MATHEMATICS (US)	**0444/41**
Paper 4 (Extended)	**May/June 2017**
MARK SCHEME	
Maximum Mark: 130	

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	Marks	Part marks
1(a)(i)	Image at (1, 4), (3, 7), (1, 7)	2	**B1** reflection in $x = 4$ or $y = k$
1(a)(ii)	Image at (–1, 1), (–4, 1), (–1, 3)	2	**B1** correct size and correct orientation wrong position or for rotation 90° clockwise around (0, 0)
1(a)(iii)	Image at (2, – 4), (4, – 4), (2, – 1)	2	**B1** for translation by $\begin{pmatrix} 1 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ -5 \end{pmatrix}$
1(b)(i)	Enlargement or dilation	1	
	[sf] – 0.5 oe	1	
	(5, 5)	1	
1(b)(ii)	Stretch	1	
	[factor] 3	1	
	y-axis invariant oe	1	
2(a)(i)	275.31	2	**M1** for $90 \times 23.15 + 1885 \times 13.5$ oe
2(a)(ii)	3202	3	**M2** for $\dfrac{198.16 - 90 \times 0.245}{0.055}$ oe **M1** for 90×0.245 or 90×24.5 oe
2(b)	17.[0] or 17.00 to 17.01	2	**M1** for $13.5 \times \left(1 + \dfrac{8}{100}\right)^3$
2(c)(i)	40	3	**M2** for $\dfrac{7.7 - 5.5}{5.5}$ [$\times 100$] oe or $\dfrac{7.7}{5.5} \times 100$ or **M1** for $\dfrac{7.7}{5.5}$ oe
2(c)(ii)	11.9 or 11.86 to 11.87	3	**M2** for $\sqrt[3]{\dfrac{7.7}{5.5}}$ oe or **M1** for $5.5 \times x^3 = 7.7$ oe
2(d)	150 [million] oe	2	**M1** for 390 [million] ÷ (5 + 2 + 6)

Question	Answer	Marks	Part marks
2(e)	250 nfww	3	**M2** for $258.25 \div ((100 + 3.3) \div 100)$ or **M1** for 258.25 associated with 103.3[%]
3(a)	$71 < t \leqslant 72$	1	
3(b)	72.3 or 72.27 to 72.28 nfww	4	**M1** for midpoints soi (condone 1 error or omission) **M1** for use of $\sum fx$ with x in correct interval including both boundaries **M1** (dep on 2nd **M1**) for $\sum fx \div 90$
3(c)(i)	41, 62, 80, 90	2	**B1** for 2 correct values
3(c)(ii)	Correct curve	3	**B1FT** *their* **(c)(i)** for 5 correct heights **B1** for 5 points plotted at upper ends of intervals **B1FT** (dep on at least **B1**) for increasing curve or increasing polygon through 5 points If zero scored, **SC1FT** for 4 correct points plotted
3(c)(iii)	72.1 to 72.4	1	
3(c)(iv)	1.9 to 2.2	2	**M1** for UQ = 73.2 to 73.4 or LQ = 71.2 to 71.3
3(d)	184 or 184.4 to 184.5	4	**M3** for $3.72 \div \left(\dfrac{40}{60 \times 60} + \dfrac{1.72}{190} \right)$ oe or **M2** for $\left(\dfrac{40}{60 \times 60} + \dfrac{1.72}{190} \right)$ or $40 + \dfrac{1.72}{190} \times 60 \times 60$ or **M1** for $\left(\dfrac{40}{60 \times 60} \right)$ or $\left(\dfrac{1.72}{190} \right)$ or $\dfrac{1.72}{190} \times 60 \times 60$
4(a)	–1.6 to –1.4	1	
4(b)	–0.5	1	
4(c)	$k > -4$	2	**B1** for identifying the –4 or for horizontal line drawn $y = -4$
4(d)	$y = x - 5$ ruled and –2.3 to –2.1 –1.2 to –1.1 1.3 to 1.4	3	**B2** for correct line and 2 correct values or no line and 3 correct values or **B1** for no line and 2 correct values or **B1** for correct line

