
MATHEMATICS

0580/23

Paper 2 (Extended)

May/June 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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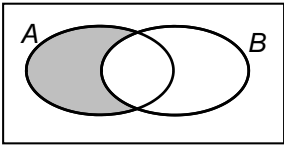
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Abbreviations

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	17	1	
2	71000 cao	1	
3	10.3 oe	2	M1 for $5x = 51.5$ oe
4	0.5 or $\frac{1}{2}$	2	M1 for correct first step e.g. $6y + 6 = 9$ or $y + 1 = \frac{9}{6}$
5	$\frac{1}{12} \times \frac{6}{5}$ oe $\frac{1}{10}$ final answer cao	M1 A1	Must be shown
6	Correct perpendicular bisector with 2 pairs of correct arcs	2	B1 for correct bisector with no arcs or incorrect arcs or for correct intersecting arcs with no/wrong line
7	$8x^6$ final answer	2	B1 for $8x^k$ or cx^6
8	$\frac{29}{90}$ oe, must be a fraction	2	M1 for $32.\dot{2} - 3.\dot{2}$ or B1 for $\frac{k}{90}$
9	$\frac{1}{4}\mathbf{a} - \frac{1}{4}\mathbf{b} - \frac{1}{4}\mathbf{c}$ oe	2	B1 for $\overline{GK} = \mathbf{a} - \mathbf{b} - \mathbf{c}$ oe soi or $\overline{GL} = \frac{1}{4}(\overline{GK})$ or for any correct route
10	14	2	M1 for $56 = 2 \times 2 \times 2 \times 7$ soi or $70 = 2 \times 5 \times 7$ soi or 2×7 as final answer
11 (a)	0.6 oe	1	
(b)	20 0.3 oe 0.3 oe	2	B1 for 20 B1 for 0.3 oe and 0.3 oe
12	110	3	B2 for $ADC = 25$ or B1 for $AEC = 135$ or $CAE = 25$

Question	Answer	Mark	Part marks
13 (a)	72	1	
(b)	123	2FT	FT dep. on answer being obtuse M1 for $(360 - \text{their}(a) - 42) [\div 2]$
14 (a) (i)	8	1	
(ii)	9, 15	1	
(b)		1	
15	310 or 310.2 to 310.3	3	M2 for $7^3 - \frac{1}{2} \times \frac{4}{3} \times \pi \times \left(\frac{5}{2}\right)^3$ or M1 for $\frac{1}{2} \times \frac{4}{3} \times \pi \times \left(\frac{5}{2}\right)^3$ or SC1 for $7^3 - \frac{4}{3} \times \pi \times \left(\frac{5}{2}\right)^3$ soi
16	90	3	M1 for $y = k(x + 2)^2$ A1 for $k = 2.5$ or M2 for $\frac{(8 + 2)^2}{250} = \frac{(4 + 2)^2}{y}$ oe
17 (a)	10.4675 cao nfw	2	B1 for 3.95 or 2.65 seen or M1 for $(4.0 - 0.05) \times (2.7 - 0.05)$
(b)	34 nfw	2	B1 for 7.65 or 0.225 seen or M1 for $(7.6 + 0.05) \div (0.23 - 0.005)$
18 (a)	2 cao	2	M1 for rise/run attempted e.g. 4/2 or other correct method for finding gradient or SC1 for $y = 2x - 1$ as answer
(b)	$y = 2x + 6$ oe	2FT	FT for $y = \text{their}(a)x + 6$ B1 for $y = mx + 6$ ($m \neq 0$ or 2) or $y = 2x [+ k]$ or $y = \text{their}(a)x [+ k]$ ($k \neq 6$) or for answer $2x + 6$ or answer $\text{their}(a)x + 6$
19 (a)	57 122	2	M1 for $20\,000 \times \left(1 + \frac{30}{100}\right)^4$ oe
(b)	15	2	M1 for two substitutions greater than 4 e.g. $20\,000 \times \left(1 + \frac{30}{100}\right)^k$ where $k > 4$

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Question	Answer	Mark	Part marks
20	$y < 4$ $y \geq 3$ $x \geq 2$ $y > x$	4	<p>B1 for each correct answer to a maximum of 3 marks. First two may be combined as a single inequality e.g. $3 \leq y < 4$ for B2</p> <p>After 0 scored SC1 for use of = signs or incorrect inequality signs in all four equations</p>
21 (a)	5	2	M1 for $\frac{9}{k} = \frac{6 + 4.8}{6}$ oe
(b)	24	3	<p>M2 for $\sqrt[3]{\frac{2592}{1500}} \times 20$ oe</p> <p>or M1 for $\sqrt[3]{\frac{2592}{1500}}$ or $\sqrt[3]{\frac{1500}{2592}}$</p>
22 (a)	1.5 nfw	2	B1 for 2.5 or 1
(b)	3.5	2	B1 for 114 soi
(c)	18	2	B1 for 102 soi
23 (a)	9.11 or 9.110...	4	<p>M3 for $\sqrt{5^2 + 3^2 + 7^2}$</p> <p>or M2 for $\sqrt{5^2 + 3^2}$ or $\sqrt{3^2 + 7^2}$ or $\sqrt{5^2 + 7^2}$</p> <p>or M1 for $5^2 + 3^2$ or $3^2 + 7^2$ or $5^2 + 7^2$</p>
(b)	33.3 or 33.28 to 33.29	3	<p>M2 for $\sin = \frac{5}{\text{their}(a)}$ oe</p> <p>or B1 for identifying angle <i>ECH</i></p>