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Paper 4 (Extended)

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Question	Answer	Marks	Part marks
1(a)(i)	600 ÷ (11+ 9) × 11 [=330] with no errors seen	M1	Could be in separate steps
1(a)(ii)	270	1	
1(b)(i)	372 cao nfww	3	B2 for answer 371.7 or M1 for 330 × $\left(1 + \frac{1.5}{100}\right)^8$ oe not spoiled
			After zero scored, SC1 for answer 42 or 41.7
1(b)(ii)	12.6 or 12.7 or 12.63 to 12.73	2	M1 for $\frac{their(\mathbf{b})(\mathbf{i}) - 330}{330}$ or $\frac{their(\mathbf{b})(\mathbf{i})}{330} \times 100$ soi by 112.7 or 113 After zero scored, SC1 for answer 12%
1(c)(i)	$\frac{99}{280}$ cao final answer	1	
1(c)(ii)	27.5[0]	3	M2 for $24.75 \div \frac{100-10}{100}$ oe or M1 for recognising 24.75 as 90[%] oe
1(d)(i)	32 cao	2	M1 for $\left(1 - \frac{20}{100}\right) \left(1 - \frac{15}{100}\right) [x]$ oe or for $0.15 \times 0.8 [x]$ oe
1(d)(ii)	13 cao	2	M1 for $\left(1 - \frac{20}{100}\right) \left(1 - \frac{15}{100}\right) \times x = 40.84 - 32$ oe seen or for <i>their</i> (d)(i) + $\left(1 - \left(\frac{their\ (\mathbf{d)(i)}}{100}\right)\right) x = 40.84$ oe
2(a)(i)	Image at (8, 1), (10, 5), (8, 5)	2	B1 for translation $\begin{pmatrix} 6 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ -5 \end{pmatrix}$ or 3 correct points not joined
2(a)(ii)	Image at (4, 10), (4, 8), (8, 8)	2	B1 for rotation 90° anticlockwise but different centre or for rotation 90° clockwise about (4, 10) or 3 correct points not joined
2(a)(iii)	Image at (6, 3), (6, 5), (7, 5)	2	B1 for enlargement factor $\frac{1}{2}$ but incorrect centre or 3 correct points not joined
2(b)	Reflection	1	
	y = -x oe	1	If zero scored, M1 for correct use of matrix product

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Question	Answer	Marks	Part marks
2(c)(i)(a)	(13) (16)	2	B1 for each in a 2 by 1 matrix or SC1 for (13 [,] 16)
2(c)(i)(b)	$\begin{pmatrix} 2 & 10 \\ 3 & 15 \end{pmatrix}$	2	B1 for answer any 2 by 2 matrix
2(c)(i)(c)	$\frac{1}{2} \begin{pmatrix} 4 & -3 \\ -2 & 2 \end{pmatrix}$ oe isw	2	B1 for $k \begin{pmatrix} 4 & -3 \\ -2 & 2 \end{pmatrix}$ oe soi $(k \neq 0)$ or for determinant = 2 oe soi
2(c)(ii)	NM or MP or N ² oe or P ² oe	1	
3(a)(i)	175.5 nfww	4	M1 for at least four of 50, 125, 175, 225, 325 soi
			M1 for Σfx with x inside or on boundary of each interval
			M1 (dep on second M1) for $\frac{\text{their } \Sigma fx}{200}$
3(a)(ii)	Fully correct histogram	4	B1 for each correct bar
			If zero scored, B1 for 0.2, 1.32, 0.7, 0.16 seen
3(b)(i)	Fully correct cumulative frequency diagram	3	B1 for correct horizontal plots B1 for correct vertical plots
			B1FT dep on at least B1 earned for points joined with smooth increasing curve or polygon If zero scored, SC1 for 4 correct plotted points
3(b)(ii)(a)	170 to 175	1	
3(b)(ii)(b)	152 to 158	2	M1 for 42 to 48 written
4(a)	-1.75 to -1.7	1	
	1.7 to 1.75	1	
4(b)(i)	Correct ruled solid tangent at (-1.5, 3.5)	1	
4(b)(ii)	−7 to −5	2 dep	dep on close attempt at ruled solid tangent at $x = -1.5$ in part (b)(i) M1 for rise/run dep on close attempt at ruled solid tangent at $x = -1.5$
4(c)(i)	1	1	
4(c)(ii)	Correct curve	3	B2 for 4 or 5 correct points or B1 for 2 or 3 correct points

