CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the May/June 2014 series

0580 MATHEMATICS

0580/41 Paper 4 (Extended), maximum raw mark 130

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

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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) (i)	$\begin{pmatrix} 6 & 4 \\ -2 & 2 \end{pmatrix}$	1	
	(ii)	Not possible	1	
	(iii)	$\begin{pmatrix} 6 & 4 \\ -2 & 2 \end{pmatrix}$	2	**B1** for one row or column correct
	(iv)	$\frac{1}{5}\begin{pmatrix} 1 & -2 \\ 1 & 3 \end{pmatrix}$ oe isw	2	**B1** for $\frac{1}{5}\begin{pmatrix} a & c \\ b & d \end{pmatrix}$ seen or $k\begin{pmatrix} 1 & -2 \\ 1 & 3 \end{pmatrix}$ seen
	(b)	1 column in **C** and 2 rows in **D**	1	Any clear indication
	(c)	Enlargement [Factor] 2 [Centre] (0, 0) oe	1 1 1	
2	(a)	8	2	**M1** for 12 ÷ 1.5 oe
	(b)	[Distance =] 36 *their*36 ÷ 3 [= 12] oe	B1 M1	
	(c)	200	2	**M1** for 12 × 1000 ÷ 60 oe e.g. 36 000 ÷ 180
	(d)	Horizontal line at 36 to 13 45 (*their* 13 45, 36) joined to (16 42, 0)	1 1FT	
3	(a)	62 705	2	**M1** for 75 246 ÷ 6 soi by 12 541 or 75 246 × 5
	(b)	10.9 or 10.88…	3	**M2** for $\frac{(150\,675 - 135\,890)}{135\,890} \times 100$ oe **or** **M1** for correct fraction soi by 0.1088… or $\frac{150\,675}{135\,890} \times 100$ soi by 110.88…

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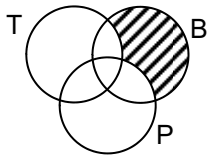
Qu		Answers	Mark	Part Marks
	(c)	127 000	**3**	**M2** for 135 890 ÷ 1.07 oe **or** **M1** for 135 890 associated with 107%
	(d) (i)	59 112 to 59 113 or 59 100 or 59 110 or 59 119 to 59 120 or 59 100 nfww	**3**	**M2** for $\pi \times 21 \times (30^2 - 2^2)$ oe **Or** **M1** for $\pi \times 21 \times 30^2$ or $\pi \times 21 \times 2^2$
	(ii)	(a) 0.0125	**1**	
		(b) 7580 or 7582 or 7581 or 7583 nfww	**4**	**M1** for 21 × 29.7 × *their* 0.0125 [=7.796 or 7.8[0]] **and** **M1** for *their* **(d)(i)** ÷ (21 × 29.7 × *their* 0.0125) **A1** for 7580 to 7583.2 (non integer) If 0 then **SC1** for *their* **(d)(i)** ÷ (21 × 29.7 × 0.125)
4	**(a)**	$4 - x$ correctly placed $5 - x$ correctly placed 7 correctly placed	**1** **1** **1**	**SC3** for 1, 2 and 7 all correctly placed instead of expressions in x
	(b)	$4 + 11 + (6 - x) + x + 9 + (4 - x) + (5 - x) + 7 = 40$ oe	**M1**	FT from their Venn diagram, condone omission of one subset
		$46 - 2x = 40$ nfww	**A1**	Must be in the form $a + bx = c$, ie each side simplified, or better
		$x = 3$	**B1**	
	(c) (i)	$\frac{9}{40}$ or 0.225 or 22.5%	**1**	ISW cancelling or conversion after correct answer seen
	(ii)	2	**1FT**	FT from their Venn diagram and their x provided $n(B \cap P \cap T') \neq 5$
	(iii)	15	**1FT**	FT from their Venn diagram
	(iv)	25	**1FT**	FT from their Venn diagram
	(v)	4	**1**	
	(d)	Correct region shaded.  	**1**	

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Qu		Answers	Mark	Part Marks
5	(a)	[0]44 to [0]48	1	
	(b)	12.6 to 13.2	2	**B1** for 8.4 to 8.8 seen
	(c)	340	1	
	(d)	1 : 150 000	2	**M1** for × 100 000 soi
	(e)	Arcs for perp bisector of *SL*	1	Two pairs of correct arcs
		Ruled perp bisector of *SL*	1	Within tolerance of overlay
		Arcs for bisector of angle *PSL*	1	Marks on *PS* and *SL* plus one pair of correct arcs
		Ruled bisector of angle *PSL*	1	Within tolerance of overlay
		B marked within accuracy	1	Within tolerance of overlay Dep on two correct bisectors drawn
	(f)	3.375	2	**M1** for 1.5×1.5^2 or $(2/3)^2$ seen
6	(a) (i)	0.6 oe	2	**M1** for 0.2 + 0.4
	(ii)	1500	1	
	(iii)	0.03 oe	2	**M1** for 0.1 × 0.3
	(b)	$\frac{112}{132}$ oe $\frac{28}{33} = 0.848[4\ldots]$	3	**M2** for $1 - \frac{5}{12} \times \frac{4}{11}$ or $\frac{7}{12} \times \frac{5}{11} + \frac{5}{12} \times \frac{7}{11} + \frac{7}{12} \times \frac{6}{11}$ or $\frac{7}{12} + \frac{5}{12} \times \frac{7}{11}$ **or** **M1** for addition of any two of $\frac{7}{12} \times \frac{5}{11}$, $\frac{5}{12} \times \frac{7}{11}$, $\frac{7}{12} \times \frac{6}{11}$ or sum of 3 products with an error in the numerator of one product or for $\frac{5}{12} \times \frac{4}{11}$ identified

