

Name:

Period:

## LAB 24 – REACTION TIME AND STOPPING DISTANCE (Part I)

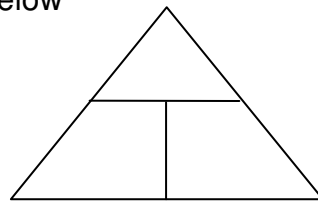
### BACKGROUND

It has already been established that speed is *calculated* by dividing the *measure* of distance by the *measure* of time.

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

As with any equation, we can manipulate the various factors to make use of them in other calculations. Recall that we could do this with the density equations as well. Complete the density triangle and equation below.

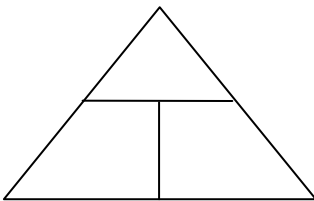
Density = \_\_\_\_\_



What were the two other equations that we used with this one to form the three density equations?

How can we manipulate the factors of the speed equation to form three “Motion Equations?”

Fill in the Speed triangle, then write *all three* speed equations.



### ACTIVITY

(Part I)

You will measure and calculate your average reaction time.

(Part II)

You will measure your average stopping distance.

### MATERIALS

- ◆ Meter stick

## PROCEDURE

### Part I

1. Place your forearm on your lab station or a desk with your hand hanging over the edge. Your elbow and arm should be in contact with the surface.
2. Have your partner suspend a meter stick between your thumb and index finger. **Your thumb and index finger must be 3 cm apart.** The meter stick should be held so that the 0 cm mark is between your thumb and finger.
3. Your partner will drop the meter stick without giving you any warning. You will grab it with your fingers as fast as you can, **but without moving your hand up or down.**
4. Note the level at which you grabbed the meter stick and record that data in Table 24-1.
5. Repeat steps 1 – 4 a total of five times. Record your distances in table 24-1.
6. Reverse roles and complete steps 1 – 5 for your partner.
7. Since your reaction time was faster than can be measured with a stopwatch, a conversion graph has already been created for you (Figure 24-2). Use this table to convert your *median* measurement into a reaction time, and record the reaction time data in Table 24-1.

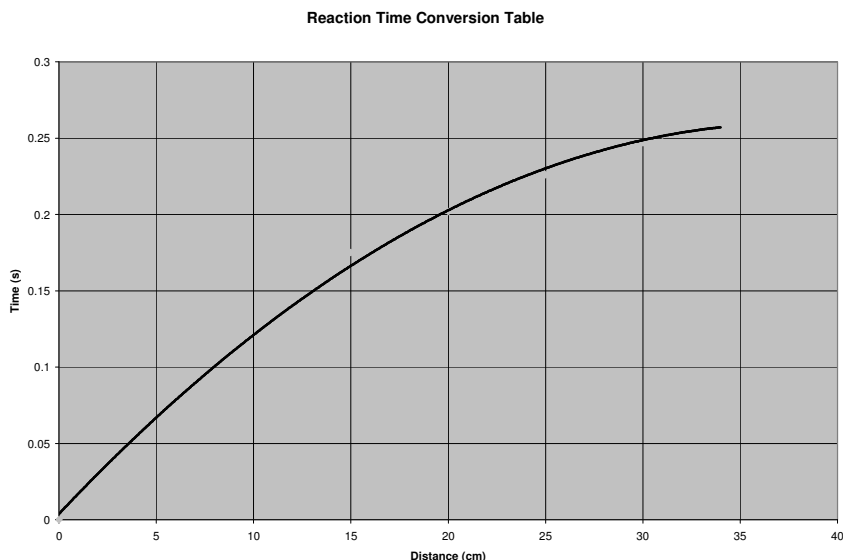


Figure 24-2

**DATA**

Table 24-1: Ruler-Drop Distances and Reaction Time

	Distance Meter Stick Drops (cm)					Median Reaction Time (s)
	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	
You						
Partner						

**LAB 24 – REACTION TIME AND STOPPING DISTANCE  
(Part II)****BACKGROUND**

In Part I, we determined our reaction time. This is the amount of time that it takes us to react to a situation that is unexpected. Today we will use that information, in conjunction with our speed, to determine our Emergency Stopping Distance.

Our stopping distance is the distance that it takes us to stop after running full speed. The Emergency Stopping Distance is the same thing, but this time we add in the fact that we stop unexpectedly.

**PROBLEM**

How do we determine our Emergency Stopping Distance?

What information do you think we need to solve the problem?

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**MATERIALS**

Meterstick  
Masking tape  
Stopwatch

**Part II**

8. Use cones or other markers to identify a 25 meter section of the track.



9. Have your partner time how long it takes you to run the course at full speed. CAUTION: Be sure to remove any obstacles from the course. **You must not slow down before the mark.**



10. **After** you pass the 25 m mark:  
a. come to a stop as quickly as possible.  
b. remain standing where you are (do not move).  
c. record your running time in Table 24-3.



11. Have your partner measure the distance from the 25 m mark to the part of your foot that is farthest from the mark. This is the distance you need to come to a complete stop. Enter your data in Table 24-3.

12. Reverse roles and collect the same data for your partner.

13. If you have time, repeat steps 9 – 11 to get additional data.

14. Clean up your equipment and return to the lab.

15. Enter your data on the class data sheet on the computer.

**DATA**

Table 24-3: Running times and stopping distances

Runner's Name	Trial	Running Time (s)	Stopping Distance (m)

**SUMMARY** (Part II)

1. Calculate your mean average time for running the 25m course. If you only ran it once, just enter that data. Be sure to use the correct units.

Mean Average Time: \_\_\_\_\_

2. Look back at the equation from the background information for calculating speed. Calculate your average speed over the 25 m course. Be sure to use the correct units.

Mean Average Speed: \_\_\_\_\_

3. Repeat steps 1 & 2 for your lab partner.
4. What was the shortest time for the class? \_\_\_\_\_
  - a. What does this mean about the person who received that time?
5. Use the class data to calculate the *mean average speed* of three additional classmates (not you or your lab partner).

Table 24-4: Average Speeds

Mean Average Speed for:				
You	Lab Partner	Classmate 1	Classmate 2	Classmate 3

6. Use the class data to calculate the mean Stopping Distance (SD) of the class. Be sure to use the correct units.

Mean stopping distance: \_\_\_\_\_

7. Use the class data to calculate the *mean* reaction time of the class.

Mean reaction time: \_\_\_\_\_

