



Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

MATHEMATICS

0580/22

Paper 22 (Extended)

March 2017

MARK SCHEME

Maximum Mark: 70

Published

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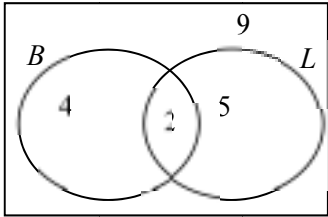
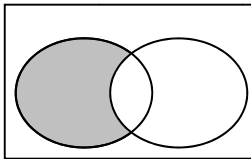
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Abbreviations

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	Marks	Part Marks
1	$18w + 14$ final answer	2	M1 for $20w + 12$ or $-2w + 2$ or answer $18w + k$ or $kw + 14$
2	Equilateral triangle with correct arcs	2	M1 for clear evidence of constructed 60° angles or arcs crossing equal in length to AB or an accurate diagram with no/incorrect arcs
3	$\frac{10 \times 20}{90 - 40}$ 4 nfww	M1 A1	
4	4 nfww	2	M1 for $[7.31 =] 7 \left(1 + \frac{1.1}{100}\right)^k$ oe
5	150	2	M1 for $2 \times 3 + 16 \times 3^2$
6	$10^k \times 0.1\dot{7} - [10] \times 0.1\dot{7}$ $k \geq 1$ oe $\frac{16}{90}$ or $\frac{8}{45}$ oe nfww	M1 A1	
7	70.7625 cao and 72.4625 cao	3	B2 for 70.7625 or 72.4625 or M2 for 9.25×7.65 and 9.35×7.75 or B1 for two of 9.25, 9.35, 7.65, 7.75 seen
8	$\frac{10}{3}$ or $\frac{5}{2}$ <i>their</i> $\frac{10}{3} \times \text{their } \frac{2}{5}$ $1\frac{1}{3}$ cao	B1 M1 A1	oe improper fractions accept $\frac{20}{6} \div \frac{15}{6}$
9	18.1 or 18.10....	3	M2 for $\sqrt{20^2 - \left(\frac{1}{2}(17)\right)^2}$ oe or M1 for $h^2 + \left(\frac{1}{2}(17)\right)^2 = 20^2$

Question	Answer	Marks	Part Marks
10	1050	3	M2 for $924 \div \frac{(100-12)}{100}$ oe or M1 for 88[%] associated with 924 oe
11		3	B2 for correct translation of A seen or B1 for translation of A by $\begin{pmatrix} -1 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ 3 \end{pmatrix}$ seen and B1 for correct reflection of their translation in $x = 2$ seen If 0 scored SC2 for correct $TM(A)$ or SC1 for reflection in $x = 2$ seen or a correct translation of $\begin{pmatrix} -1 \\ 3 \end{pmatrix}$ seen
12	4	3	M1 for $y = \frac{k}{x^2}$ M1 for $y = \frac{\text{their } k}{10^2}$ or M2 for $5^2 \times 16 = 10^2 \times y$ oe
13 (a)	$5c(3c - 1)$ final answer	2	B1 for $5(3c^2 - c)$ or $c(15c - 5)$
(b)	$(2p - m)(k + 3)$ final answer	2	B1 for $k(2p - m) + 3(2p - m)$ or $2p(k + 3) - m(k + 3)$
14 (a)	Point at (3, 5)	1	
(b)	$\begin{pmatrix} 1 \\ -3 \end{pmatrix}$	1FT	FT their \overrightarrow{AC}
(c)	$\begin{pmatrix} 0 \\ 4 \end{pmatrix}$ or $\begin{pmatrix} 0 \\ -4 \end{pmatrix}$	2	M1 for a vector of magnitude 4 or of form $\begin{pmatrix} 0 \\ \pm k \end{pmatrix}$
15 (a)	t^{20} final answer	1	
(b)	x^{10} final answer	1	
(c)	$27m^6$ final answer	2	B1 for $27m^k$ or km^6 as final answer

Question	Answer	Marks	Part Marks
16 (a)	0.25 or $\frac{1}{4}$	1	
(b)	0.45	3	B2 for 450 or M2 for $\frac{1}{2} \times 60 \times 15 \div 1000$ or M1 for $\frac{1}{2} \times 60 \times 15$ If 0 scored SC1 for correct conversion of their distance in metres to kilometres
17 (a) (i)		2	B1 for 2 correct of 4, 2, 5, 9 in the correct places or SC1 for
(ii)	9	1FT	FT their 9
(b)		1	
18 (a)	$\begin{pmatrix} 27 & -24 \\ -5 & -10 \end{pmatrix}$	2	B1 for two correct elements
(b)	$-\frac{1}{13} \begin{pmatrix} -2 & -3 \\ -1 & 5 \end{pmatrix}$ oe isw	2	B1 for $k \begin{pmatrix} -2 & -3 \\ -1 & 5 \end{pmatrix}$ or $\det = -13$ soi
19 (a)	11.4 or 11.40 to 11.41	2	M1 for $\frac{1}{2} \times 2.8 \times 8.3 \times \sin 79$ oe
(b)	231 or 230.8 to 231.1	2FT	FT their (a) $\times 4.5^2$ M1 for 4.5^2 or 20.25 seen

Question	Answer	Marks	Part Marks
20 (a)	$[y =] -2x + 3$	3	B2 for $[y =] -2x + c$ or M1 for rise/run and B1 for $[y =] kx + 3, k \neq 0$ or $c = 3$
(b)	$y = \frac{1}{2}x - \frac{5}{2}$ oe final answer	3	M1 for gradient = $-\frac{1}{\text{their gradient in (a)}}$ or gradient = 0.5 oe M1 for substitution of (3, -1) into <i>their</i> $y = mx + c$ oe
21 (a)	10	2	M1 for $\frac{x}{4} - 3 = -0.5$
(b)	$\frac{x+7}{6}$ final answer	2	M1 for $y + 7 = 6x$ or $\frac{y}{6} = x - \frac{7}{6}$ or $x = 6y - 7$
(c)	-2	2	M1 for $[f(13) =] \frac{1}{4}$