CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the May/June 2014 series

0580 MATHEMATICS

0580/42 Paper 4 (Extended), maximum raw mark 130

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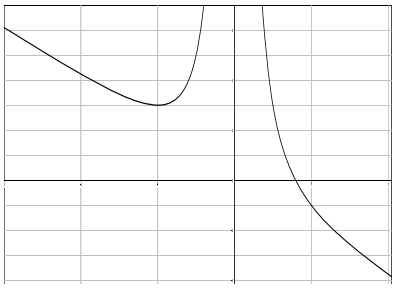
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Abbreviations

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

Qu		Answers	Mark	Part Marks
1	(a)	$240 \div (5+7) \times 7$ [=140] oe	M2	**M1** for $240 \div (5 + 7)$ or 240×7
	(b)	2 : 3 final answer	2	**B1** for ratio of form $2x : 3x$ seen or **SC1** for 3 : 2
	(c)	144	3	**M2** for $120 + \frac{120 \times 4 \times 5}{100}$ oe **or M1** for $\frac{120 \times 4 \times 5}{100}$
	(d)	89.99 cao mark final answer	3	**B2** for 89.9[8…] shown but not spoiled or answer 90[.0..] nfww or **M1** for $80 \times \left(\frac{104}{100}\right)^3$ oe If **M1** spoiled by adding 80 or subtracting 80 then **SC1** for answers 169.99 or 9.99
	(e)	4.08	3	**M2** for $\frac{200 \times r \times 2}{100} = 200 \times 1.04^2 - 200$ oe **or M1** for 200×1.04^2 [216.3[2]] oe **or** $\frac{200 \times r \times 2}{100}$ oe

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Qu		Answers	Mark	Part Marks
2	(a)	3, 3, – 1	3	**B1 B1 B1**
	(b)	Complete correct curve 	5	**B3FT** 11 points **or B2FT** for 9 or 10 points **or B1FT** for 7 or 8 points **And B1indep** two separate branches not touching or crossing y-axis
	(c)	0.5 to 0.6	1	
	(d)	Correct line and 0.4 to 0.5 **or** no line and 0.4 to 0.5 nfww	3	Must check line - not if wrong line **B2** for $y = 2x + 3$ ruled correctly **or SC1** for correct freehand line **or** ruled line with either gradient 2 or y-intercept 3 but not $y = 3$
	(e) (i)	Tangent at $x = – 1.5$	1	No daylight at $x = –1.5$. Consider point of contact as midpoint between two vertices of daylight, the midpoint must be between $x = – 1.7$ and $–1.3$
	(ii)	– 2 to – 1	2	**Dependent on** tangent mark awarded Allow integer/integer if in range **Or M1** for rise/run **also dep on** any tangent drawn or close attempt at tangent at any point Must see correct or implied calculation from a drawn tangent

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Qu		Answers	Mark	Part Marks
3	(a)	86.8 or 86.83….	3	**M2** for $\frac{80\sin 55}{\sin 49}$ or **M1** for $\frac{80}{\sin 49}=\frac{x}{\sin 55}$ oe
	(b)	51.2 or 51.15 to 51.16	4	**M2** for [cos =] $\frac{95^2+90^2-80^2}{2.95.90}$ oe **or M1** for $80^2=95^2+90^2-2.90.95.\cos BCD$ **A1** for $\frac{10\,725}{17\,100}$ or $\frac{143}{228}$ etc. or 0.627…..
	(c)	6700 or 6698 to 6703	3	**M2** for 0.5 × 80 × *their*(a) × sin(180-55-49) oe [3368 – 3370…] [If *AB* used then *AB*= 102.8 to 103] + 0.5 × 90 × 95 × sin(*their*(b)) oe [3329 – 3332] **or M1** for one of these triangle area methods oe
	(d)	2180 or 2176 to 2179	3FT	**FT** *their* (c) × 0.325 correctly evaluated to 3 sf or better **M2** for *their* (c) × $\frac{3250}{10\,000}$ **or SC1 FT** for figs 218 or figs 2176 to 2179

