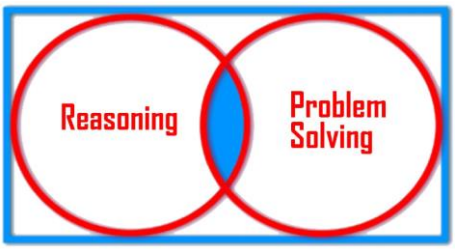
GCSE Higher (9 – 4)



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Mathematical Reasoning Questions

(Compound Measures)

Solutions

The marks shown are for guidance purposes only
The question are repeated here for your convenience

1	Convert 12 m^2 to cm^2 **John's Answer** 1 m is equal to 100 cm Therefore, $12\ m^2 = 12 \times 100 = 1200\ cm^2$ Explain why John's answer is wrong and give the correct answer **Solution** John is wrong because, meters and centimeters are units of length and not area. Correct Answer: $12\ m^2 \times 100 \times 100 = 120000 cm^2$ **[2marks]**
2	The density of hygrogen is 0.00009 g/cm^3 What is the volume of 1.8 kg of hygrogen. Choose one answer a) $2 \times 10^{-5} cm^3$ b) $2 \times 10^{-8}\ cm^3$ c) $2 \times 10^{7}\ cm^3$ d) $2 \times 10^{8}\ cm^3$ **Solution** Convert 1.8 kg into grams since the density is given in g/cm^3 That is, 1.8 kg = 1800 g {1 kg = 1000 g} Density = Mass ÷ Volume Therefore, Volume = Mass ÷ Density For ease of calculation, convert both numbers to standard form $1800 = 1.8 \times 10^3$ $0.00009 = 9 \times 10^{-5}$ Therefore, Volume $= 1.8 \times 10^3 \div 9 \times 10^{-5} = 1.8 \div 9 \times 10^{3--5}$ $= 0.2 \times 10^8 = 2 \times 10^7$ Correct Answer: C **[2marks]**
3	Answer **True** or **False** a) The pressure exeated on an area of 2 m^2 will be equal to the pressure on an area of 200cm^2 if the applied is force is the same. {The pressure will not be equal since 2 m^2 is greater than 200cm^2} Therefore, **False [1mark]** b) The pressure exeated by an object is directly proportional to the area the object is placed on. {Pressure = Force ÷ Area} Therefore, **False [1mark]** c) The density of an object is inversely proportional to its volume. {Density = Mass ÷ Volume} Therefore, **True [1mark]**

4	Masood is riding his motor bike at 120 meters per minute Convert his speed to kilometers per hour **Solution** 120 meters = 120 ÷ 1000 = 0.12 km {1000m = 1 kilometer} 1 minute = 1 ÷ 60 = $\frac{1}{60}$ hours Speed = Distance ÷ Time Therefore, Speed = $0.12 \div \frac{1}{60} = 7.2$kph **[3marks]**
5	The density of a type of cement is 1440 kg/m^3 What is the density of this type of cement in g/cm^3? Choose one answer a) 1.44×10^3 b) 1.44 c) 1.44×10^6 d) 14.4 **Solution** 1440 kg = 1440000 g = 1.44×10^6 g {1 kg = 1000 g} 1 m^3 = 1×10^6 cm^3 Therefore, 1440 kg/m^3 = $\frac{1.44 \times 10^6}{1 \times 10^6}$ = 1.44 g/cm^3 Correct Answer: B **[3marks]**
6	A car travels at 80 km/h How far will the car travel in 27 seconds? Choose one answer a) 6000 m b) 600 m c) 60 m d) 6 m **Solution** Convert 80 km/h to meters per second 80 km/h = $\frac{80 \times 1000}{60 \times 60} = \frac{80000}{3600} = \frac{200}{9}$ m/s Distance = Speed × Time {Speed = Distance ÷ Time} $= \frac{200}{9} \times 27 = 600$ m **[3marks]**

7

Stan is driving at an average speed of 5 m/s
Which calculation below gives the time it takes Stan to travel 8 km?
Choose all the correct answers

a) $80 \div 3$ minutes
b) $8000 \div 5$ minutes
c) $8000 \div 5 \times 60$ minutes
d) $1600 \div 60$ minutes

Solution

$8\text{ km} = 8000\text{ m}$

$\text{Time} = \frac{\text{Distance}}{\text{Speed}}$ {Speed = Distance ÷ Time}

$= \frac{8000}{5} = 1600\text{ seconds}$ {Now divide by 60 to change this to minutes}

$= 1600 \div 60$ minutes

Also, $1600 \div 60 = \frac{80}{3}$

Correct Answers: A and D **[2marks]**

8

A car travels 245 km at a constant speed in 3.5 hours.

How far does it travel in 80 minutes?

Amy's Answer

Speed = Distance ÷ Time

Therefore, $\text{Speed} = 245 \div 3.5 = 70\text{ km/h}$

$\text{Distance} = \text{Speed} \times \text{Time}$

$= 70 \times 80 = 5600\text{ km}$

Amy is wrong. Identify the error she made and correct it.

Solution

70 km/h and 80 minutes are in different units.

Therefore, she had to convert 80 minutes to hours

That is $80\text{ minutes} = \frac{80}{60} = \frac{4}{3}$ hours

Therefore, $\text{Distance} = 70 \times \frac{4}{3}$

$= \frac{280}{3} = 93\frac{1}{3}$ kilometers **[2marks]**

9	Here is some information about miles and kilometers $5 \text{ miles} \approx 8 \text{ kilometers}$ Bernard is travelling at 52 mph on a road which has a speed limit of 85 km/h. Is Bernard travelling above the speed limit? **Solution** If $5 \text{ miles} = 8 \text{ kilometers}$ Then, $52 \text{ miles} = \frac{52 \times 8}{5} = 83.2 \text{ kilometers}$ Therefore, 52 mph is approximately 83.2 kph No, Bernard is not travelling above the speed limit **[2marks]**
10	Nathan contructs an office desk. The desk can withstand pressure up to 25.6 N/m^2 A desktop computer has a base area of 1.53m^2 and weighs 45N. Will Nathan's desk be able to hold the computer? **Solution** $\text{Pressure} = \text{Force} \div \text{Area}$ $\text{Pressure} = 45 \div 1.53 = 29.4 \text{ N/m}^2$ Since 29.4 N/m^2 is greater than 25.6 N/m^2, it means that, the table with not be able to hold the computer. **[2marks]**