

CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International General Certificate of Secondary Education

MARK SCHEME for the October/November 2015 series

0444 MATHEMATICS (US)

0444/43

Paper 4 (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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Question	Answer	Mark	Part marks	
1	(a) (i)	3.9[0]	2	M1 for $2.6 \div 2$
	(ii)	$\frac{13}{18}$ cao	2	B1 for any correct unsimplified fraction
	(iii)	24	3	M2 for $9 \div 0.375$ oe or M1 for associating 9 with $(100 - 62.5)\%$
	(b)	109 cao	3	B2 for 108.5 to 108.6 or M1 for $250 \times \left(1 - \frac{8}{100}\right)^{10}$ oe
2	(a) (i)	Image at $(-2, 5), (1, 5), (1, 7)$	2	SC1 for translation $\begin{pmatrix} -4 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ 4 \end{pmatrix}$ or 3 correct vertices plotted but not joined
	(ii)	Image at $(2, -3), (5, -3), (5, -5)$	2	SC1 for a reflection in a horizontal line or in the line $x = -1$ or 3 correct vertices plotted but not joined
	(b) (i)	Rotation	1	Alt
		180 oe	1	Enlargement SF -1 $(-1, 0)$
		$(-1, 0)$	1	Not as column vector
	(ii)	Reflection	1	
		$y = -x$ oe	1	
	(iii)	Stretch	1	
x -axis oe invariant		1		
[factor] 3		1		

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Question	Answer	Mark	Part marks
3 (a)	43 200	3	M2 for $0.5 \times (35 + 25) \times 12 \times 120$ oe or M1 for $0.5 \times (35 + 25) \times 12$ oe
(b) (i)	$0.5 \times (25 + 30) \times 6 \times 120$ [= 19800]	M2	Dep on a valid method for obtaining the width of 30 cm B1 for $0.5 \times (25 + 35)$ oe
(ii)	45.8 or 45.83...	1FT	FT for $\frac{19800}{their(a)} \times 100$
(c)	1 h 39 min	4	B3 for 1.65 [h] or 99 mins or $\frac{33}{20}$ or M2 for $\frac{19800}{12 \times 1000}$ oe or M1 for $\frac{19800}{12}$ or $\frac{19800}{1000}$ or 12×1000 If zero scored then SC1 for figs 165 and B1 for converting their time (in hours) into hours and minutes
(d)	12.8 or 12.80 to 12.81	3	M2 for $\sqrt[3]{\frac{19800}{3\pi}}$ or M1 for $\pi r^2 3r = 19800$
(e)	21[.0]	2	M1 for $\frac{19800}{1000} + 1.2$

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Question	Answer	Mark	Part marks	
4	(a)	–1.5, 0.5	2	B1, B1
	(b)	Correct curve	5	B3 FT for 10 or 11 points or B2FT for 8 or 9 points or B1FT for 6 or 7 points and B1 independent for two branches SC4 for correct curve but branches joined
	(c)	1.25 to 1.35	1	
	(d)	–1	1	
	(e) (i)	$2 - x$	1	
	(ii)	Ruled line with gradient –1 through (0, 2) and fit for purpose	2FT	SC1 for ruled line, with gradient –1 or through (0, 2), but not $y = 2$ FT <i>their</i> $y = mx + c$ from (e)(i), if $m \neq 0$ SC1FT for ruled line either with correct gradient or through (0, c) but not $y = c$
	1.15 to 1.25 cao	1		

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Question	Answer	Mark	Part marks
5	(a) 2180 or 2181. ... nfw	4	M2 for $680^2 + 2380^2 - 2 \times 680 \times 2380 \cos 65$ oe or M1 for correct implicit cosine formula A1 for 4760000 or 4758000 to 4759000
	(b) 78.7 or 78.71 ...	3	M2 for $\frac{2380 \sin 40}{1560}$ or M1 for $\frac{1560}{\sin 40} = \frac{2380}{\sin M}$ oe
	(c) 309 or 308.7 ...	2FT	FT 230 + <i>their</i> (b) B1FT 50 + <i>their</i> (b) for 129 or 128.7 ... [i.e. for <i>C</i> from <i>M</i>]
	(d) (i) 2339 oe (ii) 650	1 2	M1 for $1560 \div$ journey time
6	(a) 101.5625 or 102 or 101.5 to 101.6 nfw	4	M1 for 55, 90, 110, 160 soi M1 for Σfm with frequencies and each <i>m</i> in or on a boundary of a correct interval 2750, 2700, 4400, 6400 M1 dep on 2nd M for $\div 160$
	(b) Correct histogram drawn with correct widths and heights 1, 1.5 and 2 (no gaps)	3	B1 for each correct block If zero scored, SC1 for correct heights or frequency densities
	(c) $\frac{40}{160}$ oe	1	
	(d) (i) $\frac{1560}{25440}$ oe	2	M1 for $\frac{40}{160} \times \frac{39}{159}$
	(ii) $\frac{4000}{25440}$ oe	3	M2 for $\frac{40}{160} \times \frac{50}{159} + \frac{50}{160} \times \frac{40}{159}$ oe or M1 for one of these products soi

