CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International General Certificate of Secondary Education

MARK SCHEME for the October/November 2014 series

0580 MATHEMATICS

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

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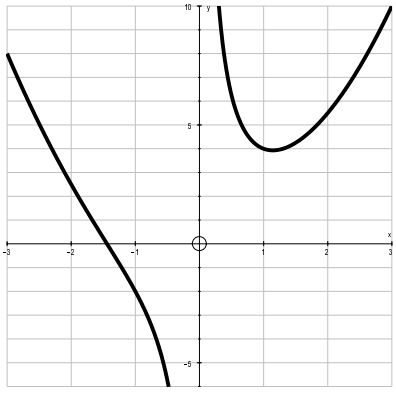
Abbreviations

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)		**2**	**M1** for 72 ÷ (7 + 2 + 3)
(ii)		**2**	**M1** for 13.5 ÷ 3 × (7 + 2 + 3) oe
(iii)		**3**	**M2** for 8.4[0] ÷ 1.12 oe or **M1** for 112[%] associated with [$]8.4[0] oe
(b) (i)	6 × 0.5 × 2 × 2 × sin60 oe	**M2**	**M1** for a correct relevant area inside the hexagon e.g. 0.5 × 2 × 2 sin60 oe
	10.38 to 10.39[…] [= 10.4]	**A1**	Must see 10.38 to 10.39[…]
(ii)	4.67 to 4.68	**2**	**M1** for 10.4 × figs 45 [figs 467 to 468]
(iii)	273	**4**	**M1** for *their* **(b)(ii)** × 1250 ÷ 1000 **A1 FT** for *their* **(b)(ii)** × 1250 ÷ 1000 evaluated to at least 3 sf **M1dep** on previous **M1** for *their* mass in tonnes (rounded up) × 45.5[0] if between 6 and 10 or for *their* mass in tonnes (rounded up) × 47[.00] if between 1 and 5 or for *their* mass in tonnes (rounded up) × 44[.00] if over 10

Qu	Answers	Mark	Part Marks
2 (a)	$[\pm]\sqrt{v^2 + 2as}$ final answer	2	**M1** for correct first step, i.e. $u^2 = v^2 + 2as$
(b) (i)	$\frac{60}{x} + \frac{45}{x+4} = 6$ oe	M2	**B1** for either $\frac{60}{x}$ or $\frac{45}{x+4}$ seen
	$60(x + 4) + 45x = 6x(x + 4)$ or better	M1	**Dep** on **M2**
	$60x + 240 + 45x = 6x^2 + 24x$ oe $0 = 2x^2 – 27x – 80$	A1	$[6x^2 – 81x – 240 = 0]$ Dep on **M3** and brackets expanded and with no errors or omissions throughout
(ii)	16 final answer	3	**M2** for $(x – 16)(2x + 5)$ [= 0] or **M1** for partial factorisation e.g. $x(2x + 5) – 16(2x + 5)$ or **SC1** for $(x + a)(2x + b)$[= 0] where $ab = –80$ or $2a + b = –27$ or **B2** for $\frac{--27 + or - \sqrt{(-27)^2 - 4.2.-80}}{2.2}$ or $[-]\sqrt{40 + \left(\frac{27}{4}\right)^2} + \frac{27}{4}$ or **B1** for $\frac{--27 + or - \sqrt{q}}{2.2}$ or $\sqrt{(-27)^2 - 4.2.-80}$ or $\left(x - \frac{27}{4}\right)^2$
(c) (i)	0.75×20 [=15]	1	
(ii)	150 cao	4	**M3** for $90 + T = 1800 \times 2 \div 15$ oe or $T – 110 = (1800 – (90 \times 15) – (20 \times 15 \div 2)) \times 2 \div 15$ oe or $t = (1800 – (90 \times 15) – (20 \times 15 \div 2)) \times 2 \div 15$ oe [$t = 40$] or **M2** for ½ $(90 + T) \times 15 = 1800$ oe or ½ $(T – 110) \times 15 + 90 \times 15 + ½ (20 \times 15) = 1800$ oe or $1800 – ½ \times 20 \times 15 – 90 \times 15$ oe [300 for area of 'end' triangle] or **M1** for method for area of triangle or rectangle or trapezium soi

