EXAM PAPERS PRACTICE

Boost your performance and confidence with these topic-based exam questions

Practice questions created by actual examiners and assessment experts

Detailed mark scheme

Suitable for all boards

Designed to test your ability and thoroughly prepare you

XVIII

2002

1583

Time allowed

Score

/

Percentage

%

Maths

Mark Scheme

AQA
AS & A LEVEL

3.6 E: Trigonometry

3(a)	$R=\sqrt{13}$ Or 3.6	B1	1	
(b)	$\dfrac{\sin\alpha}{\cos\alpha}=\tan\alpha=\dfrac{2}{3}$ $\alpha\approx 33.7$	M1A1	2	Allow M1 for $\tan\alpha=\dfrac{-2}{3}$ or $\pm\dfrac{3}{2}$ AG convincingly obtained
(c)	maximum value $=\sqrt{13}$	B1F		
	$\cos(\theta+33.7)=1$ $(\theta=-33.7)$	M1		
	$\theta=326.3$	A1	3	AWRT 326
	Total		**6**	

6(a)	$\cos 2x=2\cos^2 x-1$	B1B1	2	

4(a)(i)	$\sin 2x=2\sin x\cos x$	B1	1	
(ii)	$\cos 2x=2\cos^2 x-1$	B1	1	
(b)	$\sin 2x-\tan x=2\sin x\cos x-\dfrac{\sin x}{\cos x}$	M1		Use of their $\cos 2x$ or $\sin 2x$
	$=\sin x\left(2\cos x-\dfrac{1}{\cos x}\right)$	M1		Use of $\tan x=\dfrac{\sin x}{\cos x}$ and the other double angle identity
	$=\sin x\left(\dfrac{2\cos^2 x-1}{\cos x}\right)=\tan x\cos 2x$	A1	3	AG convincingly obtained
(c)	$\tan x\cos 2x=0$ $x=180$	B1		Ignore $x=0$, $x=360°$ & any others outside range
	$\cos 2x=0$ or $\cos^2 x=\dfrac{1}{2}$ $\left(\text{or } \sin^2 x=\dfrac{1}{2}\right)$	M1		
	$x=45$	A1		
	$x=135, 225, 315$	A1	4	CAO max 3/4 for answers in radians
	Total		**9**	

3(a)	$\cos 2x = 1 - 2\sin^2 x$	B1	1	
(b)(i)	$3\sin x - \cos 2x = 3\sin x - (1 - 2\sin^2 x)$ $= 3\sin x - 1 + 2\sin^2 x$	M1 A1	2	Candidate's $\cos 2x$ or $\sin^2 x$ AG
(ii)	$2\sin^2 x + 3\sin x - 2 = 0$ $(2\sin x - 1)(\sin x + 2) = 0$	M1 M1		Soluble quadratic form Attempt to solve (allow one error in formula, allow sign errors)
	$\sin x = \frac{1}{2} \quad x = 30 \quad x = 150$	M1 A1	4	$\sin^{-1}$ and two solutions ($0° < x < 360°$) A0 if radians
	Allow misread for $2\sin^2 x + 3\sin x - 1 = 0$	(M1)		Soluble quadratic form
	$\sin x = \frac{-3 \pm \sqrt{17}}{4}$	(M1)		Use of formula (allow one error)
	$x = 16.3°, 163.7°$	(A1)		Max 3/4
(c)	$\int \frac{1}{2}(1 - \cos 2x) = \frac{x}{2} - \frac{\sin 2x}{4} (+c)$	M1A1	2	M1 – solve integral, must have 2 terms for $\sin^2 x$ from (a)
			9	

7(a)	$\tan(x + x) = \frac{\tan x + \tan x}{1 - \tan x \tan x} \left(= \frac{2\tan x}{1 - \tan^2 x} \right)$	M1 A1	2	$A = B = x$ used
(b)	$2 - 2\tan x - \frac{2\tan x(1 - \tan^2 x)}{2\tan x}$	M1		Substitute from (a)
	$2 - 2\tan x - (1 - \tan x)(1 + \tan x)$	M1		Simplification $2 - 2\tan x - (1 - \tan^2 x)$
	$(1 - \tan x)(2 - (1 + \tan x))$	M1		$2 - 2\tan x - 1 + \tan^2 x$
	$(1 - \tan x)^2$	A1	4	AG (convincingly obtained) $= (\tan x - 1)^2 = (1 - \tan x)^2$ Any equivalent method
	Total		6	

3(a)	$R=5$	B1		
	$\tan\alpha=\frac{3}{4}$ (OE) $\quad \alpha=36.9°$ (ISW 216.9)	M1A1	3	SC1 $\tan\alpha=\frac{4}{3}, \alpha=53.1°$ R,α PI in (b)
(b)	$\cos(x-\alpha)=\frac{2}{R}$	M1		
	$x-\alpha=66.4°$	A1		
	$x=103.3°$	A1F		
	$x=330.4°$	A1F	4	accept $330.5°$, -1 each extra ft on acute α
(c)	minimum value $=-5$	B1F		ft on R
	$\cos(x-36.9)=-1$	M1		SC $\cos(x+36.9)$ treat as miscopy
	$x=216.9°$	A1	3	216.9 or better accept graphics calculator solution to this accuracy SC Find max: max = 5 at $(x+36.9)$ stated 1/3 Max 8/10 for work in radians
	Total		**10**	