

CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

MARK SCHEME for the May/June 2014 series

0444 MATHEMATICS (US)	
0444/41	Paper 4, 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.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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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
nfw	not from wrong working
soi	seen or implied

1	(a)	8	2	M1 for $12 \div 1.5$ oe
	(b)	Distance = 36 <i>their</i> $36 \div 3 [= 12]$	B1 M1	
	(c)	200	2	M1 for $12 \times 1000 \div 60$ oe e.g. $36000 \div 180$
	(d)	Horizontal line at 36 to 13 45 <i>(their</i> 13 45, 36) joined to (16 42, 0)	1 1FT	
2	(a)	62705	2	M1 for $75246 \div 6$ soi by 12541 or 75246×5
	(b)	10.9 or 10.88...	3	M2 for $\frac{(150675-135890)}{135890} \times 100$ oe or M1 for correct fraction soi by 0.1088... or $\frac{150675}{135890} \times 100$ soi by 110.88...
	(c)	127000	3	M2 for $135890 \div 1.07$ oe or M1 for 135890 associated with 107%
	(d) (i)	59112 to 59113 or 59100 or 59110 or 59119 to 59120 or 59100 nfw	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 nfw	4	M1 for $21 \times 29.7 \times$ <i>their</i> 0.0125 [=7.796 or 7.8[0]] and M1 for <i>their</i> (d)(i) $\div (21 \times 29.7 \times$ <i>their</i> 0.0125) A1 for 7580 to 7583.2 (non integer) If 0 then SC1 for <i>their</i> (d)(i) $\div (21 \times 29.7 \times 0.125)$

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(iii)	0.63	3	<p>M2 for $36 \div \left(\frac{240}{60} \times \frac{180}{60} \right)$ oe</p> <p>M1 for $\frac{240}{60}$ oe or $\frac{180}{60}$ oe</p>
3 (a) (i)	120	1	<p>B1 for $\angle ECB = 32$</p> <p>M1 for $\angle ECD = 90 - \text{their } \angle ECB$</p> <p>M1 for $\angle CED = 0.5(180 - \text{their } \angle ECD)$</p> <p>or M1 for $360 - \text{their } \angle CED - 148$</p> <p>1</p> <p>1</p> <p>1 dep on three correct statements (reasons not needed)</p> <p>1 Circumference, same segment</p> <p>1 Opposite angles</p> <p>1 Dep on 2 pairs of angles identified</p> <p>2</p> <p>M1 for $\frac{8}{12} = \frac{4}{DX}$ oe</p> <p>2</p> <p>M1 for $\left(\frac{2}{3}\right)^2$ or $\left(\frac{3}{2}\right)^2$ seen</p> <p>or $\frac{1}{2} \times 4 \times 4k$</p>
(ii)	151	4	
(b)	Two of $AP = PB$ [given] CP is common $\angle CPA = \angle CPB$ [= 90] Reason with one of the above SAS or in words		
(c) (i)	Any two of $\angle D = \angle C$ with reason $\angle A = \angle B$ with reason $AXD = BXC$ with reason Equiangular oe		
(ii)	6		
(iii)	8k		
4 (a)	91.6 or 91.59 to 91.60	2	M1 for $0.5 \times 15 \times 19 \times \sin 40$
(b)	12.2 or 12.22... nfw	3	M1 for $15^2 + 19^2 - 2 \times 15 \times 19 \times \cos 40$ A1 for 149 or 149.3 to 149.4
(c)	97.8 or 97.81... nfw	4	M2 for $\frac{19 \sin 35}{11}$ implied by 0.991 or 0.9907... or 82.2 or 82.18 to 82.19 or M1 for $\frac{11}{\sin 35} = \frac{19}{\sin ADC}$ oe M1 for 180 – an acute angle from sine rule

