

Ratio, Algebraic Equations & Speed-Distance-Time

Topic: Ratio & Proportion, Linear Equations, Averages & Speed Calculations | Time Allowed: 45 Minutes | Total Marks: 35

Candidate Name: _____ Date: _____ Score: _____

1. CORE MATHEMATICAL CONCEPTS & RULES

- Ratio: Sharing in a ratio $a:b$: sum the parts ($a + b$), divide total by parts to find 1 part, then multiply each term.
- Algebra: Balance method: whatever operation you apply to one side of an equation, apply identically to the other (e.g. $3x + 7 = 28 \rightarrow 3x = 21 \rightarrow x = 7$).
- Speed, Distance, Time: $\text{Speed} = \text{Distance} \div \text{Time}$ | $\text{Distance} = \text{Speed} \times \text{Time}$ | $\text{Time} = \text{Distance} \div \text{Speed}$.
- Mean Average = $(\text{Sum of all values}) \div (\text{Total count of values})$.

2. STEP-BY-STEP EXAMINER WORKED EXAMPLE: 11+ RATIO REDISTRIBUTION & ALGEBRAIC WORD PROBLEMS

Problem: The ratio of red counters to blue counters in a bag is 3:5. When 12 red counters are added, the ratio becomes 1:1. How many blue counters were in the bag originally?

Method & Steps:

1. Let 1 part = x . Original red = $3x$, original blue = $5x$.
2. New red count = $3x + 12$. Since new ratio is 1:1, red equals blue: $3x + 12 = 5x$.
3. Subtract $3x$ from both sides: $12 = 2x$.
4. Divide by 2: $x = 6$.
5. Original blue counters = $5x = 5 \times 6 = 30$.

Final Solution: 30 blue counters

3. 11+ EXAM TECHNIQUE & SPEED CALCULATION STRATEGIES

1. Always show full written working: examiners award partial method marks even if arithmetic slips occur.
2. Estimate your answer before calculating to check if your final magnitude makes realistic sense.
3. Watch units carefully (e.g. converting cm to m, millilitres to litres, hours to minutes).
4. In timed exam conditions, spend ~1 minute per mark and flag difficult problems for the end.
5. Specialist 1-to-1 Maths & Science tuition available: www.themathsandsciencetutor.co.uk

Section A: Practice Exercises & Exam Questions

Show all calculations clearly. Write your final answer in the box. Total: 20 Marks

[FLUENCY]

Question 1: Linear Equations

[2 marks]

Solve for y : $4y - 15 = 2y + 9$.

Answer / Working:

[FLUENCY]

Question 2: Ratio Division

[2 marks]

Divide GBP 450 in the ratio 2 : 3 : 4 among Alice, Ben, and Chloe. How much does Ben receive?

Answer / Working:

[FLUENCY]

Question 3: Speed Calculation

[3 marks]

A motorist drives 165 miles in 2 hours and 45 minutes. Calculate the average speed in miles per hour (mph).

Answer / Working:

[REASONING]

Question 4: Mean Score Elevation

[3 marks]

A student scores 74, 82, 85, and 79 on four maths tests. What mark must she achieve on her fifth test to raise her overall mean average to 82?

Answer / Working:

[WORD PROB]

Question 5: Tickets & Algebra

[3 marks]

Adult tickets cost GBP x and child tickets cost GBP $(x - 4)$. A family purchases 2 adult tickets and 3 child tickets for a total cost of GBP 48. Find the cost of one adult ticket.

Answer / Working:

[REASONING]

Question 6: Scale Map Distance

[3 marks]

On a map with scale 1 : 25,000, two towns are 14 cm apart. What is the real-world distance between the two towns in kilometres?

Answer / Working:

Section B: 11+ Grammar & Independent School Challenges

Advanced multi-step reasoning problems from top UK selective entrance exams.

CHALLENGE 1: THE CLOCK HANDS ANGLE CHALLENGE [3 MARKS]

At exactly 3:40, the minute hand points to 8 (240° from 12).

Calculate the exact acute angle in degrees between the hour hand and the minute hand at 3:40.

Final Answer:

CHALLENGE 2: TWO TRAINS APPROACHING PROBLEM [3 MARKS]

Station A and Station B are 270 miles apart. Train 1 leaves Station A heading towards B at 50 mph. At the exact same moment, Train 2 leaves Station B towards A at 40 mph.

How many hours after departure will the two trains pass each other, and how far from Station A will they meet?

Final Answer:

ROUGH WORKING / TRIAL & IMPROVEMENT SPACE

Section C: Examiner Mark Scheme & Method Solutions

Step-by-step methods, mark allocations, and alternative approaches.

Question 1 [Fluency]

Answer: $y = 12$

Method: $4y - 2y = 9 + 15 \rightarrow 2y = 24 \rightarrow y = 12$.

Question 2 [Fluency]

Answer: Ben receives GBP 150

Method: Total parts = $2 + 3 + 4 = 9$ parts. 1 part = $\text{GBP } 450 \div 9 = \text{GBP } 50$. Ben = 3 parts = $3 \times \text{GBP } 50 = \text{GBP } 150$.

Question 3 [Fluency]

Answer: 60 mph

Method: Time = 2 hours 45 mins = 2.75 hours (or $11\frac{1}{4}$ hours). Speed = $165 \div 2.75 = 60$ mph.

Question 4 [Reasoning]

Answer: 90 marks

Method: Target total for 5 tests = $5 \times 82 = 410$. Current total = $74 + 82 + 85 + 79 = 320$. Required 5th test = $410 - 320 = 90$.

Question 5 [Word Prob]

Answer: Adult ticket = GBP 12

Method: $2x + 3(x - 4) = 48 \rightarrow 2x + 3x - 12 = 48 \rightarrow 5x = 60 \rightarrow x = \text{GBP } 12$. (Child = GBP 8).

Question 6 [Reasoning]

Answer: 3.5 km

Method: $14 \text{ cm} \times 25,000 = 350,000 \text{ cm}$. $350,000 \text{ cm} = 3,500 \text{ m} = 3.5 \text{ km}$.

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