Name: _____

2.3 Acceleration

Question: How is the speed of the car changing?

Before beginning the Investigation, define the term "acceleration" in your own words. It may help you to think about flying in an airplane. When a plane is accelerating, you feel its motion. For example, you feel the motion of the plane when it is taking off, but not much when you are flying at altitude.

1 Measuring acceleration

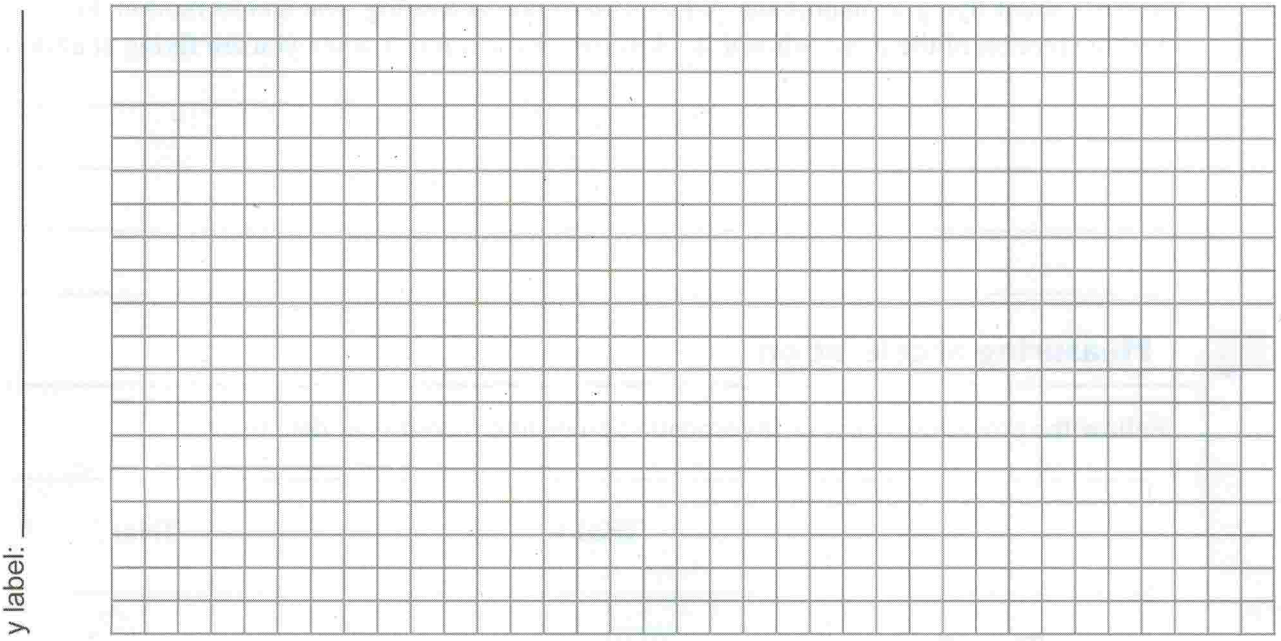
Follow the procedures in your Investigation guide and record your date below:

	Trial 1	Trial 2
Time A		
Time B		
Time A to B		
Speed at A		
Speed at B		
Acceleration		

2 Graphing speed vs. time

a. Make a speed vs. time graph. Plot the speed at photogate B on the *y*-axis. Plot the time from A to B on the *x*-axis.

Title: _____



x label: _____

b. Is your graph a straight line or a curve?

_____

c. The place on the speed vs. time graph where the line crosses the *y*-axis is called the *y*-intercept. On the speed vs. time graph for the car and ramp, the *y*-intercept represents something about the car. What is the *y*-intercept of your speed vs. time graph? (Hint: The *y*-axis is speed.)

_____

d. Does the car accelerate as it rolls down the ramp? Justify your answer. Remember that acceleration is defined as a change in speed over time.

_____

_____

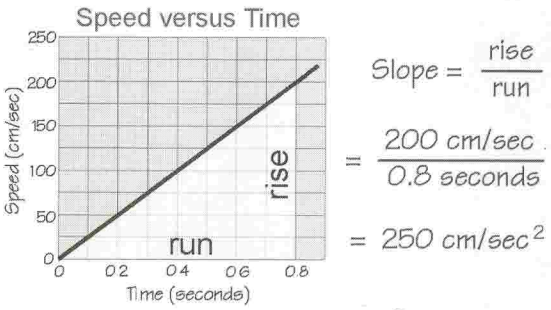
_____

_____

3 Calculating acceleration from the slope of the line

a. Using your speed vs. time graph, calculate the acceleration of the car from the slope of the line. Refer to the graphic at the right for an example of the calculation. Show all of your work.

Acceleration from the slope of the speed versus time graph



b. Is the acceleration of the car changing as it moves down the ramp? Explain your answer using what you know about the slope of a straight line.

4 Reflecting on what we learned

a. How does the acceleration you measured compare with the acceleration you calculated from the graph of speed vs. time? If there are differences, try to think where they might have come from.

b. Give the car a gentle push up the ramp from the bottom. The car will go up, slow down, and come down again. Is there a place in the motion where the speed of the car is zero? Is there a place where the acceleration is zero?

c. Can you think up two configurations of ramps and cars that show the following properties:

(1) Higher speed but lower acceleration. _____

(2) Lower speed but higher acceleration. _____

You should discuss this with your group or the class. You can also test out your ideas, or draw them in sketches. (Hint: The car may not always be in the same place!)