

1 Forces, energy and pressure – Part 2

Name: _____ Class: _____ Date: _____

Vocabulary

Write each word three times.

English	Write it 3 times (English)		
forces	_____	_____	_____
energy	_____	_____	_____
pressure	_____	_____	_____
mass	_____	_____	_____
weight	_____	_____	_____
density	_____	_____	_____
displacement method	_____	_____	_____
resultant force	_____	_____	_____
work done	_____	_____	_____
joules	_____	_____	_____
kinetic energy	_____	_____	_____
pascals	_____	_____	_____

Recall

From Part 1 you can measure and describe motion. Here we look at **forces** , **energy** and **pressure** — the rest of the mechanics you start IGCSE with.

- A **force** is a push or a pull.

- Energy is never made or destroyed — it only moves between stores.

Nothing here is hard — it just adds the key equations.

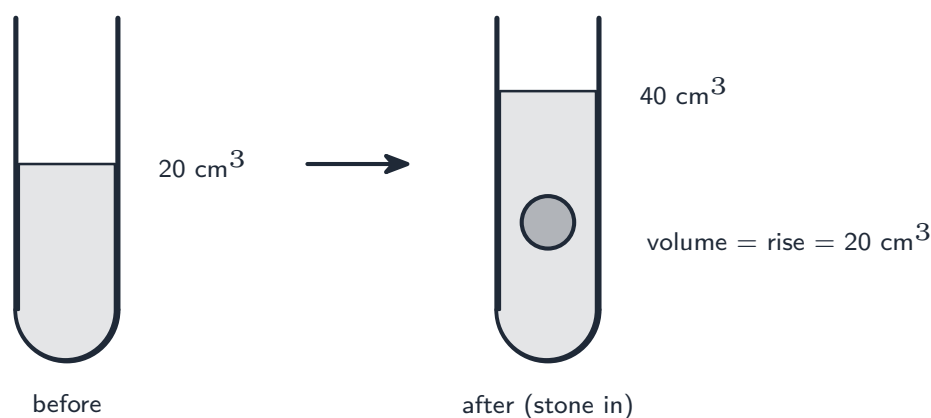
New ideas

Read these first, then do the Practice.

■ 1 Mass, weight and density

- **mass** is the amount of matter (in kg); it does not change.
- **weight** is the force of gravity on a mass (in N); $W = mg$ (with $g \approx 10 \text{ N/kg}$).
- **density** is mass per volume: $\rho = \frac{m}{V}$.

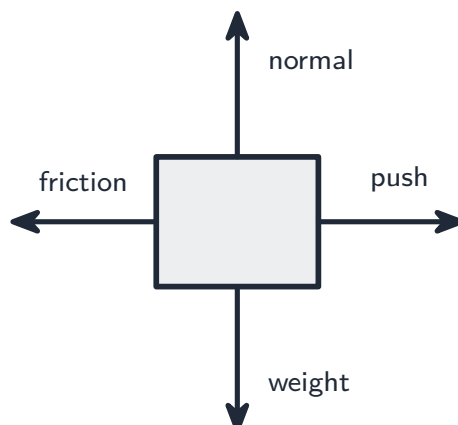
For an odd shape, find the volume by the **displacement method** — the rise in water level.



■ 2 Forces and $F = ma$

Add the forces on a line to get the **resultant force** :

- resultant force **zero** → at rest or constant speed.
- resultant force **not zero** → it accelerates: $F = ma$.



Worked example. A 1200 kg car has 3000 N driving force and 600 N friction: resultant = 2400 N, so $a = F/m = 2400/1200 = 2.0 \text{ m/s}^2$.

■ 3 Energy, work and pressure

- **work done** = energy transferred: $W = Fd$ (in **joules** , J).
- **kinetic energy** : $E_k = \frac{1}{2}mv^2$.
- **pressure** = force per area: $p = \frac{F}{A}$ (in **pascals** , Pa). A small area gives a large pressure.

Watch out: mass (kg) never changes, but weight (N) depends on g . In $F = ma$ use the **resultant** force — subtract friction first. And because $p = F/A$, a **smaller** area gives a **larger** pressure.

Practice

Try these in order. Take $g = 10 \text{ N/kg}$.

1.1 State the difference between *mass* and *weight*.

[2]

1.2 Calculate the weight of a 5.0 kg bag. [2]

1.3 A block has mass 54 g and volume 20 cm³. Calculate its density. [2]

1.4 A resultant force of 20 N acts on a 4.0 kg trolley. Calculate its acceleration. [2]

1.5 Write the equation for pressure, and its unit. [2]

1.6 Why does a sharp knife cut better than a blunt one? [1]

1.7 Challenge. A 6.0 kg block rests on a face of area 0.02 m². Calculate the pressure it exerts on the floor. (Take $g = 10$ N/kg.) [3]