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Question	Answer	Marks	Part marks
4(d)(i)	-0.95 to -0.8	1	
	1.1 to 1.45	1	
4(d)(ii)	their (-0.95 to -0.8) < x < their (1.1 to 1.45) oe	1FT	correct or FT their (d)(i)
4(e)(i)	0.125 oe and 0.03125 oe and 0.000976 to 0.000977 oe	1	
4(e)(ii)	0	1	accept zero, nought, etc
5(a)(i)	94.2 or 94.3 or 94.24 to 94.26	2	M1 for $\pi \times 3 \times 10$
5(a)(ii)	9.54 or 9.539	3	M2 for $\sqrt{10^2 - 3^2}$ or M1 for $h^2 + 3^2 = 10^2$ oe
5(a)(iii)	89.9 or 89.90 to 89.92	2	M1 for $\frac{1}{3} \times \pi \times 3^2 \times their(\mathbf{a})(\mathbf{ii})$
5(b)	108 or 107.9 to 108.1 nfww	4	M3 for $\frac{\pi \times 3 \times 10}{\pi \times 10^2} \times 360$ oe or $\frac{their (\mathbf{a})(\mathbf{i})}{\pi \times 10^2} \times 360$ oe or $\frac{2 \times \pi \times 3}{2 \times \pi \times 10} \times 360$ oe or or M2 for $\frac{x}{360} \times \pi \times 10^2 = their(\mathbf{a})(\mathbf{i})$ oe or $\frac{x}{360} \times 2 \times \pi \times 10 = 2 \times 3 \times \pi$ oe or M1 for $\frac{x}{360} \times 2 \times \pi \times 10^2$ seen or $\frac{x}{360} \times 2 \times \pi \times 10$ seen
5(c)	46.6 to 46.8	4	M3 for $\frac{their (\mathbf{b})}{360} \times \pi \times 10^2 - \frac{1}{2} \times 10 \times 10 \times \sin(their (\mathbf{b}))$ oe or M1 for $\frac{their (\mathbf{b})}{360} \times \pi \times 10^2$ or $their (\mathbf{a})(\mathbf{i})$ soi and M1 for $\frac{1}{2} \times 10 \times 10 \times \sin(their (\mathbf{b}))$ soi
6(a)	$\frac{1}{3}, \frac{6}{7}$ correctly placed	1	
	$\frac{4}{7}, \frac{3}{7}$ correctly placed	1	

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Question	Answer	Marks	Part marks
6(b)	$\frac{2}{21}$ oe	2	M1 for $\frac{2}{3} \times \frac{1}{7}$
6(c)(i)	$\frac{15}{21}$ oe	3	M2 for $\frac{2}{3} \times \frac{6}{7} + \frac{1}{3} \times \frac{3}{7}$ oe
			or M1 for $\frac{2}{3} \times \frac{6}{7}$ oe or $\frac{1}{3} \times \frac{3}{7}$ oe seen
6(c)(ii)	50	2FT	FT (70 × their (c)(i)) rounded up or down to integer
			M1 for 70 × their (c)(i)
6(d)	$\frac{10}{243}$ oe	2	M1 for $\frac{2}{3} \times \frac{1}{3} \times \frac{1}{3} \times \frac{1}{3} \times \frac{1}{3} = [\times k]$ oe nfww
	243		where k is positive integer less than 5
7(a)(i)	4.5 or $4\frac{1}{2}$ or $\frac{9}{2}$ final answer	3	M2 for $[2](4x + 7) = [2](6x - 2)$ oe
	2 2		or M1 for $2(2x + 6) + 2(2x + 1)$ oe or $4(3x - 1)$ oe or M1 for correctly reaching $ax = b$ from their linear
			equation
7(a)(ii)	$(2x+6)(2x+1) = (3x-1)^2$	M1	May be seen in different stages
	$5x^2 - 20x - 5 = 0$ oe	В3	B1 for $4x^2 + 2x + 12x + 6$ or better B1 for $9x^2 - 3x - 3x + 1$ or better
	$\frac{-(-20) \pm \sqrt{(-20)^2 - 4(5)(-5)}}{2(5)}$	M2	FT their 3 term quadratic provided formula used or complete the square
	2(5) oe		M1 for $\sqrt{(-20)^2 - 4(5)(-5)}$ oe or if in form $\frac{-(-20) + \sqrt{q}}{2(5)}$
			or $\frac{-(-20) - \sqrt{q}}{2(5)}$ FT ± <i>their</i> quadratic
			or for completing the square
			M2 for $2 \pm \sqrt{1+2^2}$ or M1 for $(x-2)^2$
	4.24 or 4.236 cao	B1	
7(b)(i)	(x+5)(x-1) final answer	2	B1 for $x(x-1) + 5(x-1)$ or $x(x+5) - [1](x+5)$ or for $(x+a)(x+b)$ where $ab = -5$ or $a+b=4$

