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

It can be calculated using the equation:

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

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

Give **two** changes that the students could make that would increase the pressure exerted on the ground. [2 marks]

1. _____

2. _____

0 1 . 2 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 m^2.

Calculate the pressure that the student exerts on the ground. [2 marks]

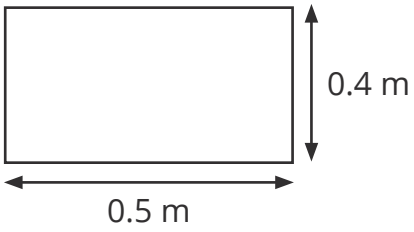
_____

_____

pressure = _____ Pa

0 1 . 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**. [2 marks]

_____

_____

area = _____ m^2

0 1 . 4 When the student stands on the rectangular prism, the pressure exerted on the ground is 2750 Pa.
Calculate the weight of the student.

[2 marks]

_____

_____

weight = _____ N

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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. Describe how the students could predict whether the objects will float or not.

[2 marks]

0 2 . 3 **Table 1** shows the volume, mass and density of each object being used in the investigation.

Table 1

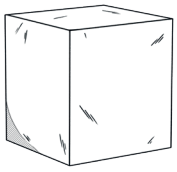
Object	Volume (cm^3)	Mass (g)	Density (g/cm^3)
1	25	100	4
2	10	250	
3	30		0.3

Complete the table.
Show any working out in the space below. [4 marks]

0 2 . 4 Water has a density of 1 g/cm^3.
Name the object(s) in **Table 1** which will float on water. [1 mark]

0 2 . 5 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]

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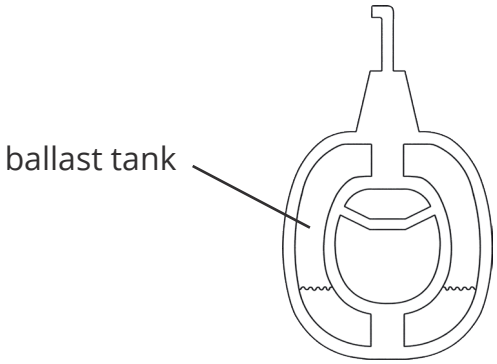
0 3 . 1 Which of the following forces can be used to explain buoyancy?

Tick **one** box. [2 marks]

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

0 3 . 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



Explain why filling and emptying the ballast tank with water causes it to sink and float.
Your answer should refer to the forces connected to buoyancy that you identified in **03.1**. [3 marks]

0 3 . 3 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, as shown in **Figure 4**. The teacher then allows water to flow out of the three holes by removing some sticky tape which was covering the holes.

Figure 4

The streams of water will travel different distances from each hole.
From which hole will the water stream travel the furthest distance from the bottle?

Tick **one** box. [1 mark]

- ☐ 1
- ☐ 2
- ☐ 3

0 3 . 4 Explain why the streams of water in **03.3** look different.
Your answer should include:

- how liquid pressure changes with depth
- how the weight of the water influences liquid pressure [3 marks]

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