

Name: \_\_\_\_\_

Group: \_\_\_\_\_

# Speed

### Measuring Speed

To measure speed you must measure the distance traveled and the elapsed time.

In the green lab manual *Investigations*:

1. Follow the instructions on how to set up the timer and photogates on pages 2-3.
2. Follow the instruction on how to set up the ramps and photogates on page 6.
3. Determine how to find the speed of your cars by performing sections 1 and 2 of lab 1.3 on page 8.
4. Fill out the chart below and answer the following questions with the data you recorded in your chart.

a. What is the formula for speed?

b. Which is the fastest speed of the three, or are they all the same speed?

c. Is it possible that a speed of 254 and a speed of 100 could be the same speed? Explain

### Speed, Disatance, and Time Data

Distance from A to B	Time from A to B (sec)	Speed
(feet)		(feet/sec)
(cm)		(cm/sec)
(inches)		(in/sec)

Calculate the speed in ft/sec, cm/sec and in/sec and write the results in the table.

Write in your best definition from your academic vocabulary

### Speed

$$\rightarrow S = \frac{\Delta D}{\Delta T} \leftarrow$$

Variable

S=

D=

T=

Unit

*Ex. A plane flies 200 meters in 5 sec. Calculate its speed.*

G-	R-
E-	C-

**Why we use change of distance:**  
 A tree 4 m away for 2 sec has a speed of zero — it hasn't moved. That's why we have to use  $\Delta D$  (change of distance) distance (D).  
**An object has to be moving to have speed.**

*Physics Explains Mathematics:*  
 If  $\Delta T = 0$  (in  $S = \Delta D / \Delta T$ ), then an object is in two places at once, which is impossible. This is why dividing by zero is undefined: it makes no physical sense!

## Types of Speed

**Instantaneous:**

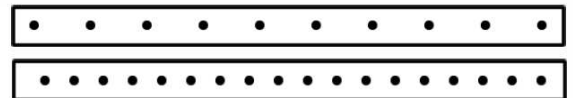
**Constant:**

**Initial:**

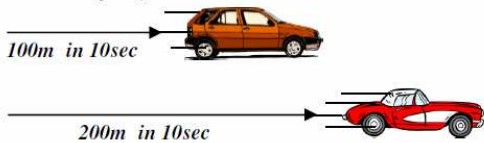
**Final:**

**Average:**

Each dot represents an object's position at regular time intervals (time is constant).

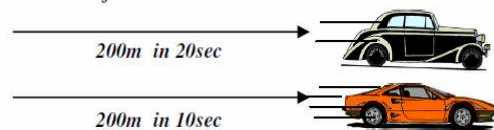


**Speed is proportional to distance:**  
A faster object goes farther, in the same amount of time.



*Doubling the distance, doubles the speed.*

**Speed is indirectly proportional to time:**  
A faster object travels the same distance in less time.



*Doubling the time, halves the speed.*

**A slower object can travel the same distance as a faster object, it just takes more time.** A fast object travels the same distance faster.

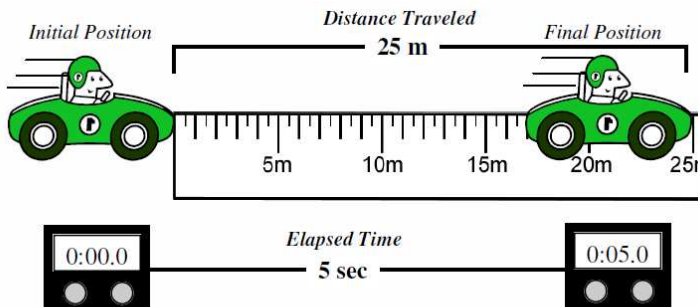
### Measuring Speed

To measure speed you must measure the distance traveled and the elapsed time.

Measure distance in meters using a meter stick or measuring tape.

Measure time with a stopwatch or with photogates.

*Photogates (which start and stop when an object breaks beams of light) are a very accurate and precise method of measuring time.*

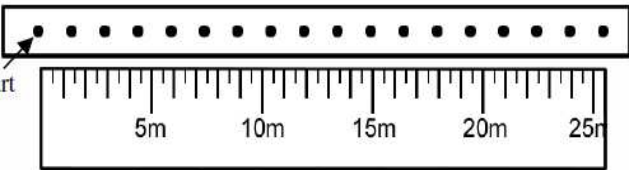


$$S = \frac{\Delta D}{\Delta T} = \frac{25 \text{ m}}{5 \text{ sec}} = 5 \text{ m/s}$$

1. Speed	A. How far an object moves between two positions.	1. Slow speed	A. An object that travels a long distance quickly.
2. Distance Traveled	B. When an object covers equal amounts of time each second.	2. Fast speed	B. Can travel a long distance, but requires a lot of time.
3. Elapsed Time	C. The rate of how fast an object travels a particular distance.	3. Photogate	C. Uses a beam of light to start and stop a timer.
4. $\Delta$	D. How many seconds it takes for an event to occur.	4. Directly Proportional	D. One quantity increases as another quantity increases.
5. Constant Speed	E. Delta: means "change of".	5. Indirectly Proportional	E. One quantity decreases as another quantity increases.

Will Speed Increase or Decrease?	Mark these as Speed, Distance, Time, or Other
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<p>___ Distance is constant and time increases.</p> <p>___ Time is constant and distance decreases.</p> <p>___ Time is constant and distance increases.</p> <p>___ Distance is constant and time decreases.</p>	<p>___ 5 mm/sec      ___ 20 meters/sec      ___ 15 ft/min</p> <p>___ 10 inches      ___ 228 meters      ___ 78 sec</p> <p>___ 50 m/s<sup>2</sup>      ___ 8 minutes      ___ 6 Newtons</p>
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<p>True or false (and why): "A fast car goes farther."</p> <p>Can a slow object travel as far as a fast object? Explain.</p> <p>Why do we have to use change of distance (<math>\Delta D</math>) instead of just distance (<math>D</math>)?</p>	 <ol style="list-style-type: none"> <li>Is the above motion at constant speed?</li> <li>Why or why not?</li> <li>Each dot = 1 sec. How long did it take to go 15 m?</li> <li>Calculate the object's speed.</li> <li>How would the dots change if it were moving faster?</li> </ol>
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A bike moves 50 m in 10 seconds. Calculate the speed of the bike.	A car travels 200 miles in 4 hours. Calculate the car's speed.
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Given-	Rearrange-	Given-	Rearrange-
s-		s-	
d-	Calculate-	d-	Calculate-
t-		t-	
Equation-		Equation-	

A car travels 60 m/s for 10 secs. Calculate how far it traveled.	On holiday, a family travels from Meyerville (10 miles away) to Sprytown (70 miles away), in 3 hours. Find their speed.
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