1. Solve the equation $\tan 2\theta = 3$ for $0° < \theta < 360°$. [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 $0° < \theta < 360°$. [7]

4. Solve the equation $\cos 2\theta = 0.3$ for $0° \leq \theta < 360°$. [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	39.75836177.., 139.75…, 239.75…339.75…(grad)
			if M1A0A0, SC1 for 251.565…, 431.565…, 611.565…	
			Examiner's Comments	
	125.78..., 215.78..., 305.78... to 3 or more sf	A1	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°.	for second A1, ignore extra values outside range, A0 if extra values in range
	Total	**3**		
2	$\arcsin x = \theta$ $\Rightarrow x = \sin\theta$	**M1(AO1.1)**		
	$\arccos y = \theta \Rightarrow y = \cos\theta$	**M1(AO1.1)**		
		E1(AO2.1)		

			$\sin^2\theta + \cos^2\theta = 1$ $\Rightarrow x^2 + y^2 = 1$ AG	[3]		
			Total	**3**		
3			$\frac{2\sin\theta}{\cos\theta} + \cos\theta = 0$ $2\sin\theta + 1 - \sin^2\theta = 0$ $\sin\theta = 1 \pm \sqrt{2}$ $\sin\theta = 1 + \sqrt{2}$ has no roots since $-1 \le \sin\theta \le 1$ If $\sin\theta = 1 - \sqrt{2}$, $\theta = -24.47$ or $-155\text{-}53$ 204 335	M1(AO1.1) M1(AO3.1a) A1(AO1.1) E1(AO2.3) A1(AO1.1) A1(AO3.2a) A1(AO1.1) [7]	DR Use of identity Multiplication by cos θ and use of Pythagoras Both answers from correct factorizing or correct use of quadratic formula allow 204.5 or 204.47 allow 335.5 or 335.53	Ignore extra values outside range. Deduct one mark if extra values in range. If A0A0 allow

					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		