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MARK SCHEME

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Question	Answer	Marks	Part marks
1(a)(i)	$600 \div (11+9) \times 11$ [=330] with no errors seen	M1	Could be in separate steps
1(a)(ii)	270	1	
1(b)(i)	372 cao nfw	3	B2 for answer 371.7... or M1 for $330 \times \left(1 + \frac{1.5}{100}\right)^8$ 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 $\frac{\text{their (b)(i)} - 330}{330}$ or $\frac{\text{their (b)(i)}}{330} \times 100$ 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 $\text{their (d)(i)} + \left(1 - \left(\frac{\text{their (d)(i)}}{100}\right)\right)x = 40.84$ 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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2(c)(i)(a)	$\begin{pmatrix} 13 \\ 16 \end{pmatrix}$	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 N² oe or P² oe	1	
3(a)(i)	175.5 nfw	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

Question	Answer	Marks	Part marks
4(d)(i)	-0.95 to -0.8	1	
	1.1 to 1.45	1	
4(d)(ii)	<i>their</i> (-0.95 to -0.8) < x < <i>their</i> (1.1 to 1.45) oe	1FT	correct or FT <i>their</i> (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 $\frac{1}{3} \times \pi \times 3^2 \times \textit{their}(\text{a})(\text{ii})$
5(b)	108 or 107.9 to 108.1 nfw	4	M3 for $\frac{\pi \times 3 \times 10}{\pi \times 10^2} \times 360$ oe or $\frac{\textit{their}(\text{a})(\text{i})}{\pi \times 10^2} \times 360$ oe or $\frac{2 \times \pi \times 3}{2 \times \pi \times 10} \times 360$ oe or M2 for $\frac{x}{360} \times \pi \times 10^2 = \textit{their}(\text{a})(\text{i})$ oe or $\frac{x}{360} \times 2 \times \pi \times 10 = 2 \times 3 \times \pi$ oe or M1 for $\frac{x}{360} \times \pi \times 10^2$ seen or $\frac{x}{360} \times 2 \times \pi \times 10$ seen
5(c)	46.6 to 46.8	4	M3 for $\frac{\textit{their}(\text{b})}{360} \times \pi \times 10^2 - \frac{1}{2} \times 10 \times 10 \times \sin(\textit{their}(\text{b}))$ oe or M1 for $\frac{\textit{their}(\text{b})}{360} \times \pi \times 10^2$ or <i>their</i> (a)(i) soi and M1 for $\frac{1}{2} \times 10 \times 10 \times \sin(\textit{their}(\text{b}))$ soi
6(a)	$\frac{1}{3}, \frac{6}{7}$ correctly placed	1	
	$\frac{4}{7}, \frac{3}{7}$ correctly placed	1	

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 ($70 \times$ <i>their</i> (c)(i)) rounded up or down to integer M1 for $70 \times$ <i>their</i> (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 nfw 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 or M1 for $2(2x + 6) + 2(2x + 1)$ oe or $4(3x - 1)$ oe or M1 for correctly reaching $ax = b$ from <i>their</i> 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	B3	B1 for $4x^2 + 2x + 12x + 6$ or better B1 for $9x^2 - 3x - 3x + 1$ or better
	$\frac{-(-20) \pm \sqrt{(-20)^2 - 4(5)(-5)}}{2(5)}$ oe	M2	FT their 3 term quadratic provided formula used or complete the square 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 \pm <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 $a + b = 4$

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 $33.90\dots$ M2 for $\sqrt{(\text{their } PB)^2 + 7.5^2 - 2 \times \text{their } PB \times 7.5 \times \cos(\text{their } BPX)}$ 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 $200 \div \text{their time interval}$ or M1 for $\frac{10}{60}$ soi oe
9(b)(i)	240 nfw	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 $\text{their (b)(i)} \div 1080$ to 3 sf or better M1 for $\text{their (b)(i)} \times \frac{1000}{3600}$ soi

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 $[(3x - 2)^2 =] 9x^2 - 6x - 6x + 4$ 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