

Why weight changes from planet to planet

Grade 7 science (Year 8 · Class 7) · Lab

Name: _____ Date: _____ Class: _____

Is weight really proportional to mass? This lab hangs slotted masses from a spring scale, plots weight against mass and uses the gradient of the line to estimate the gravitational field strength at your school.

Level: Grade 7 science (Year 8 · Class 7) · **Curriculum:** MS-PS2-4

Aim

To find how the weight of an object depends on its mass and to use the results to estimate the gravitational field strength g .

Equipment

- A spring scale that reads 0 to 5 N in steps of 0.1 N
- A set of slotted masses and a hanger (steps of 50 g, adding up to 300 g)
- A clamp stand, boss and clamp
- Graph paper

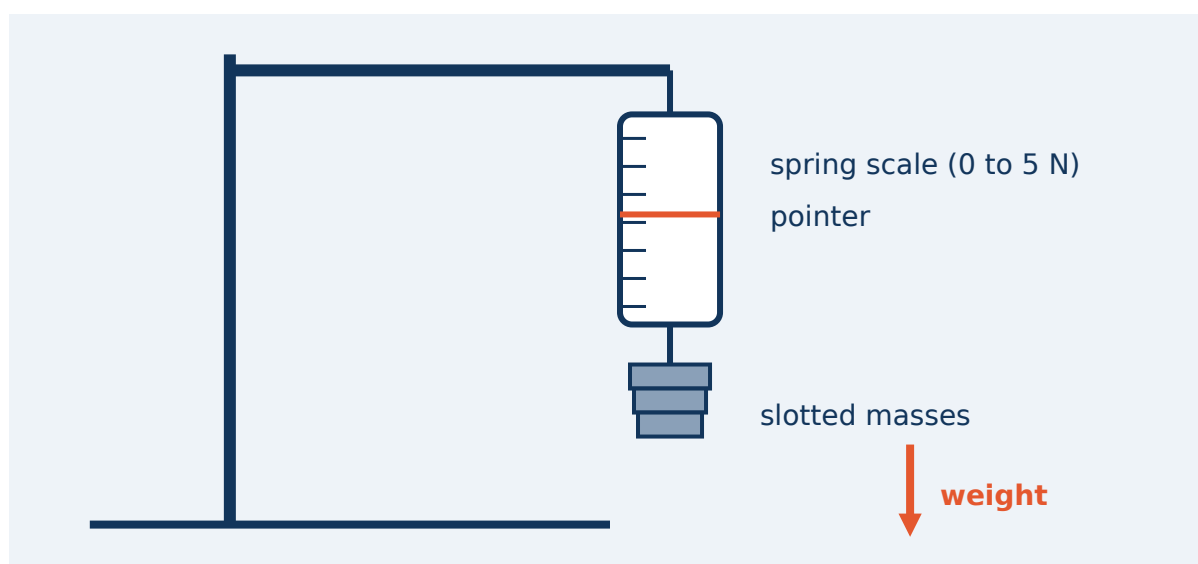
Safety

Safety

Stand the clamp stand on the table with the base towards you so it cannot tip. Keep your feet away from the area below the masses in case they fall.

Method

1. Hang the spring scale from the clamp and check that the pointer is on zero when nothing is attached.
2. Hang the empty hanger. If it has a mass, note it; here the hanger and 50 g slot together make the first 0.050 kg.
3. Add masses one at a time up to 0.300 kg. After each addition wait until the pointer is still and read the weight at eye level.
4. Record the results in the table and repeat the readings once to check them.



The weight of each load is read on the spring scale.

Results

Sample measurements from one group are shown below.

Mass (kg)	Weight read on scale (N)
0.050	0.5
0.100	1.0
0.150	1.5
0.200	1.9
0.250	2.4
0.300	2.9

Analysis questions

Question 1 Quantities in the lab

Name the quantity you change, the quantity you measure, and one condition that stays fixed during the lab.

Question 2 Expected weights

Use $g = 9.8 \text{ N/kg}$ to calculate the expected weight for each mass in the table.

Question 3 Draw the graph

Plot weight (y-axis) against mass (x-axis) and draw a line of best fit through the origin. Describe the shape.

Question 4 Gradient

Use the point (0.300 kg, 2.9 N) to calculate the gradient of the line and explain what it represents.

Question 5 Percentage difference

Compare your gradient of 9.67 N/kg with the accepted value of 9.8 N/kg as a percentage.

Question 6 Prediction

Predict the scale reading for a mass of 0.450 kg on Earth, and say why this is risky with a 5 N scale.

Question 7 On the Moon

Sketch where the line would lie for the same masses on the Moon and calculate the reading for 0.300 kg ($g = 1.6 \text{ N/kg}$).

Question 8 Zero error

The scale reads 0.1 N when nothing is hanging. Explain how this would change the graph and how to correct it.