

Describing movement and average speed

Grade 6 science (Year 7 · Class 6) · Lab

Name: _____ Date: _____ Class: _____

Does a toy car keep the same speed over a longer distance? In this lab you time a car over four distances, calculate its speed each time and plot a distance-time graph to find out. You also judge how reaction time affects the accuracy of the results.

Level: Grade 6 science (Year 7 · Class 6) · **Curriculum:** MS-PS2-2

Aim

To measure the average speed of a toy car over several distances and to show that its distance-time graph is a straight line.

Equipment

- Toy car with free-running wheels
- Wooden board and two books to make a ramp
- Tape measure or metre rule (2 m or more)
- Masking tape for the marks
- Stopwatch (a phone timer is fine)
- Graph paper

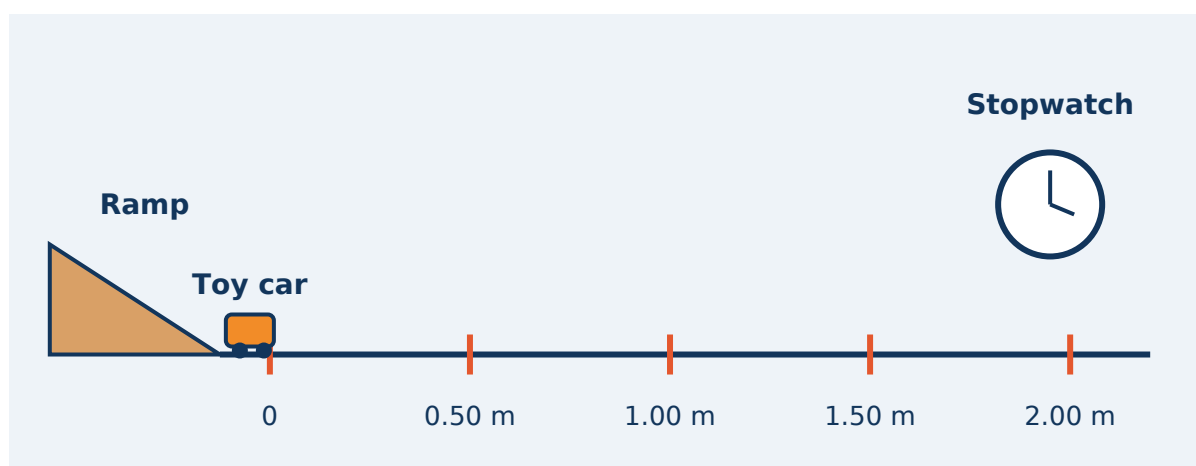
Safety

Safety

Run the car on a clear, dry floor. Keep the track free of bags and cables so nobody trips, and stand to the side of the path of the car.

Method

1. Build a ramp with the board and books, and mark the point where the car leaves the ramp as 0 m.
2. Stick tape marks on the floor at 0.50 m, 1.00 m, 1.50 m and 2.00 m from the start line.
3. Release the car from the same point on the ramp every time.
4. Start the stopwatch when the front of the car crosses 0 m and stop it when it crosses the mark. Repeat three times for each distance.
5. Calculate the mean time for each distance and record it in the table.



Mark the floor with tape and time the car over each distance.

Results

Sample measurements from one group:

Distance d (m)	Time 1 (s)	Time 2 (s)	Time 3 (s)	Mean time t (s)	Speed $v = d \div t$ (m/s)
0.50	1.31	1.28	1.34	1.31	to calculate
1.00	2.58	2.62	2.60	2.60	to calculate
1.50	3.95	3.91	3.99	to calculate	to calculate
2.00	5.20	5.28	5.24	5.24	to calculate

Analysis questions

Question 1 Mean time

Calculate the missing mean time for the distance 1.50 m.

Question 2 Speeds

Calculate the speed for each distance, to three decimal places.

Question 3 Graph

Plot a graph of distance (vertical axis) against mean time (horizontal axis) and describe its shape.

Question 4 Gradient

Use the point (5.24 s, 2.00 m) and the origin to find the gradient. Compare it with the mean of the four speeds.

Question 5 Timing error

The uncertainty in each time is about ± 0.1 s because of reaction time. Calculate the percentage uncertainty for 1.31 s and for 5.24 s, and say which distance gives the better result.

Question 6 Prediction

Use the speed 0.382 m/s to predict the time for the car to travel 3.00 m.

Question 7 Improvements

Suggest two ways to make the measurements more reliable.