

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 $72 \div (7 + 2 + 3)$	
		(ii)	2 M1 for $13.5 \div 3 \times (7 + 2 + 3)$ oe	
		(iii)	3 M2 for $8.4[0] \div 1.12$ oe or M1 for $112[\%]$ associated with $[\$]8.4[0]$ oe	
	(b)	(i)	$6 \times 0.5 \times 2 \times 2 \times \sin 60$ oe	M2 M1 for a correct relevant area inside the hexagon e.g. $0.5 \times 2 \times 2 \sin 60$ 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 $10.4 \times$ figs 45 [figs 467 to 468]
		(iii)	273	4 M1 for <i>their</i> (b)(ii) $\times 1250 \div 1000$ A1 FT for <i>their</i> (b)(ii) $\times 1250 \div 1000$ evaluated to at least 3 sf M1dep on previous M1 for <i>their</i> mass in tonnes (rounded up) $\times 45.5[0]$ if between 6 and 10 or for <i>their</i> mass in tonnes (rounded up) $\times 47[.00]$ if between 1 and 5 or for <i>their</i> mass in tonnes (rounded up) $\times 44[.00]$ if over 10

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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 $\frac{-27 + \text{or} - \sqrt{(-27)^2 - 4 \cdot 2 \cdot -80}}{2 \cdot 2}$ or $[-]\sqrt{40 + \left(\frac{27}{4}\right)^2} + \frac{27}{4}$ or B1 for $\frac{-27 + \text{or} - \sqrt{q}}{2.2}$ or $\sqrt{(-27)^2 - 4 \cdot 2 \cdot -80}$ or $\left(x - \frac{27}{4}\right)^2$
(c) (i)	$0.75 \times 20 [=15]$	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 $\frac{1}{2}(90 + T) \times 15 = 1800$ oe or $\frac{1}{2}(T - 110) \times 15 + 90 \times 15 + \frac{1}{2}(20 \times 15) = 1800$ oe or $1800 - \frac{1}{2} \times 20 \times 15 - 90 \times 15$ oe [300 for area of 'end' triangle] or M1 for method for area of triangle or rectangle or trapezium soi

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Qu	Answers	Mark	Part Marks
(d)	10 cao nfw	3	M2 for $22.5 \div 2.25$ or M1 for 21.5 to $22.5 \div 2.25$ 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 90° anticlockwise about the wrong centre or 90° 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 $\frac{1}{4} : 1$	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 $1 : \frac{1}{4}$
(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, $k \neq 0$

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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) $x \geq 4$ or $4 \leq x$ final answer nfw	3	B2 for 4 with no/incorrect inequality or equals sign as answer or M2 for $8x + 4 \leq 15x - 24$ or better or M1 for $4(2x + 1) \leq 3(5x - 8)$
	(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 – <i>their q</i>
(iii) $x = 4.5$ oe	1FT	FT $x =$ <i>their p</i>	
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) $-2.6 \leq x \leq -2.4$ $0.6 \leq x \leq 0.7$ $1.8 \leq x \leq 1.9$	3	B1 for each value If B0 then SC1 for $y = 5$ used

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Qu	Answers	Mark	Part Marks
(d)	$y = x + 5$ ruled correctly and $-2.2 \leq x \leq -2.0$ $0.5 \leq x \leq 0.6$ $2.4 \leq x \leq 2.6$	4	B1 for $y = x + 5$ ruled correctly B1indep for each value
6 (a)	2000 or 1998.75 or 1998.8 or 1999 nfw	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
(b) (ii)	Correct curve or ruled polygon	3	B1FT <i>their</i> (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
(b) (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 $\frac{2}{5}$

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Qu	Answers	Mark	Part Marks
7 (a) (i)	<p><u>Any two of with conclusion</u> Angle ACD = angle ABD Angle CAB = angle CDB Angle AXC = angle DXB AND ‘triangles have equal angles’ oe OR <u>All three of without conclusion</u> Angle ACD = angle ABD Angle CAB = angle CDB Angle AXC = angle DXB</p>	2	<p>B1 for two pairs without a conclusion</p> <p>e.g. similar and AA or AAA</p>
(ii) (a)	10	2	<p>M1 for $\frac{DX}{12.5} = \frac{3.2}{4}$ oe</p>
(b)	$4^2 + 3.2^2 - 2 \times 4 \times 3.2 \cos 110$ 34.9 to 35 5.92 or 5.915 to 5.916	<p>M2</p> <p>A1</p> <p>B1</p>	<p>or M1 for implicit version</p> <p>Implied by answer 5.92 or 5.915 to 5.916 after M2</p>
(c)	58.7 or 58.73[...]	2FT	<p>FT for $\frac{1}{2} \times 12.5 \times \text{their } 10 \times \sin 110$ oe correctly evaluated to 3 or more sig figs M1 for $\frac{1}{2} \times 12.5 \times \text{their } 10 \times \sin 110$ oe or $\frac{1}{2} \times 4 \times 3.2 \times \sin 110 \times (12.5/4)^2$</p> <p>After 0 scored and 15.6... in (a)(ii)(a), allow SC1 for $\frac{1}{2} \times 4 \times 3.2 \times \sin 110 \times (12.5/3.2)^2$</p>
(b)	7.62 or 7.623 to 7.624	5	<p>B4 for 37.6[2...] or 37.63 or M2 for $[AB =] \frac{30}{\tan 31}$ or $30 \times \tan 59$ oe or M1 for $\tan 31 = \frac{30}{AB}$ or $\tan 59 = \frac{AB}{30}$ oe</p> <p>And M2 for $[BD =] \text{their } AB \times \tan 37$ oe or M1 for $\tan 37 = \frac{BD}{\text{their } AB}$ oe</p>

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Qu	Answers	Mark	Part Marks
8	(a) $2c + 3b$	2	M1 for \overrightarrow{OQ} recognised as pos vector.
	(b) (i) $3c - 6a$ or $3(c - 2a)$	1	
	(ii) $2c - 4a$ or $2(c - 2a)$	2	M1 for any valid route from P to Q e.g. $-(3b - 2a) - 6a + \text{their } \overrightarrow{OQ}$ 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