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Qu		Answers	Mark	Part Marks
4	**(a)**	Image at (–3, 2), (–5, 2), (–5, 4), (–3, 3)	**2**	**SC1** reflection in $y = -1$ or $x = k$ **or** 4 correct points not joined
	(b) (i)	Image at (–2, –4), (–6, –4), (–6, –8), (–2, –6)	**2**	**SC1** other enlargement of scale factor -2, correct size and correct orientation **or** 4 correct points not joined
	(ii)	$\begin{pmatrix} -2 & 0 \\ 0 & -2 \end{pmatrix}$	**2**	**SC1** for $\begin{pmatrix} k & 0 \\ 0 & k \end{pmatrix}$, k may be algebraic or numeric but not 0 or 1
	(c) (i)	Image at (1, 4), (3, 4), (3, 8), (1, 6)	**2**	**SC1** for trapezium with vertices at (1, 6) and (3, 8) or correct stretch with y-axis invariant **or** 4 correct points not joined
	(ii)	$\begin{pmatrix} 1 & 0 \\ 0 & 2 \end{pmatrix}$	**2**	**SC1** for $\begin{pmatrix} 1 & 0 \\ 0 & k \end{pmatrix}$ k may be algebraic or numeric but not 0 or 1 **or** for $\begin{pmatrix} 2 & 0 \\ 0 & 1 \end{pmatrix}$
	(iii)	$\frac{1}{2}\begin{pmatrix} 2 & 0 \\ 0 & 1 \end{pmatrix}$ oe isw	**2FT**	FT inverse of their (c)(ii) (algebraic or numeric) **B1FT** *their* (c)(ii) for $\frac{1}{2}\begin{pmatrix} a & c \\ b & d \end{pmatrix}$ or $p\begin{pmatrix} 2 & 0 \\ 0 & 1 \end{pmatrix}$ ie **FT** *their* correct fraction or *their* transposed matrix **FT** for **2** and **1** mark dependent on det $\neq 0$
	(iv)	Stretch, [factor] $\frac{1}{2}$, invariant [line] x-axis oe	**3**	**B1 B1 B1** each independent cao

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Qu		Answers	Mark	Part Marks
5	**(a) (i)**	2412 to 2413….	**B2**	Must be at least 4 figures shown **M1** for $\pi \times 8^2 \times 12$ oe
	(ii)	2.41[0]	**B1**	
	(b)	1 min 24 s	**4**	**B3** for 83.76 to 83.8[0] or 84 or 1.396 to 1.397 or 1.4 or 1 min 23.76 to 1 min 23.8 seen **or M2** for $\frac{1}{3}\pi \times 4^2 \times 10 \div 2$ [$80/3\,\pi$] **or M1** for $\frac{1}{3}\pi \times 4^2 \times 10$ [$160/3\,\pi$ or 167.5 to 167.6]
	(c)	14	**3**	**M1** for $\frac{2410}{\frac{1}{3}\pi \times 4^2 \times 10}$ or $\frac{2410}{\textit{their cone vol from part (b)}}$ **A1** for 14.3 to 14.4….
6	**(a) (i)**	[x =] 21, [y =] 42	**2**	**B1 B1**
	(ii)	3.79 or 3.8[0] or 3.792 to 3.802	**2**	**M1** for $\frac{3.31}{TQ} = \frac{8.23}{9.43}$ oe or $\frac{\sin 21 \textit{ or } \sin \textit{their } x}{TQ} = \frac{\sin 117}{9.43}$ oe
	(b)	40	**4**	**B3** for angle between HE and tangent = 25 **or** GFH = 40 **or** EGH = 25 **and** angle EHG = 115 (accept 90 and 25 at H for 115) **B2** for angle EGH = 25 **or** angle EHG = 115 (accept 90 and 25 at H for 115) **B1** for angle FEG = 25 **or** angle EFG = 65
	(c)	38	**5**	**B4** for angle ADC = 104 or **M4** for $x + 14 + 20 + x + 70 = 180$ or better **or B3** for angle OBA = 20 **and** angle OBC = 56 **or** angle CBA = 76 **or** reflex angle AOC = 208 **or B2** for angle OAB or OBA = 20 **and** angle ACB = 70 **or** obtuse angle AOC = 152 **or** angle BOC = 68 **or B1** for angle OAB or OBA = 20 **or** angle ACB = 70

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Qu		Answers	Mark	Part Marks
7	(a) (i)	(100 – 70) × 0.4 [= 12] or better	1	Accept $\frac{24}{78} \times 39$ oe
	(ii)	60.9 or 60.89… nfww	5	**B1** for 3 or 4 correct extra frequencies 3, 6, 10, 8 soi **M1** for at least 4 of mid-interval values 15, 40, 55, 65, 85 soi **M1** for Σfx where x is any value in each interval allow *their* frequencies provided integers and they must be shown [3 × 15 + 6 × 40 + 10 × 55 + 8 × 65 + 12 × 85] [2375] **M1** (**dependent on second M1**) for ÷ 39 **or** ÷ (3 + 6 + 10 + 8 +12)
	(b)	60.5	3	**M2** for 20 × 70 – 19 × 70.5 oe **or M1** for either 20 × 70 or 19 × 70.5
8	(a) (i)	$\frac{600}{x}$	1	Not $x = \frac{600}{x}$
	(ii)	$\frac{600}{x+1}$	1	Not $x = \frac{600}{x+1}$
	(b) (i)	$\frac{600}{x} - \frac{600}{x+1} = 20$ oe	M1FT	**FT** *their* (a)(i) – *their* (a)(ii) = 20 oe If **M0, SC1FT** for *their*(a)(ii) – *their* (a)(i) = 20 oe
		$600(x+1) - 600x = 20x(x+1)$ or better	A1	May still be over common denominator and can be implied by third line. Allow recovery if bracket omitted
		$600x + 600 - 600x = 20x^2 + 20x$ $0 = 20x^2 + 20x - 600$ $x^2 + x - 30 = 0$	A1	**Dep on M1A1** and conclusion reached with at least one of the interim lines and without any errors or omissions

