CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the October/November 2013 series

0444 MATHEMATICS (US)

0444/43 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.

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

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the October/November 2013 series for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level components and some Ordinary Level components.

Abbreviations

cao correct answer only
cso correct solution only
dep dependent
ft follow through after error
isw ignore subsequent working
oe or equivalent
SC Special Case
www without wrong working
art anything rounding to
soi seen or implied

	Correct answer	Mark	Part marks
1 (a) (i)	45	**2**	**M1** for $5 \times 63 \div 7$
(ii)	20	**2**	**M1** for $5 \times 56 \div 14$
(iii)	23.4 or 23.38 to 23.41	**3**	**M2** for $\frac{13 \times 4.9 - 48.8}{13 \times 4.9} \times 100$ or $\frac{4.9 - 48.8 \div 13}{4.9} \times 100$ or **M1** for $\frac{13 \times 4.9 - 48.8}{13 \times 4.9}$ or $\frac{48.8}{13 \times 4.9} \times 100$ or 76.6[…]

	(b)	128	**4**	Using fractions (percentages / decimals): **M1** for $\frac{3}{4} \times \frac{3}{8} \left[= \frac{9}{32}\right]$ or $\frac{75}{100} \times 37.5$ [= 28.125%] **A1** for $\frac{9}{32}$ or 28.125[%] **M1** for $36 \div \frac{9}{32}$ oe or $36 \times \frac{100}{28.125}$ oe Partial percentages **M1** for (Remaining) $\frac{100 \times 36}{37.5}$ [= 96] **A1** for 96 **M1** for $96 \div \frac{75}{100}$ oe **SC1** for 288
2	**(a)**	119.94[…] nfww	**3**	**M2** for $\frac{62 \times \sin 122}{\sin 26}$ or **M1** for $\frac{AC}{\sin 122} = \frac{62}{\sin 26}$ oe **SC2** for correct answer from alternative methods
	(b)	109 or 108.7 to 108.8 nfww	**4**	**M2** for $119.9..^2 + 55^2 - 2 \times 119.9.. \times 55\cos 65$ **A1** for 11827[·…] or 11834 to 11835[·…] or **M1** for implicit version
	(c)	1970 or 1969 to 1970.4	**2**	**M1** for ½ × 119.9.. × 62 × sin32
	(d)	22300 or 22310 to 22320	**3**	**M2** for (*their* (**c**) + 0.5 × 55 × 119.9.. × sin65) × 4.5 or **M1** for *their* (**c**) + 0.5 × 55 × 119.9.. × sin65

3	**(a)**	$9 - 2x$, $7 - 2x$ oe	**2**	**B1** for each, accept in any ord
	(b)	$x(9 - 2x)(7 - 2x)$ $4x^3 - 32x^2 + 63x$	**M1FT** **A1**	Correct expansion and simplification with no errors
	(c)	24 20	**2**	**B1** for each correct value
	(d)	Correct curve	**3**	**B2 FT** for 5 correct plots or **B1FT** for 3 or 4 correct plots
	(e)	0.65 to 0.75 x 2 oe	**2**	**B1** for 0.65 to 0.75 seen
	(f) (i)	36 to 37	**1**	
	(ii)	1.2 to 1.4	**1**	
4	**(a)**	48 and 84 66 and 66	**2**	**B1** for each pair
	(b)	540	**2**	**M1** for 3×180 or $(2 \times 5 - 4) \times 90$ or $5 \times (180 - 360 \div 5)$ oe
	(c)	1620	**2**	**M1** for 7×360 – *their* 540 – 360
	(d) (i)	$2x + 5 + 3y - 20 + 4x - 5 + x + y - 10 = 360$ oe	**1**	Allow partial simplification but not $7x + 4y - 30 = 360$
	(ii)	$2x + 5 + 3y - 20 = 180$	**1**	
	(iii)	[x =] 30, [y =] 45 nfww	**4**	**M1** for correct multiplication **M1** for correct elimination **A1** $x = 30$ or $y = 45$ If 0 scored **SC1** for correct substitution to find the other variable
	(iv)	65, 115, 115, 65	**1**	Accept in any order

