

4.5.1 Circles

Name: _____ Class: _____ Date: _____

KEY WORDS cyclic quadrilateral

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

Objective

Practise circles within the labelled native lessons. Public original tasks; locally authored answer guidance.

1 Key knowledge and worked examples

■ Circle theorems and reasoned proofs · Higher

The angle at the centre is twice the angle at the circumference on the same arc. Angles in the same segment are equal. Opposite angles of a cyclic quadrilateral sum to 180° . A radius is perpendicular to a tangent at contact.

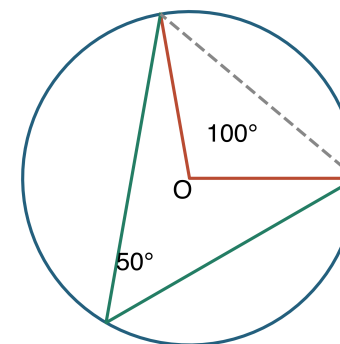
$$\theta_{\text{centre}} = 2\theta_{\text{circumference}}$$

If a central angle is 100° , the corresponding angle at the circumference is 50° . In a cyclic quadrilateral with one angle 112° , its opposite angle is $180 - 112 = 68^\circ$. A radius meeting a tangent gives 90° , even if the drawing looks oblique.

Identify the same chord and the correct arc before using a theorem. Two visible right angles do not prove a quadrilateral cyclic without a valid converse argument. A diagram need not be to scale.

Write one reason alongside each angle calculation. For the alternate-segment theorem, name the tangent and chord, then identify the angle in the opposite segment. Use auxiliary radii only when they help the proof.

The centre angle is twice the circumference angle



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

2 Practice

2.1 (Higher) Find the circumference angle corresponding to a 100° central angle.

2.2 (Higher) Find the angle opposite 112° in a cyclic quadrilateral.

2.3 (Higher) Find the angle between a radius and its tangent in degrees.

3 Exam-style questions

3.1 Decide whether this claim is true. Justify with a concrete calculation or counterexample: Every quadrilateral has opposite angles summing to 180° .

Solutions

2.1 For the same chord and corresponding arc, centre angle=twice circumference angle:
 $100/2=50^\circ$.

2.2 Opposite cyclic angles sum to 180° , so $180-112=68^\circ$.

2.3 A radius and its tangent are perpendicular at contact: 90° .

3.1 False. A parallelogram with successive angles $60^\circ, 120^\circ, 60^\circ, 120^\circ$ has opposite sums 120° and 240° . The 180° theorem requires a cyclic quadrilateral.

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