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MARK SCHEME

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Abbreviations

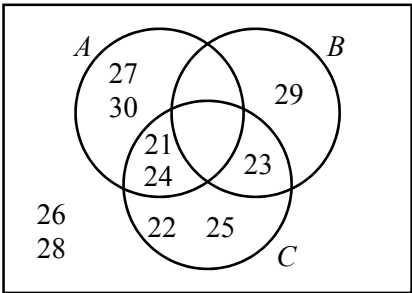
cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfw	not from wrong working
soi	seen or implied

Question	Answer	Marks	Part marks
1(a)(i)	9550	1	
1(a)(ii)	23 158 750	2FT	FT <i>their (a)(i)</i> $\times 2425$ correctly evaluated M1 for <i>their</i> lower bound $\times 2425$
1(a)(iii)	23 160 000	1FT	FT <i>their (a)(ii)</i> rounded to 4 sf
1(a)(iv)	2.316×10^7	1FT	FT <i>their (a)(iii)</i> or <i>their (a)(ii)</i> rounded to 3sf or more and in standard form
1(b)	520 nfw	3	M2 for $546 \times \frac{100}{(100+5)}$ oe or M1 for 105[%] associated with 546 oe
1(c)	3380 or 3376 to 3377	2	M1 for $3000 \times \left(1 + \frac{3}{100}\right)^4$ oe
2(a)	38	1	
	118	1	
	62	1FT	FT $180 - \textit{their } y$
2(b)	69	3	B2 for $ACB = 42$ or B1 for $ADB = 42$ If zero scored, SC1 for $ACB = \textit{their } ADB$
2(c)	107	2	B1 for $QPS = 73$ or [reflex] $QOS = 214$
3(a)	0 2.25 2 1.25	4	B1 for each
3(b)	Fully correct smooth curve	4	B3 FT for 7 or 8 points or B2 FT for 5 or 6 points or B1 FT for 3 or 4 points

Question	Answer	Marks	Part marks
3(c)	1	1	
3(d)(i)	$[y =] x + 1$	1	
3(d)(ii)	–2.2 to –2.1	1	
	–0.45 to –0.4	1	
	0.51 to 0.6	1	If zero scored, SC1 for <i>their</i> line in (d)(i) drawn. It must be of the form $y = mx + c$ ($m \neq 0$) and drawn ‘fit for purpose’
3(e)	$-1.33 < k < 0$ to 0.1	2FT	FT Strict fit of <i>their</i> max point and min point dep on cubic graph or accept correct answer from calculus B1 for each If zero scored, SC1 for two correct values reversed
4(a)(i)	17.5 or 17.46....nfww	6	B3 for triangle height 3.46[4...] or $\sqrt{12}$ oe or M2 for $\sqrt{4^2 - 2^2}$ or M1 for $h^2 + 2^2 = 4^2$ and M2 for $2 \times 7 + \frac{1}{2} \times 2 \times \text{their } h$ oe or M1 for $\frac{1}{2} \times 2 \times \text{their } h$
4(a)(ii)	140 or 139.6 to 139.7...	1FT	FT <i>their</i> (a) $\times 8$
4(b)(i)	2.62 or 2.618...	3	M2 for $[r^2 =] \frac{280}{13\pi}$ oe or M1 for $280 = \pi \times r^2 \times 13$
4(b)(ii)	10.2 or 10.20... or $10\frac{10}{49}$	3	M2 for $\frac{280}{14^3} [\times 100]$ oe or B1 for 2744 or 14^3 seen
5(a)(i)	80 33 20	1, 1, 1	
5(a)(ii)	17.3 nfww	4	M1 for 5, 15, 22.5, 27.5, 40 soi M1 for $\sum fx$ with <i>their</i> f 's and x in correct interval including both boundaries M1 (dep on 2nd M1) for $\sum fx \div 200$

