LessonTitle: Racing Toys and Rates of Change — Alg 5.4

Utah State Core Standard and Indicators Algebra Content Standard 2 Process Standards 1-5

Summary

In this lesson, students generate rates of speed using animated cars or toys. By examining the graphs they connect rates of change with slope. Then they use the CBRs to duplicate given rates of change related to time.

Enduring Understanding	Essential Questions
The slope in a linear equation is also a unit rate such as miles per hour, students per teacher, pay per hour, cost per bagel , sit-ups per minute, words read per minute, miles per gallon, commercials per hour of TV watching, cost per oz., cost per lb., cost per candy kiss etc.	How do the graph and the equation tell the story of a rate of speed? What are some other stories in which the slope is a unit rate? (cost per minute, words read per minute etc.)
Skill Focus • Tracking data • Unit rates and slope • Graphing linear equations	**Vocabulary Focus**

Assessment

Materials: Battery operated movable toys, Stop watches, measuring tools, a marked 3 meter time trial runway, graphing calculators, CBRs.

Launch

Explore

Summarize

Apply

Directions:
We also suggest looking at this NCTM i-math investigation "Learning about Rate of Change in Linear Functions Using Interactive Graphs: Constant Cost per Minute".
http://standards.nctm.org/document/eexamples/chap6/6.2/index.htm#applet

Follow the directions found on the worksheets for the following activities.

5.4a Racing toys
5.4b Match the Graph

5.4a Racing Toys

1) Each group will have a moveable racing toy. The goal is to predict which toy will win a race without racing them against each other. To do this we will collect data in order to find the rate of speed for each toy.

   Each group will have a time trial traveling for 3 meters. Track the distance covered by each toy over time.

   - Measure this information using a stop watch and measuring tools. After the start, one student in your group will call out seconds. For each second the timer calls out, another student will drop markers to mark where the toy is at each second. (use linking cubes or other small manipulatives). Then measure the distance at each second marker and record on your table.
   - Measure the same information using the CBR. Compare with your data. Then record.
   - Create a table to compare the rates of speed for all the toys. Label.

Moveable Toy Distances								
Seconds	A	B	C	D	E	F	G	H
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								

3) Find the rate in meters/sec speed for each toy car.

   A =_____meters/sec B=_____meters/sec C=_____meters/sec D=_____meters/sec

   E =_____meters/sec F=_____meters/sec G =_____meters/sec H =_____meters/sec

4) Explain how the rates of speed relate to the slopes of the lines in the graph.

5.4b Match the Graph

Practice using DIST MATCH in the CBR™ Ranger program to match graphs.

A. Hold the motion detector and the calculator. Point the motion detector at the wall and practice walking the graphs.

B. Have the group hold the motion detector and calculator. Point the motion detector at one person in the group. As a group, instruct the walker on how to walk the graph.

Find an Equation for Your Walk

1. Start 1.5 ft away from the motion detector and walk away at 2 ft/sec.

x (time)	*y (distance)*
0	
1	
2	
10	
x	

Write a sentence to describe the walk:

Write an equation which communicates the walk: y = _____

2. Walk at a constant rate away from the motion detector.

x	*y*
0	
1	
2	
x	

Write a sentence to describe the walk:

Write an equation which communicates the walk: y = _____

3. Walk quickly away from the motion detector at a constant rate.

x	*y*
0	
1	
2	
x	

Write a sentence to describe the walk:

Write an equation which communicates the walk: y = _____

4. Stand still 5 feet away from the motion detector.

x	*y*
0	
1	
2	
x	

Write a sentence to describe the walk:

Write an equation which communicates the walk: y = _____

5. Walk slowly toward the motion detector at a constant rate.

x	*y*
0	
1	
2	
x	

Write a sentence to describe the walk:

Write an equation which communicates the walk: y = _____

6. Walk quickly toward the motion detector at a constant rate.

x	*Y*
0	
1	
2	
x	

Write a sentence to describe the walk:

Write an equation which communicates the walk: y = _____

7. How do graphs and equations tell the story of a rate of speed?