

Title: __What's the Best Deal (taken from *Navigating Through Algebra 3-5*)__by __Pat Goodheart, Donald Reinecker, Karen Miller, Pauline McAfee, Cristina Orantes, Ellen Richard__Pre-lesson date__ October 2, 2008__

Research Aim:

Students will grow into persistent and flexible problem solvers.

Broad Content Goal:

Students will communicate their mathematical ideas clearly and respectfully.

Lesson Objectives :

- Students will describe, extend and make generalizations about geometric and numeric patterns.
- Students will identify and describe situations with constant or varying rates of change and compare them.

SOL Addressed:

5.20 Students will analyze the structure of numerical and geometric patterns (how they change or grow) and express the relationship using words, tables, graphs or a mathematical sentence. Concrete materials and calculators will be used.

5.21 A. Students will investigate and describe the concept of variable.

B. Use a variable expression to represent a given verbal quantitative expression involving one operation, and

C. Write an open sentence to represent a given mathematical relationship, using a variable.

POS Addressed: 5.6.1.3; 5.6.1.2

Lesson Overview:

The students should find that-

- using choice 1, they would have earned a total of \$1000 on the tenth day;
- using choice 2, they would have earned a total of \$1000 on the twenty-sixth day.

So, with choice 1, they would reach the goal more quickly.

Steps	Instructional activities	Anticipated Student Responses	Remarks on Teaching
Pre-Lesson Activity	Read <i>One Grain of Rice</i> and discuss the concept of doubling with students	We anticipate some student confusion when differentiating “adding 2” versus doubling.	Incorporate calculator and manipulatives (Unifix cubes) to familiarize students with tools
Link	Review concept from <i>One Grain</i> Quick mini-lesson on doubling – give students a chance to use manipulatives to demonstrate doubling concept --- teacher records select results on chart paper	<ul style="list-style-type: none"> • What is the difference between adding 2 and doubling? 	Model concepts using Unifix cubes, including 3 rd column of “total amount”
Engage	<p>Teachers will present two options for salary;</p> <p>Option 1: Your salary will be doubled each day: you will earn \$1 the first day, \$2 the second day, \$4 the third day, \$8 the fourth day, and so on.</p> <p>Option 2: Your salary will increase \$3 each day: you will make \$3 the first day, \$6 the second day, \$9 the third day, \$12 the fourth day, and so on.</p> <p>Which of the two options will get your salary to \$1000 the fastest?</p> <p>**Teacher will model the two</p>		<p>Be consistent by using either “Option” or “Choice” to describe the 2 scenarios</p> <p>On task sheet, separate the two options’ columns more clearly so it is visually appealing.</p> <p>Give each group 1 calculator to share/use.</p> <p>Have students or teachers act out the scenario so students clearly see the “daily amount” and how it affects the “total amount” column. This may help students get a much better understanding of what the problem is asking of them.</p> <p>To eliminate the influence of peer</p>

	<p>options using manipulatives on white board and chart paper.</p> <p>**Before students begin, teacher will ask students to write their name on an individual Post-It note and “vote” on the Option s/he thinks will get to \$1000 first. Teacher will make it clear that students can change answer at any time during the lesson.</p>	<p>We anticipate that students will have various reasons for choosing Option 1 and 2. They will be asked to defend their choices at this point.</p>	<p>pressure, change the voting system so that the students are given 3 sticky notes to vote, rather than giving 1 sticky note. Names are not necessary. All 3 voting results should be displayed so trends can be discussed.</p> <p>Once the first round of the votes has been cast, teacher leads into Active Learning section of lesson by asking, “Let’s test out our hypotheses!”</p>
<p>Active Learning</p>	<p>Teacher will stop students after many of them reach Day 3 and ask if they want to change their “votes”, and why/not.</p> <p>Time allowing, teacher will have students graph their results at this point (Day 3) to see if they see any trends emerging.</p>	<p>We anticipate a majority of students will choose Option 2 because on Day 3, the total earnings for Option 2 (\$18) is more than the total earning for Option 1 (\$7).</p>	<p>Stop students after Day 5. (To ensure student stop at Day 5, have students work on individual task sheets. After each “day”, students at each table group must discuss their results. Once they all agree, students fill in their group poster [assign one student to be the scribe, one person to be calculator person, etc.] and fold/tape the bottom part of chart.) Have the students re-vote.</p> <p>Ask students if it is mathematically efficient to start at Day 1’s daily salary each time they need to find the total amount, or should they add-on to the previous day’s total? [“Don’t forget to add what’s already in your pocket!”]</p>

	<p>Teacher will stop students after Day 6, and ask if they want to change their “votes”, and why/not.</p> <p>Time allowing, teacher will have students graph their results at this point (Day 6) to see if they see any trends emerging.</p>	<p>We anticipate several students beginning to see that Option 1 is growing faster than Option 2, especially after reviewing the graph at Day 6.</p>	<p>Stop students again after Day 6, and discuss relevance of equal totals.</p> <p>On-going: Ask early finishers to write down patterns that they see, make hypotheses about the “better” options.</p>
	<p>Students will be allowed to continue the pattern.</p> <p>Teacher will remind students that they may change their “votes” based on their tables and graphs.</p>	<p>When several students begin to change their votes to option 1, teacher will ask select students to justify their decision.</p> <ul style="list-style-type: none"> • Will you have 2 times as much money on Day 10, as you had in Day 5 for Option 1? 	<p>Allow students to work until Day 10.</p> <p>Have students vote</p> <p>Extension: Early finishers will be asked to see how many days must pass before Option 2 reaches \$1000.</p>
<p>Reflect</p>	<p>Teacher will stop students after Day 10 and ask them to describe their findings.</p> <p>Early finishers can write their responses in a math journal or on the back of the data sheet.</p>	<p>When students are finished with Day 10 of both options, they should see that Option 1 is the better choice.</p> <ul style="list-style-type: none"> • When will the tables end, if ever? • Will Option 2 ever “beat” Option 1? Use graph to answer. • What do you think would happen if Option 1 was still doubling each day, and Option 2 was tripling each day? Then, which option would be best? 	<p>Have students vote for the 3rd time and discuss results.</p> <p>Have kids record all of the patterns that they can discover.</p>

Now and Then		<ul style="list-style-type: none">• Where and when in our own lives might this knowledge be helpful?	<p>Show the graph of the two options so students can see the power of doubling. “Which line do you think is Choice 1 and which is Choice 2?” Extension: Show students how Excel can be used to graph the data, have students do it by hand or have students graph using Excel.</p> <p>HW: Assign similar problem, where students are trying to spend \$1000.</p>
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