



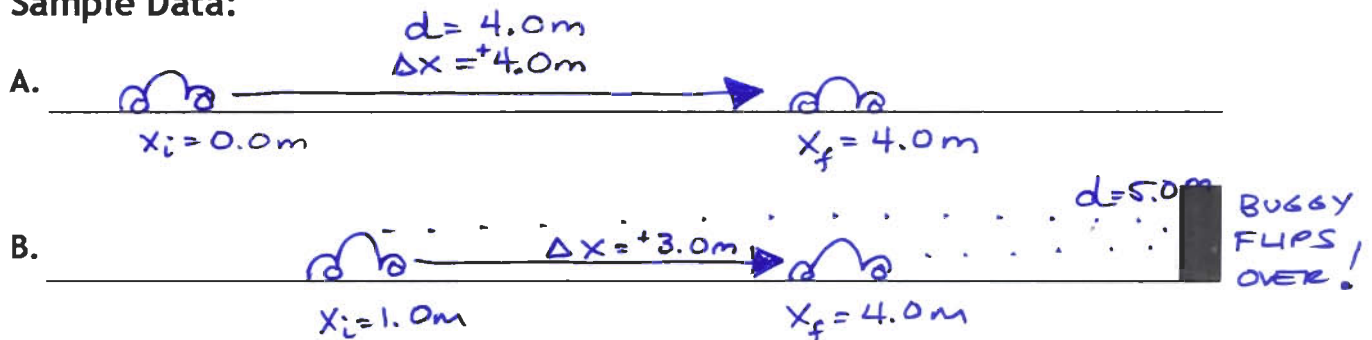
# M-09 Constant Speed Buggy (Tumble Buggy)

## What is the difference between Position, Distance, Displacement, Speed, and Velocity?!

### Directions:

1. Set markers on floor or table at equal intervals (i.e. 25 cm, .5 m, or 1m)
2. Select three students to be "the timers". Provide stopwatches.
3. Select two more students to operate the buggy. One student will start the buggy and the other will pick it up.
4. Choose a initial position ( $x_i$ ) and a final position ( $x_f$ ). Collect time data as the buggy moves from  $x_i$  to  $x_f$ .
5. Calculate the distance, displacement, speed, and velocity. Use (+) and (-) to designate direction for displacement and velocity.
6. Choose four scenarios. For at least one scenario, place a sturdy upright barrier in the path of the buggy so that the buggy will flip over and change direction between  $x_i$  and  $x_f$ . (see B below)

### Sample Data:



### Data/Calculations:

	Initial Position $x_i$	Final Position $x_f$	Time Interval $\Delta t$	Distance $d$	Displacement $\Delta x = x_f - x_i$	Speed $v_s = \frac{d}{\Delta t}$	Velocity $v = \frac{\Delta x}{\Delta t}$
					+ Direction		+ Direction
A	0.0m	4.0m	8.0s	4.0m	+4.0m	$\frac{4.0m}{8.0s} = .5 \frac{m}{s}$	$\frac{+4.0m}{8.0s} = +.5 \frac{m}{s}$
B	1.0m	4.0m	10.0s	5.0m	+3.0m	$\frac{5.0m}{10.0s} = .5 \frac{m}{s}$	$\frac{+3.0m}{10.0s} = +.3 \frac{m}{s}$

↑ NOTICE SPEED STAYS THE SAME!

**Follow-up Activity:** Introduce motion graphs by challenging students to create  $x$  vs.  $t$  and  $v$  vs.  $t$  graphs of the buggy motion using the data above. A motion detector can be used to verify their results.

## What is the difference between Position, Distance, Displacement, Speed, and Velocity?!

A. \_\_\_\_\_

B. \_\_\_\_\_

C. \_\_\_\_\_

D. \_\_\_\_\_

### Data/Calculations:

	Initial Position $x_i$	Final Position $x_f$	Time Interval $\Delta t$	Distance $d$	Displacement $\Delta x = x_f - x_i$	Speed $v_s = \frac{d}{\Delta t}$	Velocity $v = \frac{\Delta x}{\Delta t}$
					+ Direction		+ Direction
A							
B							
C							
D							