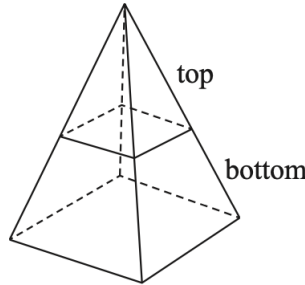


**Dr Oliver Mathematics**  
**Worked Examples**  
**Mass, Density, and Volume 4**

**From:** Edexcel GCSE Mathematics 2022 November Paper 3H (Calculator)

1. The pyramid **P** is formed from two parts made of different materials.

(5)



- The top part of **P** has a mass of 92.8 g and is made from material with a density of  $2.9 \text{ g/cm}^3$ .
- The bottom part of **P** has a mass of 972.8 g.
- The average density of **P** is  $4.7 \text{ g/cm}^3$ .

Calculate the volume of the top part of **P** as a percentage of the total volume of **P**.  
Give your answer correct to 1 decimal place.  
You must show all your working.

**Solution**

Well,

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

and

$$\begin{aligned} \text{density}_{\text{top}} &= \frac{\text{mass}_{\text{top}}}{\text{volume}_{\text{top}}} \Rightarrow \text{volume}_{\text{top}} = \frac{\text{mass}_{\text{top}}}{\text{density}_{\text{top}}} \\ &\Rightarrow \text{volume}_{\text{top}} = \frac{92.8}{2.9} \\ &\Rightarrow \text{volume}_{\text{top}} = 32 \text{ cm}^3. \end{aligned}$$

Now,

$$\begin{aligned} & \frac{\text{mass}_{\text{top}} + \text{mass}_{\text{bottom}}}{\text{volume}_{\text{top}} + \text{volume}_{\text{bottom}}} = \text{average density} \\ \Rightarrow & \frac{92.8 + 972.8}{32 + \text{volume}_{\text{bottom}}} = 4.7 \\ \Rightarrow & \frac{1065.6}{32 + \text{volume}_{\text{bottom}}} = 4.7 \\ \Rightarrow & \frac{1065.6}{4.7} = 32 + \text{volume}_{\text{bottom}} \\ \Rightarrow & 226\frac{34}{47} = 32 + \text{volume}_{\text{bottom}} \\ \Rightarrow & \text{volume}_{\text{bottom}} = 194\frac{34}{47} \text{ cm}^3. \end{aligned}$$

Finally,

$$\begin{aligned} \text{percentage} &= \left( \frac{32}{32 + 194\frac{34}{47}} \right) \times 100\% \\ &= 14.11\dot{4} \text{ (exact!)} \\ &= \underline{\underline{14.1\%}} \text{ (1 dp)}. \end{aligned}$$