1 Forces, energy and pressure – Part 2

Name: _____ Class: _____ Date: _____

Vocabulary 词汇

Write each word three times. 把每个单词抄写三遍。

English	**中文**	**Write it 3 times** (English)		
forces	力			
energy	能量			
pressure	压强			
mass	质量			
weight	重力			
density	密度			
displacement method	排水法			
resultant force	合力			
work done	做功			
joules	焦耳			
kinetic energy	动能			
pascals	帕斯卡			

Recall

From Part 1 you can measure and describe motion. Here we look at **forces** 力, **energy** 能量 and **pressure** 压强 – 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.

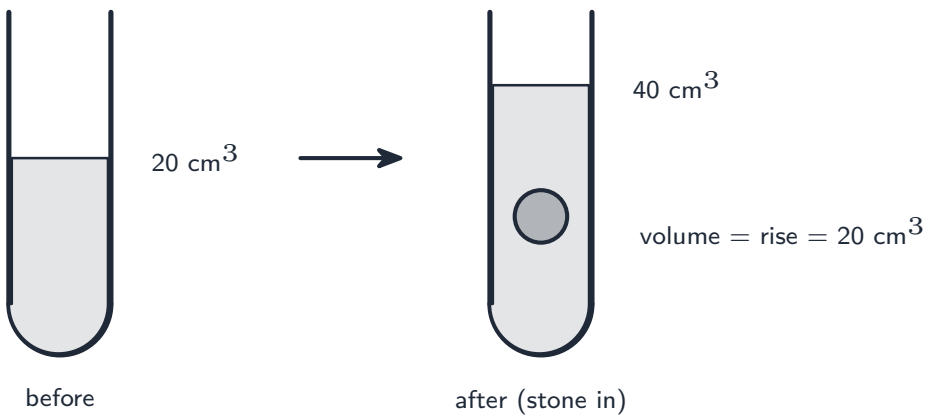
New ideas

Read these first, then do the Practice.

■ 1 Mass, weight and density

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

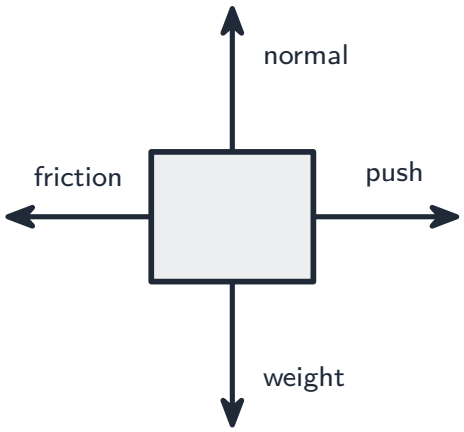
For an odd shape, find the volume by the **displacement method** 排水法 – the rise in water level.



■ 2 Forces and F = ma

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

- 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 $a = F/m = 2400/1200 = 2.0$ m/s^2.

3 Energy, work and pressure

- **work done** 做功 = energy transferred: $W = Fd$ (in **joules** 焦耳, J).
- **kinetic energy** 动能: $E_k = \frac{1}{2}mv^2$.
- **pressure** 压强 = force per area: $p = \dfrac{F}{A}$ (in **pascals** 帕斯卡, 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 $g = 10$ 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 cm^3. 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 m^2. Calculate the pressure it exerts on the floor. (Take $g = 10$ N/kg.) [3]