Dimensional Analysis
Example Density Problem

The density of lead is 11.34 g/mL. What Is the density of lead in pounds per cubic foot? Could you easily lift a 1.25 cubic foot block of lead? (Hint: calculate the weight of 1.25 cubic feet of Pb.)

Have:

$$d = 11.34\ {}^{g}\!/_{mL} = 11.34\ {}^{g}\!/_{cm^3}$$

$$V = 1.25\ ft^3$$

Need: density in lb/ft^3

Conversions:

1 lb = 453.6 g
1 in = 2.54 cm
12 in = 1 ft

Calculate:

$$d = 11.34\,\frac{\cancel{g}}{cm^3} \times \frac{1\ lb}{453.6\ \cancel{g}} = 0.02500\,\frac{lb}{cm^3}$$

$$d = 0.02500\,\frac{lb}{cm^3} \times \left(\frac{2.54\ cm}{1\ in}\right)^3 \times \left(\frac{12\ in}{1\ ft}\right)^3 = 707.9\,\frac{lb}{ft^3}$$

Alternatively:

$$d = 11.34\,\frac{\cancel{g}}{cm^3} \times \frac{1\ lb}{453.6\ \cancel{g}} \times \left(\frac{2.54\ cm}{1\ in}\right)^3 \times \left(\frac{12\ in}{1\ ft}\right)^3 = 707.9\,\frac{lb}{ft^3}$$

Now for the second part... can you lift $1.25\ ft^3$ of lead?
Set it up dimensionally to cancel units:

$$m_{Pb} = 707.9\,\frac{lb}{ft^3} \times 1.25\ ft^3 = 884.9\ lb = 885\ lb\ \text{(with correct SF)}$$