WALK MY WALK

Investigating slope and speed through motion

A two-part activity that uses a CBR to develop the notion of slope and y-intercept through various walking activities. Part A develops a general notion of how changes in walking are reflected in various graphical representations. Part B formalizes the ideas of (1) slope and its relationship to speed and (2) y-intercept and its relationship to starting point.

Mathematical Concepts Explored	Technology Used	Commands/Functions Utilized
• Relating slope and a graph to a physical activity	• Group set TI83+ and CBR • Teacher's presentation calculator with overhead panel and CBR	• TI83+ Program: MOVE • Trace function

California Mathematics Content Standards Addressed by this Activity

5th grade

- Algebra and Functions 1.4 - Identify and graph ordered pairs
- Algebra and Functions 1.5 - Solve problems involving linear functions with integer values; write the equation and graph the resulting ordered pairs

6th grade

- Algebra and Functions 2.2 - Understand that *rate* is a measure of one quantity per unit value of another quantity.
- Algebra and Functions 2.3 - Solve problems involving rates, average speed, distance, and time

7th grade

- Algebra and Functions 1.5 - Represent quantitative relationships graphically; interpret meaning of graphs or parts of graphs
- Algebra and Functions 3.3 - Graph linear functions and understand concept of slope

Prior Knowledge

Students should have experience in graphing in the coordinate plane. An understanding of ratio as it relates to slope (change in y over change in x) would be helpful.

Teacher will…	Student will…
Part I Set up motion detector, overhead, and teacher workstation. Explain the hardware set up to students and give a brief explanation on how the motion sensor works.	Participate in discussion.
Pass out worksheet 1. Student Walking Conditions: Walker 1 - Start 1 meter from the CBR and walk away at a slow steady rate. Walker 2 - Start at opposite end of room and walk towards CBR at a fast steady rate. After students have made and shared predictions for each walk, acquire graph. Discuss general characteristics of the graph. Elicit from students where the walker is stopped, the relative slant of the line and any other relevant parts of the graph. Use trace function to get 4 representative data points. Data points should be significant graph events (places where slope is changing) Slopes will be calculated in part 2. The Move Program places the time and distance data into L1 and L2. To recall the graph for Part 2, this data should be saved into a group named appropriately (e.g. Walk2P3 could represent walker 2 period 3)	For each walk: • have students sketch a prediction about the graph and share their prediction with a partner • have student volunteers walk according to the conditions in the teacher section. • observe the graph of the motion and sketch the graph on the worksheet • copy the data point information for walk 1 and 2. Note: slope will be calculated in part 2 (after the data has been collected of all walks)
Tell students they will be exploring motion graphs in small groups. Each group will need a walker, a recorder, someone to hold the motion sensor and someone to hold the graphing calculator. Distribute the equipment and go through the process of running the program Move. Make sure the motion sensors are activated and students know how to turn the sensors off. Students will need a large open area to collect data (outside works really well). Allow about 20 minutes for students to recreate the graphs and have some time for exploration.	Student will make prediction about how to create the four graphs on the worksheet. In groups, students will collect motion data and check their predictions.

Part 2 Use the following walks to gather data and analyze slope. Continue the discussion on the relevant parts and characteristics of the graph. Walker 3 -Start 1 meter from the CBR and walk away at a slow steady rate - at 3 meters stop for 2 seconds then walk at a faster rate to the end. Walker 4 - Start 1 meter from the CBR and walk away at a fast steady rate - turn around at 4 meters and walk back towards CBR at a slow rate. After analyzing the above walks – recall yesterdays walks by ungrouping the information. Have students use Walker 1 and Walker 2 data to calculate slopes for those graphs.	Students will predict and observe the walk graphs, participate in the class discussion and calculate slope for the relevant parts of the graph.
Discussion: Tie together the concepts of slope and speed: $\frac{\Delta y}{\Delta x} = \frac{\Delta d}{\Delta t}$. Have students complete questions on side b of part 2. If time allows, choose several student's graphs and descriptions from worksheet. Have a volunteer follow the student description and see if graph is accurate on graph generated by the CBR.	Students will answer questions on worksheet.