



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.

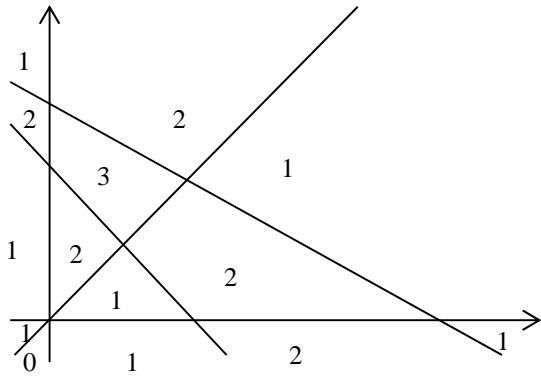
Cambridge will not enter into discussions about these mark schemes.

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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 $4(x^2 - 2xy)$ or $x(4x - 8y)$ or $2(2x^2 - 4xy)$ 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 <i>their</i> $(x-y)$ squared
5	68.6 or 68.62 to 68.64	2	M1 for $\frac{1}{2} \times \frac{4}{3} \pi \times 3.2^3$ 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 $7 \times$ their (a) provided $0 < \text{their answer} < 180$
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)	$x \leq 3$ final answer	2	M1 for $13 - 7 \geq 3x - x$ oe
16(b)	1, 2, 3	1FT	correct answer or FT their answer to (a)

Question	Answer	Marks	Part Marks
17	$\frac{2}{7}p + \frac{5}{7}q$	3	M1 for $PZ = \frac{5}{7}(q - p)$ oe or $QZ = \frac{2}{7}(p - q)$ 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 $-0.225\dots$ and -1.8 or $-1.774\dots$ 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 $[\tan =] 26 \div \text{their } AC$ 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	<p>M4 for $\left(\left(\left(\frac{\sqrt{2500 \times 1.6 \times 3}}{100} + 2000 \right)^3 - 1 \right) - 1 \right) [\times 100]$ oe or 1.96... or [0].0196... or 101.96... or 1.0196... or</p> <p>M3 for $\sqrt[3]{\frac{2500 \times 1.6 \times 3}{100} + 2000}$ or</p> <p>B2 for [SI =] 120 or [CI total =] 2120 or M1 for $\frac{2500 \times 3 \times 1.6}{100}$ and M1 for $2000 \times (k)^3$</p>