Ratios and rates - topic test

15 questions | 40 marks | 45 minutes

A progressive paper covering ratio, unit rates, proportional graphs, journeys and practical models.

Equivalent correct methods earn the corresponding marks.

1. Simplify $24 : 36$. [1 mark]

Divide both terms by 12.

Answer: $2 : 3$.

2. Complete $3 : 8 = 15 : \square$. [1 mark]

Multiply both terms by 5.

Answer: 40.

3. Six kilograms cost AUD 21. Find the price per kilogram. [2 marks]

$21 \div 6 = 3.50$.

Answer: AUD 3.50/kg.

4. Convert 18 km/h to m/s. [2 marks]

$18 \div 3.6 = 5$.

Answer: 5 m/s.

5. Share AUD 84 in the ratio $2 : 5$. [3 marks]

There are 7 parts.

Each part is $84 \div 7 = 12$.

The shares are 2×12 and 5×12.

Answer: AUD 24 and AUD 60.

6. Seven identical notebooks cost AUD 28. Find the cost of eleven. [2 marks]

One costs $28 \div 7 = 4$.

Eleven cost $11 \times 4 = 44$.

Answer: AUD 44.

7. A train travels 126 km in 1.5 h. Find its average speed. [2 marks]

$126 \div 1.5 = 84$.

Answer: 84 km/h.

8. Which is cheaper per kilogram: 350 g for AUD 2.80 or 900 g for AUD 6.75? Show both unit prices. [3 marks]

$2.80 \div 0.35 = 8$.

$6.75 \div 0.9 = 7.50$.

Answer: The 900 g offer: AUD 7.50/kg versus AUD 8/kg.

9. Use the table to answer the parts. [4 marks]

Two related quantities

x	y
1	6
3	18
5	30

(a) Show that y is directly proportional to x and write a rule. [2 marks]

Each ratio y/x equals 6.

Answer: $y = 6x$.

(b) Find y when x is 8. [2 marks]

$y = 6 \times 8 = 48$.

Answer: 48.

10. A bus travels at 72 km/h for 40 minutes. Find the distance. [2 marks]

40 minutes is 2/3 hour.

$72 \times 2/3 = 48$.

Answer: 48 km.

11. A drink has water:concentrate $= 4:3$. Find each amount in 2.1 L of drink. [3 marks]

One part is $2.1 \div 7 = 0.3$ L.

Water is $4 \times 0.3 = 1.2$ L; concentrate is $3 \times 0.3 = 0.9$ L.

Answer: 1.2 L water and 0.9 L concentrate.

12. A tap runs steadily at 4.5 L/min. [3 marks]

(a) How long will it take to supply 63 L? [2 marks]

$63 \div 4.5 = 14$.

Answer: 14 minutes.

(b) Express its rate in mL/s. [1 mark]

$4500 \div 60 = 75$.

Answer: 75 mL/s.

13. A taxi fare is AUD 5 plus AUD 2 per kilometre. [3 marks]

(a) Explain why fare is not directly proportional to distance. [1 mark]

At zero distance the model gives AUD 5, not zero.

Answer: There is a fixed AUD 5 charge.

(b) Find the fare for 12 km. [2 marks]

$5 + 2 \times 12 = 29$.

Answer: AUD 29.

14. Six workers pack 120 boxes in 2 h. Predict the number packed by 8 workers in 5 h at the same rate per worker. State one assumption. [4 marks]

Each worker packs $120 \div (6 \times 2) = 10$ boxes/h.

The prediction is $10 \times 8 \times 5 = 400$.

Assume sufficient supplies and the same steady rate per worker.

Answer: 400 boxes, assuming equal steady productivity.

15. A cyclist rides 20 km at 12 km/h, then another 20 km at 20 km/h, without stopping. [5 marks]

(a) Find the total time. [2 marks]

The stage times are $20/12 = 5/3$ h and $20/20 = 1$ h.

Total time is $8/3$ h, or 2 h 40 min.

Answer: 2 h 40 min.

(b) Find the average speed for the whole trip. [2 marks]

Total distance is 40 km.

$40 \div (8/3) = 15$.

Answer: 15 km/h.

(c) Why is the average speed not $(12 + 20)/2$? [1 mark]

The ordinary mean applies to equal times, not equal distances.

Answer: The cyclist spends different lengths of time at the two speeds.