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Qu		Answers	Mark	Part Marks
7	(a) (i)	Image: (–4, –3), (–4, –1), (–3, –1)	2	**SC1** for translation $\begin{pmatrix}-5\\k\end{pmatrix}$ or $\begin{pmatrix}k\\-4\end{pmatrix}$
	(ii)	Image: (1, –1), (3, –1), (3, –2)	2	**SC1** for rotation about the origin but 90º anticlockwise
	(b) (i)	Image: (2, 1), (2, 3), (4, 3)	3	**B2** for 2 correct vertices plotted **or** **SC2** for 3 vertices shown in working **or** **SC1** for 2 vertices shown in working **or** **M1** $\begin{pmatrix}2&0\\0&1\end{pmatrix} \times \begin{pmatrix}1&1&2\\1&3&3\end{pmatrix}$
	(ii)	Stretch [factor] 2 Invariant line *y*-axis oe	1 1 1	 Accept $x = 0$, stays the same
8	(a)	2.125 and 2.375	2	**B1** for one correct value
	(b)	Correct curve	B4	**B3FT** for 11 correct plots **or** **B2FT** for 9 or 10 correct plots **or** **B1FT** for 7 or 8 correct plots
	(c)	Ruled tangent at $x = 2$	B1	No daylight at $x = 2$. Consider point of contact as midpoint between two vertices of daylight, this must be between $x = 1.8$ and 2.2
		Gradient from 7.8 to 10.2	2	**Dep** on B1 awarded Allow integer/integer or a mixed number if within range **or** **M1 dep** for (change in *y*) ÷ (change in *x*) Dependent on any tangent drawn or close attempt at a tangent at <u>any</u> point Must see correct or implied calculation from a drawn tangent
	(d)	0 and –1.75 to –1.65 and 1.65 to 1.75	2	**B1** for two correct values
	(e)	-1.2 to $-0.8 < k < 2.8$ to 3.2	2	**B1** for each correct or **SC1** for reversed answers

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Qu		Answers	Mark	Part Marks
9	(a) (i)	37.5 to 38.5	1	
	(ii)	19.5 to 20.5 nfww	2	**B1** for [LQ =] 23.5 to 24 or [UQ =] 43.5 to 44
	(iii)	43	2	**B1** for 56 seen or horizontal line drawn at cf = 56
	(b) (i)	31.8[4…] nfww	4	**M1** for midpoints soi (condone 1 error or omission) and **M1** for use of $\sum ft$ with t in correct interval including both boundaries (condone 1 further error or omission) and **M1** (**dep** on 2nd M1) for $\sum ft \div 80$ (2547.5 ÷ 80)
	(ii)	Correct histogram	4	**B1** for each correct block with correct width and height If **B0** then **SC1** for four correct f.d.s or four correct widths
10	(a) (i)	5	1	
	(ii)	$-2\frac{1}{3}$ oe	2	**B1** for [h(– 1) =] $\frac{1}{3}$ soi or **M1** for $2(3^x) - 3$
	(iii)	$\frac{x+3}{2}$ or $\frac{x}{2} + 1.5$ as final ans	2	**M1** for $y + 3 = 2x$ or $x = 2y - 3$ or $\frac{y}{2} = x - 1.5$ or better or correct reverse flowchart
	(iv)	$4x - 9$ as final answer nfww	2	**M1** for $2(2x - 3) - 3$
	(v)	$(2x - 3)(x + 1) = 1 + 2(x + 1)$	M1	$(2x - 5)(x + 1) = 1$ (eliminate fractions)
		$2x^2 - 3x + 2x - 3$ or better seen	B1	$2x^2 - 5x + 2x - 5$ or better seen
		$2x^2 - 3x - 6 = 0$	A1	No errors or omissions seen

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Qu		Answers	Mark	Part Marks
	(vi)	$\frac{-(-3) \pm \sqrt{(-3)^2 - 4 \times 2 \times -6}}{2 \times 2}$	**B2**	**B1** for $\sqrt{(-3)^2 - 4 \times 2 \times -6}$ or better [$\sqrt{57}$] and if in form $\frac{p + \sqrt{q}}{r}$ or $\frac{p - \sqrt{q}}{r}$ **B1** for $p = -(-3)$ and $r = 2 \times 2$ or better
		2.64 and – 1.14 cao	**B1B1**	**SC1** for 2.64 **and** –1.14 seen in working or 2.6 **and** –1.1 as final ans or 2.637. **and** –1.137.. as final ans or –2.64 **and** 1.14 as final ans
	(b)	$\frac{x-1}{x+5}$ as final answer nfww	**4**	**B3** for $(x - 1)(x - 2)$ and $(x + 5)(x - 2)$ **or B2** for $(x - 1)(x - 2)$ or $(x + 5)(x - 2)$ **or SC1** for $(x + a)(x + b)$ where $a + b = 3$ or -3 or $ab = 2$ or -10
11	**(a) (i)**	(– 5, 7)	**1**	
	(ii)	5	**2**	**M1** for $\sqrt{(-3)^2 + 4^2}$ or better
	(b) (i)	(a) $\frac{3}{5}\mathbf{a} + \frac{2}{5}\mathbf{b}$ or $\frac{1}{5}(3\mathbf{a} + 2\mathbf{b})$ final answer	**2**	**M1** for any correct vector path for $\overrightarrow{ON}$
		(b) $\frac{2}{5}\mathbf{a}$	**2**	**M1** for any correct vector path for $\overrightarrow{NY}$
	(ii)	$NY = \frac{2}{5}BC$ oe	**1dep**	**dep** on **(b)(i)(b)** correct
		[NY] parallel to [BC]	**1dep**	**dep** on $\overrightarrow{NY} = k\mathbf{a}$, $k \neq 1$

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