

2.2 Investigation: Pushing and Pulling

Aims

Experiment 1 To find how the weight of the ball affects the push.

Experiment 2 To measure and compare the force of pulling trolleys along different slopes.



Experiment 1 Pushing Balls

Equipment

Different balls about the same size: beach ball, basketball, soccer ball or medicine ball.

Markers or tape for a 5 metre start to finish race.

Digital Scales for weighing.

Method

Make a 5 metre track for your balls with a starting line and a finish line. Make sure there is plenty of room (outside on the verandah or courtyard is a good place).

Gather quite a few large balls of different weight to roll along the floor from the start to the finish line. name the ball by its use or colour in the top row of the table.

You will be testing how hard you need to push the balls at the start to get to the finish line.

Weigh each ball on the scales and record in your table.

Make a prediction which ball will need the greatest push.

Now start with lightest ball and just push softly.

Did it make the finish line. If not try again a little bit harder.

Record whether it needed a soft push, a hard push or a really hard push.

Repeat with the next heavy ball until you have finished.

Make sure all your pushes have been written in the table

Results

Balls used	1.	2.	3.	4.	5.
Weight (grams)					
Push needed circle the correct box	soft	soft	soft	soft	soft
	hard	hard	hard	hard	hard
	really hard	really hard	really hard	really hard	really hard

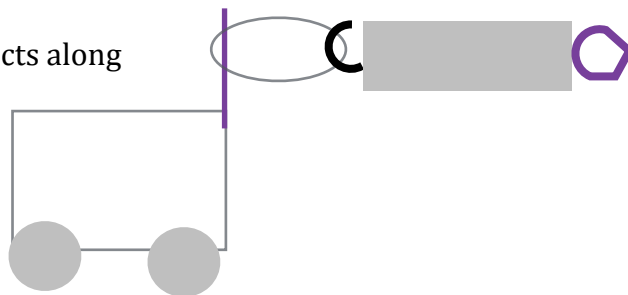
Conclusions

1. Was your prediction correct?
2. What things make a ball move easily?

Experiment 2 – Pulling trolleys

In this experiment we want to compare pulling objects along different slopes.

Slopes measure whether the ground is flat, uphill or downhill.



Equipment

You need a trolley or car on wheels for pulling. You need something pretty heavy. Toy metal truck, shopping trolley or cart on wheels.

You also need a digital force balance or spring balance with a hook.

You will need three slopes in or around your classroom (flat, uphill and downhill). A ramp could be used for up and downhill.

String if needed.

Measuring your Pull

Now using the Digital force or spring balance with a hook, attach the balance to the trolley (You may have to tie some string around the trolley and hook it on).

1. Start with flat ground

Try pulling the trolley so it moves slowly along the flat ground. Read the balance while your pulling go for about 1 metre.

Try to keep the balance the same amount all the way. Write down what the number was (just the whole number)

2. Try now up hill

Once you found an uphill slope start your trolley at the bottom and pull it slowly uphill for about 1 metre. Read the balance number that you had to stay on to keep it moving.

3. Try now down hill.

You should be able to use the same slope but now go downhill. If the trolley moves without pulling it, record zero as the number for pulling otherwise read the value you need to just get it moving.

Record your results

Slope	Level ground	Uphill	Downhill
Pulling Force			

Conclusions

1. Which slope needed the biggest force?
2. If you didn't get what you expected what might have been the reason?
3. Is pulling easier than pushing ?

Note: One reason pushing can be harder is that you push down into the ground which makes more friction (see next investigation)