MiSP Motion Lab L2

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.*

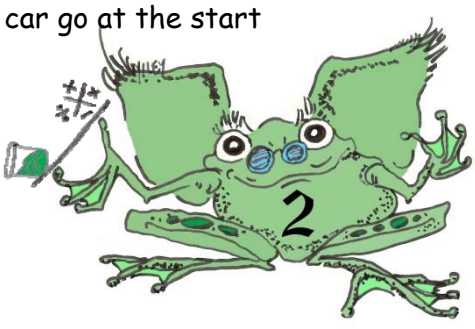
Materials:

- 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: _____



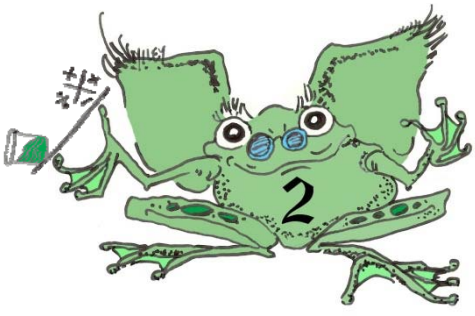
- Line up the metersticks on the floor and turn on the car.
- When the timer says "go," the driver should release the car on the start line.
- Time the car for 4 seconds.
- At the end of 4 seconds, the timer will say "stop." The official will determine the distance the car traveled by using the metersticks. 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**.

Car 1	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				

Car 2	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				

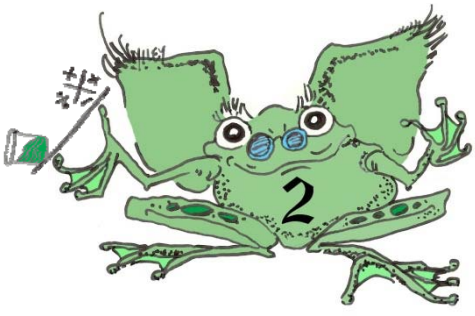


Car 3	Distance small car moved (cm)			Calculate (show formulas and substitutions)
Time (sec)	Trial 1	Trial 2	Trial 3	Average distance
4 sec				
6 sec				
8 sec				

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

Car 1		Calculate (Show formulas and substitutions)
Time (sec)	Average distance (cm)	Speed

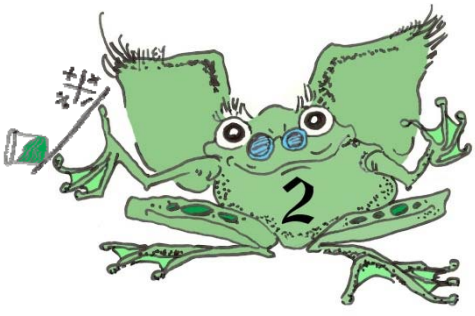
Car 2		Calculate (Show formulas and substitutions)
Time (sec)	Average distance (cm)	Speed

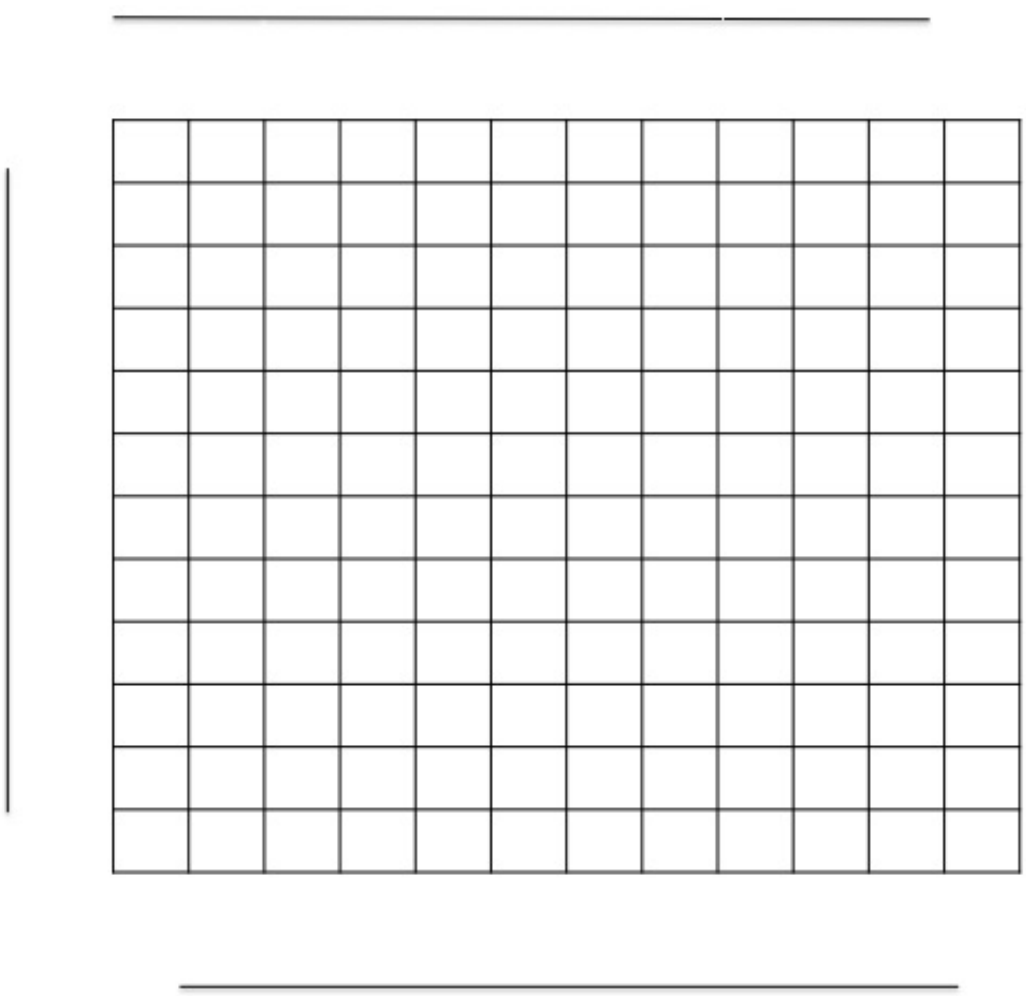


Car 3		Calculate (Show formulas and substitutions)
Time (sec)	Average distance (cm)	Speed

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?

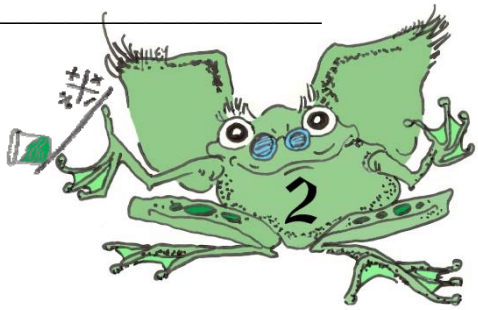
   _____

   _____

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?

   _____



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) and (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?_____

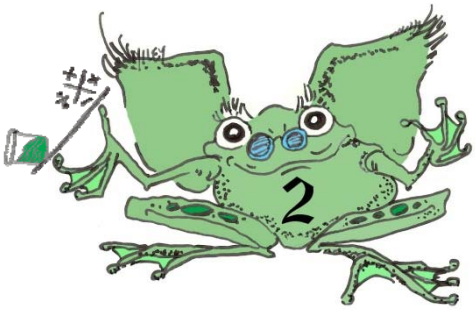
_____

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:



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:

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

Slope =

11. What is the relationship between slope and speed? _____

_____