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Question	Answer	Marks	Part marks
7(b)(ii)	$5(x+1) - 8x = x(x+1)$ or $5x + 5 - 8x = x^2 + x$	M2	Could be seen in different stages M1 for $5(x + 1) - 8x$ seen or for common denominator of $x(x + 1)$ for LHS or both sides soi
	-5 and 1 cao	A2	A1 for $x^2 + 4x - 5 = 0$ oe
8(a)	66[.0] or 66.03 to 66.04	2	M1 for $\tan = \frac{9}{4}$ oe
8(b)	$\sqrt{3^2 + 4^2}$ or $\frac{1}{2}\sqrt{6^2 + 8^2}$	M1	Any alternative method must be full and complete and result in exactly 5
8(c)	60.9 or 60.94 to 60.95	2	M1 for $\tan = \frac{9}{5}$ oe
8(d)	5.83 or 5.84 or 5.827 to 5.840	6	M1 for [PB or PC =] $\sqrt{9^2 + 5^2}$ or [XC =] $\sqrt{9^2 + 5^2} - 7.5$
			M1 for angle $BPX = 2 \times \text{invsin} \frac{3}{\text{their } PB}$ oe
			B1 for [PB or $PC = $] $\sqrt{106} = 10.29$ to 10.30 or $XC = 2.79$ to 2.8[0] or angle $BPX = 33.9$ or 33.86 to 33.90
			M2 for $\sqrt{(their PB)^2 + 7.5^2 - 2 \times their PB \times 7.5 \times \cos(their BPX)}$ oe
			or M1 for correct implicit equation
9(a)(i)	100	1	
9(a)(ii)	92.3 or 92.29 to 92.31	3	M2 for $200 \div (2 + \frac{10}{60})$ oe
			or M1 for 200 ÷ <i>their</i> time interval
			or M1 for $\frac{10}{60}$ soi oe
9(b)(i)	240 nfww	3	M2 for $\frac{V}{2} \left(\frac{30}{60} + \frac{20}{60} \right) = 100$ oe
			or $M1$ for any correct relevant area seen in terms of V
9(b)(ii)	$\frac{2}{9}$ oe	2FT	FT for their (b)(i) \div 1080 to 3 sf or better M1 for their (b)(i) $\times \frac{1000}{3600}$ soi

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Question	Answer	Marks	Part marks
10(a)	-11	1	
10(b)	7	2	M1 for $3x - 2 = 19$ or better
10(c)	25	2	M1 for $3 \times 3^x - 2$ oe
10(d)	$9x^2 - 8x + 2$ final answer	3	M1 for $(3x-2)^2 + 3x - 2 + x$ oe
			B1 for $\left[(3x-2)^2 = \right] 9x^2 - 6x - 6x + 4$ oe
10(e)	$\frac{x+2}{3}$ oe final answer	2	M1 for $x = 3y - 2$ or $y + 2 = 3x$ or $\frac{y}{3} = x - \frac{2}{3}$ or better

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