Ratio, rates and similarity - practice paper 2

16 questions | 37 marks | 50 minutes

Practise proportional rules, unit conversions, map scales, similar figures and enlargements, with reasoning questions.

Equivalent correct methods earn the corresponding marks.

1. Write $7:4$ as an equivalent ratio whose second entry is 20. [1 mark]

Multiply both entries by 5.

Answer: $35:20$

2. A cost is directly proportional to mass. 2.5 kg costs 9 dollars. Find the price per kg. [1 mark]

$\frac{9}{2.5}=3.6$.

Answer: 3.60 dollars per kg

3. Use $C=3.6m$ to find the cost of 4 kg. [1 mark]

$3.6\times 4=14.4$.

Answer: 14.40 dollars

4. Convert 12 m/s to km/h. [2 marks]

$12\times 3.6=43.2$.

Answer: 43.2 km/h

5. A floor plan is drawn at $1:50$. Find the drawing length of a 6 m wall. [2 marks]

6 m $=600$ cm.

$\frac{600}{50}=12$ cm.

Answer: 12 cm

6. A drink contains juice and water in the ratio $2:5$. How much juice is in 1.4 L of drink? [3 marks]

There are $2+5=7$ parts.

$\frac{1.4}{7}=0.2$ L per part.

Juice $=2\times 0.2=0.4$ L.

Answer: 0.4 L

7. A train travels 180 km at a constant 90 km/h. Find the journey time. [2 marks]

$t = \frac{180}{90} = 2$ h.

Answer: 2 h

8. If $\triangle LMN \sim \triangle XYZ$, identify the side corresponding to LN. [1 mark]

L matches X; N matches Z.

Answer: XZ

9. Similar rectangles have corresponding lengths 12 cm and 18 cm. The larger width is 10.5 cm. Find the smaller width. [3 marks]

$k = \frac{18}{12} = 1.5$.

Smaller width $= \frac{10.5}{1.5} = 7$ cm.

Answer: 7 cm

10. Two points are 6.4 cm apart on a $1:125\,000$ map. Find their actual separation. [3 marks]

$6.4 \times 125\,000 = 800\,000$ cm $= 8$ km.

Answer: 8 km

11. Reduce $(10, -6)$ by factor 0.5 about the origin. [2 marks]

Multiply both coordinates by 0.5.

Answer: $(5, -3)$

12. An enlargement about $C(1, 2)$ with factor 3 takes $P(3, 5)$ to which point? [3 marks]

Displacement from C is $(2, 3)$.

Triple it to $(6, 9)$, then add C: $(7, 11)$.

Answer: $(7, 11)$

13. A pump transfers 24 L in 80 seconds. Find its rate in L/min. [3 marks]

$\frac{24}{80} = 0.3$ L/s.

$0.3 \times 60 = 18$ L/min.

Answer: 18 L/min

14. A triangle has side lengths 6, 8, 10. Another has lengths 9, 12, 16. Are the triangles similar? Explain. [3 marks]

$\frac{9}{6} = \frac{12}{8} = 1.5$, but $\frac{16}{10} = 1.6$.

No common length factor exists.

Answer: No.

15. A map is printed at $1:80\,000$ then reduced to half its original linear size. State the new scale. [3 marks]

An original 1 cm becomes 0.5 cm but represents 80,000 cm.

So $0.5:80\,000 = 1:160\,000$.

Answer: $1:160\,000$

16. A paint model uses 7.2 L for 54 square metres. [4 marks]

(a) Find the amount used per square metre. [1 mark]

$\frac{7.2}{54} = \frac{2}{15}$ L per square metre.

Answer: $\frac{2}{15}$ L per square metre

(b) Predict the amount needed for 75 square metres. [2 marks]

$75 \times \frac{2}{15} = 10$ L.

Use the same rate for the same surface and number of coats.

Answer: 10 L

(c) State one condition that could make this prediction unreliable. [1 mark]

The model assumes the same paint coverage per square metre.

Answer: For example, a different surface or a different number of coats.