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Blue Ribbon Algebra Project
Subject: Algebra I
Topic: Slope

I. Objectives

- a. AM 2.2.1 analyze a given set of data for the existence of a pattern numerically, algebraically and graphically; determine the domain and range; and determine if the relation is a function
- b. AM 2.2.2 determine the slope of a line given an equation of a line, the graph of a line and two points to be identified

II. Materials

CBR per group
TI 83 per group
Self guided activity handout per group (How Far'dja Go?)

III. Vocabulary

Slope
Trace
Distance vs. time

IV. Procedures

- a. Briefly review how to operate a CBR and TI 83. Demonstrate using graphing calculator overhead. Display a visual aid that reminds them of the steps.
- b. Divide class into groups of 3 and assign the roles for the first part of the activity. Explain that they will switch roles for each part (they are reminded on activity sheet).
- c. Hand out activity sheets, CBRs, and graphing calculators.
- d. Remind students of proper use of materials. Explain that they will discuss their findings as a class when finished. Tell students to begin.
- e. Lead class discussion using the following questions:
Based on drawings and calculations of CBR results:
 1. a. Which graph was steepest? Why?
b. What was the value for the slope?
 2. a. Which graph had the largest value for the slope?
b. How did you get that value?
 3. Do you see a relationship between the steepness of the line on the graph and the value calculated for the slope of the line? If so, what is the relationship?
 4. a. What happened when you stood still?
b. What did the graph look like?
c. What was the value of the slope?
 5. What does the steepness of slope tell you about your rate of walking?

V. Evaluation

Each student will submit a paragraph describing what each of the group members did during the activity. The group will be graded as a whole on the completion of

the activity sheet.

VI. Individual Differences

- a. Visual aid for procedures with CBRs and graphing calculators
- b. Learning disabled students placed in groups with strong readers and strong math students

Web Resources:

<http://mathforum.org/library/drmath>

“Ask Dr. Math” from Drexel University is a wonderful resource for all math students. It focuses on actual student questions dealing with mathematics at all levels and gives full explanations and answers of how to work specific problems. Sections of the site include elementary, middle, and high school level topics. College mathematics is also addressed. There is a link to a formulas page and a section in which students can order algebra books from Dr. Math.

<http://www.scholars.uh.edu/~math1300help>

This site provides online practice problems in algebra. Students go to a topic of choice, work problems online, and get immediate feedback.

<http://www.math.com/homeworkhelp/Algebra.html>

This site provides online tutorial material on most algebra topics. It walks students through instructional reading and then provides interactive practice problems with immediate feedback.

How Far'dja Go?

Objectives

- AM 2.2.1 analyze a given set of data for the existence of a pattern numerically, algebraically and graphically; determine the domain and range; and determine if the relation is a function
- AM 2.2.2 determine the slope of a line given an equation of a line, the graph of a line and two points to be identified

Three People - Three jobs:

- ✓ one person stands with the CBR
- ✓ one person is the walker
- ✓ one person is the recorder/sketcher

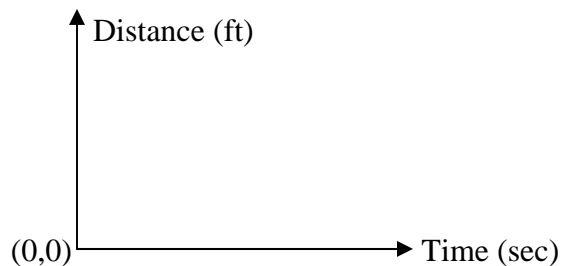
*** Trade roles for each part.***

Part One:

CBR holder – Hold the CBR steady and point it directly at the walker.

Walker – Begin directly in front of the CBR. You will move away from the CBR when the recorder says Go! Walk VERY slowly at a STEADY pace.

Recorder – Say Go! And start the CBR simultaneously. After the CBR finishes and the graph appears on the screen, sketch the graph below.



As a group –

1. Explain what the line on the graph represents using the words distance and time.
2. a. Using the trace button and the left and right arrow keys on the TI 83, determine the walker's distance (to the nearest tenth) at approximately 3.0 seconds. Also express the numbers in as an ordered pair (**round to the nearest tenth**).

Time _____ Distance _____

(,)

- b. Using the trace button and the left and right arrow keys on the TI 83, determine the walker's distance (to the nearest tenth) at approximately 4.0 seconds. Also express the numbers as an ordered pair (**round to the nearest tenth**).

