

4752 (C2) Concepts for Advanced Mathematics

Section A

1	using Pythagoras to show that hyp. of right angled isos. triangle with sides a and a is $\sqrt{2}a$ completion using definition of cosine	M1 A1	www a any letter or a number NB answer given	2
2	$2x^6 + 5x$ value at 2 – value at 1 131	M2 M1 A1	M1 if one error ft attempt at integration only	4
3	(i) 193 (ii) divergent + difference between terms increasing o.e.	2 1	M1 for $8 + 15 + \dots + 63$	3
4	(i) 2.4 (ii) 138	2 2	M1 for $43.2 \div 18$ M1 for their (i) $\times \frac{180}{\pi}$ or $\frac{43.2 \times 360}{36\pi}$ o.e. or for other rot versions of 137.50...	4
5	(i) sketch of $\cos x$; one cycle, sketch of $\cos 2x$; two cycles, Both axes scaled correctly (ii) (1-way) stretch parallel to y axis sf 3	1 1 D1 1 D1		5
6	$y' = 3x^2 - 12x - 15$ use of $y' = 0$, s.o.i. ft $x = 5, -1$ c.a.o. $x < -1$ or $x > 5$ f.t.	M1 M1 A1 A1 A1	for two terms correct	5
7	use of $\cos^2 \theta = 1 - \sin^2 \theta$ at least one correct interim step in obtaining $4 \sin^2 \theta - \sin \theta = 0$. $\theta = 0$ and 180 , 14.(47...) 165 - 166	M1 M1 B1 B1 B1	NB answer given r.o.t to nearest degree or better -1 for extras in range	5

8	attempt to integrate $3\sqrt{x} - 5$ [y=] $2x^{\frac{3}{2}} - 5x + c$ subst of (4, 6) in their integrated eqn $c = 10$ or [y=] $2x^{\frac{3}{2}} - 5x + 10$	M1	A1 for two terms correct	5
		A2		
		M1		
		A1		
9	(i) 7	1	M1 for at least one of $5 \log_{10} a$ or $\frac{1}{2} \log_{10} a$ or $\log_{10} a^{5.5}$ o.e.	3
	(ii) 5.5 o.e.	2		

Section B

10	i	0.6(0..), 0.8(45..), [1], 1.1(76..) 1.3(0..), 1.6(0..) points plotted correctly f.t. ruled line of best fit	T 1	Correct to 2 d.p. Allow 0.6, 1.3 and 1.6 tol. 1 mm	3
			P1		
			L1		
	ii	b = their intercept a = their gradient $-11 \leq b \leq -8$ and $21 \leq a \leq 23.5$	M1		3
			M1		
			A1		
	iii	34 to 35 m	1		1
	iv	$29 = "22" \log t - "9"$ $t = 10^{1.727..}$ 55 [years] approx	M1	accept 53 to 59	3
			M1		
			A1		
	v	For small t the model predicts a negative height (or $h = 0$ at approx 2.75) Hence model is unsuitable	1		2
			D1		

11	iA	10+20+30+40+50+60	B1	or $\frac{6}{2}(2 \times 10 + 5 \times 10)$ or $\frac{6}{2}(10 + 60)$	1
	iiB	correct use of AP formula with $a = 10$ and $d = 10$ $n(5 + 5n)$ or $5n(n + 1)$ or $5(n^2 + n)$ or $(5n^2 + 5n)$	M1 A1		
	iiA	$10n^2 + 10n - 20700 = 0$ 45 c.a.o. 4	M1 A1 1	Or better	4 1
	iiB	£2555	2	M1 for $5(1 + 2 + \dots 2^8)$ or $5(2^9 - 1)$ o.e.	2
	iiC	correct use of GP formula with $a = 5, r = 2$ $5(2^n - 1)$ o.e. = 2621435 $2^n = 524288$ www 19 c.a.o.	M1 DM1 M1 A1	"S" need not be simplified	 4
	i	6.1	2	M1 for $\frac{(3.1^2 - 7) - (3^2 - 7)}{3.1 - 3}$ o.e.	2
	ii	$\frac{((3+h)^2 - 7) - (3^2 - 7)}{h}$ numerator = $6h + h^2$ $6 + h$	M1 M1 A1	s.o.i.	 3
12	iii	as h tends to 0, grad. tends to 6 o.e. f.t.from "6"+h	M1 A1		2
	iv	$y - 2 = "6" (x - 3)$ o.e. $y = 6x - 16$	M1 A1	6 may be obtained from $\frac{dy}{dx}$	2
	v	At P, $x = 16/6$ o.e. or ft At Q, $x = \sqrt{7}$ 0.021 cao	M1 M1 A1		 3