Marking guide | Measurement

Measurement topic test 3

10 questions | 49 marks | 65 minutes

Reverse problems and material orders. Use a scientific calculator, show working and include units. Sketches are not to scale.

Equivalent correct methods earn the corresponding marks.

1. A contractor works with large area and liquid quantities. [4 marks]

(a) Convert 0.025 km^2 to m^2. [2 marks]

$0.025 \times 1000^2 = 25\,000$.

Answer: 25,000 m^2.

(b) Convert 1.2 ML to m^3. [2 marks]

1 ML is one million litres; divide 1,200,000 L by 1000 L/m^3.

Answer: 1200 m^3.

2. A scale gives repeated readings of 2.04 kg for a verified 2.00 kg reference. [5 marks]

(a) Describe repeatability and accuracy. [2 marks]

Readings agree with one another but exceed the reference by 0.04 kg.

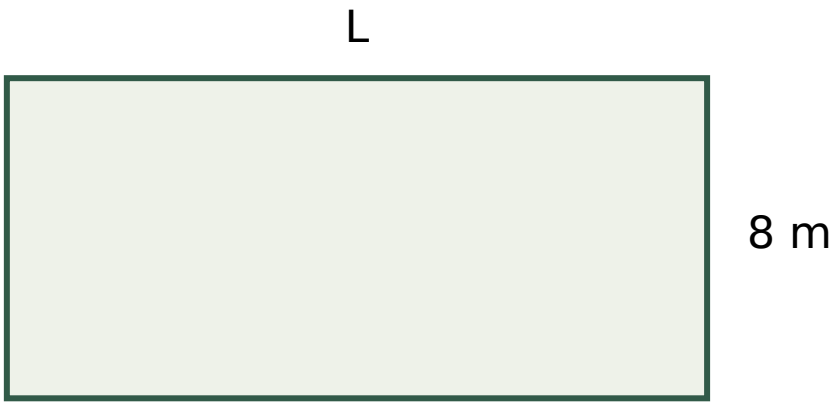
Answer: Repeatable but inaccurate.

(b) Find percentage error and explain why more repeated readings alone will not remove the offset. [3 marks]

$0.04/2.00 \times 100 = 2\%$. Repeating the same biased measurement does not recalibrate the scale.

Answer: 2%; the offset is systematic.

3. A rectangular enclosure has perimeter 42 m and width 8 m. [4 marks]



Sketch not to scale

(a) Find its length. [2 marks]

$2(L + 8) = 42$, so $L + 8 = 21$ and $L = 13$.

Answer: 13 m.

(b) Find its area. [2 marks]

$13 \times 8 = 104$.

Answer: 104 m^2.

4. A cylindrical container has internal radius 0.7 m and capacity 490π L. [5 marks]

(a) Express the volume in cubic metres. [2 marks]

Divide litres by 1000: $490\pi/1000 = 0.49\pi$.

Answer: 0.49π m^3.

(b) Find the internal height. [3 marks]

$0.49\pi = \pi(0.7)^2 h = 0.49\pi h$, so $h = 1$.

Answer: 1 m.

5. A model tank has capacity 64 L and external surface area 2.4 m^2. A geometrically similar tank doubles every linear dimension. [4 marks]

(a) Find the new capacity. [2 marks]

Volume factor $= 2^3 = 8$; $64 \times 8 = 512$.

Answer: 512 L.

(b) Find the new external surface area. [2 marks]

Area factor $= 2^2 = 4$; $2.4 \times 4 = 9.6$.

Answer: 9.6 m^2.

6. On a scale plan, a region has area 12 cm^2. Its actual area is 192 m^2. [5 marks]

(a) Find the area scale factor using centimetres on both sides. [2 marks]

$192\ m^2 = 1,920,000\ cm^2$; $1,920,000/12 = 160,000$.

Answer: 160,000.

(b) Find the linear plan scale. [3 marks]

The linear factor is $\sqrt{160\,000} = 400$.

Answer: 1:400.

7. A paved design contains a 14 m by 3 m rectangular strip and a non-overlapping triangle of base 14 m and perpendicular height 6 m. [5 marks]

(a) Find the combined area. [3 marks]

Rectangle $= 42\ m^2$; triangle $= \frac{1}{2}(14)(6) = 42\ m^2$; total 84.

Answer: 84 m^2.

(b) A sealant covers 7 m^2/L. Find the amount for one coat and the number of 5 L tins. [2 marks]

$84/7 = 12$ L; $12/5 = 2.4$, so buy 3 tins.

Answer: 12 L; 3 tins.

8. An aluminium plate is 20 cm by 15 cm by 0.4 cm. Density is 2.7 g/cm^3. The supplier allows 3% extra mass for cutting, at AUD 12/kg. [6 marks]

(a) Find the plate mass before the allowance. [3 marks]

$V = 20 \times 15 \times 0.4 = 120$ cm^3; mass $= 120 \times 2.7 = 324$ g.

Answer: 324 g.

(b) Find the quoted material cost to the nearest cent. [3 marks]

Allowance mass $= 324 \times 1.03 = 333.72$ g $= 0.33372$ kg. Cost $= 0.33372 \times 12 = 4.00464$, rounded to AUD 4.00.

Answer: AUD 4.00.

9. A staircase has 14 risers of height 0.18 m and 13 horizontal goings of 0.27 m. Its width is 1.2 m. [5 marks]

(a) Find the total vertical rise. [2 marks]

$14 \times 0.18 = 2.52$.

Answer: 2.52 m.

(b) Find horizontal run and the rectangular floor footprint. [3 marks]

Run $= 13 \times 0.27 = 3.51$ m; footprint $= 3.51 \times 1.2 = 4.212$ m^2.

Answer: 3.51 m; 4.212 m^2.

10. A 4.2 m by 3.6 m floor uses tiles measuring 300 mm by 600 mm. Add 10% to the basic tile count for cuts. Tiles come in packs of eight at AUD 34.50 per pack. [6 marks]

(a) Find the basic tile count. [3 marks]

Floor area $= 15.12$ m^2; tile area $= 0.3 \times 0.6 = 0.18$ m^2; $15.12/0.18 = 84$.

Answer: 84 tiles.

(b) Find the pack order and cost. [3 marks]

With allowance $= 84 \times 1.10 = 92.4$ tiles; packs $= 92.4/8 = 11.55$, rounded up to 12. Cost $= 12 \times 34.50 = 414$.

Answer: 12 packs; AUD 414.