

Problem week 1 (vectors)

Problem # 1. What is the height in centimetres of a woman who is 5 feet and 6 inches tall?

Step1: unite the units

1 foot = 12 inches

The woman is $5 \times 12 + 6 = 66$ inches

Step2: convert the unite

1 inch = 2.54 cm

The woman is $66 \times 2.54 = 167.64$ cm

Problem # 2. A cube has 5 in. on a side. What is the volume of the cube in SI units and in USCS units?

Step1: converting to SI

A) convert from inches to cm

5 inches = $2.5 \times 5 = 12.7$ cm

$v = 12.7 \times 12.7 \times 12.7 = 2048$ cm³

B) convert to meter³

$2048 \times 10^{-6} = 0.002048$ m³

Step2: converting to USCS

The volume of the cube in inches is = $5 \times 5 \times 5 = 125$ in³

Convert to feet (1 foot = 12 inches)

$$\frac{125}{12 \times 12 \times 12} = 0.072 \text{ ft}^3$$

Problem # 3. A Nissan engine has a piston displacement (volume) of 1600 cm³ and a bore diameter 84 mm. Express these measurements in cubic inches and inches.

Step1: unite the units

1 cm = 10 mm

The dimeters $84 \times 10^{-1} = 8.4$ cm

Step2: converting

1 inch = 2.54 cm

1 inch³ = $(2.54 \times 2.54 \times 2.54)$ cm

Dimeter = $\frac{8.4}{2.54} = 3.307$ in

Piston volume = $\frac{1000}{2.54 \times 2.54 \times 2.54} = 97.68$ in³

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Problem # 4. One US gallon is a volume equivalent to 231 in^3 . How many gallon are needed to fill the tank that is 18 in. long, 16 in. wide and 12 in. high?

$$V \text{ of the tank} = 16 \times 18 \times 12 = 3456 \text{ in}^3$$

$$\text{Number of gallons is} = \frac{3456 \text{ in}^3}{231 \text{ in}^3} = 15 \text{ gal}$$

Problem # 5. According to the label on a bottle of salad dressing, the volume of the contents is 0.473 liters (L). If 1 L = 1000 cm^3 and 1 inch = 2.54 cm , express the volume in cubic inches.

Step1: convert to cm

$$0.473 \text{ (L)} \times 1000 = 473 \text{ cm}^3$$

Step2: convert to inches

$$\frac{473 \text{ cm}^3}{2.54^3} = 28.864 \text{ in}^3$$

Problem # 6. The density of gold is of $19.3 \text{ g} / \text{cm}^3$. What is the value in kilograms per cubic meter?

Step1: convert to kilogram

$$\frac{19.3}{1000} = 0.0193 \text{ kilogram}$$

Step2: convert to cubic meter

$$\frac{0.0193}{10^{-6}} = 19300 \text{ kg/m}^3$$

Problem # 7. A person on a diet might lose 2.3 kg per week. Express the mass loss rate in milligram per second.

Step1: convert to milligram

$$2.3 \times 1000 \times 1000 = 2,300,000 \text{ mg}$$

Step2: convert to seconds

$$7_{\text{days}} \times 24_{\text{hours}} \times 60_{\text{minutes}} \times 60_{\text{seconds}} = 604,800 \text{ s}$$

$$\frac{2,300,000}{604,800} = 3.8 \text{ mg/s}$$