The Panda Math Tutor

www.thepandamathtutor.com

Circle Theorems

Solutions & Answer Key

Full worked solutions, marking scheme & answer key

IGCSE Mathematics

The Panda Math Tutor

Prepared by

Nikolas Agisilaou

Companion to the *Student Worksheet*

Contents

4 Part IV — Complete Solutions **2**
4.1 Solutions — Parts of a Circle . . . 2
4.2 Solutions — Theorem 1: Angle at the Centre . . . 3
4.3 Solutions — Theorem 2: Angles in the Same Segment . . . 5
4.4 Solutions — Theorem 3: Angle in a Semicircle . . . 6
4.5 Solutions — Theorem 4: Cyclic Quadrilaterals . . . 7
4.6 Solutions — Theorems 5 and 6: Tangents . . . 8
4.7 Solutions — Theorem 7: Perpendicular from the Centre to a Chord . . . 10
4.8 Solutions — Theorem 8: Alternate Segment Theorem . . . 11
4.9 Solutions — Chain Reasoning . . . 12
4.10 Solutions — Real-World Applications . . . 14
4.11 Solutions — Mixed Review . . . 15
4.12 Marking Scheme — Examination-Style Practice . . . 17

5 Part V — Common Mistakes & Learning Tips **19**

6 Part VI — Final Answer Key **21**

The Panda Math Tutor

Note

About this booklet. These are the complete solutions to every question in the *Circle Theorems — Student Worksheet*. Question numbers match exactly: parts of a circle V1–V5, angle at the centre C1–C5, same segment S1–S4, semicircle M1–M4, cyclic quadrilaterals Y1–Y5, tangents T1–T6, chord and centre H1–H4, alternate segment N1–N4, chain reasoning X1–X5, applications A1–A5, the Mixed Review MR1–MR10, and the examination questions 1–8 of Part III.
Every solution names the theorem being used, exactly as an examiner expects. Part V collects the common mistakes to watch for, and Part VI is a quick answer key for fast marking.

4 Part IV — Complete Solutions

Note

Each solution states the theorem by name and works one step at a time. Depth is scaled to difficulty — brief for basic questions, fuller for the harder ones. Angles are given in degrees throughout.

4.1 Solutions — Parts of a Circle

Solution V1

(a) A $\boxed{\text{chord}}$ — both endpoints lie on the circumference.
(b) A $\boxed{\text{sector}}$ — bounded by two radii and an arc.
(c) A $\boxed{\text{tangent}}$ — it meets the circle at the point of tangency only.

Solution V2

(a) $d = 2r = 2 \times 6.5 = \boxed{13\,\text{cm}}$.
(b) $r = \dfrac{d}{2} = \dfrac{23}{2} = \boxed{11.5\,\text{cm}}$.

The Panda Math Tutor

Solution V3

A **segment** is the region between a *chord* and the arc it cuts off. A **sector** is the region between *two radii* and the arc between them.
In short: a segment is cut off by a straight line across the circle; a sector is a "slice" cut from the centre. A sketch should show a chord with the shaded region above it for the segment, and a wedge with its point at O for the sector.

Solution V4

OA and OB are both radii of the same circle, so $OA = OB$. A triangle with two equal sides is isosceles, so

$$\boxed{\triangle OAB \text{ is always isosceles, because } OA = OB \text{ (radii).}}$$

This is one of the most useful facts in the whole topic: the two base angles $\angle OAB$ and $\angle OBA$ are therefore equal.

Solution V5

(a) $ABCD$ is a cyclic quadrilateral because $\boxed{\text{all four vertices lie on the circle}}$.
(b) Opposite angles of a cyclic quadrilateral are supplementary:

$$\angle DAB + \angle BCD = \boxed{180^\circ}.$$

4.2 Solutions — Theorem 1: Angle at the Centre

Solution C1

Theorem 1 — the angle at the centre is twice the angle at the circumference standing on the same arc:

$$\angle AOB = 2 \times \angle ACB = 2 \times 34 = \boxed{68^\circ}.$$

Solution C2

The same theorem, used in reverse (halve instead of double):

$$\angle PRQ = \frac{\angle POQ}{2} = \frac{126}{2} = \boxed{63^\circ}.$$

The Panda Math Tutor

Preview ends here

19 more pages are in the full pack.

Circle Theorems — Solutions — €9.99

Buy the pack and the complete PDF lands in your inbox.

Personal study use only — please don't resell or share.