and continue adding for numerous pitchers. This is also helpful when asked about 1 tbsp of mix.</p> </div> <ul style="list-style-type: none"> ▪ After filling in the table, ask them if they found any simple ways to fill in the table. Push for any patterns they may have found. ▪ Ask the question, "How would you find the amount of water for 25 tbsp. of lemonade mix?" ▪ Collect ways either on transparencies, or just by having students come up and write what they did. 	
B	<ul style="list-style-type: none"> • For the other questions on page 1, ask them to make predictions first. This is a perfect time for great questions about how they're making those predictions; what are their predictions based on? • Allow them time to grapple with the questions. • After they have explored, find out how they are coming up with their results. • Push for any patterns they notice or generalizations they can get 	

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TECH TIP #1	<p>For <u>TI Graphing Calculators</u>:</p> <p>(If students haven't come up with the equation yet, only use the teacher calculator, and without letting students see, write $Y_9 = 2.5X$)</p> <p>OR, use this section later after students have come up with the equation; then each student can use a calculator and write $Y_1 = 2.5X$.</p> <p>In TBLSET:</p> <p style="padding-left: 40px;">TblStart = 1</p> <p style="padding-left: 80px;">$\Delta = 1$</p> <p style="padding-left: 40px;">Indpnt: Auto ASK</p> <p style="padding-left: 40px;">Depend: Auto ASK</p> <p>Then go to <i>Table</i>. Typing in 25 in the <i>X</i> column, they should predict what they think will be in the <i>Y</i>. Arrowing right and up, pressing ENTER, they will see 62.5 for the number of cups. How well did this match their prediction? For 100 cups of water, how many tbsp. do you need? The <i>y</i>-value cannot be typed in. Students have to make predictions in the <i>x</i>-value and then see if <i>y</i> is 100.</p> <p>Return to the TBLSET. In TBLSET:</p> <p style="padding-left: 40px;">TblStart = 1</p> <p style="padding-left: 80px;">$\Delta = 1$</p> <p style="padding-left: 40px;">Indpnt: AUTO Ask</p> <p style="padding-left: 40px;">Depend: AUTO Ask</p> <p>Now go to <i>Table</i> again. The <i>X</i> and <i>Y</i> values will all be displayed. This is different than their in/out table as it goes in ones, not twos. Ask them to look for patterns in the table. What do they notice about the <i>Y</i> values? If they don't see the change being 2.5, don't push it right now. You can come back to it later. Again, push for the meaning being 2.5 <i>cups/tbsp</i>.</p>	

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C	<p><u>Page Two: A new recipe</u></p> <ul style="list-style-type: none"> • Now, students will briefly leave Lemony Snickade and explore a recipe for Luscious lemon. If they weren't able to make generalizations from the questions on page 1, this is the time to start pushing for those patterns. • This exploration is easier in the sense that they may see the patterns faster, but may be a trickier proportion. • The same strategies and questioning can be repeated for Luscious lemon. • The important piece comparing rates and lemony-ness come up here. 	
D	<p><u>Page Three: Comparing the two recipes</u></p> <ul style="list-style-type: none"> • The first question may have already have been reasoned out, or may be a challenge still. It's important here to really push for the variety of ways students come to the unit tablespoon value. • The tables now go by unit values and it's easier to see the increase (in Lemony Snickade) being 2.5. It's important, if kids see that increase of 2.5, to really push for that verbal link to the situation! <div style="border: 1px solid black; padding: 10px; margin-top: 10px;"> <p><u>RATE:</u> This is the point where this important concept needs to be brought up. How will you access what students already know about rate and connect it to the lemonade mix situation? What does 2.5 represent? What does it mean?</p> <p>What might kids say? 2.5 cups of water for each 1 tablespoon of mix added 1.75 <u>cups/tbsp</u> for Luscious lemon</p> </div>	

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	<ul style="list-style-type: none">• Once the tables are filled in, the first question pushes for the patterns student see in the table. What might be their responses?• #4 is the "biggie". It pushes them toward writing an equation for each recipe. Give them struggle time. Once they come up with possibilities (correct or otherwise), tell them to test their equations with numbers from the table.• Once the tables are filled in and the questions have been explored, the students are asked to graph the numbers from the tables.	

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TECH TIP #2	<p>For TI Graphing Calculator: Keeping $Y_1 = 2.5X$, write $Y_2 = 1.75X$</p> <p>In TBLSET: TblStart = 1 $\Delta = 1$ Indpnt: AUTO Ask Depend: AUTO Ask</p> <p>Then go to Table. Both the tables for Y_1 and Y_2 will be displayed, but they will be side-by-side. Visually this will give students a good feel for the rate at which the recipes are changing - which is moving "faster"? Which is more lemony? What patterns do they see?</p> <p>The TBLSET values can be altered depending on what you want your students to do. You can have TblStart at any value, have the Δ change in 2's to match their tables, or have the Indpnt be AUTO and the Depend be ASK, etc.</p>	
E	<p><u>Page Four: Comparing the two recipes on the graph</u></p> <p>The scaling was left off of the graph, so students could grapple with that idea from Quarter 1. It's important that students learn to tie in the values from the table to how they are going to scale. They need to tie x and y to what they mean in terms of the recipes (m and W). Students should graph the two recipes using two colors and label the lines with the equations for easy identification.</p>	<p>Tell students that they need to be able to show in their graphs that 25 tbsp of mix will produce 62.5 cups of Lemony Snickade.</p>

Answering the questions for the graph and tying the graph back to the table help to solidify the concept of **rate**, which later leads to slope, a fundamental idea from algebra to calculus. Having a visual picture of which rate is more "lemony" is powerful. Additionally, keeping all of the mathematical terms and discussion tied to the lemonade mix story/problem, helps keep the mathematics from becoming too abstract.

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	<div style="border: 1px solid black; padding: 10px; margin: 10px auto; width: fit-content;"> <p>You can utilize the 2 equations as one-step models of solving for x (tbsp.) or y (cups), being sure to talk using the story model.</p> </div>	
TECH TIP #3	<p>For TI Graphing Calculator: Keeping $Y_1 = 2.5X$, write $Y_2 = 1.75X$, press Zoom Standard (#6). This gives a "standard" window for the graphs which go from -10 to 10 on both axes. However, it doesn't fit the situation of the recipes, and it doesn't look like the students' graph. This gives another opportunity to talk about scaling and quadrants. The situation takes place in the first quadrant as only positive values of cups and tbsp. are explored.</p> <p>Press WINDOW and they will see the "standard" window. Ask them to explain what the X means in this situation (tbsp of lemon mix), and what the minimum and maximum values are for the graphs they made. Repeat this for Y (cups of water). The graph will now be more meaningful in light of the situation.</p> <p>Optional: Pressing Trace, you will get a value for each X. If you arrow up and down, you will go back and forth between each function. (Note the top left of the screen has the equation of which line you are on. The bottom of the screen has the coordinate points.)</p> <p>If you arrow left and right, you will have decimal values. However, if you go back to the middle of the screen and press Zoom Integer (#8), the values will be more appealing, but may not be a great window for the situation.</p>	