Warm-up activity



Here is a formula: $d = \frac{m}{v}$

a) Work out the value of *d* when m = 18 and v = 3

$$d=\frac{18}{3}=\frac{6}{3}$$

b) Rearrange the formula to make m the subject.



c) Work out the value of *m* when d = 5 and v = 10

 $M = dV = 5 \times 10 = 50$

d) Rearrange the formula to make v the subject.



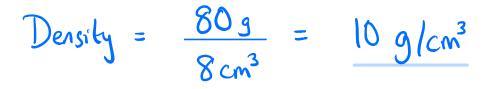
e) Work out the value of v when m = 28 and d = 4

$$v = \frac{M}{d} = \frac{28}{4} = \frac{7}{4}$$



Alpha Exercise

A block with a volume of **8 cm³** weighs **80 g**. What is the density of this a) block in g/cm³?



A 1 cm x 2 cm x 10 cm cuboid weighs 80 grams. What is the density of b) the cuboid?

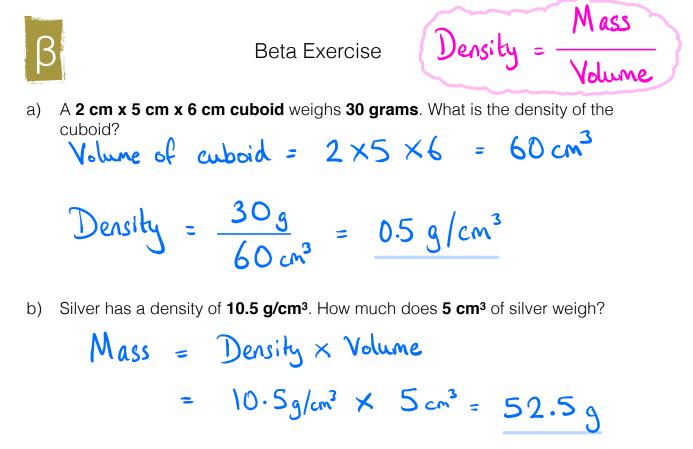
Volume of cuboid = 1×2×10 = 20 cm³ Density = $\frac{80g}{20cm^3}$ = $4g/cm^3$

A gym ball with a volume of **800 cm³** has a mass of 1600 g. What is the C) density of the ball?

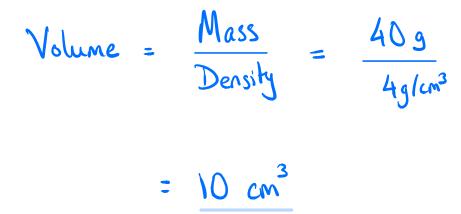
Density =

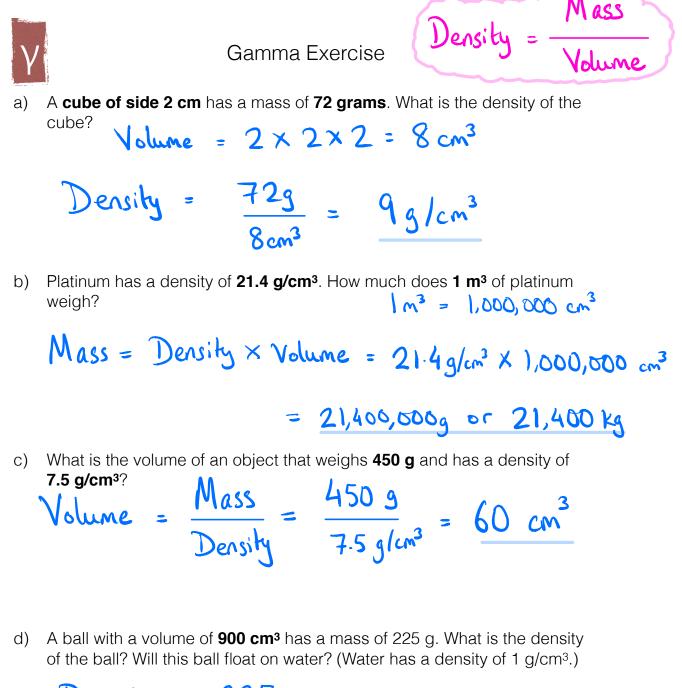
 $\frac{1600g}{800cm^3} = \frac{2g/cm^3}{cm^3}$

Density



c) What is the volume of an object that weighs 40 g and has a density of 4 g/cm³.





Density = $\frac{225g}{900 \text{ cm}^3} = \frac{0.25g/\text{cm}^3}{900 \text{ cm}^3}$ This is less dense than water, so will float.

Explain the mistake



Denise answers this question as follows:

Iridium has a density of 22.56 g/cm³. How much does 1 m³ of gold weigh? Give your answer in kg.

Each cm³ of iridium weighs 22.56 g. So 100 cm³ weighs 22.56 x 100 = 2256 g. Therefore 1 m³ of iridium weighs 2256 g or 2.256 kg. $m^3 \neq 100 \text{ cm}^3$.

Denise has made a mistake. What is it?

 $lm^3 = 1,000,000 \text{ cm}^3$, so lm^3 of iridium weight 22.56 × 1,000,000 = 22,560,000 g or 22,560 kg

Exam-style question

Wu has made a bronze sculpture. The sculpture weighs 384.5 kg. The density of the bronze used is 7.8 g/cm^3 . What is the volume of the sculpture, correct to the nearest cm³?

Volume = $\frac{Mass}{Density}$ = $\frac{384,500 \text{ g}}{7.8 \text{ g/cm}^3}$ = $\frac{49,295 \text{ cm}^3}{\text{to rearest cm}^3}$

Challenge

 \triangle A scientist has a measuring jug with a capacity of 800 cm³ weighs 90 g when empty.

The scientist adds 200 cm³ of liquid A and 600 cm³ of liquid B to the jug, so the jug is now full and has a mass of 850 g.

 \bigcirc The mass of 200 cm³ of liquid A is equal to the mass of 350 cm³ of liquid B.

What is the density of liquid A?

Let
$$M_A$$
 and M_B be the masses (in g) of liquids
A and B respectively. Similarly, let d_A and d_B
be the densities (in g/cm³).
(A) $\&$ (B) \Rightarrow $M_A + M_B = 850 - 90 = 760$
 $200d_A + 600d_B = 760$
 $200d_A + 600d_B = 760$
Divide through by 40
 $\Rightarrow 5d_A + 15d_B = 19$
 \bigcirc
(C) \Rightarrow Also $d_B = \frac{200}{350}d_A = \frac{4}{7}d_B$
Substituting (2) into (0): $5d_A + \frac{60}{7}d_A = 19$
 $\Rightarrow \frac{95}{7}d_A = 19 \Rightarrow d_A = \frac{7}{95} \times 19$
 $= 1.4 g/cm^3$