

4.5.3 Circle Angle Proofs

Name: _____ Class: _____ Date: _____

KEY WORDS angle at the centre

<!-- Session 2 native-skill companion -->

Objective

Practise circle angle proofs within the labelled native lessons. Public original tasks; locally authored answer guidance.

1 Key knowledge and worked examples

■ Circle angles and proof chains · Higher

The central angle on an arc is twice a circumference angle standing on that same arc. A diameter therefore gives a 90° circumference angle. Angles in the same segment are equal. Opposite angles of a cyclic quadrilateral sum to 180° . State the chord, arc and segment before applying a theorem.

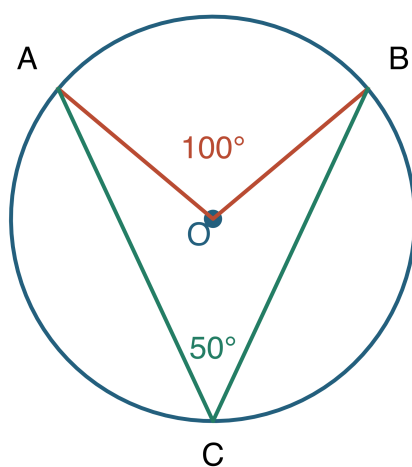
$$\angle AOB = 2\angle ACB, \quad \angle A + \angle C = 180^\circ$$

Let A,B,C lie on the circle and let O be the centre inside angle ACB. Put α =angle ACO and β =angle OCB. Equal radii make triangles AOC and BOC isosceles. Thus angle AOC= $180-2\alpha$ and angle COB= $180-2\beta$. Angles around O give the remaining angle AOB= $360-(180-2\alpha)-(180-2\beta)=2(\alpha+\beta)=2$ angle ACB. Other centre positions need the corresponding subtraction of isosceles angles, with the same result for the chosen arc. If AB is a diameter, angle AOB= 180° , so angle ACB= 90° . Two circumference angles on the same chord in the same segment each equal half the same central angle, so they agree. For opposite cyclic angles, their arcs together make 360° ; half-arc angles therefore sum to 180° . A central angle 100° gives 50° at the circumference; an angle opposite 112° in a cyclic quadrilateral is 68° .

Distinguish the reflex central angle from the smaller one and identify which arc does not contain the circumference vertex. Opposite segments can give supplementary rather than equal angles. A theorem must be tied to named points.

AQA G10 Higher requires application and proof. Draw auxiliary radii, use isosceles base angles and point sums, then extend the proof to the intended configuration rather than inferring equality from the drawing.

Angles on the same upper arc: centre = twice circumference



Original native-lesson illustration; labels belong to its worked example.

2 Practice

2.1 (Higher) Find a circumference angle standing on the same arc as a 100° central angle.

2.2 (Higher) Find the angle subtended by a diameter at the circumference.

2.3 (Higher) Find the opposite cyclic angle to 112° .

3 Exam-style questions

3.1 Decide whether this claim is true. Justify with a concrete calculation or counterexample: Any two circumference angles are equal regardless of their chords and segments.

Solutions

2.1 Half the central angle is 50° .

2.2 Half of 180° is 90° .

2.3 Opposite angles sum to 180° : $180-112=68^\circ$.

3.1 False. A diameter subtends 90° , while a chord subtending 60° at the centre subtends 30° at the circumference on the other arc. Equal angles require the same chord and segment.

Local review guidance: show the chosen method; give the checked result; explain the condition or failed shortcut. This is authored classroom guidance.