5	**(a) (i)**	3.81 or 3.812 to 3.813 or 3h 49min nfww	**4**	**M1** for midpoints soi (condon or omission) and **M1** for use of $\sum fx$ with x in correct interval including both boundaries (condone 1 further error or omission) and **M1** (**dep** on 2nd M1) for $\sum fx \div 80$ ($305 \div 80$)
	(ii)	Correct histogram	**4**	**B1** for each correct block and **B1** for correct widths
	(b) (i)	$\frac{2}{5}$, $\frac{1}{4}$, $\frac{3}{4}$, $\frac{1}{4}$ oe	**2**	**B1** for $\frac{2}{5}$ or both $\frac{1}{4}$s in correct place
	(ii)	$\frac{18}{20}$ nfww $\left[\frac{9}{10}\right]$	**3**	**M2 FT** for $1 - \textit{their}\ \frac{2}{5} \times \textit{their}\ \frac{1}{4}$ or $\frac{3}{5} \times \frac{3}{4} + \frac{3}{5} \times \textit{their}\ \frac{1}{4} + \textit{their}\ \frac{2}{5} \times \frac{3}{4}$ oe or **M1 FT** for $\textit{their}\ \frac{2}{5} \times \textit{their}\ \frac{1}{4}$ or $\frac{3}{5} \times \textit{their}\ \frac{1}{4} + \textit{their}\ \frac{2}{5} \times \frac{3}{4}$ oe
	(iii)	$\frac{27}{125}$ [0.216]	**2**	**M1** for $\frac{3}{5} \times \frac{3}{5} \times \frac{3}{5}$
6	**(a)**	329.7 to 330	**3**	**M2** for $\frac{1}{2}\pi(12^2 + 8.75^2 - 3.25^2)$ oe or **M1** for $\frac{1}{2}\pi 12^2$ or $\frac{1}{2}\pi 8.75^2$ or $\frac{1}{2}\pi 3.25^2$ **SC2** for answer 1318 to 1320
	(b)	2970 or 2967 to 2969.[…]	**4**	**M3** for $\frac{1}{2}\pi(24 + 17.5 + 6.5) \times 35$ + *their* (**a**) or **M2** for $\frac{1}{2}\pi(24 + 17.5 + 6.5) \times 35$ or **M1** for $\frac{1}{2}\pi \times 24$ or $\frac{1}{2}\pi \times 17.5$ or $\frac{1}{2}\pi \times 6.5$ **SC3** for 3955 to 3960 dep on **SC2** in (**a**)

	(c)	11.5 or 11.6 or 11.53 to 11.55	**3FT**	**M1** for *their* (**a**) × 35 **A1** for 11500 or 11530 to 11550
	(d) (i)	$\frac{r}{h} = \frac{20}{40}$ or $\frac{r}{20} = \frac{h}{40}$	**1**	Accept 20 : 40 = *r* : *h* leading to $40r = 20h$ [$r = h/2$] $\frac{20}{40} = \frac{1}{2}$ and $\frac{r}{h} = \frac{1}{2}$
	(ii)	35.3 or 35.31 to 35.34	**3**	**M2** for $\sqrt[3]{\frac{\textit{their}\ 11545 \times 12}{\pi}}$ oe or 2 × *their r* or **M1** for *their* $11545 = \frac{1}{3} \times \pi \times \left(\frac{h}{2}\right)^2 \times h$ oe or *their* $11545 = \frac{1}{3} \times \pi \times r^2 \times 2r$ oe
7	**(a) (i)**	$\frac{3}{2}$ or 1.5	**2**	**M1** for $\frac{14-(-4)}{8-(-4)}$ oe
	(ii)	$y = \frac{3}{2}x + 2$ oe	**2**	**B1** for $y = \textit{their}\ \frac{3}{2}x + c$ o.e. or $y = mx + 2$, $m \neq 0$ **SC1** for $\frac{3}{2}x + 2$
	(iii)	$\begin{pmatrix}12\\18\end{pmatrix}$	**1**	
	(iv)	21.6 or 21.63[…]	**2**	**M1 FT** for *their* 12^2 + *their* 18^2 oe

