

# Angles, Area & Volume, Percentages & Line Graphs

Topic: Angle Rules (Straight Lines/Triangles), Area of Rectangles/Triangles & Percentages | Time Allowed: 45 Minutes | Total Mark: \_\_\_\_\_

Candidate Name: \_\_\_\_\_ Date: \_\_\_\_\_ Score: \_\_\_\_\_

## 1. CORE MATHEMATICAL CONCEPTS & RULES

- Angle Rules: Angles on a straight line sum to  $180^\circ$ . Angles around a point sum to  $360^\circ$ . Interior angles of a triangle sum to  $180^\circ$ .
- Area of a Rectangle = Length x Width. Area of a Right-Angled Triangle =  $(\text{Base} \times \text{Height}) \div 2$ .
- Volume of a Cuboid = Length x Width x Height (measured in cubic units:  $\text{cm}^3$  or  $\text{m}^3$ ).
- Percentages: 'Per cent' means out of 100.  $50\% = 1/2$ ,  $25\% = 1/4$ ,  $10\% = 1/10$ ,  $1\% = 1/100$ .

## 2. STEP-BY-STEP EXAMINER WORKED EXAMPLE: FINDING MISSING ANGLES IN COMPOSITE TRIANGLE

**Problem:** In triangle ABC, angle A is  $65^\circ$  and angle B is an isosceles equal to angle A. Calculate angle C.

**Method & Steps:**

1. Triangle angle sum rule: Angle A + Angle B + Angle C =  $180^\circ$ .
2. Since angle B = angle A, angle B =  $65^\circ$ .
3. Sum of known angles =  $65^\circ + 65^\circ = 130^\circ$ .
4. Angle C =  $180^\circ - 130^\circ = 50^\circ$ .

**Final Solution:**  $50^\circ$

## 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](http://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: Angle on Straight Line

[2 marks]

Three angles meet on a straight line:  $48^\circ$ ,  $77^\circ$ , and angle  $x$ . Calculate the value of  $x$  in degrees.

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Answer / Working:

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[FLUENCY]

### Question 2: Percentage of Amount

[3 marks]

Calculate: (a) 15% of GBP 240 (b) 35% of 600 kg.

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Answer / Working:

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[FLUENCY]

### Question 3: Area of Triangle

[2 marks]

A right-angled triangle has a base of 12 cm and a perpendicular height of 7 cm. Calculate its area.

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Answer / Working:

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[REASONING]

### Question 4: Volume of Cuboid

[3 marks]

A fish tank in the shape of a cuboid measures 50 cm long, 30 cm wide, and 40 cm deep. Calculate its volume in litres ( $1,000 \text{ cm}^3 = 1 \text{ litre}$ ).

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Answer / Working:

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[WORD PROB]

### Question 5: Discount Sale

[3 marks]

A bicycle normally costs GBP 320. In a summer clearance sale, it is reduced by 25%. A customer also has a voucher for an additional GBP 15 off the sale price. What is the final price paid?

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Answer / Working:

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[REASONING]

### Question 6: Composite Shape Area

[3 marks]

An L-shaped floor plan is split into two rectangles: 8m by 5m, and 4m by 3m. What is the total floor area? If carpet costs GBP 12 per  $\text{m}^2$ , what is the total cost?

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Answer / Working:

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## Section B: 11+ Grammar & Independent School Challenges

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

### CHALLENGE 1: THE SWIMMING POOL PATH AREA CHALLENGE [3 MARKS]

A swimming pool is 20m long by 10m wide. A concrete tiled pathway 2m wide is built completely around the perimeter of the pool.

Calculate the total surface area of the concrete pathway alone.

Final Answer:

### CHALLENGE 2: TWO ANGLES IN A REGULAR PENTAGON [3 MARKS]

A regular pentagon has five equal interior angles. The sum of interior angles in any n-sided polygon is  $(n - 2) \times 180^\circ$ .

Calculate the size of one interior angle and one exterior angle of a regular pentagon.

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:  $x = 55^\circ$**

Method: Angles on straight line =  $180^\circ$ .  $48^\circ + 77^\circ = 125^\circ$ .  $180^\circ - 125^\circ = 55^\circ$ .

### Question 2 [Fluency]

**Answer: (a) GBP 36 (b) 210 kg**

Method: (a)  $10\% = \text{GBP } 24$ ,  $5\% = \text{GBP } 12 \rightarrow 15\% = \text{GBP } 36$ . (b)  $10\% = 60\text{kg}$ ,  $30\% = 180\text{kg}$ ,  $5\% = 30\text{kg} \rightarrow 35\% = 210\text{kg}$ .

### Question 3 [Fluency]

**Answer:  $42 \text{ cm}^2$**

Method: Area =  $(\text{Base} \times \text{Height}) / 2 = (12 \times 7) / 2 = 84 / 2 = 42 \text{ cm}^2$ .

### Question 4 [Reasoning]

**Answer:  $60,000 \text{ cm}^3 = 60 \text{ Litres}$**

Method: Volume =  $50 \times 30 \times 40 = 60,000 \text{ cm}^3$ .  $60,000 \div 1,000 = 60 \text{ Litres}$ .

### Question 5 [Word Prob]

**Answer: GBP 225**

Method:  $25\%$  of GBP 320 = GBP 80 discount. Sale price = GBP 320 - GBP 80 = GBP 240. With voucher: GBP 240 - GBP 15 = GBP 225.

### Question 6 [Reasoning]

**Answer: Total Area =  $52 \text{ m}^2$  | Total Cost = GBP 624**

Method: Area 1 =  $8 \times 5 = 40 \text{ m}^2$ ; Area 2 =  $4 \times 3 = 12 \text{ m}^2$ . Total =  $52 \text{ m}^2$ . Cost =  $52 \times \text{GBP } 12 = \text{GBP } 624$ .

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