

Q1. (2019)

20(a)	Alternative method 1: shows that $BAC = ACD$ and alternate angles		
	$ACD = ABC$	M1	accept both with same letter on diagram
	$ABC = BAC$	M1	accept both with same letter on diagram
	$BAC = ACD$ and alternate segment (theorem) with M2 awarded	M1dep	dep on M2
	Other two correct reasons given with M3 awarded	A1	eg (base angles of) isosceles triangle and alternate angles
	Alternative method 2: shows that $ABC + BCD = 180$ and co-interior angles		
	$ACD = ABC$	M1	accept both with same letter on diagram
	$ABC = BAC$	M1	accept both with same letter on diagram
	$BCD = 180 - (BAC + ABC) + ACD$ and $ABC + BCD = 180$ and alternate segment (theorem) with M2 awarded	M1dep	oe dep on M2
	Other two correct reasons given with M3 awarded	A1	eg (base angles of) isosceles triangle and (co-)interior angles or allied angles
The mark scheme for question 20(a) continues on the next page			

20(a) (cont)	Alternative method 3: line from midpoint of AB to C is perpendicular to AB and CD		
	Let M be the midpoint of AB and MC is perpendicular to AB	M1	any letter
	MC is perpendicular to CD	M1	
	AB and CD are both perpendicular to MC with M2 awarded	M1dep	oe dep on M2
	Three correct reasons given with M3 awarded	A1	eg (perpendicular bisector of) isosceles triangle and MC goes through the centre of the circle and tangent is perpendicular to radius
	Additional Guidance		
	Other correct methods can be found by extending one or more of the lines. For example, by extending BC it is possible to use corresponding angles as a proof instead of alternating angles. This should be reflected in the reasons required for the last mark		
	In the scheme, ACD (for example) means angle ACD and not triangle ACD		
	Accept equality of angles indicated by labelling with the same letter, but not by arcs		
	Accept (angle) B for angle ABC Do not accept (angle) A for angle BAC or (angle) C for angle ACB unless intention is clear from annotation of the diagram		
	For the third mark in alternative method 2, accept algebraic expressions for angles if clearly marked on the diagram		
	Do not award marks for an argument based only on assumed values of angles, but ignore 60° marked on diagram, which is for (b)		
	Ignore an angle marked at ADC		
	Ignore incorrect statements that do not affect the proof eg ACD is an isosceles triangle (but not used in proof)		