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Cambridge International General Certificate of Secondary Education

MARK SCHEME for the March 2016 series

0580 MATHEMATICS

0580/22

Paper 2 (Paper 22 – Extended), maximum raw mark 70

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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
nfw	not from wrong working
soi	seen or implied

Qu.	Answers	Mark	Part Marks
1	7, – 4	1	
2	$2x(1 - 2y)$ final answer	2	M1 for $2(x - 2xy)$ or $x(2 - 4y)$ or for correct answer then spoilt
3	75.1 or 75.09 to 75.10	2	M1 for $\cos [\dots] = \frac{0.9}{3.5}$
4	$n < 1.5$ oe final answer	2	B1 for 1.5 oe in answer or M1 for $3 > 8n - 6n$ oe
5	9.1 oe	2	M1 for $\frac{5.2}{PQ} = \frac{12.4}{21.7}$ oe
6	$\frac{4}{9}$ oe, must be fraction	2	M1 for $10 \times 0.\dot{4} - 0.\dot{4}$ oe
7	130 or 130.0 to 130.1	2	M1 for $\frac{1}{2} \times 22.3 \times 27.6 \times \sin 25$
8	$\frac{1}{5} \begin{pmatrix} 7 & 2 \\ 8 & 3 \end{pmatrix}$ oe isw	2	M1 for $\frac{1}{5} \begin{pmatrix} a & b \\ c & d \end{pmatrix}$ soi or $k \begin{pmatrix} 7 & 2 \\ 8 & 3 \end{pmatrix} \quad k \neq 0$ or $\det = 5$ soi
9	$\frac{35(\text{or } 95)}{60} + \frac{39}{60}$ $2\frac{7}{30}$	M1 A2	accept $\frac{35k(\text{or } 95k)}{60k} + \frac{39k}{60k}$ or A1 for $\frac{67}{30}$ or $\frac{134k}{60k}$ or $1\frac{74k}{60k}$ or $2\frac{14k}{60k}$
10	64 000	3	M2 for $\frac{1.6 \times 20000^2}{100^2}$ oe or M1 for figs 64 in answer or $1 \text{ cm}^2 = 40\,000 \text{ m}^2$

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Qu.	Answers	Mark	Part Marks
11	16.58 cao	3	B2 for 16.6 or 16.580 to 16.583 final answer or 16.58 not as final answer or M1 for $\frac{38}{360} \times 2 \times \pi \times 25$ and B1 for rounding their more accurate answer correctly to 4sf
12	87 cao nfw	3	B2 for 87.04.... or 87.0 nfw or M1 for 500.5 or 5.75 seen or for $(500 + 0.5) \div (5.8 - 0.05)$ and B1 for truncating their decimal answer to an integer
13 (a)	$2^5 \times 3^2 \times 7$ oe final answer	3	B2 for product of two of $2^5, 3^2, 7$ or B1 for 2, 3 and 7 seen or M1 for 2×1008 or 3×672 or 7×288 soi
(b)	2.016×10^3	1	
14 (a)	$x^8 y^7$ final answer	2	B1 for answer $x^8 y^k$ or $x^k y^7$ ($k \neq 0$)
(b)	$27 p^6 m^{15}$ final answer	2	B1 for 2 correct of $27, p^6, m^{15}$ in a product as answer
15	111.2 or 111.1 to 111.2	4	M2 for $[\cos =] \frac{2.8^2 + 3.6^2 - 5.3^2}{2 \times 2.8 \times 3.6}$ or M1 for implicit form A1 for $[\cos =] -0.362$ to -0.361
16	44.1 or 44.07...	4	M1 for 4 of mid-values 15 30 45 55 75 soi M1 for $\sum fx$ for any x in intervals including boundaries M1 dep for $\sum fx \div 70$ Dep on 2nd M mark earned

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Qu.	Answers	Mark	Part Marks
17	$\frac{-(-11) \pm \sqrt{(-11)^2 - 4(3)(4)}}{2 \times 3}$ 0.41 and 3.26 final ans cao	2 B1B1	B1 for $\sqrt{(-11)^2 - 4(3)(4)}$ or better and, if in form $\frac{p + \sqrt{q}}{r}$ or $\frac{p - \sqrt{q}}{r}$, B1 for $p = -(-11)$ and $r = 2(3)$ SC1 for 0.4 and 3.3 or 0.409... and 3.257... or -0.41 and -3.26 or 0.41 and 3.26 seen in working
18 (a)	47	1	
(b)	117	2	M1 for $360 - (115 + 85 + 97)$
(c)	244	2	B1 for 116 seen at centre or 122 seen at circumference
19	$y < 2$ oe and $x \geq -2$ oe $y \geq \frac{1}{2}x + 1$ oe and $y \leq -x + 3$ oe	2 3	B1 for either correct B2 for either $y \geq \frac{1}{2}x + 1$ oe or $y \leq -x + 3$ oe or SC2 for $y = \frac{1}{2}x + 1$ oe and $y = -x + 3$ oe or SC1 for $y = \frac{1}{2}x + 1$ oe or $y = -x + 3$ oe or SC4 for $y \leq 2$ oe, $x > -2$ oe, $y > \frac{1}{2}x + 1$ oe and $y < -x + 3$ oe
20 (a)	$9a + 3b$	1	
(b)	$36a + 6b = 96$ or $9a + 3b = 21$ for correct method to eliminate one variable $a = 3$ $b = -2$	B1 M1 A1 A1	If M0 A0 A0 scored SC1 for 2 values satisfying $36a + 6b = 96$ or $9a + 3b = 21$ or if no working shown, but 2 correct answers given

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Qu.	Answers	Mark	Part Marks
21 (a)	$\frac{2}{3}$ oe	1	
(b)	their $\frac{2}{3}$, $\frac{7}{8}$, $\frac{5}{8}$ oe	2	B1 for either $\frac{7}{8}$ or $\frac{5}{8}$
(c) (i)	$\frac{1}{24}$ oe	2	M1 for $\frac{1}{3} \times \frac{1}{8}$ seen
(ii)	$\frac{17}{24}$ oe	3	M2FT for $\frac{1}{3} \times \frac{7}{8} + \frac{2}{3} \times \frac{5}{8}$ or M1FT for $\frac{1}{3} \times \frac{7}{8}$ or $\frac{2}{3} \times \frac{5}{8}$