Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

MATHEMATICS	**0580/41**
Paper 4 (Extended)	**May/June 2016**
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	Mark	Part marks
1 (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
(d)	1.5[0]	3	**M2** for $\sqrt[10]{\dfrac{638.3[0]}{550}}$ oe or **M1** for $550 \times m^{10} = 638.3[0]$
2 (a) (i)	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
(ii)	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
(iii)	Enlargement	1	
	[factor] 3	1	
	[centre] $(-6, -5)$	1	
(b) (i)	$\begin{pmatrix} 2 & 5 \\ 3 & 10 \end{pmatrix}$	1	

Question	Answer	Mark	Part marks
(ii)	$\begin{pmatrix} 10 & 14 \\ 18 & 24 \end{pmatrix}$ final answer	2	**SC1** for one row or one column correct
(iii)	$\frac{1}{4}$ oe	3	**M2** for $1 \times 4 - 2 \times 3 = 4 \times k - 3 \times 1$ or better or **B1** for $1 \times 4 - 2 \times 3$ or $4 \times k - 3 \times 1$ seen
(c) (i)	Rotation	1	
	90° [anti-clockwise] oe	1	
	(0, 0) oe	1	
(ii)	$\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$	2	**SC1** for one correct row or column
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)	$\frac{10712}{39800}$ oe isw	2	**M1** for $\frac{104}{200} \times \frac{103}{199}$ oe
4 (a)	14 137 to 14 137.2 or 14 139	2	**M1** for $\frac{4}{3} \times \pi \times 15^3$
(b) (i)	104 000 or 103 600 to 103 700	3	**M2** for $\pi \times 25^2 \times 60 - 14140$ or **M1** for $\pi \times 25^2 \times 60$

Question	Answer	Mark	Part marks
(ii)	52.8 or 52.75 to 52.81…	2	**M1** for *their* (b)(i) ÷ $(\pi \times 25^2)$ 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 $\dfrac{1}{3} \times \pi \times r^2 \times 54 = 14\,140$ oe
(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)	$20 + x^2 = x^3$	M1	Multiplication by *x*
	$x^3 - x^2 - 20 = 0$	A1	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

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Question	Answer	Mark	Part marks
6 (a) (i)	$[y =] \dfrac{1}{2}(80 - 2x)$	**M1**	$40 - x$ is enough
	$A = their \dfrac{1}{2}(80 - 2x) \times x$ oe	**M1**	
	$A = 40x - x^2$ and $x^2 - 40x + A = 0$	**A1**	No errors or omissions
(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 **and** 34.1 or 34.14…
	34.14	**B1**	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 $\dfrac{200}{80} - \dfrac{200}{90}$

Question	Answer	Mark	Part marks
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	
(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)	$\dfrac{x-1}{2}$ oe final answer	2	**M1** for $y - 1 = 2x$ or $\dfrac{y}{2} = x + \dfrac{1}{2}$ 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) (i)	$-\dfrac{1}{2}x + 2$ oe	3	**SC2** for $y = -\dfrac{1}{2}x + c$ oe or **SC1** for $y = kx + 2$ oe, $k \neq 0$ or **M1** for [gradient =] $\dfrac{-2}{4}$ and **M1** for substituting (4, 0) or (0, 2) into $y = (their\ m)x + c$
(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	

Question	Answer	Mark	Part marks
(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

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