

1. Solve the equation $\tan 2\theta = 3$ for $0^\circ < \theta < 360^\circ$. [3]

2. Given that $\arcsin x = \arccos y$, prove that $x^2 + y^2 = 1$. [Hint: Let $\arcsin x = \theta$] [3]

3. In this question you must show detailed reasoning.
Solve the equation
$$2\tan \theta + \cos \theta = 0$$
in the range $0^\circ < \theta < 360^\circ$. [7]

4. Solve the equation $\cos 2\theta = 0.3$ for $0^\circ \leq \theta < 360^\circ$. [3]

END OF QUESTION paper

Mark scheme

Question			Answer/Indicative content	Marks	Part marks and guidance	
1			71.5 (6505118..) soi	M1	or 1.24 (9045772..) (rad) or 79.5 (1672353..) (grad)	
			35.7 to 36	A1	if A0, SC1 for all four answers in radians or grad r.o.t to 3 or more sf 0.62452286, 2.195319213, 3.76611554, 5.336911867 (rad), but 0 if extra values in range if M1A0A0, SC1 for 251.565..., 431.565..., 611.565... Examiner's Comments Most candidates started correctly, a few doubled 71.6 instead of halving it, but most successfully obtained 35.8°. 215.835.8° was frequently found, but the other two values were often missed. Some candidates rounded off their calculator value, and then over-specified their final values (215.79 etc was common), thus losing the second A mark. A common error was arctan(1.5) to start, and some candidates unwittingly worked in radians and went on to add multiples of 90°.	39.75836177..., 139.75..., 239.75...339.75...(grad)
			125.78..., 215.78..., 305.78... to 3 or more sf	A1		for second A1, ignore extra values outside range, A0 if extra values in range
			Total	3		
2			$\arcsin x = \theta$ $\Rightarrow x = \sin \theta$ $\arccos y = \theta \Rightarrow y = \cos \theta$	M1(AO1.1) M1(AO1.1) E1(AO2.1)		

			$\sin^2 \theta + \cos^2 \theta = 1$ $\Rightarrow x^2 + y^2 = 1$ AG	[3]		Equations
			Total	3		
3			$\frac{2 \sin \theta}{\cos \theta} + \cos \theta = 0$ $2 \sin \theta + 1 - \sin^2 \theta = 0$ $\sin \theta = 1 \pm \sqrt{2}$ $\sin \theta = 1 + \sqrt{2} \text{ has no roots since } -1 \leq \sin \theta \leq 1$ $\text{If } \sin \theta = 1 - \sqrt{2}, \theta = -24.47 \text{ or } -155.53$ 204 335	M1(AO1.1) M1(AO3.1a) A1(AO1.1) E1(AO2.3) A1(AO1.1) A1(AO3.2a) A1(AO1.1)	<div>DR</div> <div>Use of identity</div> <div>Multiplication by $\cos \theta$ and use of Pythagoras</div> <div>Both answers from correct factorizing or correct use of quadratic formula</div> <div>allow 204.5 or 204.47 allow 335.5 or 335.53</div> <div>Ignore extra values outside range. Deduct one mark if extra values in range. If A0A0 allow</div>	

						Equations
						SC1 for both correct answers given to greater precision.
			Total	7		
4			$2\theta = \cos^{-1} 0.3$ $2\theta = 72.54, 287.46, 432.54, 647.46$ $\theta = 36.3, 143.7, 216.3, 323.7$	M1(AO 1.1a) A1(AO 1.1b) A1(AO 1.1b) [3]	For at least one correct answer in the range For all correct with no others in the range	
			Total	3		