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Qu		Answers	Mark	Part Marks
	(ii)	$x = 5$	B3	**B2 for** $(x+6)(x-5)$ [= 0] oe **or SC1** for $(x+a)(x+b)$ where $ab = -30$ or $a+b=1$ **or B2** for $\frac{-1+or-\sqrt{1^2-4.1.-30}}{2.1}$ or $\sqrt{30+\left(\frac{1}{2}\right)^2}-\frac{1}{2}$ **or B1 for** $\frac{-1+or-\sqrt{q}}{2.1}$ **or** $\sqrt{1^2-4.1-30}$ **or** $\left(x+\frac{1}{2}\right)^2$
		100	B1FT	**FT** 600 ÷ (*their* x + 1) if $x > 0$ correctly evaluated
9	(a)	$\frac{1}{4}, \frac{9}{10}, \frac{1}{3}, \frac{2}{3}$	3	**B1** for $\frac{1}{4}$ **B1** for $\frac{9}{10}$ **B1** for $\frac{1}{3}$ **and** $\frac{2}{3}$
	(b)	45	1	
	(c)	$\frac{3}{40}$ oe	2	**M1** for $\frac{3}{4}\times\frac{1}{10}$ oe
	(d)	$\frac{101}{120}$ oe	3	**M2** for $\frac{3}{4}\times\frac{9}{10}+\frac{1}{4}\times\frac{2}{3}$ only or $1-$ *their* (c) $-\frac{1}{4}\times\frac{1}{3}$ only **or M1** for $\frac{3}{4}\times\frac{9}{10}$ or $\frac{1}{4}\times\frac{2}{3}$ or *their* (c) + $\frac{1}{4}\times\frac{1}{3}$
	(e)	$\frac{781}{1024}$ oe	2	**M1** for $1-\left(\frac{3}{4}\right)^5$ oe

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Qu		Answers	Mark	Part Marks
10	(a)	2	2	**B1** for g $\left(\frac{1}{2}\right)=\frac{1}{2}$ soi or [fg=] $\frac{1}{1-x}$
	(b)	$1-x$	1	Accept equivalents e.g. $-(x-1)$
	(c)	x^2-2x+2	3	**M1** for $(1-x)^2+1$ **B1** for $(1-x)^2 = 1-x-x+x^2$ or better
	(d)	– 6	1	
	(e)	$\sqrt{(-3)^2-4(1)(1)}$ or better	B1	**or** for $\left(x-\frac{3}{2}\right)^2$
		$p=-(-3)$ and $r=2\times1$ oe	B1	Must see $\frac{p+\sqrt{q}}{r}$ or $\frac{p-\sqrt{q}}{r}$ or both **or** for $\frac{3}{2}+or-\sqrt{\left(\frac{3}{2}\right)^2-1}$
		0.38, 2.62	B1B1	**SC1** for answers 0.4 **and** 2.6 or 0.3819 to 0.3820 **and** 2.618… or 0.38 **and** 2.62 seen in working or for –0.38 and –2.62 as final ans
	(f)	f(x) and g(x)	1	Accept f and g or $1/x$ and $1-x$

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Qu		Answers	Mark	Part Marks
11		$\frac{1}{3}$	1	Allow equivalent decimal throughout (3sf or better where necessary)
		$\frac{72}{360}$ oe	1	
		$\frac{1}{4}$	2	**M1** for $\left(\frac{1}{2}\right)^2$ or $(2)^2$ or $1^2 : 2^2$ or $2^2 : 1^2$ oe seen
		$\frac{1}{6}$	2	**M1** for $[X = 6 \times]\ 0.5 \times l^2 \times \sin 60$ or $[X = 6 \times]\ 0.5 \times l^2 \times \sin 120$ Or recognition that the area of the obtuse-angled triangle shaded is equal to the area of one of the 6 equilateral triangles from the centre
		$\frac{\pi - 2}{\pi}$ or $1 - \frac{2}{\pi}$ or 0.363 or 0.3630 to 0.3635	4	If fraction given as answer, check if it falls into range **B1** for [sector=] $\frac{1}{4}\pi r^2$ oe **B1** for [triangle =] $\frac{1}{2}r^2$ oe **M1dep** for $\frac{\text{their sector} - \text{their triangle}}{\text{their sector}}$ dep on **B1B1** earned

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