Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

MATHEMATICS (US) **0444/23**

Paper 2 (Extended) **October/November 2016**

MARK SCHEME

Maximum Mark: 70

Published

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
nfww not from wrong working
soi seen or implied

Question	Answer	Mark	Part marks
1	36	**1**	
2	n^7	**1**	
3	*B*	**1**	
4 (a)	2.47×10^6	**1**	
(b)	7.9×10^{-3}	**1**	
5	$\frac{23}{30}$ cao	**2**	**M1** for $\frac{3\times 6+[1\times]5}{5\times 6}$ oe
6	Thursday	**2**	**M1** for 5.4 found or at least two of: 3.8, 3.6 and 4 found
7	0.4^2 0.22 $\left(\frac{1}{2}\right)^2$ $\sqrt{0.09}$	**2**	**M1** for decimal conversion 0.25 and 0.3 and 0.16
8 (a)	$\frac{1}{2}$ oe	**1**	
(b)	$\frac{3}{2}$ oe	**1**	
9	5	**2**	**M1** for speed × time
10	$8\sqrt{3}$	**2**	**B1** for $3\sqrt{3}$ or $5\sqrt{3}$ seen
11	9600	**2**	**M1** for $20000 \times (1 - \frac{40}{100}) \times (1 - \frac{20}{100})$ oe
12	18	**2**	**M1** for $\left[\frac{1}{2}\times\right]\frac{4}{3}\times\pi\times 3^3$
13	120	**1**	
	4	**1**	**SC1** for answers reversed

Question	Answer	Mark	Part marks
14 (a)	30	**1**	
(b)	47.5	**2**	**M1** for 4.5 × 5 oe
15 (a)	68	**1**	
(b)	9	**2**	**M1** for 360 ÷ 40 oe or $\frac{180(n-2)}{n}$ =140 oe
16	0.5 oe nfww	**3**	**M1** for $d = \frac{k}{(w+1)^2}$ or better **M1** for $[d =] \frac{their\ k}{(9+1)^2}$ or **M2** for $2(4 + 1)^2 = d(9 + 1)^2$
17	$y = 2x$ oe	**3**	**M1** for $\frac{1-3}{12-8}$ oe **M1** for perpendicular gradient × *their* $\frac{1-3}{12-8}$ = –1 oe If M0 scored, **SC1** for answer $y = kx$ $k \neq 2$ or 0
18 (a)	–16	**1**	
(b)	1	**1**	
(c)	$2 – 3x$ final answer	**2**	**M1** for $1 – (3x – 1)$
(d)	$1 – x$ oe final answer	**1**	
19 (a)	Correct tangent $2.1 \leqslant$ grad $\leqslant 3.9$	**B1** **2**	No daylight between tangent and curve at point of contact. Consider point of contact as midpoint between two vertices of daylight, the midpoint must be between $x = 0.8$ and $x = 1.2$ dep on B1 **M1** for $\frac{rise}{run}$ also dep on any tangent drawn or close attempt at tangent at any point Must see correct or implied calculation from a drawn tangent
(b)	(–2, 8)	**1**	

Question	Answer	Mark	Part marks
20 (a)	$[w =] \pm \frac{2}{3}$	**2**	**M1** for $w^2 = \frac{4}{9}$ soi by $\frac{2}{3}$
(b)	$[y =] 32$	**2**	**M1** for $y = 4^{\frac{5}{2}}$ oe
21	30 nfww	**3**	**B2** for $\sin x = \frac{1}{2}$ or **M1** for $\frac{1}{2} \times 12 \times 20 \sin x [= 60]$
22	1 3.5 1	**4**	**B3** for 2 correct **B2** for 1 correct or **M1** for 2, 7, [...] and 2 seen [FD's]
23	$\frac{7n}{2t+3m}$ final answer	**4**	**M1** for $7n(6p - 1)$ seen and **M2** for $(2t + 3m)(6p - 1)$ seen or **M1** for $2t(6p - 1) + 3m(6p - 1)$ or $6p(2t + 3m) - 1(2t + 3m)$
24	$y \leqslant -\frac{3}{5}x + 6$ oe $x \geqslant 2$ oe $y > x$ oe final answers	**5**	**SC4** for $y < -\frac{3}{5}x + 6,\ x > 2,\ y \geqslant x$ oe or **B3** for $y \leqslant -\frac{3}{5}x + 6$ oe or **B2** for $y = -\frac{3}{5}x + 6$ oe or **B1** for gradient $= -\frac{3}{5}$ oe soi and **B2** for $x \geqslant 2$ and $y > x$ oe or **B1** for either $x \geqslant 2$ or $y > x$ oe or for $x = 2$ and $y = x$ with incorrect inequalities
25 (a) (i)	75	**2**	**M1** for angle $XAC = 90$ or $ABC = 90$ soi
(ii)	150	**1**	
(iii)	75	**1FT**	**FT** *their* **(a)(i)** or *their* **(a)(ii)** ÷ 2
(b)	40	**2**	**M1** for $\frac{\text{angle}}{360} \times \pi \times 18 = [2\pi]$ oe