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Question	Answer	Mark	Part marks
7 (a)	83 nfw	4	<p>B3 for $17x = 1411$ or $17x = 14.11$ oe in form $ax = b$ or final answer of 0.83 or B2 for $6x + 11x - 55 = 1356$ oe or $6x + 11x - [0.]55 = 13[.]56$ or M1 for $6x + 11(x - [0.0]5) = 13[.]56$</p>
(b)	$\frac{1}{3}$ oe nfw	4	<p>M1 for $y(y+3)$ oe or $\frac{1}{2}(2y+1)(y+1)$ oe and B2 for $2y^2 + 6y = 2y^2 + 2y + y + 1$ oe or better or B1 for $(2y+1)(y+1) = 2y^2 + 2y + y + 1$ soi</p>
(c)	25 nfw	4	<p>M1 for $\frac{4[.]80}{w-1}$ or $\frac{7[.]80}{2w-11}$ M1 for $\frac{4[.]80}{w-1} = \frac{7[.]80}{2w-11}$ oe M1 for $480(2w-11) = 780(w-1)$ oe or ALT M1 for $n(w-1) = 4[.]80$ or $n(2w-11) = 7[.]80$ M1 for $2wn - 11n = 7[.]80$ $2wn - 2n = 9[.]60$ oe M1 for $9n = 180$ oe or better ALT M1 for $n(w-1) = 4[.]80$ or $n(2w-11) = 7[.]80$ M1 for $\frac{4[.]80 + n}{n} = \frac{7[.]80 + 11n}{2n}$ M1 for $9n = 180$ oe or better</p>
(d) (i)	$\frac{1}{2}u(3u-2) = 2.5$ One further correct step leading to $3u^2 - 2u - 5 = 0$ with no errors	M1 A1	<p>First step must involve $\frac{1}{2}u(3u-2)$</p>
(ii)	$(3u-5)(u+1)$	2	<p>SC1 for $(3u+a)(u+b)$ where $ab = -5$ or $a + 3b = -2$ [a, b integers]</p>
(iii)	29.1 or 29.05...	3	<p>M2 for $\tan = \frac{\text{their } \frac{5}{3}}{3 \times \text{their } \frac{5}{3} - 2}$ or M1 for substituting <i>their</i> positive value of u into [u and] $3u - 2$</p>

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Question	Answer	Mark	Part marks
8	(a) (i)	1	Accept $DAB = CAB$ oe
		1dep	Dep on previous mark
	(ii)	1	Similar
	(iii)	2	M1 for $\frac{16}{12} = \frac{11}{BD}$ oe or better
	(b) (i)	1	75
	(ii)	2	B1 for OAB or $OBA = 20$
(c)	36 nfw	5	B4 for an equation in m that simplifies to $5m = 180$ or B1 for each of 3 of the listed angles expressed in terms of m , in its simplest form, stated or labelled on diagram Angle $PQO = m$ Angle $QOR = m$ Angle $OQR = 2m$ Angle $PQR = 3m$ or $180 - 2m$ or $90 + \frac{m}{2}$ Angle $POR = 180 - m$ or $4m$ or $360 - 6m$ Reflex angle $POR = 360 - 4m$ or $6m$ or $180 + m$
9	(a)	1	8
	(b)	2	3
	(c)	2	M1 for $[g(0.5) =] 2$ soi or M1 for $2\left(\frac{1}{x}\right) - 1$ or better
	(d)	2	M1 for $x = 2y - 1$ or $y + 1 = 2x$ or better or $\frac{y}{2} = x - \frac{1}{2}$
	(e)	2	M1 for $2(2x - 1) - 1$
	(f)	1	B1 for $[(2x - 1)^2] = 4x^2 - 2x - 2x + 1$
	(g)	1	x
	(h)	1	$g^{-1}(x) = g(x)$
		1	$fh(x)$

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Question	Answer	Mark	Part marks
10	A $-13, -20$	1	SC1 for $-7n + k$ or $kn + 22$ oe
	$-7n + 22$ oe	2	
	B $\frac{9}{22}, \frac{10}{23}$	1	B1 for $n + 4$ oe or $n + 17$ oe seen, but not in wrong position
	$\frac{n+4}{n+17}$ oe	2	
	C 26, 37	1	
	$n^2 + 1$ oe	1	
	D 162, 486	1	SC1 for $k \times 3^{n+p}$ [k, p integers] Accept $2 \times \frac{3^n}{3}$
	$2 \times 3^{n-1}$ oe	2	