Question	Answer	Marks	Part marks
5(b)(i)	$\frac{30}{210}$ oe	2	M1 for $\frac{6}{15} \times \frac{5}{14}$ If zero scored, SC1 for answer $\frac{36}{225}$ oe
5(b)(ii)	$\frac{108}{210}$ oe	3	M2 for $\frac{6}{15} \times \frac{9}{14} + \frac{9}{15} \times \frac{6}{14}$ oe or $1 - \frac{9}{15} \times \frac{8}{14} - \frac{6}{15} \times \frac{5}{14}$ or M1 for $\frac{6}{15} \times \frac{9}{14}$ or $\frac{9}{15} \times \frac{6}{14}$ or $\frac{9}{15} \times \frac{8}{14} + \frac{6}{15} \times \frac{5}{14}$ If zero scored, SC1 for answer $\frac{108}{225}$ oe
5(c)	150	1	
6(a)(i)	Translation	1	
	$\begin{pmatrix} 3 \\ -13 \end{pmatrix}$ oe	1	
6(a)(ii)	Enlargement	1	
	$[\text{sf}] - \frac{1}{2}$ oe	1	
	(0, -4)	1	
6(b)	Image at (0, 0) (0, 6) (-4, 6) (-4, 2)	2	B1 for rotation of 90° anticlockwise about the wrong centre or 90° clockwise about (3, -1) or 4 points correct but not joined.
6(c)	Image at (4, 0) (10, 0) (10, -4) (6, -4)	2	B1 for reflection in $y = k$ or in $x = 1$ or 4 points correct but not joined
6(d)	Enlargement	1	
	$[\text{sf}] 3$	1	
	Origin oe	1	

Question	Answer	Marks	Part marks
7(a)	$[x =] -5$ $[y =] 7$ with correct working	4	M1 for correctly equating one set of coefficients M1 for correct method to eliminate one variable OR M1 for correctly rearranging one equation M1 for correct method to eliminate one variable A1 $x = -5$ A1 $y = 7$ both dep on M2 If zero scored, SC1 for 2 values satisfying one of the original equations SC1 if no correct working shown, but 2 correct answers given
7(b)	$[a =] 36$ $[b =] -6$	3	B2 for either correct or M1 for $a = b^2$ or for $x^2 + bx + bx + b^2$ or better or for $(x - 6)^2$ seen and M1 for $2b = -12$ soi
7(c)	$\frac{7x^2 - 12x - 10}{(2x - 5)(x - 1)}$ oe final answer nfw	4	B1 for common denom $(2x - 5)(x - 1)$ seen oe isw M1 for $x(x - 1) + (3x + 2)(2x - 5)$ soi isw B1 for $6x^2 - 15x + 4x - 10$ soi
8(a)(i)	4 points correctly plotted	2	B1 for 2 or 3 points correctly plotted
8(a)(ii)	Positive	1	
8(b)	mean 3.1	3	M2 for $\frac{\text{sum of products}}{30}$ or M1 for at least 4 correct products soi
	median 3	2	M1 for 15.5 oe indicated
	mode 5	1	
	range 5	1	
8(c)	24 nfw	3	M1 for $\frac{x \times 52 + 45 \times 75 + 11 \times 91}{x + 45 + 11}$ [= 70.3] M1 for clearing <i>their</i> fraction

Question	Answer	Marks	Part marks
9(a)	1120 or 1121.	4	M2 for $[AC^2 =]$ $525^2 + 872^2 - 2 \times 525 \times 872 \times \cos 104$ or M1 for implicit version A1 for 1257000 to 1258000
9(b)	$[QB \text{ or } x =] 872 \times \tan 1$ seen	M2	M1 for $\tan 1 = \frac{QB}{872}$
	$\tan = \text{their } QB \div 525$	M1	
	1.7 or 1.660 to 1.661 nfw	A1	dep on M3
9(c)(i)	222 000 or 222 100. or 222 101	2	M1 for $\frac{1}{2} \times 525 \times 872 \times \sin 104$
9(c)(ii)	5.55 or 5.550 to 5.553 nfw	2FT	FT <i>their (c)(i)</i> $\times 100^2 \div 20\,000^2$ M1 for <i>their (c)(i)</i> $\times 100^2 \div 20\,000^2$ or restart
10(a)		4	All 8 regions correct M3 for 6 or 7 regions correct M2 for 4 or 5 regions correct M1 for 3 regions correct
10(b)(i)	$\notin$	1	
10(b)(ii)	$\emptyset$	1	
10(c)	21, 23, 24, 29	2FT	Correct or FT SC1 for 1 omission or 4 correct and 1 extra
10(d)(i)	5	1FT	Correct or FT if less than 10
10(d)(ii)	9	1FT	Correct or FT if less than 10
10(e)	$\subset$ or $\subseteq$	1	

Question	Answer	Marks	Part marks
11	64 $(n+3)^2$ oe final answer	1, 2	M1 for a quadratic expression seen or second differences 2
	17 $3n+2$ oe final answer	1, 2	B1 for $3n+k$ (any k) or $kn+2$ ($k \neq 0$)
	47 $(n+3)^2 - (3n+2)$ oe isw	1, 2FT	FT <i>their</i> difference expressions $A - B$ M1 for expression $an^2 + bn + c$ seen or second differences 2
	$\frac{7}{6}$ $\frac{n+2}{n+1}$ oe final answer	1, 2	B1 for $\frac{n+k+1}{n+k}$ seen