

# **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

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<b>Page 2</b>	<b>Mark Scheme</b>	<b>Syllabus</b>	<b>Paper</b>
	<b>Cambridge IGCSE – October/November 2015</b>	<b>0444</b>	<b>43</b>

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

<b>Page 3</b>	<b>Mark Scheme</b>	<b>Syllabus</b>	<b>Paper</b>
	<b>Cambridge IGCSE – October/November 2015</b>	<b>0444</b>	<b>43</b>

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

Page 4	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2015	0444	43

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

<b>Page 5</b>	<b>Mark Scheme</b>	<b>Syllabus</b>	<b>Paper</b>
	<b>Cambridge IGCSE – October/November 2015</b>	<b>0444</b>	<b>43</b>

<b>Question</b>	<b>Answer</b>	<b>Mark</b>	<b>Part marks</b>
<b>5 (a)</b>	2180 or 2181. ... nfw	<b>4</b>	<b>M2</b> for $680^2 + 2380^2 - 2 \times 680 \times 2380 \cos 65^\circ$ oe or <b>M1</b> for correct implicit cosine formula  <b>A1</b> for 4 760 000 or 4 758 000 to 4 759 000
<b>(b)</b>	78.7 or 78.71 ...	<b>3</b>	<b>M2</b> for $\frac{2380 \sin 40}{1560}$ or <b>M1</b> for $\frac{1560}{\sin 40} = \frac{2380}{\sin M}$ oe
<b>(c)</b>	309 or 308.7 ...	<b>2FT</b>	<b>FT</b> 230 + <i>their (b)</i>  <b>B1FT</b> 50 + <i>their (b)</i> for 129 or 128.7 ... [i.e. for <i>C</i> from <i>M</i> ]
<b>(d) (i)</b>	23 39 oe	<b>1</b>	
<b>(ii)</b>	650	<b>2</b>	<b>M1</b> for $1560 \div \text{journey time}$
<b>6 (a)</b>	101.5625 or 102 or 101.5 to 101.6 nfw	<b>4</b>	<b>M1</b> for 55, 90, 110, 160 soi  <b>M1</b> for $\Sigma fm$ with frequencies and each <i>m</i> in or on a boundary of a correct interval 2750, 2700, 4400, 6400  <b>M1 dep on 2nd M</b> for $\div 160$
<b>(b)</b>	Correct histogram drawn with correct widths and heights 1, 1.5 and 2 (no gaps)	<b>3</b>	<b>B1</b> for each correct block If zero scored, <b>SC1</b> for correct heights or frequency densities
<b>(c)</b>	$\frac{40}{160}$ oe	<b>1</b>	
<b>(d) (i)</b>	$\frac{1560}{25440}$ oe	<b>2</b>	<b>M1</b> for $\frac{40}{160} \times \frac{39}{159}$
<b>(ii)</b>	$\frac{4000}{25440}$ oe	<b>3</b>	<b>M2</b> for $\frac{40}{160} \times \frac{50}{159} + \frac{50}{160} \times \frac{40}{159}$ oe or <b>M1</b> for one of these products soi

Page 6	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2015	0444	43

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

<b>Page 7</b>	<b>Mark Scheme</b>	<b>Syllabus</b>	<b>Paper</b>
	<b>Cambridge IGCSE – October/November 2015</b>	<b>0444</b>	<b>43</b>

<b>Question</b>	<b>Answer</b>	<b>Mark</b>	<b>Part marks</b>
<b>8 (a) (i)</b>	Angle $A$ is common to both triangles oe $ADB = ABC$ Third angle of triangles equal oe	<b>1</b> <b>1dep</b>	Accept $DAB = CAB$ oe Dep on previous mark
<b>(ii)</b>	Similar	<b>1</b>	
<b>(iii)</b>	8.25	<b>2</b>	<b>M1</b> for $\frac{16}{12} = \frac{11}{BD}$ oe or better
<b>(b) (i)</b>	75	<b>1</b>	
<b>(ii)</b>	70	<b>2</b>	<b>B1</b> for $OAB$ or $OBA = 20$
<b>(c)</b>	36 nfw	<b>5</b>	<b>B4</b> for an equation in $m$ that simplifies to $5m = 180$ or <b>B1</b> 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 $180 + m$
<b>9 (a)</b>	8	<b>1</b>	
<b>(b)</b>	3	<b>2</b>	<b>B1</b> for $[g(0.5) =] 2$ soi or <b>M1</b> for $2\left(\frac{1}{x}\right) - 1$ or better
<b>(c)</b>	$\frac{x+1}{2}$ final answer	<b>2</b>	<b>M1</b> for $x = 2y - 1$ or $y + 1 = 2x$ or better or $\frac{y}{2} = x - \frac{1}{2}$
<b>(d)</b>	$4x - 3$	<b>2</b>	<b>M1</b> for $2(2x - 1) - 1$
<b>(e)</b>	$4x^2 - 4x + 7$	<b>2</b>	<b>B1</b> for $[(2x - 1)^2] = 4x^2 - 2x - 2x + 1$
<b>(f)</b>	$x$	<b>1</b>	
<b>(g)</b>	$g^{-1}(x) = g(x)$	<b>1</b>	
<b>(h)</b>	$fh(x)$	<b>1</b>	

Page 8	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2015	0444	43

Question	Answer	Mark	Part marks
10	<b>A</b> $-13, -20$	1	SC1 for $-7n + k$ or $kn + 22$ oe
	$-7n + 22$ oe	2	
	<b>B</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	
	<b>C</b> $26, 37$	1	
	$n^2 + 1$ oe	1	
	<b>D</b> $162, 486$	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	