GCSE Mathematics (1MA1)

Themed papers – Circle Theorems B

Compiled from student-friendly mark schemes

Please note that this mark scheme is not the one used by examiners for making scripts. It is intended more as a guide to good practice, indicating where marks are given for correct answers. As such, it doesn't show follow-through marks (marks that are awarded despite errors being made) or special cases.

It should also be noted that for many questions, there may be alternative methods of finding correct solutions that are not shown here – they will be covered in the formal mark scheme.

NOTES ON MARKING PRINCIPLES

Guidance on the use of codes within this mark scheme
M1 – method mark. This mark is generally given for an appropriate method in the context of the question. This mark is given for showing your working and may be awarded even if working is incorrect. P1 – process mark. This mark is generally given for setting up an appropriate process to find a solution in the context of the question. A1 – accuracy mark. This mark is generally given for a correct answer following correct working. B1 – working mark. This mark is usually given when working and the answer cannot easily be separated. C1 – communication mark. This mark is given for explaining your answer or giving a conclusion in context supported by your working. Some questions require all working to be shown; in such questions, no marks will be given for an answer with no working (even if it is a correct answer).

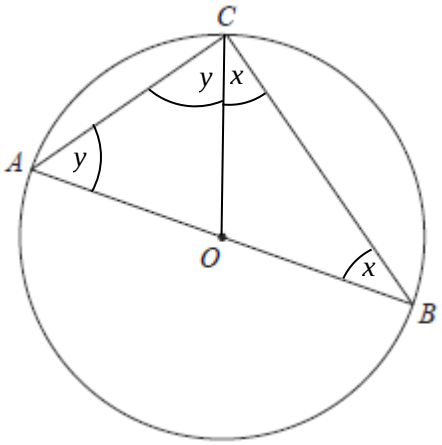
Question 1 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	(angle) *BAE* = (angle) *CDE* angles in the same segment are equal or angles at the circumference subtended on the same arc are equal	C1	This mark is given for identifying one pair of equal angles with a correct reason
	(angle) *AEB* = (angle) *DEC* opposite angles or vertically opposite angles are equal	C1	This mark is given for identifying a second pair of equal angles with a correct reason
	Thus the two triangles have three pairs of equal angles and so are similar	C1	This mark is given for a correct conclusion with supporting reasons

Question 2 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$\angle ACB = \angle ADB = 60°$ Angles in the same segment are equal $\angle DBC = \angle DAC = 60°$ Angles in the same segment are equal Thus $\angle ACB = \angle DBC = 60°$	C1	This mark is given for arguments to show that $\angle ACB = \angle ADB$ and $\angle DBC = \angle DAC$ with reasons given to show that $\angle ACB = \angle DBC$
	$\angle ABC = 60 + \angle ABD = 60 + \angle ACD = \angle DCB$ Angles in the same segment are equal	C1	This mark is given for an argument to show that $\angle ABC = \angle DCB$
	BC is common to both triangles	C1	This mark is given for finding a side common to both triangles
	Thus triangles *ABC* and *DCB* are congruent (AAS)	C1	This mark is given for a correct conclusion with reference to AAS

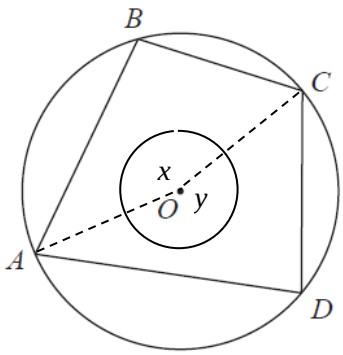
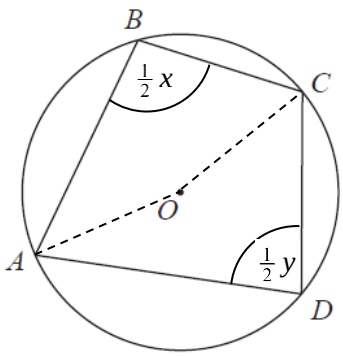
Question 3 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	 base angles of an isosceles triangle are equal	1	This mark is given for drawing the line *OC* to make an isosceles triangles *OBC* and *AOC*
	$x + x + y + y = 180°$ angles in a triangle add up to 180	1	This mark is given for finding the sum of the angles in triangle *ABC*
	$2x + 2y = 2(x + y) = 180$, so $x + y$ = angle $ACB = 90°$	1	This mark is given for a complete proof to show ACB = 90°
		1	This mark is given for a complete proof with all reasons given