(b)	**(i)**	**(a)**	$3\mathbf{b} - 4\mathbf{a}$	**1**	
		(b)	$\frac{1}{5}(6\mathbf{b} - 8\mathbf{a})$ oe simplified	**2**	**M1** for $\frac{1}{5}(12\mathbf{a} + 6\mathbf{b}) - 4\mathbf{a}$ or $\overrightarrow{AR} = \overrightarrow{AO} + \overrightarrow{OR}$
		(c)	$6\mathbf{a} + 3\mathbf{b}$ oe simplified	**1**	
	(ii)		*OR* is parallel to *OT*	**1**	Dep on $\overrightarrow{OT}$ correct
	(iii)		$\frac{9}{4}$ or 2.25	**2**	**M1** for $\left(\frac{3}{2}\right)^2$
8	**(a)**	**(i)**	215		
	(ii)		$\sqrt{5^2 - 4(1)(-20)}$ or better	**B1**	
			$[p =] -5$ and $[q =] 2(1)$	**B1**	Only if in form $\frac{p + \sqrt{q}}{r}$ or $\frac{p - \sqrt{q}}{r}$
			2.62	**B1**	
	(iii)		$\frac{2(s - ut)}{t^2}$ oe nfww	**3**	**M1** for a correct rearrangement to isolate the *a* term and **M1** for a correct multiplication by 2 and **M1** for a correct division by t^2
	(b)	**(i)**	**(a)** 120	**1**	
			(b) 201	**1**	
			(c) 1100.1	**1**	
		(ii)	$100 + \frac{m}{2}$	**1**	

9	**(a)**	$\frac{x}{x+3}$ cao	**3**	**B1** for $(x + 3)(x – 3)$ **B1** for $x(x – 3)$
	(b)	$\frac{3}{2}$ and $–5$	**7**	**M2** for $15(x + 1) – 20x = 2x(x + 1)$ or **M1** for multiplication by one denominator only or $\frac{15(x+1)-20x}{x(x+1)}$ and **B2** for $2x^2 + 7x – 15 = 0$ or **B1** for $15x + 15 – 20x$ or $2x^2 + 2x$ and **M2** for $(2x – 3)(x + 5)$ or *their* correct factors or formula or **M1** for $(2x + a)(x + b)$ where $ab = –15$ or $a + 2b = 7$ **A1** for $x = \frac{3}{2}$ and $–5$
10	**(a)**	15 18 $3n + 3$ or $3(n + 1)$ 6 10 25 36 $(n + 1)^2$	**9**	**B2** for 15, 6, 25 or **B1** for two correct values **B3** for 18, 10, 36 or **B1** for each correct value **B2** for $3n + 3$ oe or **M1** for $3n + k$, for any k **B2** for $(n + 1)^2$ oe or **M1** for a quadratic expression
	(b)	14	**2**	**M1** for $(n + 1)(n + 2) = 240$ or better or $15 \times 16 = 240$
	(c) (i)	$½ + p + q = 9$	**1**	
	(ii)	$[p =]$ 3 $[q =] \frac{11}{2}$	**5**	**B2** for $4p + 2q = 23$ or **B1** for $½ \times 2^3 + p \times 2^2 + q \times 2$ oe **M1** for correct multiplication and subtraction of *their* equations **A1** for $[p =]$ 3 or $[q =] \frac{11}{2}$ If 0 scored then **SC1** for either correct