Circle Theorem Past Paper Answers GCSE Edexcel – Non Calculator

1.

21	C1	for angle $OAB = 90 - 56$ (= 34)	Throughout, angles may be written on the diagram; accept as evidence if correct. Ignore absence of degree sign Reasons need not be given.
	C1	for process to find angle CAD (= 69) or angle BCA (= 56) or angle COA (= 138) , eg use of alternate segment theorem or angle at centre is twice the angle at the circumference	
	C1	cao	

2.

proof	C1	uses cyclic quad eg if $CAB = x$ then $CRO = 180 - x$ (Opposite angles of a cyclic quadrilateral add up to 180º.)	Underlined words need to be shown; reasons need to be linked to their method; any reasons not linked do not credit.
	C1	establishes relationship outside a circle eg $ORB = x$ (Angles on a straight line add up to 180)	Correct method can be implied from angles on the diagram if no ambiguity or contradiction.
	C1	uses properties of a circle eg $RO = OB$ (both radii) so $ABC = x$ (Base angles of an isosceles triangle are equal.)	
	C1	Complete proof and conclusion	Full reasons given without any redundant reasons and correct reasoning throughout.

3.

$90 - 2x$	M1	for identifying an unknown angle eg $BAO = x$, $AOB = 180 - 2x$, $OBC = 90$, $ABC = 90 + x$	Could be shown on the diagram alone
	M1	full method to find the required angle eg a method leading to $180 - x - x - 90$	Needs to be an algebraic method Accept $x + x + 90 + y = 180$ for M2
	A1	for $90 - 2x$	
	C2	(dep M2) full reasons for their method, from base angles in an isosceles triangle are equal angles in a triangle add up to 180° a tangent to a circle is perpendicular to the radius (diameter) angles on a straight line equal 180° the exterior angle of a triangle is equal to the sum of the interior opposite angles	Underlined words need to be shown; reasons need to be linked to their method; any reasons not linked do not credit.
	(C1	(dep M1) for a tangent to a circle is perpendicular to the radius (diameter))	Apply the above criteria

4.

n	Answer	Mark	Mark scheme	Additional guidance
(a)	Shown	M1	for finding one missing angle eg $BDE = y$ **or** $ODE = 90$ **or** $ODF = 90$ **or** $DBO = x$ **or** $BCD = 180 - y$ **or** (reflex) $BOD = 2y$	Could be shown on the diagram or in working
		A1	for a complete correct method leading to $y - x = 90$	
		C1	(dep on A1) for all correct circle theorems given appropriate for their working eg The tangent to a circle is perpendicular (90°) to the radius (diameter) Alternate segment theorem **OR** Angle at the centre is twice the angle at the circumference Opposite angles in a cyclic quadrilateral sum to 180°	
(b)	Explanation	C1	for explanation eg No as y must be less than 180 as it is an angle in a triangle	

5.

	Proof	C1	draws OC and considers angles in an isosceles triangle (algebraic notation may be used, eg two angles labelled x)
		C1	finds sum of angles in triangle ABC, eg $x + x + y + y = 180$, or sum of angles at O, eg $180 - 2x + 180 - 2y$
		C1	complete method leading to $ACB = 90$
		C1	complete proof with all reasons given, eg base angles of an isosceles triangle are equal, angles in a triangle add up to 180°, angles on a straight line add up to 180°

6.

Answer	Mark	Notes
Proof	C1	for identifying one pair of equal angles with a correct reason, e.g. (angle) BAE = (angle) CDE; angles in the same segment are equal or angles at the circumference subtended on the same arc are equal or for identifying two pairs of equal angles with no correct reasons given (angles must be within the appropriate triangles)
	C1	for identifying a second pair of equal angles with a correct reason, e.g. (angle) AEB = (angle) DEC; opposite angles or vertically opposite angles are equal or for identifying the three pairs of equal angles with no correct reasons given
	C1	for stating the three pairs of equal angles of the two triangles e.g. $ABE = DCE$, $BEA = CED$, $EAB = EDC$ with fully correct reasons

7.

estion	Working	Answer	Notes	
	∠ *TSU* = 360 ÷ 5 (=72) Exterior angles of a polygon add up to 360°	proof	M1	for method to find interior or exterior angle of regular pentagon
	∠ *QRO* = ∠ *OTP* = 90 The tangent to a circle is perpendicular (90°)to the radius (diameter)		M1	for using angle between tangent and radius
	∠ *ROT* = 540 – 2 × 90 – 2 × 108 (= 144)		M1	for method to find angle *ROT*
	∠ *RUT* = 144 ÷ 2 (= 72) The angle at the centre of a circle is twice the angle at the circumference		C1	for method to find angle *RUT* with reason
	Base angles of an isosceles triangle are equal		C1	for deduction that *ST* = *UT* with reasons

8.

	Working	Answer	Notes	
		29°	C1	angle *OTP* = 90°, quoted or shown on the diagram
			M1	method that leads to 180 – (90 + 32) or 58 shown at *TOP* OR that leads to 122 shown at *SOT*
			M1	complete method leading to "58"÷2 or (180 – "122") ÷ 2 or 29 shown at *TSP*
			C1	for angle of 29° clearly indicated and appropriate reasons linked to method eg angle between radius and tangent = 90° and sum of angles in a triangle = 180°; ext angle of a triangle equal to sum of int opp angles and base angles of an isos triangle are equal or angle at centre = 2x angle at circumference or ext angle of a triangle equal to sum of int opp angles