Time _____ Distance _____

(,)

c. Using the two ordered pairs from a and b, calculate the slope of the line between those two points (use units).

change in distance _____ \div change in time _____

Slope = _____

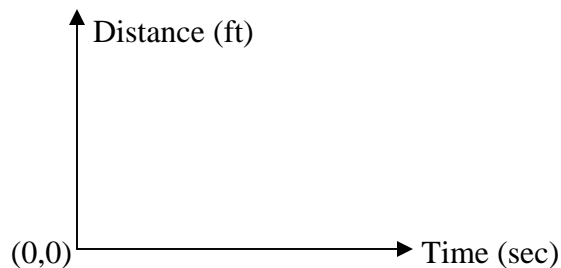
3. What does this slope tell you about your rate of movement during the time the CBR was running?

Part Two:

CBR holder – Hold the CBR steady and point it directly at the walker.

Walker – Stand in front of the CBR (at a distance of your choice) and stand still for the duration of the 10 seconds (until the CBR finishes running).

Recorder – Start the CBR. After the CBR finishes and the graph appears on the screen, sketch the graph below.



As a group –

1. Explain what the line on the graph represents using the words distance and time.

2. a. Using the trace button and the left and right arrow keys on the TI 83, determine the walker's distance (to the nearest tenth) at approximately 3.0 seconds. Also express the numbers in as an ordered pair (**round to the nearest tenth**).

Time _____ Distance _____

(,)

b. Using the trace button and the left and right arrow keys on the TI 83, determine the walker's distance (to the nearest tenth) at approximately 4.0 seconds. Also express the numbers in as an ordered pair (**round to the nearest tenth**).

Time _____ Distance _____

(,)

c. Using the two ordered pairs from a and b, calculate the slope of the line between those two points (use units).

change in distance _____ \div change in time _____

Slope = _____

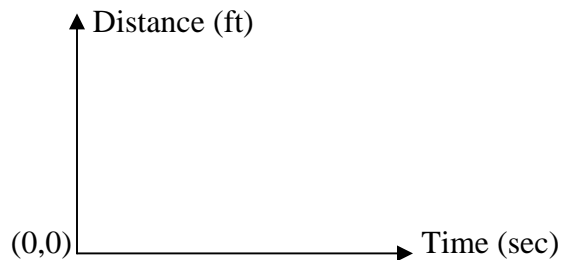
3. What does this “special” slope tell you about your rate of movement during the time the CBR was running?

Part Three:

CBR holder – Hold the CBR steady and point it directly at the walker.

Walker – Begin directly in front of the CBR. You will move away from the CBR when the recorder says Go! Walk at a NORMAL STEADY pace. (Note: This should be faster than what was walked in part one.)

Recorder – Say Go! And start the CBR simultaneously. After the CBR finishes and the graph appears on the screen, sketch the graph below.



As a group –

1. Explain what the line on the graph represents using distance and time vocabulary.
2. a. Using the trace button and the left and right arrow keys on the TI 83, determine the walker’s distance (to the nearest tenth) at approximately 3.0 seconds. Also express the numbers in as an ordered pair (**round to the nearest tenth**).

Time _____ Distance _____
(,)

- b. Using the trace button and the left and right arrow keys on the TI 83, determine the walker’s distance (to the nearest tenth) at approximately 4.0 seconds. Also express the numbers in as an ordered pair (**round to the nearest tenth**).

Time _____ Distance _____
(,)

- c. Using the two ordered pairs from a and b, calculate the slope of the line between those two points (use units).

change in distance _____ ÷ change in time _____

Slope = _____

3. What does this slope tell you about your rate of movement during the time the CBR was running?

Performance Descriptors

- **Distinguished**

The student demonstrates exceptional and exemplary performance with distinctive and sophisticated application of knowledge and skills that exceeds the standard in algebra. The student solves, interprets and defends the reasonableness of solutions in a clear concise manner to the multi-step practical application problem. The student analyzes the set of data for the existence of a pattern numerically, algebraically, and graphically. Given graphical and numerical information, the student determines the slope of a line.

- **Above Mastery**

The student demonstrates competent and proficient performance and shows a thorough and effective application of knowledge and skills that exceeds the standard in algebra. The student solves, interprets, and defends the solutions to the multi-step practical application problem. The student recognizes a graphical and numerical pattern given a set of data. Given graphical and numerical information, the student determines the slope of a line.

- **Mastery**

The student demonstrates fundamental knowledge and skills by showing consistent and accurate performance that meets the standard in algebra. The student solves and interprets the solutions to the multi-step practical application problem. The student recognizes a numerical pattern given a set of data. Given numerical information, the student determines the slope of a line.

- **Partial Mastery**

The student demonstrates basic but inconsistent performance of fundamental knowledge and skills characterized by errors and/or omissions in algebra. Performance needs further development. The student solves the multi-step practical application problem without interpretation or defense of solutions. Given numerical information, the student determines the slope of a line.

- **Novice**

The student demonstrates substantial need for the development of fundamental knowledge and skills characterized by fragmented and incomplete performance in algebra. Performance needs considerable development. The student solves the multi-step practical application problem with procedural errors. Given numerical information, the student determines the slope of a line with procedural errors.