

0	1
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Pressure is the force acting on each unit area of a surface.

0	1	.	1
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Some students are investigating how the force and area of a student's shoe changes the pressure exerted on the ground.

Which of the following changes would increase the pressure exerted on the ground?

Tick **two** boxes.

[2 marks]

☐

allow the student to sit on a chair while pressure through their feet is being measured

☐

give the student some weights to carry

☐

swap the student's shoes for ones with a larger area of sole touching the ground

☐

swap the student's shoes for ones with a smaller area of sole touching the ground

0	1	.	2
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The student's weight is measured to be 490 N and the area of their feet in contact with the ground is measured to be 0.04 m².

Calculate the pressure that the student exerts on the ground.

Use the equation:

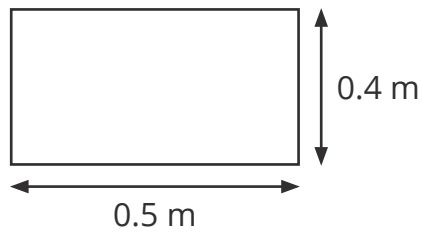
[2 marks]

$$\text{pressure} = \frac{\text{force}}{\text{area}}$$

pressure = _____ Pa

01.3

A different student stands on a rectangular prism. The base of the prism is shown in **Figure 1**.

Figure 1

Calculate the area of the base of the rectangular prism in **Figure 1**.

Use the equation:

[2 marks]

$$\text{area} = \text{width} \times \text{height}$$

area = _____ m²

01.4

When the student stands on the rectangular prism, the pressure exerted on the ground is 2750 Pa.

Calculate the weight of the student.

Use the equation:

[2 marks]

$$\text{weight} = \text{pressure} \times \text{area}$$

weight = _____ N

0 2

Density can be used to determine whether an object will float or sink in a fluid.

0 2 . 1

Which of the following substances is **not** a fluid?

Tick **one** box.

[1 mark]

☐

air

☐

fizzy drink

☐

liquid water

☐

vegetable oil

☐

wood

0 2 . 2

Some students are investigating the buoyancy of different objects when placed in water. They know the density of water and the density of the different objects.

Complete the sentence to describe how the students could predict whether the objects will float or not.

[1 mark]

Use the words from the box.

float

larger

less

sink

If the density of the object is _____ than the density of water, it will _____.

0 2 . 3

Table 1 shows the volume, mass and density of each object being used in the investigation.

Table 1

Object	Volume (cm ³)	Mass (g)	Density (g/cm ³)
1	25	100	4
2	10	250	
3	30		0.3

Calculate the density of object 2.

[2 marks]

Use the equation:

$$\text{density} = \frac{\text{mass}}{\text{volume}}$$

density = _____ g/cm³

0 2 . 4

Calculate the mass of object 3.

[2 marks]

Use the equation:

$$\text{mass} = \text{density} \times \text{volume}$$

mass = _____ g

0 2 . 5

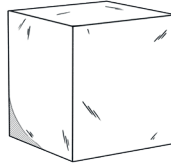
Water has a density of 1 g/cm³.

[1 mark]

Name the object(s) in **Table 1** which will float on water.

0 2 . 6

The students have a fourth object that they need to determine the density of. The object is a cube, as shown in **Figure 2**.

Figure 2

The students have a ruler and mass balance available to them.

Describe how the students could use this equipment to determine the density of the object in **Figure 2**. [4 marks]

03.1 Which of the following forces can be used to explain buoyancy?

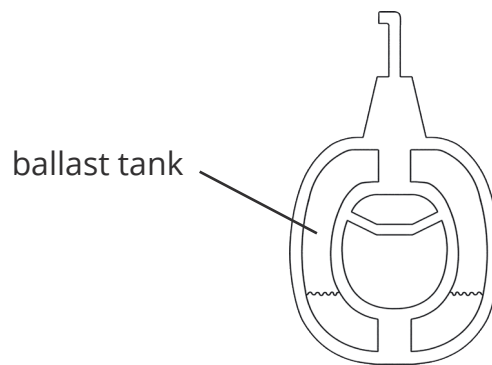
Tick **two** boxes.

[2 marks]

- ☐ friction
- ☐ tension
- ☐ upthrust
- ☐ weight

03.2 Submarines are designed so they can sink and float in the water easily. They do this by filling and emptying ballast tanks with water, as shown in **Figure 3**. When the ballast tank fills with water, they start to sink. When the water is pushed out of the ballast tank, it is replaced with air and starts to float again.

Figure 3



Describe what happens to the weight of the submarine when the ballast tanks fill with water. [1 mark]

03.3 Explain why the upthrust acting on the submarine remains constant. [1 mark]

03.4

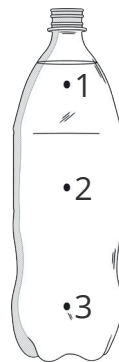
Explain why filling the ballast tank with water causes it to sink.

Your answer should refer to the forces connected to buoyancy that you identified in **03.1**. [1 mark]

03.5

To explain why the liquid pressure acting on the submarine changes as it descends, a teacher carries out a demonstration. They fill a bottle with water. The bottle has three holes in the side and the teacher allows water to flow out of the three holes, as shown in **Figure 4**.

Figure 4



Explain why the water stream coming from the bottom hole travels further than the other streams.

Your answer should include:

- how liquid pressure changes with depth
- how the weight of the water influences liquid pressure

[3 marks]