Question 4 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	If $CAB = x$, then $CRO = 180 - x$ Opposite angles of a cyclic quadrilateral add up to 180	C1	This mark is given for establishing a relationship between angles in a cyclic quadrilateral with a reason given
	$ORB = x$ Angles on a straight line add up to 180	C1	This mark is given for finding the size of angle ORB with a reason given
	$RO = OB$ since both a radii of the same circle $ABC = x$ Base angles of an isosceles triangle are equal	C1	This mark is given for finding the size of angle ABC with a reason given
	Thus $\angle CAB = \angle ABC$	C1	This mark is given for a complete proof with all correct reasons given

Question 5 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	 angles at a point add up to 360° $x + y = 360°$	C1	This mark is given for drawing *AO* and *OC* and considering angles around the point *O*
	The angle at the centre of a circle is twice the angle at the circumference $\angle ABC = \frac{1}{2}x$ or $\angle ADC = \frac{1}{2}y$ 	C1	This mark is given for a correct use of "angle at centre..." to find angle *ABC* or angle *ADC*
	$\angle ABC + \angle ADC = \frac{1}{2}x + \frac{1}{2}y$ $= \frac{1}{2}(x + y) = \frac{1}{2}(360°) = 180°$	C1	This mark is given for a conclusion
		C1	This mark is given for a correct complete proof with all reasons given NB: "opposite angles of a cyclic quadrilateral add up to 180°" is not acceptable

Question 6 (Total 6 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	eg $BCT = x$ so $BCO = 90 - x$ **or** eg $OBC = OCB$	P1	starts process by identifying OCT as 90° or by use of isosceles triangle angle properties
	eg if $BAC = y$ then $BOC = 2y$ $2y + 2w + 2(90 - x) = 180$ or $(x + y) + (y + w) + (w + x) = 180$	P1	continues process by using another angle property eg in triangle ABC forms an equation using the angles
	eg $BAC(y) = BCT(x)$ or $BAC = y + w = 90 - x = BCT$	C1	complete process leading to establishment of a link between BAC and BCT
	full proof with full appropriate reasons given for their method of proof eg using The tangent to a circle is perpendicular to the radius (diameter) ; The angle at the centre of a circle is twice the angle at the circumference ; Angles in a triangle add up to 180 ; Base angles of an isosceles triangle are equal.	C1	

Mark scheme for 1MA1 Higher themed papers: Circle Theorems B

Performance data:

Q	Taken from			Total Marks available	TOPIC	Spec Ref	AO	% Mean marks	Edexcel mean averages Marks of candidates who achieved grade:										
	Q	Series	Paper						ALL	9	8	7	6	5	4	3	2	1	U
1	15	June 2017	2H	3	Geometry	G6 G10	2	20	0.60	1.91	1.21	0.76	0.47	0.27	0.12	0.04	-	-	0.01
2	22	Nov 2019	1H	4	Geometry	G4 G5 G10	2	4	0.17	1.78	0.76	0.50	0.33	0.16	0.08	0.03	-	-	0.02
3	20	Nov 2017	3H	4	Geometry	G10	2	1	0.03	2.75	0.82	0.08	0.08	0.03	0.01	0.00			0.00
4	21	Nov 2018	2H	4	Geometry	G3, G9, G10	2	0	0.00	0.30	0.06	0.00	0.00	0.00	0.00	0.00	-	-	0.00
5	21	Mock Set 1	3H	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	17	Mock set 3	1H	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				23					0.80	6.74	2.85	1.34	0.88	0.46	0.21	0.07			0.03