Question	Answer	Marks	Part marks
4(e)	Tangent ruled at $x = 1$	**B1**	No daylight at point of contact. Consider point of contact as midpoint between two vertices of daylight, the midpoint must be between $x = 0.8$ and 1.2
	–6 to –4	**2**	Dep on **B1** or close attempt at tangent at $x = 1$ **M1** for rise/run for *their* tangent at $x = 1$
5(a)	9	**1**	
5(b)	$[a =]\ 4$ $[b =]\ -4$ $[c =]\ 2$	**3**	**M1** for $(2x-1)^2 + 1$ **B1** for $[(2x-1)^2 =]\ 4x^2 - 4x + 1$
5(c)	$\dfrac{x+1}{2}$ oe final answer	**2**	**M1** for $y + 1 = 2x$ or for $\dfrac{y}{2} = x - \dfrac{1}{2}$ or for $x = 2y - 1$
5(d)	$\sqrt{3}$ or 1.73 or 1.732…	**1**	
6(a)(i)	50890 or 50893 to 50900.4	**2**	**M1** for $\pi \times 18^2 \times 50$
6(a)(ii)	20.5 or 20.52 to 20.534	**3**	**B2** for answer 29.5 or 29.46 to 29.48 OR **M2** for $(50900 - 30000) \div (\pi \times 18^2)$ oe or **M1** for (figs 50.9 –figs 30) $\div$ ($\pi \times$ figs 18^2) or **M1** for $(50900 - 30000) = (\pi \times 18^2)h$ oe OR **alternative method** **M2** for $50 - \dfrac{30000}{\pi \times 18^2}$ oe **M1** for figs $30 = \pi \times$ figs $18^2 \times (50 - h)$ oe or for $\dfrac{\text{figs } 30}{\pi \times \text{figs } 18^2}$ oe OR **alternative method** **M2** for $\dfrac{(50.9 - 30)}{50.9} \times 50$ oe or **M1** for $\dfrac{(50.9 - 30)}{50.9}$ or $\dfrac{30}{50.9} \times 50$ oe or **M1** for $\dfrac{(\text{figs } 50.9 - \text{figs } 30)}{\text{figs } 50.9} \times 50$ oe

Question	Answer	Marks	Part marks
6(a)(iii)	334 nfww	4	**M2** for figs $30 \div \frac{2}{3}\pi \times 3.5^3$ oe or **M1** for $\frac{1}{2} \times \frac{4}{3}\pi \times 3.5^3$ oe and **B1** for 30 000
6(b)(i)	3.28[6..] or 3.29	3	**M2** for $[r^2 =] \dfrac{95 \times 3}{8.4\pi}$ oe or **M1** for $\frac{1}{3}\pi \times r^2 \times 8.4 \ [= 95]$
6(b)(ii)	93.1 to 93.6	4	**M3** for $\pi \times 3.3 \times \sqrt{3.3^2 + 8.4^2}$ or **M2** for $\sqrt{3.3^2 + 8.4^2}$ or **M1** for $3.3^2 + 8.4^2$
7(a)(i)	$-7x + 55$ final answer	2	**M1** for $8x + 20$ or $-15x + 35$ or answer $-7x + k$ or $kx + 55$
7(a)(ii)	$x^2 - 14x + 49$ final answer	2	**M1** for 3 of $x^2 - 7x - 7x + 49$
7(b)(i)	-18	3	**M1** for a correct first step ie correctly multiplying by 3 or correctly dividing by 2 or for correctly subtracting 5 **M1** for correctly reaching $ax = b$ from *their* first step
7(b)(ii)	15	3	**M2** for $6x - 4x = 21 + 9$ oe or **M1** for $6x - 21$ or correct division by 3 or for correctly reaching $ax = b$ from *their* first step
7(b)(iii)	5 and -5	3	**B2** for 5 or -5 or **M1** for $[x^2 =] (74 + 1) \div 3$ or better
8(a)	$(-0.5, 3)$	2	**B1** for one correct value
8(b)	$[y =] -2x + 2$ final answer	3	**M1** for $\dfrac{-2 - 8}{2 - -3}$ or better **M1** for substitution of $(-3, 8)$ or $(2, -2)$ or *their* midpoint into $y = mx + c$ with *their* m
8(c)	$y = -2x + 7$ oe	2FT	**FT** *their* **(b)** **M1** for $y = (their\ -2)x + k$ ($k \neq 2$) or $y = kx + 7$ ($k \neq 0$) If zero scored, **SC1** for $(their - 2)x + 7$

