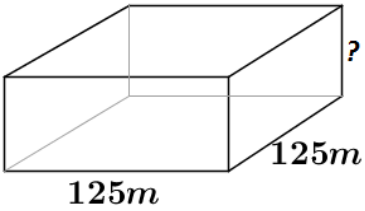
Density Problems

1. a)
A standard UK brick has dimensions $65mm \times 102.5mm \times 215mm$. Find the volume of a single brick, in cm^3.

b)
Brick material has a density of $2\ g/cm^3$.
A brick barbecue is built from 100 bricks, as shown. How much does it weigh, in kilograms?

2. a)
The metal of the Eiffel Tower weighs 7300 tonnes.
It is wrought iron, with a density of $7850\ kg/m^3$.
Work out the total volume of the iron used, to the nearest m^3.

b)
If the tower were melted down to form a cuboid with the same base dimensions as the original tower ($125m$ by $125m$), what would its height be?



3. a)
Gold has a current value of £30 per gram.
One cubic centimetre of gold costs £579.
Work out the density of gold in g/cm^3.

b)
In total the world contains 165,000 tonnes of mined gold.
A shipping container measures $6m \times 2.5m \times 2.5m$, and a small cargo ship holds 300 containers.
Is this enough space to hold all the gold in the world?

Density Problems SOLUTIONS

1. a)

A standard UK brick has dimensions $65mm \times 102.5mm \times 215mm$. Find the volume of a single brick, in cm^3.

$$6.5 \times 10.25 \times 21.5 = \mathbf{1432.4375cm^3}$$

b)

Brick material has a density of 2 g/cm^3.

A brick barbecue is built from 100 bricks, as shown. How much does it weigh, in kilograms?

One brick: $1432.4375 \times 2 = 2864.875g = 2.864875kg$

100 bricks: $100 \times 2.864875 = \mathbf{286.4875kg}$

2. a)

The metal of the Eiffel Tower weighs 7300 tonnes.

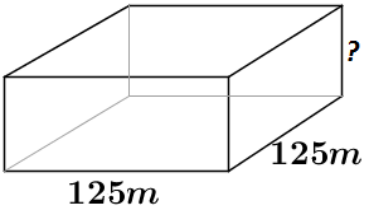
It is wrought iron, with a density of 7850 kg/m^3.

Work out the total volume of the iron used, to the nearest m^3.

$$Density = \frac{Mass}{Volume} = \frac{7300000}{7850} \approx \mathbf{930\ m^3}$$

b)

If the tower were melted down to form a cuboid with the same base dimensions as the original tower ($125m$ by $125m$), what would its height be?



$$930 \div (125 \times 125) = 0.05952m \approx \mathbf{6cm}$$

3. a)

Gold has a current value of £30 per gram.

One cubic centimetre of gold costs £579.

Work out the density of gold in g/cm^3.

$$\frac{579}{30} = \mathbf{19.3\ g/cm^3}$$

b)

In total the world contains 165,000 tonnes of mined gold.

A shipping container measures $6m \times 2.5m \times 2.5m$, and a small cargo ship holds 300 containers.

Is this enough space to hold all the gold in the world?

$$165{,}000\ tonnes = 165{,}000{,}000{,}000\ g$$

$$V = \frac{M}{D} = \frac{165{,}000{,}000{,}000}{19.3} \approx 8{,}549{,}000{,}000\ cm^3$$

$$8549000000cm^3 = \mathbf{8549\ m^3}$$

Container ship holds: $300 \times 6 \times 2.5 \times 2.5 = \mathbf{11250m^3}$

Yes, there is enough space, *but* it would weigh 30 times as much as the ship itself, so attempting this would be an expensive (£5 trillion) mistake.