

Speed of a Toy Car

Integrated Science

Name _____ Period: _____ Date: _____

Background: How long does it take a car to move 200 centimeters?

We all have a good idea that if it takes a smaller period of time to move 50 centimeters, the car must be moving faster. But how do we measure the speed of a toy car? In your own car, it is easy because engineers have designed a speedometer that automatically tells you how fast your car is moving. A common unit for speed is miles per hour. From this it is easy to figure out the formula that we have to use to calculate the speed of a toy car. Miles is a unit to measure distance. Hour is a unit to measure time. The word PER stands for division. So, if Miles Per Hour = Miles / Hour we can replace miles with distance and hour with time and we get the following formula:

$$\text{speed} = \text{distance} / \text{time}$$

Materials: Toy Car Ramp Tape Stopwatch Meter Stick

Procedure:

1. Mark off the following distances on the floor with tape: 0 meters, 50 cm, 100 cm, 150 cm and 200 cm.
2. Wind up your car and set it before the 0 m mark. Release the car.
3. When the front of the car reaches the 0 meter mark, start your timer. Then, stop the timer when the front of the car reaches the 50-cm mark. Record the time in the table on the back.
4. Repeat this procedure for 2 more trials.
5. Calculate the average time and record it in the table. (Add up time trials for that distance and divide by 3.)
6. Calculate the average speed and record it in the table. (See speed formula above.)
7. Repeat steps 1-6 for the 100-cm mark and 150-cm mark.

Pre-Lab Assignment: Answer the following questions in complete sentences

1. What is the purpose of this activity?
2. If you record the time it takes for the car to move 50 centimeters and then record the time it takes to move 150 centimeters, will there be a difference in the speed of the car between the two runs? Explain your prediction.

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Data Table: Speed of Toy Car

Distance Traveled (cm)	Trial 1 Time (s)	Trial 2 Time (s)	Trial 3 Time (s)	Average time (s)
0				
50				
100				
150				
200				

Post-laboratory Questions: Answer the following questions in complete sentences using the data from the lab to support your answers. For all math questions, show your work and include appropriate units and significant figures.

1. **Calculations:** Complete the following calculations:
 - a. Determine the average time for the distance traveled.

 - b. Determine the speed of the car at each distance.

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- c. Prepare a line graph of distance vs. time for the toy car. The time (s) should be placed on the x-axis and the distance should be placed on the y-axis.
 - d. Determine the slope of the line by calculating the rise over the run for two points on the line.
2. What is the independent variable? Explain your answer.
3. What is the dependent variable? Explain your answer.
4. What does the slope of the line represent? What are the units?
5. What is the average speed of your toy car?

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6. Was there a significant difference in the speed of the car while it traveled 50 cm versus 150 cm? Explain why.

7. What happens to the time of travel of the car if the distance that the car moves increases?

8. As the car moves away from the starting point (0 cm) what happens to its speed?

9. What is the reason for doing the experiment with multiple trials? Why not let the car run one time and record the time?

10. What are two variables that affect the speed of the toy car? Explain why.