Section A - Answers

1	D	2	A	3	B	4	C
5	D	6	B	7	B	8	D

2 marks each (16 marks)

Section B - Marking Scheme

	Give 1 mark for each •	Illustration(s) for awarding each mark
9(a)	**ans: (11, – 10, 2)** **(2 marks)**	
	•¹ valid method	•¹ evidence of using stepping out/section formula
	•² answer	•² (11, – 10, 2)
(b)	**ans: proof** **(4 marks)**	
	•¹ finds $\overrightarrow{DA}$	•¹ $\overrightarrow{DA} = \begin{pmatrix}-10\\10\\-5\end{pmatrix}$
	•² finds $\overrightarrow{DC}$	•² $\overrightarrow{DC} = \begin{pmatrix}-7\\-6\\2\end{pmatrix}$
	•³ finds $\overrightarrow{DA}.\overrightarrow{DC}$	•³ $\overrightarrow{DA}.\overrightarrow{DC} = 70 - 60 - 10 = 0$
	•⁴ conclusion	•⁴ since $\overrightarrow{DA}.\overrightarrow{DC} = 0$; $\angle$ ADC is right angled
(c)	**ans: proof** **(3 marks)**	
	•¹ finds $\overrightarrow{BA}$ and $\overrightarrow{BC}$	•¹ $\overrightarrow{BA} = \begin{pmatrix}-4\\4\\-2\end{pmatrix}$ $\overrightarrow{BC} = \begin{pmatrix}-1\\-12\\5\end{pmatrix}$
	•² finds $\overrightarrow{BA}.\overrightarrow{BC}$	•² $\overrightarrow{BA}.\overrightarrow{BC} = 4 - 48 - 10 = -54$
	•³ conclusion	•³ scalar product < 0 so obtuse angle

	Give 1 mark for each •	Illustration(s) for awarding each mark
10(a)	**ans: proof** **(3 marks)**	
	•[1] applies given info to new function	•[1] $\cos^2 \frac{1}{2}x° = \frac{1}{2}(\cos x° + 1)$
	•[2] knows to substitute in function	•[2] $6[\frac{1}{2}(\cos x° + 1)] + \sqrt{3}\sin x°$
	•[3] simplifies to required form	•[3] $3(\cos x + 1)] + \sqrt{3}\sin x°; 3\cos x + 3 + \sqrt{3}\sin x°$
(b)	**ans: $\sqrt{12}\cos(x - 30)^o + 3$** **(3 marks)**	
	•[1] finds k	•[1] $k = \sqrt{9+3} = \sqrt{12}$
	•[2] finds tan α	•[2] $\tan\alpha = \frac{\sqrt{3}}{3}$
	•[3] finds α	•[3] $\alpha = 30°$
(c)	**ans: 240^o** **(4 marks)**	
	•[1] equates to 0	•[1] $\sqrt{12}\cos(x - 30)^o + 3 = 0$
	•[2] simplifies	•[2] $\cos(x - 30)^o = -\frac{3}{\sqrt{12}}$
	•[3] finds values	•[3] $x = 240^o; 360^o$
	•[4] discards	•[4] 240^o
11(a)	**ans: $P = 4t^{½}$** **(3 marks)**	
	•[1] knows form of equation, takes logs, expands	•[1] $y = ax^b$; $\log_2 P = \frac{1}{2}\log_2 t + 2$
	•[2] finds b	•[2] $b = \frac{1}{2}; \log_2 a = 2; a = 2^2; a = 4$
	•[3] writes relationship	•[3] $P = 4t^{½}$
(b)	**ans: proof** **(3 marks)**	
	•[1] subs into expression	•[1] $4t^{\frac{1}{2}} = \sqrt{8} + 4$
	•[2] starts to simplify	•[2] $t^{\frac{1}{2}} = \frac{1}{4}(\sqrt{8}+4); t = [\frac{1}{4}(\sqrt{8}+4)]^2$
	•[3] completes simplification to answer	•[3] $t = \frac{1}{16}(8 + 8\sqrt{8} + 16); t = \frac{1}{16}(24 + 16\sqrt{2})$ $t = \frac{24}{16} + \sqrt{2}; t = \frac{3}{2} + \frac{2\sqrt{2}}{2}; t = \frac{1}{2}(3 + 2\sqrt{2})$
12	**ans: $a = -4; b = 3$** **(4 marks)**	
	•[1] uses synthetic division to find one equation	•[1] $b - a = 7$
	•[2] uses synthetic division to find other eq.	•[2] $b + 3a = -9$
	•[3] knows to use system of equations	•[3] evidence
	•[4] solves for a and b	•[4] $a = -4; b = 3$

	Give 1 mark for each •	Illustration(s) for awarding each mark
13(a)	**ans: proof** **(3 marks)**	
	•[1] differentiates first term in brackets	•[1] $\sqrt{3}(2\sin x\cos x$.......
	•[2] differentiates second term in brackets	•[2] ....$2\sin 2x)$
	•[3] contracts $2\sin x\cos x$ and simplifies	•[3] $\sqrt{3}(\sin 2x + 2\sin 2x) = \sqrt{3}(3\sin 2x)$
(b)	**ans: 9/2** **(2 marks)**	
	•[1] subs into derivative	•[1] $\sqrt{3}(3\sin 2(\frac{\pi}{6}); \sqrt{3}(3\sin\frac{\pi}{3})$
	•[2] evaluates	•[2] $\sqrt{3}\times 3\times\frac{\sqrt{3}}{2} = \frac{9}{2}$
	Sect. B (34 marks)	16 + 34 Total: 50 marks