Lesson Title: Biker Betty **Date:**_____

Subject: Algebra I **Topic:** Linear Functions: Slope and y-intercept

Grade: 8 and 9 **Designer:** Katie and Kristina

Stage 1 - Desired Results

Lesson Overview

In this activity, students will use their prior knowledge of linear equations to interpret one graph. Students will calculate the slope and interpret its real world meaning. The will also interpret what is the real world meaning of the y-intercept. Students should make the connection that when the slope (speed) is zero the line is horizontal. Students should also make the connection that the slope (speed) determines the steepness of the line.

Standards Addressed

- The motion of an object can be described by its position, direction of motion, and speed. That motion can be measured and represented on a graph. (NSES p154, grades 5-8)
- Graphs can show a variety of possible relationships between two variables. (BSL 9B/M3, grades 6-8)
- Tables, graphs, and symbols are alternative ways of representing data and relationships that can be translated from one to another. (BSL 9B/H4, grades 9-12)
  - 8.F.3. Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line.
  - 8.F.4. Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.
  - 8.F.5. Describe qualitatively the functional relationship between two quantities by analyzing a graph

Enduring Understanding:	**Essential Question(s):** How is motion represented on a position-time graph?
Motion along a straight line can be measured and described. A position-time graph is a conventional way to represent motion.	
Students will need to know: • **Key terms:** distance, time, origin, axes, slope, y-intercept, steepness, flat • Units of measure for position and time	**Students will be able to:** • Describe the motion of an object qualitatively. • Describe an object's position relative to a reference point. • Predict, confirm, and describe an object's position and time on a position-time graph. • Differentiate moving from stopping on a position-time graph.

Stage 2 - Assessment Evidence

Performance Tasks	**Other Evidence:**
In this activity, students: • Predict and analyze position-time data for moving and stopping	• *Checkin (assessment) for Biker Betty!*

(over)

Stage 3 - Learning Plan

Lesson Procedure **Many days before:** • Practice the activity, review lesson plan, secure materials, design additional teaching instruments as desired. **Day of:** • Set up computers and projector. • Introduce lesson: using an example graph • Have students complete *Biker Betty*. • Whole group discussion after completing SmartGraphs Activity • Complete worksheet assessment (Hmwrk) • Finish with Exit Ticket.	**Required Materials:** • PC or Macintosh Computers: 1 per person • Supported Internet browser with access to SmartGraphs portal • Projector and IWB
Possible Discussion Questions for Students:	**Sample Answers to Discussion Questions:**
In a position-time graph, what information does…: a) the x-coordinate of a point represent? b) the y-coordinate of a point represent? c) a single point tell you?	In a position-time graph, a) The x-coordinate refers to the object's time in seconds. b) The y-coordinate refers to the object's position in meters. c) A single point (x, y) tells you an object's position, y, at a particular time, x.
Why is time represented on the x (horizontal) axis and position represented on the y (vertical) axis?	Time is the independent variable, which is usually represented on the x-axis; position is the dependent variable, usually represented on the x-axis.
What units of measure can you use to measure: a) Time? b) Position? c) Speed or Velocity?	a) Time units: seconds, minutes, hours, days… b) Position units: meters, kilometers, inches, feet, yards… c) Speed and velocity units; meters/sec, km/min, miles/hour…
How is stopping represented on the graph?	When you stop, your position does not change with time. A horizontal line results.
How can you tell how much time elapsed as you moved from one position to another?	Look at the time data associated with each position. Find the difference of the two times.
How can you tell how far you moved within a certain time interval?	Look at the position data associated with each time. Find the difference of the two positions.
What does the steepness of a straight position-time graph tell you about the motion?	The steepness tells you how fast the object moved. Lines with steeper slopes indicate faster motion.

Template adapted from Wiggins and McTighe (2004). Understanding by Design