Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

MATHEMATICS **0580/23**

Paper 2 (Extended) **May/June 2017**

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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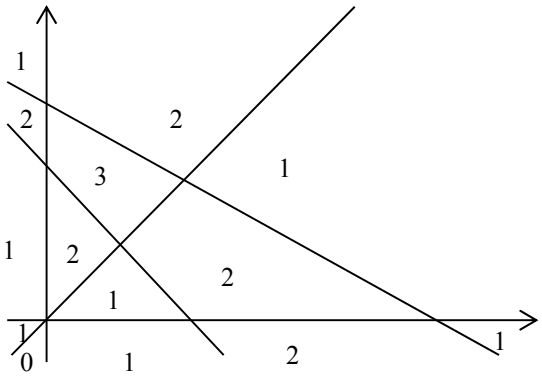
Abbreviations

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	Marks	Part Marks
1	0.407 or 0.4067...	**1**	
2	$4x(x-2y)$ final answer	**2**	**M1** for $4\left(x^2-2xy\right)$ or $x\left(4x-8y\right)$ or $2\left(2x^2-4xy\right)$ or $2x\,(2x-4y)$
3	120	**2**	**M1** for finding a correct product of prime factors or correctly listing a minimum of 3 multiples of 20 **and** 24 or for answer $2^3 \times 3 \times 5$ oe or $120k$ where k is an integer > 1
4	$(x-y)^2$ oe final answer	**2**	**M1** for $x-y=\sqrt{a}$ or *their* $(x-y)$ squared
5	68.6 or 68.62 to 68.64	**2**	**M1** for $\frac{1}{2}\times\frac{4}{3}\pi\times3.2^3$ If zero scored, **SC1** for final answer 137 or 137.2 to 137.3
6	$\frac{4}{25}$ oe	**2**	**M1** for $\frac{2}{5}\times\frac{2}{5}$ oe or denominator 5^2 oe
7	$\frac{32}{x^2}$ or $32x^{-2}$ final answer	**2**	**M1** for $y=\frac{k}{x^2}$ oe or [k =] 32
8	$\frac{2}{a^4}$ or $2a^{-4}$ final answer	**2**	**B1** for $\frac{2}{a^k}$ oe or $\frac{k}{a^4}$ oe ($k \neq 0$) final answer
9(a)(i)	$\begin{pmatrix}30\\-20\end{pmatrix}$	**1**	
9(a)(ii)	$\begin{pmatrix}-6\\4\end{pmatrix}$	**1**	
9(b)	–4	**1**	

Question	Answer	Marks	Part Marks
10(a)	10	**2**	**M1** for $5x + 6x + 7x = 180$ oe or $\frac{180}{5+6+7}$ or **B1** for angles 50, 60 and 70
10(b)	70	**1FT**	**FT** 7 × *their* (***a***) provided 0 < *their answer* < 180
11	Correct region	**3**	 **SC1** for *R* not marked and reverse shading
12(a)	$3 + 12x$ final answer	**1**	
12(b)	$24x + 31$ final answer	**2**	**M1** for $3 + 4(6x + 7)$
13	150	**3**	**M2** for $\left(\frac{1}{0.512}\right)^{\frac{2}{3}}$ oe or $\left(\frac{0.512}{1}\right)^{\frac{2}{3}}$ oe or **M1** for scale factor $\left(\frac{1}{0.512}\right)^{\frac{1}{3}}$ oe or $\left(\frac{0.512}{[1]}\right)^{\frac{1}{3}}$ oe
14	$10^{k+2} \times [0].\dot{6}\dot{3} - 10^{k} \times [0].\dot{6}\dot{3}$ oe where $k > 1$	**M1**	
	$\frac{63}{99}$ or equivalent fraction	**A1**	e.g. $\frac{6300}{9900}$ but not $\frac{7}{11}$
	$\frac{7}{11}$	**B1**	
15	35.8 or 35.77….	**3**	**M2** for [sin =] $\frac{24 \times \sin 71.8}{39}$ or **M1** for $\frac{39}{\sin 71.8} = \frac{24}{\sin x}$ oe
16(a)	$x \leqslant 3$ final answer	**2**	**M1** for $13 - 7 \geqslant 3x - x$ oe
16(b)	1, 2, 3	**1FT**	correct answer or **FT** their answer to **(a)**

Question	Answer	Marks	Part Marks
17	$\frac{2}{7}\mathbf{p} + \frac{5}{7}\mathbf{q}$	**3**	**M1** for $PZ = \frac{5}{7}(\mathbf{q} - \mathbf{p})$ oe or $QZ = \frac{2}{7}(\mathbf{p} - \mathbf{q})$ oe **M1** for correct route from O to Z or identifying OZ
18	3000	**3**	**M2** for $12.5 \times \frac{1}{2}(200 + 280)$ oe or **M1** for part area
19	common denominator 12	**B1**	accept $k \times 12$ throughout
	one correct from $\frac{9}{12}$ or $\frac{8}{12}$ oe	**M1**	accept $\frac{9k}{12k}$ or $\frac{8k}{12k}$
	$\frac{5}{6}$ cao	**A2**	**A1** for $\frac{10}{12}$ or $\frac{10k}{12k}$
20(a)	6	**1**	
20(b)	$2x^3$ final answer	**1**	
20(c)	$15y^4$ final answer	**2**	**B1** for $15y^k$ or ky^4 as final answer ($k \neq 0$)
21	$\sqrt{10^2 - 4 \times 5 \times 2}$ oe or better	**B1**	If completing the square: **B1** for $(x+1)^2$ oe **B1** for $-1 + \sqrt{1 - \frac{2}{5}}$ or $-1 - \sqrt{1 - \frac{2}{5}}$ oe
	$\frac{-10 + \sqrt{q}}{2(5)}$ or $\frac{-10 - \sqrt{q}}{2(5)}$ oe	**B1**	
	– 0.23, –1.77 final ans cao	**B1B1**	**SC1** for – 0.2 or – 0.225... **and** –1.8 or –1.774... or –1.775 or 0.23 and 1.77 as answer or – 0.23 and –1.77 seen in working Maximum score without working is 2
22	35.3 or 35.26…	**4**	**M3** for [tan =] $\frac{26}{\sqrt{26^2 + 26^2}}$ oe or **M1** for [AC^2 =] $26^2 + 26^2$ oe and **M1** for [tan =] 26 ÷ *their AC* oe or for angle CAG indicated

Question	Answer	Marks	Part Marks
23(a)	$4(x-6)$ or $4x-24$ as final answer	**1**	
23(b)	$x^2+23x+26$ final answer	**3**	**B2** for $x^2+4x+4x+16$ or better or **B1** for $15x+10$
24	1.96 cao	**5**	**M4** for $\left(\left(\left(\sqrt[3]{\frac{\frac{2500\times1.6\times3}{100}+2000}{2000}}\right)-1\right)-1\right)$ [× 100] oe or 1.96…or [0].0196... or 101.96… or 1.0196… or **M3** for $\sqrt[3]{\frac{\frac{2500\times1.6\times3}{100}+2000}{2000}}$ or **B2** for [SI =] 120 or [CI total=] 2120 or **M1** for $\frac{2500\times3\times1.6}{100}$ and **M1** for $2000\times(k)^3$