Published

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Abbreviations

cao   correct answer only
dep   dependent
FT   follow through after error
isw   ignore subsequent working
oe   or equivalent
SC   Special Case
nfww   not from wrong working
soi   seen or implied

Question	Answer	Mark	Part marks
1 (a)	Triangle drawn, vertices $(2, -4)$, $(2, -5)$, $(4, -4)$	2	**SC1** for translation $\begin{pmatrix} 5 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ -2 \end{pmatrix}$ or correct points not joined
(b)	Triangle drawn, vertices $(-3, 4)$, $(-3, 5)$, $(-1, 4)$	2	**SC1** for reflection in line $y = k$ or line $x = 1$ or correct points not joined
(c)	Enlargement	1	
	[factor] 3	1	
	[centre] $(-6, -5)$	1	
(d)	Stretch	1	
	x-axis invariant	1	
	[factor] 2	1	
2 (a) (i)	48	2	**M1** for $\dfrac{72}{3}$
(ii)	32.4[0]	1	
(iii)	$\dfrac{13}{30}$	2	**M1** for $\dfrac{72 - their(ii) - 8.4}{72}$ oe
(iv)	24	3	**M2** for $\dfrac{19.2}{0.8}$ oe or **M1** for recognising 19.2 is 80%
(b)	660	3	**M2** for $\dfrac{550 \times 2 \times 10}{100} + 550$ oe or **M1** for $\dfrac{550 \times 2 \times 10}{100}$ oe
(c)	663.9[0]	2	**M1** for 550×1.019^{10} oe

Question			Answer	Mark	Part marks
	(d)		1.5[0]	3	**M2** for $\sqrt[10]{\dfrac{638.3[0]}{550}}$ oe or **M1** for $550 \times m^{10} = 638.3[0]$
3	**(a)**	**(i)**	400	1	
		(ii)	350	1	
		(iii)	70	1	
		(iv)	170	2	**B1** for 30 seen
	(b)	**(i)**	Mid-values 40, 80, 125, 200 soi	**M1**	
			Σfx with correct frequencies and x's in correct intervals or on boundaries of correct intervals	**M1**	
			$\div$ 200	**M1(dep)**	Dependent on second M1
			106 nfww	**A1**	**SC2** for correct answer without working
		(ii)	Correct histogram	4	**B1** for correct widths **and B1** for each rectangle of correct height at 0.8, 1.6, 1.6 (up to **B3**) After 0 scored, **SC1** for 3 correct frequency densities seen
		(iii)	$\dfrac{10712}{39800}$ oe isw	2	**M1** for $\dfrac{104}{200} \times \dfrac{103}{199}$ oe
4	**(a)**		14 137 to 14 137.2 or 14 139	2	**M1** for $\dfrac{4}{3} \times \pi \times 15^3$
	(b)	**(i)**	104 000 or 103 600 to 103 700	3	**M2** for $\pi \times 25^2 \times 60 - 14140$ or **M1** for $\pi \times 25^2 \times 60$
		(ii)	52.8 or 52.75 to 52.81…	2	**M1** for *their* (b)(i) $\div (\pi \times 25^2)$ or $14\,140 \div (\pi \times 25^2)$
	(c)	**(i)**	15.8 or 15.81…..	3	**M2** for $[r^2 =]\ \dfrac{14140}{\frac{1}{3} \times \pi \times 54}$ or **M1** for $\dfrac{1}{3} \times \pi \times r^2 \times 54 = 14140$ oe

Question			Answer	Mark	Part marks
		(ii)	3580 or 3576 to 3581 nfww	4	**M1** for (*their* (c)(i))^2 + 54^2 **M1** for $\pi \times$ (*their* (c)(i)) $\times \sqrt{\{($*their* (c)(i)$)^2 + 54^2\}}$ **M1** for $\pi \times$ (*their* (c)(i))^2
5	(a)		9 10.5	1 1	
	(b)		Fully correct curve	5	**SC4** for correct curve, but branches joined **B3 FT** for 9 or 10 points plotted or **B2 FT** for 7 or 8 points plotted or **B1 FT** for 5 or 6 points plotted and **B1** for two separate branches not touching or cutting *y*-axis
	(c)		2.1 to 2.6	1	
			8.5 to 9	1	
	(d)		2, 3, 5, 7	2	**SC1** for correct 4 values and no more than one extra positive integer or ±2, ±3, ±5, ±7 or 3 correct values and no extras
	(e)		(− 2, − 12)	1	
	(f)	(i)	$20 + x^2 = x^3$ $x^3 - x^2 - 20 = 0$	M1 A1	Multiplication by *x* No errors or omissions
		(ii)	Fully correct curve $y = x^2$	2	**SC1** for U – shaped parabola, vertex at origin
		(iii)	2.5 to 3.5	1	
		(iv)	3.[0] to 3.1 or FT their answer to (iii)	1FT	**FT** dep on (iii) > 0
6	(a)	(i)	$[y =] \frac{1}{2}(80 - 2x)$ $A = their \frac{1}{2}(80 - 2x) \times x$ oe $A = 40x - x^2$ and $x^2 - 40x + A = 0$	M1 M1 A1	40 – *x* is enough No errors or omissions

