Worked answers | Ratios and rates

Modelling practical rate problems and checking assumptions

6 questions | 17 marks

Equivalent correct methods earn the corresponding marks.

1. A printer produces 18 pages/min. Predict its output in 7 min and state one assumption. [2 marks]

$18 \times 7 = 126$.

The prediction excludes warm-up, paper changes and jams.

Answer: 126 pages, assuming it prints at a steady rate without stops.

2. Five volunteers pack 120 boxes in 2 h. At the same rate per volunteer, how many boxes can 8 volunteers pack in 3 h? [3 marks]

Rate per volunteer per hour: $120 \div (5 \times 2) = 12$.

Prediction: $12 \times 8 \times 3 = 288$.

Answer: 288 boxes.

3. One litre of paint covers 8 square metres. A wall is 38 square metres. Paint is sold in whole 1 L tins. How many tins are needed? [3 marks]

The model requires $38 \div 8 = 4.75$ L.

Four tins cover only 32 square metres, so buy 5.

Answer: 5 tins.

4. A walker averages 4.8 km/h while moving. Predict the time for 3 km. State why the whole journey might take longer. [3 marks]

$t = 3 \div 4.8 = 0.625$ h.

$0.625 \times 60 = 37.5$ min.

Answer: 37.5 minutes; rests or crossings may add time.

5. A service costs AUD 30 plus AUD 50 per hour. Is the total cost directly proportional to hours? Find the cost of 3 h. [3 marks]

The fixed AUD 30 means zero hours does not give zero cost.

$C = 30 + 50t$; $C(3) = 30 + 150 = 180$.

Answer: No; the cost is AUD 180.

6. A tap supplies 4 L after 1 min, 8 L after 2 min and 11 L after 3 min. Does one exact constant-rate model fit all the data? Explain. [3 marks]

The first two records suggest 4 L/min.

That model predicts 12 L at 3 min, but 11 L was measured.

The flow may have changed, or measurement error may be present.

Answer: No.