Qu	Answers	Mark	Part Marks
(d)	10 cao nfww	**3**	**M2** for 22.5 ÷ 2.25 or **M1** for 21.5 to 22.5 ÷ 2.25 to 2.75 or **B1** for 22.5 or 2.25 seen
3 (a)	Correct reflection (0, 1) (3, 1) (3, 3)	**1**	
(b)	Correct rotation (–5, 1) (–7, 1) (–5, 4)	**2**	**SC1** for rotation of 90º anticlockwise about the wrong centre or 90º clockwise about (–4, 0) or for 3 correct points plotted but not joined
(c) (i)	Enlargement [scale factor] 2 [centre] (–7, 7)	**3**	**B1** for each
(ii)	1 : 4 or 3 : 12 or ¼ : 1	**2**	**M1** for $1 : 2^2$ oe, e.g. $(3 \times 2)/2 : (6 \times 4)/2$ or **SC1** for 4 : 1 or 12 : 3 or 1 : ¼
(d)	$\begin{pmatrix} 4 & 0 \\ 0 & 1 \end{pmatrix}$	**2**	**B1** for $\begin{pmatrix} k & 0 \\ 0 & 1 \end{pmatrix}$, k may be algebraic or numeric but $\neq 0$ or 1 or **SC1** for $\begin{pmatrix} 1 & 0 \\ 0 & 4 \end{pmatrix}$
(e) (i)	Correct shear drawn (0, 1) (–3, –5) (–3, –3)	**3**	**B2** for two correct points plotted or if not plotted correctly shown in working or **B1** for $\begin{pmatrix} 1 & 0 \\ 2 & 1 \end{pmatrix}\begin{pmatrix} -3 \\ 3 \end{pmatrix}$ or $\begin{pmatrix} 1 & 0 \\ 2 & 1 \end{pmatrix}\begin{pmatrix} -3 \\ 1 \end{pmatrix}$ or $\begin{pmatrix} 1 & 0 \\ 2 & 1 \end{pmatrix}\begin{pmatrix} 0 \\ 1 \end{pmatrix}$ or better
(ii)	Shear y-axis or $x = 0$ invariant [factor] 2	**3**	**B1** for each
(iii)	$\begin{pmatrix} 1 & 0 \\ -2 & 1 \end{pmatrix}$ oe	**2**	**B1** for [determinant =] 1 shown or stated or $k\begin{pmatrix} 1 & 0 \\ -2 & 1 \end{pmatrix}$ soi, $k \neq 0$

Qu	Answers	Mark	Part Marks
4 (a) (i)	$11 - x$ final answer	**2**	**M1** for $8x - 4 - 9x + 15$ or **B1** for final answer $11 - kx$ or $k - x$
(ii)	$6x^2 - xy - 12y^2$ final answer	**3**	**M2** for $6x^2 + 8xy - 9xy - 12y^2$ [= 0] or for final answer with **one** error in a **coefficient** (includes sign) but otherwise correct or **M1** for any two of $6x^2$, $8xy$, $-9xy$, $-12y^2$
(b)	$x(x^2 - 5)$ final answer	**1**	Condone $x(x - \sqrt{5})(x + \sqrt{5})$ as final answer
(c)	$x \geqslant 4$ or $4 \leqslant x$ final answer nfww	**3**	**B2** for 4 with no/incorrect inequality or equals sign as answer or **M2** for $8x + 4 \leqslant 15x - 24$ or better or **M1** for $4(2x + 1) \leqslant 3(5x - 8)$
(d) (i)	$p = 4.5$ oe $q = 8.25$ oe	**3**	**B2** for one correct answer or for $(x - 4.5)^2 - 8.25$ oe seen or **M1** for $(x - 4.5)^2$ oe seen or $x^2 - px - px + p^2$ seen and **M1** for $p^2 - q = 12$ or $2p = 9$
(ii)	-8.25 oe	**1FT**	**FT** – *their q*
(iii)	$x = 4.5$ oe	**1FT**	**FT** x = *their p*
5 (a)	-2, 5.5	**2**	**B1** for each value
(b)	Correct curve 	**5**	**B5** for correct curve over full domain or **B3FT** for 9 or 10 points or **B2FT** for 7 or 8 points or **B1FT** for 5 or 6 points Point must touch line if exact or be in correct square if not exact (including boundaries) **and** **B1** independent for one branch on each side of the y-axis and **not touching** or crossing the y-axis **SC4** for correct curve with branches joined
(c)	$-2.6 \leqslant x \leqslant -2.4$ $0.6 \leqslant x \leqslant 0.7$ $1.8 \leqslant x \leqslant 1.9$	**3**	**B1** for each value If **B0** then **SC1** for $y = 5$ used

Qu	Answers	Mark	Part Marks
(d)	$y = x + 5$ ruled correctly and $-2.2 \leqslant x \leqslant -2.0$ $0.5 \leqslant x \leqslant 0.6$ $2.4 \leqslant x \leqslant 2.6$	**4**	**B1** for $y = x + 5$ ruled correctly **B1indep** for each value
6 (a)	2000 or 1998.75 or 1998.8 or 1999 nfww	**4**	**M1** for midpoints **soi** (condone 1 error or omission) (500, 1250, 1750, 2250, 3000) and **M1** for use of $\sum fx$ with x in correct interval including both boundaries (condone 1 further error or omission) (5000, 37500, 96250, 162000, 99000) and **M1** (dep on 2nd **M1**) for $\sum fx \div 200$
(b) (i)	10, 40, 95, 167, 200	**2**	**B1** for 2 correct
(ii)	Correct curve or ruled polygon	**3**	**B1FT** *their* **(b)(i)** for 5 correct heights within 1mm vertically and **B1** for 5 points at upper ends of intervals on correct vertical line and **B1FT** (dep on at least **B1**) for increasing curve or polygon through 5 points After 0 scored, **SC1FT** for 4 correct points plotted
(iii)	68 to 80	**2**	**M1** for 120 to 132 seen
(c)	$\frac{21}{50}$ oe	**4**	**M3** for $\frac{9}{10} \times \frac{2}{5} + \frac{1}{10} \times \frac{3}{5}$ oe or better or **M2** for $\frac{9}{10} \times \frac{2}{5}$ or $\frac{1}{10} \times \frac{3}{5}$ or $\frac{18}{50}$ oe or $\frac{3}{50}$ oe or **M1** for sight of $\frac{1}{10}$ and $\frac{2}{5}$

