

# MiSP Motion Lab L3

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

Date: \_\_\_\_\_

## A Race Against Time

### Problem:

Which toy car has the fastest speed?

Gather information:

Formula:  
Speed = \_\_\_\_\_

Prediction: *If I time the \_\_\_\_\_ car, then it will go the \_\_\_\_\_ to win the race.*

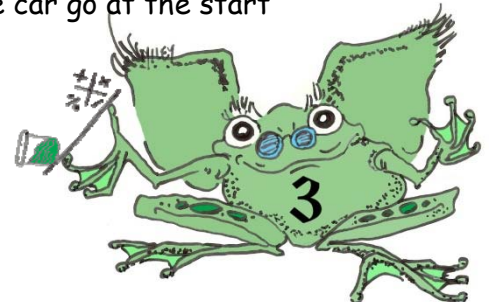
### Materials:

- 3 toy cars
- 3 metersticks
- 1 stopwatch
- 1 calculator

### Procedure:

Check off each step as you complete it.

- Assign roles within the group. You will need one timer, at least one official, and one driver. Write names in spaces provided.
  - Timer: This student will use the stopwatch to monitor the times:  
\_\_\_\_\_
  - 1 or 2 officials: These students will be responsible for determining the distance the car traveled in a given time:  
\_\_\_\_\_ / \_\_\_\_\_
  - Driver: This student will be responsible for letting the car go at the start line: \_\_\_\_\_



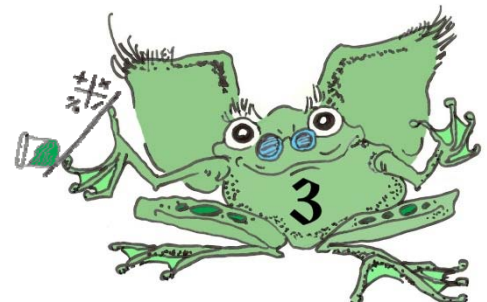
- Line up the metersticks on the floor and turn on the car.
- When the timer says "go," the driver should release the car on the start line.
- Time the car for 4 seconds.
- At the end of 4 seconds, the timer will say "stop." The official will determine the distance the car traveled by using the metersticks. Record data.
- Repeat steps 3-5 for two more trials.
- Calculate the average distance the car traveled in 4 seconds.
- Repeat steps 3-7 for 6 seconds and again for 8 seconds. Rotate to the next two lab tables to complete the experiment for the remaining cars.

**Record Data:**

1. Calculating Average Distance: To find the average distance, your group must find the mean of three trials for each car. After finishing all trials, **add** the three distances for each time point and **divide** by **three**.

<b>Car 1</b>	Distance small car moved (cm)			Calculate (show formulas and substitutions)
Time (sec)	Trial 1	Trial 2	Trial 3	Average distance
4 sec				
6 sec				
8 sec				

<b>Car 2</b>	Distance small car moved (cm)			Calculate (show formulas and substitutions)
Time (sec)	Trial 1	Trial 2	Trial 3	Average distance
4 sec				
6 sec				
8 sec				

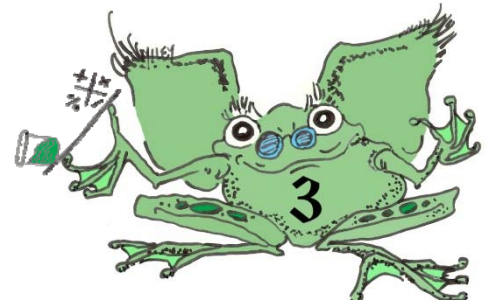


<b>Car 3</b>	Distance small car moved (cm)			Calculate (show formulas and substitutions)
Time (sec)	Trial 1	Trial 2	Trial 3	Average distance
4 sec				
6 sec				
8 sec				

2. Calculating Speed: Use the average distances that you just calculated for each car to fill in the tables below:

<b>Car 1</b>		Calculate (Show formulas and substitutions)
Time (sec)	Average distance (cm)	Speed

