

C4.6 Angles

Name: _____ Class: _____ Date: _____ **Total: 20 marks**

KEY WORDS vertically opposite angles 对顶角 • parallel 平行 • quadrilateral 四边形
• triangle 三角形 • polygon 多边形

Objective

Use angles to solve Core IGCSE Mathematics problems.

You must be able to:

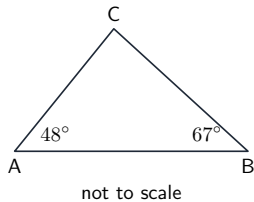
- Use angle sums and straight-line or point facts
- Recognise corresponding, alternate and co-interior angles
- Find regular polygon angles and give geometrical reasons

1 Key knowledge and worked examples

■ **Key knowledge: Angles**

Angles on a straight line sum to 180° ; at a point, 360° . Vertically opposite angles are equal. A triangle sums to 180° , a quadrilateral to 360° . With parallel lines, corresponding and alternate angles are equal; co-interior angles sum to 180° . Give the geometric reason with each result. For an n -gon, interior sum is $(n - 2)180^\circ$; regular exterior angle is $360^\circ/n$.

■ **Worked example: Angles**



A triangle has angles 48° and 67° .

- Triangle sum: $C = 180 - 48 - 67 = 65^\circ$.
- Its adjacent exterior angle: $E = 180 - 65 = 115^\circ$, using a straight line.
- A regular hexagon has $e = 360/6 = 60^\circ$ and interior $i = 180 - 60 = 120^\circ$.
- A co-interior partner of 72° is $b = 180 - 72 = 108^\circ$.

■ **Method check**

Name the angle fact that connects the unknown to the given angle. Parallel-line rules apply only when the lines are known to be parallel.

2 Practice

2.1 An angle on a straight line is 124° . Find the adjacent angle and give a reason. [2]

2.2 Three angles at a point are $95^\circ, 140^\circ, x$. Find x with a reason. [2]

2.3 Parallel lines have co-interior angles 68° and y . Find y with a reason. [2]

2.4 Find each interior angle of a regular decagon. [2]

3 Exam-style questions

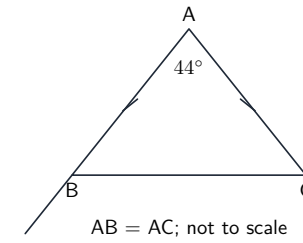
3.1 Apply the angles methods below. Show working and include units where appropriate.

(a) A regular polygon has exterior angle 45° . Find its number of sides. [2]

(b) Find each interior angle. [2]

(c) Find its total interior angle sum and show that this agrees with the individual angles. [2]

3.2 Triangle ABC is isosceles with $AB = AC$ and angle $BAC = 44^\circ$.



(a) Find angles ABC and ACB. Find the exterior angle at B formed by extending AB past B, giving reasons. [3]

(b) On a separate diagram two parallel lines are cut by a transversal. One angle is 68° . Find an alternate angle and its co-interior partner, naming the facts. [3]

Solutions

Award method and answer marks as indicated; accept equivalent correct methods.

2.1

- $a = 180 - 124 = \mathbf{56^\circ}$; **angles on a straight line**.

2.2

- $x = 360 - 95 - 140 = \mathbf{125^\circ}$; **angles at a point**.

2.3

- $y = 180 - 68 = \mathbf{112^\circ}$; **co-interior angles on parallel lines sum to 180 degrees**.

2.4

- $e = 360/10 = 36^\circ$; $i = 180 - e = \mathbf{144^\circ}$.

3.1

(a)

- $n = 360/e = 360/45 = \mathbf{8}$.

(b)

- $i = 180 - 45 = \mathbf{135^\circ}$.

(c)

- $S = (8 - 2)180 = \mathbf{1080^\circ}$; check $8(135) = 1080$.

3.2

(a)

- Base angles are equal, so $\beta = (180 - 44)/2 = \mathbf{68^\circ}$ at B and C.
- The exterior angle is $e = 180 - 68 = \mathbf{112^\circ}$, using a straight-line sum.

(b)

- The alternate angle is $\mathbf{68^\circ}$, because alternate angles are equal for parallel lines.
- Co-interior angles sum to 180° , giving $c = 180 - 68 = \mathbf{112^\circ}$.