



Testing a car's performance

Design an experiment to test how long it takes a vehicle to move down a slope

Subject(s): Mathematics, Design & Technology

Approx. time: 60-120 minutes

Key words / Topics:

- > Length
- > Ramp
- > Pictogram
- > Speed
- > Slope
- > Testing
- > Time

Suggested Learning Outcomes

- > To understand that a product can be evaluated by testing its performance
- > To be able to carry out a simple calculation of speed

Introduction

In this series of activities pupils will learn about nets and wheels and axles. They will combine these technologies to make the base and body for a vehicle made from card, finishing by evaluating the performance of the assembled vehicle.

This activity evaluates the performance of the vehicle previously manufactured by the pupils. It involves recording the time taken by each vehicle to go down a slope. This can be converted into the speed of the vehicle. It could be used at Key Stage 1 or 2 to develop understanding of the use of testing and numeracy skills.

Purpose of this activity

In this activity pupils will test how long it takes vehicles to move down a slope.

Activity

1. Introduction and demonstration (10 mins)

Explain how the testing will be carried out and demonstrate the use of the test ramp (using the slide in the presentation for illustration). If necessary, explain how the stop watches are used.

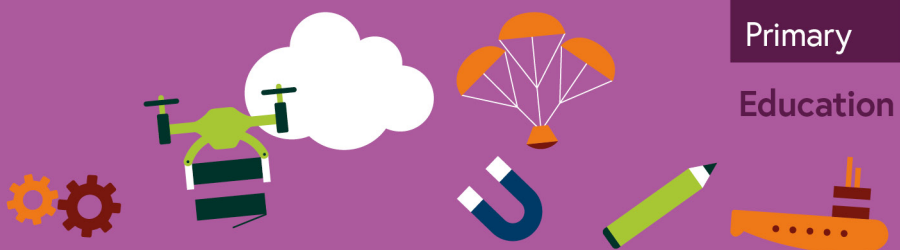
2. Testing (30-60 mins)

Ask pupils to create a table to record their results, using the 'create a table...' slide in the presentation for illustration.

Teacher notes

The ramp to test the vehicles on could be constructed by placing a plank of wood so that it runs from a desk top to the floor, forming a ramp; alternatively, a 'step up' bench used for physical education could be positioned in this way. To prevent vehicles coming off the side of the ramp, it is recommended that rigid strips of card or cardboard are placed along each side. These can be attached to the ramp using staples.

It greatly simplifies the calculation of the speed if the ramp is of an integer length, e.g. 2 m. Masking tape





Pupils take turns to let their vehicles go down the test ramp, recording the times taken to reach the bottom.

If time permits, pupils could be allowed a second run, taking the fastest time from the two runs.

3. Presentation of results (20-50 mins)

Pupils use the stated length of the test ramp to calculate the speed of each vehicle ($\text{speed} = \text{time} / \text{length}$). The units for the speed are m / s (metres per second).

They then create a pictogram for the results from their table or selected results from the class.

could be used across the ramp at the start and at a suitable end distance. Pupils could be advised of the length of the ramp.

To prevent cheating, pupils should not be allowed to push their vehicles from the top of the ramp. A ruler can be placed in front of the vehicle. When the ruler is raised, the vehicle should move forward of its own volition, without additional force, due to the slope of the ramp.

In the event that vehicles fail to complete the length of the ramp, the distance covered could be measured.

The lesson timings could be compressed by pupils carrying out the calculations and graphical representation simultaneous with the testing.

Differentiation

Basic

- > Pupils could record only the time needed for each vehicle to go down the slope.
- > A table format could be provided that the pupils could record their data in.
- > The results could be presented as a simple bar chart.

Extension


- > Pupils could measure the length of the ramp on which the vehicle is to be tested themselves.
- > Pupils could identify the factors which influence the speed of the vehicles – including the freedom of movement of the axle, the stability of the wheel, the slope of the test bed, the weight of the vehicle, the design of the body etc. They could test how these factors influence the time taken and speed.
- > Pupils could use powered vehicles, as described on the 'car base' activity.

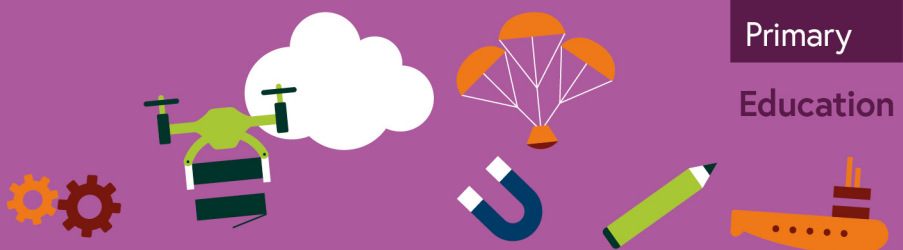
Resources

Vehicles (or at minimum bases) previously manufactured by the pupils
Stop watches
A ramp to test the vehicles
Rigid card or cardboard to make sidewalls for the ramp
A heavy-duty stapler of the type used for displays (to make the sidewalls for the ramp)

Required files



 Testing vehicles





Additional websites

- > Video explaining how speed is calculated – aimed at Key Stage 3/4, but simple language used
<https://www.youtube.com/watch?v=nAKwhZyXnw>
- > A set of lesson resources for year 5 from the Nuffield foundation, including making a buggy and testing its performance
https://www.stem.org.uk/system/files/elibrary-resources/legacy_files_migrated/2828-buggy_col-1840.pdf