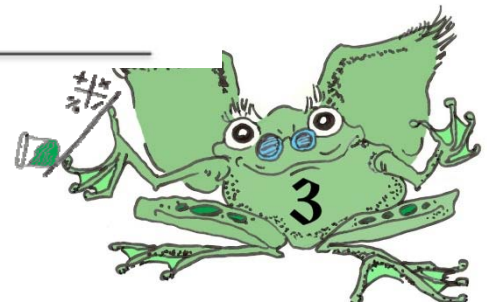
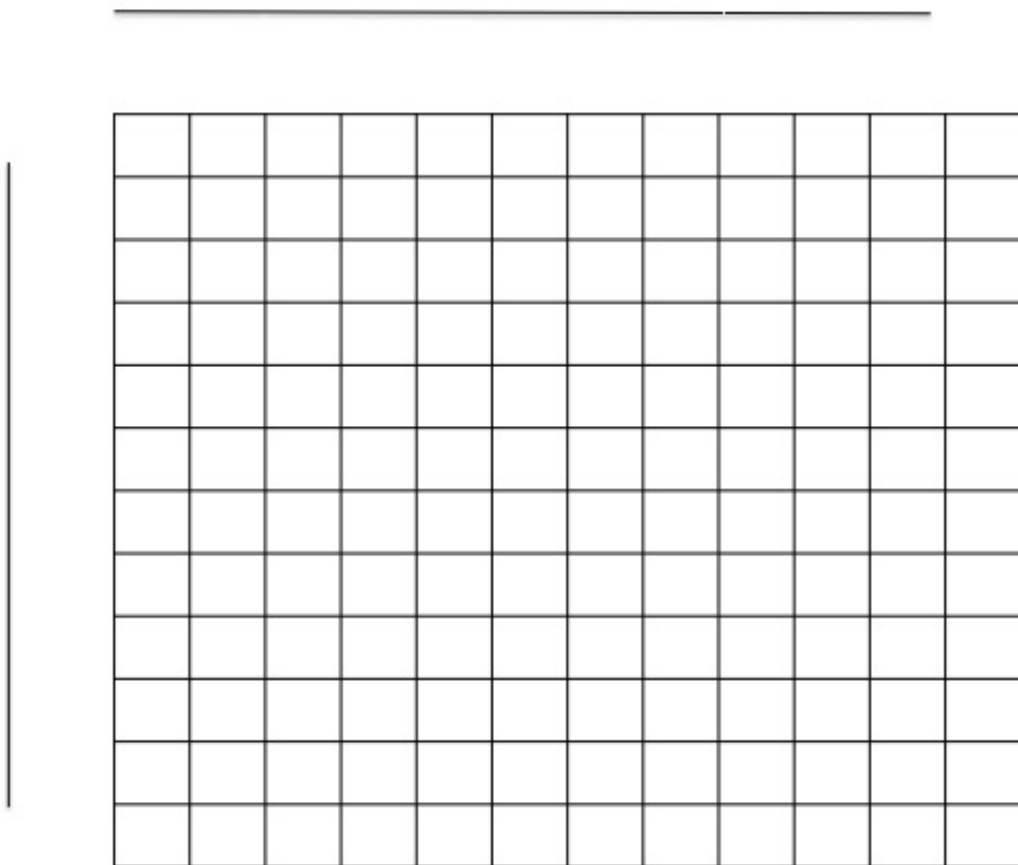
<b>Car 2</b>		Calculate (Show formulas and substitutions)
Time (sec)	Average distance (cm)	Speed



Car 3		Calculate (Show formulas and substitutions)
Time (sec)	Average distance (cm)	Speed

**Graph your data:**

Graph the data. Use the data for each of the cars to graph the relationship between time and distance. The relationships will all be linear.



**Conclusion:**

1. Which car travels the fastest? \_\_\_\_\_

2. What do you notice about the slope of the line of the fastest car?

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3. Approximately how far had car 1 traveled at 5 seconds? \_\_\_\_\_

4. On a graph, how do you know if the car is traveling at a constant speed?

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5. Using the best-fit line, calculate the slope of the car traveling **the fastest**.

Choose two ordered pairs on the line (these may not be data points).

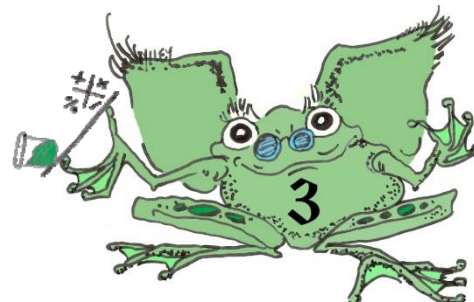
\_\_\_\_\_ and \_\_\_\_\_  
 $(x_1, y_1)$        $(x_2, y_2)$

Calculate, using this formula:

$$\text{Slope of a line} = \frac{(y_2 - y_1)}{(x_2 - x_1)}$$

Slope of a line =  $\frac{(\quad - \quad)}{(\quad - \quad)}$  =

Slope =



6. What is the speed of this car? \_\_\_\_\_
7. Is your answer for the slope correct? \_\_\_\_\_
8. How do you know? \_\_\_\_\_  
\_\_\_\_\_

9. Using the best-fit line, calculate the slope of car 2. Show all your work!

Choose two ordered pairs on the best-fit line.

\_\_\_\_\_ and \_\_\_\_\_

Formula for slope:

$$\text{Slope of a line} = \frac{(\quad - \quad)}{(\quad - \quad)} =$$

Slope =

10. Using the best-fit line, calculate the slope of car 3. Show all your work!

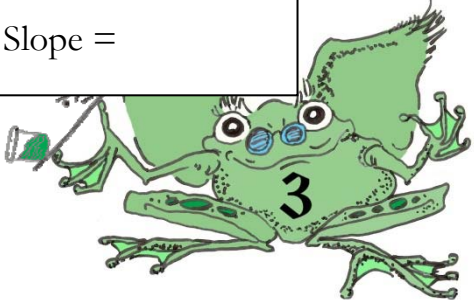
Choose two ordered pairs on the line.

\_\_\_\_\_ and \_\_\_\_\_

Formula:

$$\text{Slope of a line} = \frac{(\quad - \quad)}{(\quad - \quad)} =$$

Slope =



11. What is the relationship between slope and speed? \_\_\_\_\_  
 \_\_\_\_\_

12. Using the equation of a line ( $y = mx + b$ ), complete the chart below:

Car	Slope ( $m$ )	$y$ -intercept ( $b$ )	Equation $y = mx + b$
Car 1			$y =$
Car 2			$y =$
Car 3			$y =$

Use the equation of the fastest car line to gather information about  $x$  and  $y$ .

$x$ Time (sec)	$y$ Distance (cm)
0	0
2	
3	
9	

Show your work:

Conclusion: Given the equation  $y = 4x + 2$ ,

what is the slope of the line? \_\_\_\_\_

what is the  $y$ -intercept? \_\_\_\_\_

If  $x$  is 12, what is the value for  $y$ ? Show your work.

