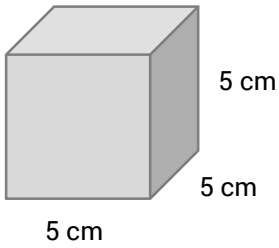
0 1

A factory produces steel components for use by a number of different companies. The density of the steel used by the factory is 8000 kg/m^3.

0 1 . 1

A particular steel cube produced by the factory has a side length of 5 cm.



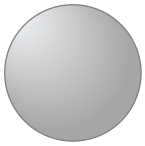
Calculate the **mass** of one of these cubes. Write your answer in kilograms.

V = 0.05 × 0.05 × 0.05 = 0.000125 m^3 (or 1.25 × 10^{-4} m^3)

m = ρ × V = 8000 × 1.25 × 10^{-4} = **1 kg**

0 1 . 2

The factory also produces a 10 g steel ball bearing.



Calculate the radius of this ball bearing.
Include the unit with your answer.

Remember that the equation for the volume of a sphere is $V = \frac{4}{3}\pi r^3$.

m = 0.01 kg
V = m ÷ ρ = 0.01 ÷ 8000 = 1.25 × 10^{-6} m^3

1.25 × 10^{-6} = $\frac{4}{3}$ × π × r^3
r^3 = 2.98 × 10^{-7}

r = **6.68 × 10^{-3} m**

(or 0.69 cm or 6.9 mm)

0 2

A student uses below setup to measure the density of water.

The steps which they take in their investigation are as follows:

- Use measuring cylinder to measure out 200 cm^3 of water
- Pour water into beaker
- Turn on and zero electronic balance
- Place beaker containing water onto balance
- Measure mass

0 2 . 1

Identify the mistake in the method used by the student.

They measured the mass of the water and the beaker, and not just the water on its own [1].

0 2 . 2

What is the name given to this type of error?

Systematic error.

0 2 . 3

The actual density of water is 1 g/cm^3. Using the incorrect method above, will the student calculate a value for the density of water which is less than or greater than this value? Explain your answer.

Greater [1]. The value which the student used for the mass of the water was higher than its actual value (as it would have included the mass of the beaker too) [1]. Therefore, as $\rho = m \div V$, the density value they calculated would have been higher than the true value [1].