Qu	Answers	Mark	Part Marks
7 (a) (i)	**Any two of with conclusion** Angle *ACD* = angle *ABD* Angle *CAB* = angle *CDB* Angle *AXC* = angle *DXB* **AND** 'triangles have equal angles' oe **OR** **All three of without conclusion** Angle *ACD* = angle *ABD* Angle *CAB* = angle *CDB* Angle *AXC* = angle *DXB*	**2**	**B1** for two pairs without a conclusion e.g. similar and AA or AAA
(ii)	**(a)** 10	**2**	**M1** for $\frac{DX}{12.5} = \frac{3.2}{4}$ oe
	(b) $4^2 + 3.2^2 - 2 \times 4 \times 3.2\cos 110$	**M2**	or **M1** for implicit version
	34.9 to 35	**A1**	Implied by answer 5.92 or 5.915 to 5.916 after **M2**
	5.92 or 5.915 to 5.916	**B1**	
	(c) 58.7 or 58.73[…]	**2FT**	**FT** for ½ × 12.5 × *their* 10 × sin110 oe correctly evaluated to 3 or more sig figs **M1** for ½ × 12.5 × *their* 10 × sin110 oe or ½ × 4 × 3.2 × sin110 × $(12.5/4)^2$ After **0** scored **and** 15.6... in **(a)(ii)(a)**, allow **SC1** for ½ × 4 × 3.2 × sin110 × $(12.5/3.2)^2$
(b)	7.62 or 7.623 to 7.624	**5**	**B4** for 37.6[2…] or 37.63 or **M2** for [*AB* =] $\frac{30}{\tan 31}$ or 30 × tan59 oe or **M1** for tan31 = $\frac{30}{AB}$ or tan59 = $\frac{AB}{30}$ oe **And** **M2** for [*BD* =] *their AB* × tan37 oe or **M1** for tan37 = $\frac{BD}{\text{their } AB}$ oe

Qu	Answers	Mark	Part Marks
8 (a)	$2\mathbf{c} + 3\mathbf{b}$	**2**	**M1** for $\overrightarrow{OQ}$ recognised as pos vector.
(b) (i)	$3\mathbf{c} - 6\mathbf{a}$ or $3(\mathbf{c} - 2\mathbf{a})$	**1**	
(ii)	$2\mathbf{c} - 4\mathbf{a}$ or $2(\mathbf{c} - 2\mathbf{a})$	**2**	**M1** for any valid route from P to Q e.g. $-(3b - 2a) - 6a + their\overrightarrow{OQ}$ or $\overrightarrow{PQ} = \overrightarrow{PA} + \overrightarrow{AO} + \overrightarrow{OQ}$ or $\overrightarrow{PQ} = \overrightarrow{PB} + \overrightarrow{BQ}$
(c)	$PQ = \frac{2}{3}AC$ oe and PQ is parallel to AC	**2FT**	**STRICT FT** dep on $\overrightarrow{PQ} = k\overrightarrow{AC}$ from **(b)(i)** and **(b)(ii)** **B1FT** for each statement After **0** scored and $\overrightarrow{PQ} = k\overrightarrow{AC}$ in **(b)(i)** and **(ii)**, allow **SC1FT** for correct statement, e.g. PQ is not parallel to AC
9 (a)	36, 9, 45	**2**	**B1** for two correct values
	$8n + 4$ oe	**2**	**M1** for $8n + k$, for any k
	$(n - 1)^2$ oe	**2**	**M1** for a quadratic expression of form n^2 [$+ an + b$] oe
(b)	19	**2**	**M1** for $(n + 1)(n + 5) = 480$ or better or 20×24 seen
(c) (i)	$\frac{1}{3} + p + q = 12$ and no errors seen	**1**	Accept $p + q = 12 - \frac{1}{3}$ after $\frac{1}{3}[1^3] + p[1^2] + q[1]$ shown
(ii)	$\frac{1}{3} \times 8 + 4p + 2q = 12 + 21$	**2**	**M1** for $12 + 21$ seen or 33 seen
(iii)	$[p =] \frac{7}{2}$ oe $[q =] \frac{49}{6}$ oe	**3**	**M1** for correct multiplication and subtraction or substitution using the correct given equations **B1** for $[p =] \frac{7}{2}$ or $[q =] \frac{49}{6}$ After 0 scored, **SC1** for 2 values satisfying one of the original correct given equations