Question	Answer	Mark	Part marks
(ii)	$(x-30)(x-10)$	B2	**B1** for $x(x-30)-10(x-30)$ $[=0]$ or $x(x-10)-30(x-10)$ $[=0]$ or **SC1** for $(x+a)(x+b)$ where $ab=300$ or $a+b=-40$
	30, 10	B1	
(iii)	$\sqrt{(-40)^2-4(1)(200)}$ or better	B1	or for $(x-20)^2$
	$p=--40$ and $r=2(1)$	B1	Must see $\dfrac{p+\sqrt{q}}{r}$ or $\dfrac{p-\sqrt{q}}{r}$ or both or for $20\pm\sqrt{200}$
	5.86	B1	If B0, **SC1** for 5.9 or 5.857 to 5.858
	34.14	B1	**and** 34.1 or 34.14… or 5.86 **and** 34.14 seen in working or −5.86 **and** −34.14 as final answers
(b) (i)	$\dfrac{200}{x}-\dfrac{200}{x+10}$	M2	or **M1** for $\dfrac{200}{x}$ or $\dfrac{200}{x+10}$ soi
	$\dfrac{200(x+10)-200x}{x(x+10)}=\dfrac{2000}{x(x+10)}$	A1	No errors or omissions
(ii)	16 [min] 40 [s]	3	**B2** for $0.2\dot{7}$ or 0.278 or 0.2777 to 0.2778 or $\dfrac{5}{18}$ [h] oe or $16.\dot{6}$ or 16.7 or 16.66 to 16.67 or $\dfrac{50}{3}$ [min] or **M1** for $2000\div 80(80+10)$ or $\dfrac{200}{80}-\dfrac{200}{90}$
7 (a) (i)	$\frac{1}{2}\mathbf{p}$	1	
(ii)	$\frac{1}{2}\mathbf{p}-\frac{1}{3}\mathbf{r}$	1	
(iii)	$\mathbf{p}+\frac{2}{3}\mathbf{r}$	1	

Question	Answer	Mark	Part marks
(b)	$\mathbf{r} + \frac{3}{2}\mathbf{p}$	2	**M1** for correct unsimplified answer or for correct route or for recognising $\overrightarrow{OU}$ as position vector
(c)	6 nfww	3	**B2** for $(2k)^2 + ([-]k)^2 = 180$ oe or **M1** for $(2k)^2 + ([-]k)^2$ oe
8 (a)	2	2	**M1** for $2x + 1 = 1 + 4$
(b)	17	2	**B1** for [h(3) =] 8 soi or $2 \times 2^x + 1$ oe
(c)	$\frac{x-1}{2}$ oe final answer	2	**M1** for $y - 1 = 2x$ or $\frac{y}{2} = x + \frac{1}{2}$ or $x = 2y + 1$
(d)	$4x^2 + 4x + 5$ final answer	3	**M1** for $(2x + 1)^2 + 4$ and **B1** for $[(2x + 1)^2 =] 4x^2 + 2x + 2x + 1$ or better
(e)	$\sqrt{2}$ or 1.41 or 1.414....	1	
(f)	-1	1	
9 (a)	4.5	2	**M1** for $\frac{7}{10.5} = \frac{3}{PQ}$ oe
(b) (i)	The lengths 12 and 18 are also in the ratio 2 : 3 oe	1	Must see 12, 18 in explanation
(ii)	$\frac{27V}{8}$	2	**M1** for $\left(\frac{3}{2}\right)^3$ or $\left(\frac{2}{3}\right)^3$ oe soi
(c)	23.7 or 23.74 to 23.75	3	**M2** for $\frac{3\sin 110}{7}$ or **M1** for $\frac{7}{\sin 110} = \frac{3}{\sin ACB}$ oe
10 (a) (i)	$-\frac{1}{2}x + 2$ oe	3	**SC2** for $y = -\frac{1}{2}x + c$ oe or **SC1** for $y = kx + 2$ oe, $k \neq 0$ or **M1** for [gradient =] $\frac{-2}{4}$ and **M1** for substituting (4, 0) or (0, 2) into $y = (their\ m)x + c$

Question	Answer	Mark	Part marks
(ii)	$\dfrac{16}{a^2}\left[+\dfrac{0^{[2]}}{b^2}\right]=1$ or $\dfrac{4^2}{a^2}\left[+\dfrac{0^{[2]}}{b^2}\right]=1$ and $a^{[2]}=4^{[2]}$	**1**	
	$\left[\dfrac{0^{[2]}}{a^2}\right]+\dfrac{4}{b^2}=1$ or $\left[\dfrac{0^{[2]}}{a^2}\right]+\dfrac{2^2}{b^2}=1$ and $b^{[2]}=2^{[2]}$	**1**	
(b) (i)	1.73 or 1.732.. or $\sqrt{3}$	**3**	**M2** for $\dfrac{k^2}{4}=\dfrac{3}{4}$ or better or **M1** for $\dfrac{2^2}{16}+\dfrac{k^2}{4}=1$ oe
(ii)	81.8 or 81.78 to 81.79	**3**	**M2** for $2\times\tan^{-1}\left(\dfrac{their\sqrt{3}}{2}\right)$ oe or **M1** for $\tan=\dfrac{their\sqrt{3}}{2}$ oe
(c) (i)	8π final answer	**1**	
(ii)	72π final answer	**2FT**	FT their (c)(i) × 9 in terms of π **M1** for area factor of 3^2 or 9 or [new a] = 12, [new b] = 6