Ratio, rates and similarity - practice paper 1

16 questions | 35 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. Simplify the ratio $18:30$. [1 mark]

Divide both entries by 6.

Answer: $3:5$

2. Five exercise books cost 17.50 dollars at a fixed unit price. Find the cost of one. [1 mark]

$17.50/5 = 3.50$.

Answer: 3.50 dollars

3. $y = 4x$. Find y when $x = 6$. [1 mark]

$y = 4 \times 6 = 24$.

Answer: 24

4. Convert 36 km/h to m/s. [2 marks]

$36/3.6 = 10$.

Answer: 10 m/s

5. A map has scale $1:25\,000$. What real distance does 1 cm represent, in metres? [2 marks]

$25\,000$ cm $= 250$ m.

Answer: 250 m

6. A recipe for four serves uses 300 g of rice. Find the rice needed for ten serves. [2 marks]

Factor $= 10/4 = 2.5$.

$300 \times 2.5 = 750$ g.

Answer: 750 g

7. A runner travels 9 km in 45 minutes. Find the average speed in km/h. [2 marks]

45 min $= 0.75$ h.

$9/0.75 = 12$ km/h.

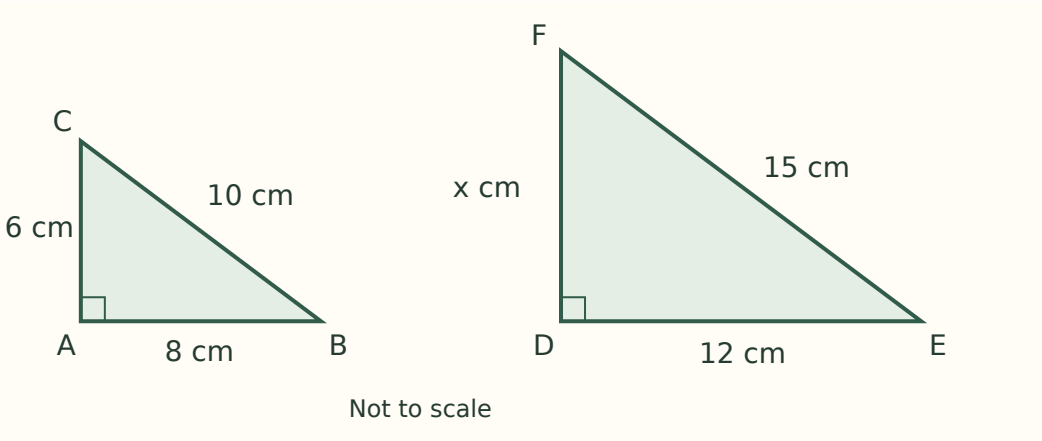
Answer: 12 km/h

8. In $\triangle ABC \sim \triangle DEF$, which side corresponds to BC? [1 mark]

B matches E and C matches F.

Answer: EF

9. Use the supplied similar triangles to find x. [3 marks]



$k = 12/8 = 1.5$.

$x = 6 \times 1.5 = 9$ cm.

Answer: 9 cm

10. A 16 cm model represents an 8 m object. Find the scale. [2 marks]

$8\,\text{m} = 800\,\text{cm}$.

$16 : 800 = 1 : 50$.

Answer: $1 : 50$

11. Enlarge $(-3, 4)$ by factor 2 about the origin. [2 marks]

Multiply both coordinates by 2.

Answer: $(-6, 8)$

12. Similar triangles have perimeters 28 cm and 42 cm. Find the larger side corresponding to a 9 cm smaller side. [3 marks]

$k = 42/28 = 1.5$.

$9 \times 1.5 = 13.5\,\text{cm}$.

Answer: 13.5 cm

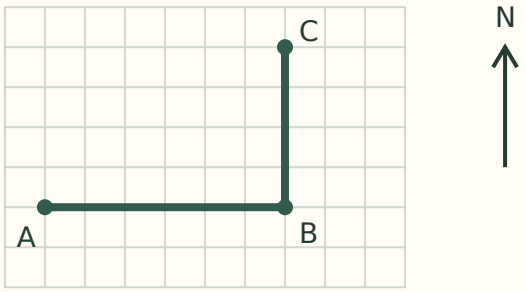
13. Compare 600 g for 4.20 dollars with 1 kg for 6.50 dollars. Which has the lower price per kg? [3 marks]

$4.20/0.6 = 7.00$ dollars/kg.

The other costs 6.50 dollars/kg.

Answer: The 1 kg pack.

14. On the supplied map, find the actual route length A-B-C. [3 marks]



Each square is 1 cm on the map.
Scale 1 : 50 000

$6 + 4 = 10$ cm on the map.

Scale gives 0.5 km/cm, so $10 \times 0.5 = 5$ km.

Answer: 5 km

15. A taxi costs 5 dollars plus 2 dollars per km. A student says the fare is directly proportional to distance. Explain the error. [3 marks]

The rule is $C = 5 + 2d$.

There is a 5 dollars fare even at zero distance; the quotient C/d is not constant.

Answer: The fixed charge prevents direct proportion.

16. At the same time, a vertical 1.6 m marker has a 2 m shadow and a building has a 17.5 m shadow on level ground. [4 marks]

(a) Estimate the building height. [3 marks]

The shadow scale factor is $17.5/2 = 8.75$.

Height $= 1.6 \times 8.75 = 14$ m.

Answer: 14 m

(b) State one geometric assumption used. [1 mark]

These conditions give similar right triangles.

Answer: For example, the building is vertical and the sunlight directions are parallel.