

Dimensional Analysis

1. How many seconds are there in 5 minutes?

$$5 \cancel{\text{min}} \times \frac{60 \text{ (sec)}}{1 \cancel{\text{min}}} = \boxed{300 \text{ sec}}$$

2. How many grams are in 3 kilograms?

$$3 \cancel{\text{kg}} \times \frac{1000 \text{ (g)}}{1 \cancel{\text{kg}}} = \boxed{3000 \text{ g}}$$

3. How many metres are there in 12 kilometres?

$$12 \cancel{\text{km}} \times \frac{1000 \text{ (m)}}{1 \cancel{\text{km}}} = \boxed{12000 \text{ m}}$$

4. How many milligrams are there in 22 kilograms?

$$22 \cancel{\text{kg}} \times \frac{1000 \cancel{\text{g}}}{1 \cancel{\text{kg}}} \times \frac{1000 \text{ (mg)}}{1 \cancel{\text{g}}} = \boxed{22000000 \text{ mg}}$$

5. How many centimetres are there in 6 kilometres?

$$6 \cancel{\text{km}} \times \frac{1000 \cancel{\text{m}}}{1 \cancel{\text{km}}} \times \frac{100 \text{ (cm)}}{1 \cancel{\text{m}}} = \boxed{600000 \text{ cm}}$$

6. How many millilitres are there in 4 litres?

$$4 \cancel{\text{L}} \times \frac{1000 \text{ (mL)}}{1 \cancel{\text{L}}} = \boxed{4000 \text{ mL}}$$

7. How many minutes are there in a year?

$$1 \cancel{\text{year}} \times \frac{365.25 \cancel{\text{days}}}{1 \cancel{\text{year}}} \times \frac{24 \cancel{\text{hours}}}{1 \cancel{\text{day}}} \times \frac{60 \text{ (min)}}{1 \cancel{\text{hour}}} = \boxed{525960 \text{ min}}$$

8. There are 0.45 kg in one pound. If a student has a mass of 120 lb, what is his mass in milligrams?

$$120 \cancel{\text{lb}} \times \frac{0.45 \cancel{\text{kg}}}{1 \cancel{\text{lb}}} \times \frac{1000 \cancel{\text{g}}}{1 \cancel{\text{kg}}} \times \frac{1000 \text{ (mg)}}{1 \cancel{\text{g}}} = \boxed{54000000 \text{ mg}}$$

9. There are 12 inches in a foot and there are 3.28 feet in one metre. Alex is 6ft, 2 inches tall. What is his height in metres?

$$6.1666 \text{ ft} \times \frac{1 \text{ (m)}}{3.28 \text{ ft}} = \boxed{1.88 \text{ m}}$$

10. Has one mole (6.02×10^{23}) of seconds gone by since the Bing Bang occurred 13.8 bya?

$$13.8 \cancel{\text{bya}} \times \frac{10^9 \cancel{\text{year}}}{1 \cancel{\text{bya}}} \times \frac{365.25 \cancel{\text{day}}}{1 \cancel{\text{year}}} \times \frac{24 \cancel{\text{h}}}{1 \cancel{\text{day}}} \times \frac{60 \cancel{\text{min}}}{1 \cancel{\text{h}}} \times \frac{60 \text{ (sec)}}{1 \cancel{\text{min}}}$$

$$= 4.355 \times 10^{17} \text{ sec} \Rightarrow \text{no, } 1 \text{ mole} = 6.02 \times 10^{23}$$

$$4.355 \times 10^{17} < 6.02 \times 10^{23}$$