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5	<p>(a) (i) 0.6 oe</p> <p>(ii) 1500</p> <p>(iii) 0.03 oe</p> <p>(b) $\frac{112}{132}$ oe $\frac{28}{33} = 0.848[4\dots]$</p>	<p>2 M1 for $0.2 + 0.4$</p> <p>1</p> <p>2 M1 for 0.1×0.3</p> <p>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 $\frac{7}{12} + \frac{5}{12} \times \frac{7}{11}$</p> <p>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</p>
6	<p>(a) (i) Image: $(-5, -1)$, $(-4, -1)$, $(-5, -3)$</p> <p>(ii) Image: $(1, -1)$, $(3, -1)$, $(3, -2)$</p> <p>(b) (i) Enlargement [factor] 3 [centre] $(3, 3)$</p> <p>(ii) Stretch [factor] 3 Invariant line y-axis oe</p>	<p>2 SC1 for translation $\begin{pmatrix} -6 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ -4 \end{pmatrix}$</p> <p>2 SC1 for rotation about the origin but 90° anticlockwise</p> <p>1 Accept dilation</p> <p>1 Do not allow column vector for coordinates of centre</p> <p>1</p> <p>1 Accept $x = 0$, stays the same</p>
7	<p>(a) 2.125 and 2.375</p> <p>(b) Correct curve</p>	<p>2 B1 for one correct value</p> <p>B4 B3FT for 11 correct plots or B2FT for 9 or 10 correct plots or B1FT for 7 or 8 correct plots</p>

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(c)	Ruled tangent at $x = 2$ Gradient from 7.8 to 10.2	B1 2	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 Dep on B1 awarded Allow integer/integer or a mixed number if within range or M1 dep for $(\text{change in } y) \div (\text{change in } x)$ 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
8	(a) (i) 34 to 34.5 (ii) 18 (iii) 41 to 42 (b) (i) 31.8[4...] nfwf (ii) Correct histogram	1 2 2 4 4	B1 for [UQ =] 43 or [LQ =] 25 B1 for 56 seen or horizontal line drawn at cf = 56 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 $\sum ft \div 80$ ($2547.5 \div 80$) B1 for each correct block with correct width and height If B0 then SC1 for four correct f.d.s or four correct widths
9	(a) (i) 5 (ii) $-2\frac{1}{3}$ oe (iii) $\frac{x+3}{2}$ or $\frac{x}{2} + 1.5$ as final ans	1 2 2	B1 for $[h(-1) =] \frac{1}{3}$ soi or M1 for $2(3^x) - 3$ M1 for $y + 3 = 2x$ or $x = 2y - 3$ or $\frac{y}{2} = x - 1.5$ or better or correct reverse flowchart

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(iv)	$4x - 9$ as final answer nfw	2	M1 for $2(2x - 3) - 3$
(v)	$(2x - 3)(x + 1) = 1 + 2(x + 1)$ $2x^2 - 3x + 2x - 3$ or better seen $2x^2 - 3x - 6 = 0$	M1 B1 A1	$(2x - 5)(x + 1) = 1$ (eliminate fractions) $2x^2 - 5x + 2x - 5$ or better seen No errors or omissions seen
(vi)	$\frac{-(-3) \pm \sqrt{(-3)^2 - 4 \times 2 \times -6}}{2 \times 2}$ 2.64 and -1.14 cao	B2 B1B1	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 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 nfw	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
10 (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}
(i) (b)	$\frac{2}{5}\mathbf{a}$	2	M1 for any correct vector path for \overrightarrow{NY}
(b) (ii)	$NY = \frac{2}{5}BC$ oe [NY] parallel to [BC]	1dep 1dep	dep on (b)(i)(b) correct dep on $\overrightarrow{NY} = k\mathbf{a}$, $k \neq 1$
11 (a) (i)	$(x - 1.5)^2 - 1.25$ oe	2	M1 for $(x - 1.5)^2$
(ii)	$(1.5, -1.25)$	2FT	1FT each FT only if in completed square form

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(b)	$[p =] - 2$ $[q =] - 6$ nfww	4	M1 for $1 - p + q = -3$ M1 for $4^2 + 4p + q = 2$ A1 for correct p or q
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