Question	Answer	Marks	Part marks
8(d)	$x - 2y = -9$ or $-x + 2y = 9$ oe	4	**B3** for any correct equivalent in wrong form Or **M2** for $y = \frac{1}{2}x + k$ oe (**FT** negative reciprocal of *their* gradient in **(b)**) or **M1** for grad $= \frac{1}{2}$ (**FT** negative reciprocal of *their* gradient in **(b)**) **M1** for substitution of (1, 5) into $y = mx + c$ oe with *their m*
9(a)(i)	290	2	**M1** for 180 + 110 oe
9(a)(ii)	156.8 or 156.7[9..]	5	**B1FT** for $CBA = 10°$ (*their* **(a)** – 280) and **B3** for [angle $ACB =$]13.2° or **M2** for [sin C] $= \dfrac{50\sin(their\,10)}{38}$ or **M1** for $\dfrac{50}{\sin C} = \dfrac{38}{\sin(their\,10)}$ oe
9(a)(iii)	8.68 or 8.677 to 8.684	3	**M2** for [$x =$]$50\sin(their\,10)$ oe or **M1** for $\sin(their\,10) = \dfrac{x}{50}$ oe or **M1** for a correct right-angled triangle drawn with 50 as hypotenuse
9(b)(i)	$x(x - 25) = 2200$	1	and no errors seen
9(b)(ii)	$\dfrac{-(-25) \pm \sqrt{(-25)^2 - 4(1)(-2200)}}{2(1)}$ or better	B2	**B1** for $\sqrt{(-25)^2 - 4(1)(-2200)}$ or better **or** for $\left(x - \dfrac{25}{2}\right)^2$ oe or **B1** for $\dfrac{-(-25) + \sqrt{q}}{2(1)}$ or $\dfrac{-(-25) - \sqrt{q}}{2(1)}$ or both or for $\dfrac{25}{2} +$ or $- \sqrt{\left(\dfrac{25}{2}\right)^2 + 2200}$
	–36.04 and 61.04 final answer	B1,B1	If **B0B0**, **SC1** for values in ranges –36.042 to –36.041 **and** 61.041 to 61.042 seen or for answers –36[.0] or –36.042 to –36.041 **and** 61[.0] or 61.041 to 61.042 or –36.04 **and** 61.04 seen in working or for –61.04 **and** 36.04 as final ans

Question	Answer	Marks	Part marks
10(a)(i)	5 and 13	**1**	
10(a)(ii)	$8n - 3 = 203$	**M1**	Evaluation of 25th or 26th term with supporting evidence or explanation
	25.75 or $25\frac{3}{4}$	**A1**	Second evaluation of 25th or 26th terms with supporting evidence or explanation If zero scored, **SC1** for 25.75 or 197 and 205 with partial evidence or explanation
10(b)(i)	$6n + 7$ oe final answer	**2**	**B1** for $6n + c$ or $kn + 7$ $k \neq 0$
10(b)(ii)	$n^2 + n + 2$ oe final answer	**2**	**B1** for a quadratic expression or second difference = 2
10(c)	$[y =]$ 10	**2**	**M1** for $5(20 - y) = 50$
	[First term =] 14	**2**	**M1** for $5(x - their\ y) = 20$ or for $20 \div 5 + their\ y$