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**MATHEMATICS**

**0580/23**

Paper 2 (Extended)

**October/November 2016**

MARK SCHEME

Maximum Mark: 70

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**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

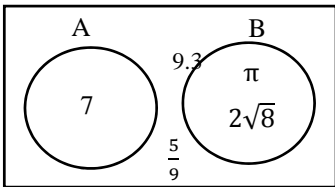
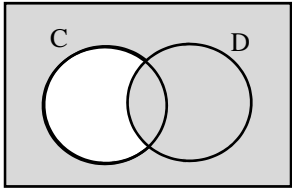
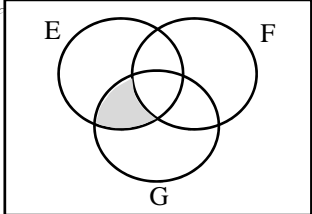
cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Mark	Part marks
<b>1</b>	36	<b>1</b>	
<b>2</b>	$n^7$ final answer	<b>1</b>	
<b>3</b>	$B$	<b>1</b>	
<b>4 (a)</b>	$2.47 \times 10^6$	<b>1</b>	
<b>(b)</b>	$7.9 \times 10^{-3}$	<b>1</b>	
<b>5</b>	$\frac{18}{30}$ and $\frac{5}{30}$ oe must be shown  $\frac{23}{30}$ cao	<b>M1</b>  <b>A1</b>	$\frac{18k}{30k}$ and $\frac{5k}{30k}$
<b>6</b>	Thursday	<b>2</b>	<b>M1</b> for 5.4 found or at least two of: 3.8, 3.6 and 4 found
<b>7</b>	$0.4^2$ $0.6^3$ $0.22$ $\sqrt{0.09}$	<b>2</b>	<b>M1</b> for decimal conversion 0.216 and 0.3 and 0.16
<b>8</b>	4.25 4.15	<b>2</b>	<b>B1</b> for each or both answers reversed
<b>9 (a)</b>	A	<b>1</b>	
<b>(b)</b>	A ruled line joining (65, 23) to (80, 28)	<b>1</b>	
<b>10 (a)</b>	2.9[0] or 2.900 to 2.901	<b>1</b>	
<b>(b)</b>	3.17 or 3.172 to 3.173	<b>1</b>	
<b>11</b>	18 360	<b>2</b>	<b>M1</b> for $34\,000 \times \left(1 - \frac{40}{100}\right) \times \left(1 - \frac{10}{100}\right)$ oe
<b>12</b>	32.7 or 32.72 to 32.73	<b>2</b>	<b>M1</b> for $\left[\frac{1}{2} \times \frac{4}{3}\right] \times \pi \times \left(\frac{5}{2}\right)^3$

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Question	Answer	Mark	Part marks
13	$\frac{2}{9}$ oe, must be a fraction	2	<b>M1</b> for $2.\dot{2} - 0.\dot{2}$ oe or <b>B1</b> for $\frac{k}{9}$
14 (a)	30	1	
(b)	47.5	2	<b>M1</b> for $4.5 \times 5$ oe
15 (a)	68	1	
(b)	9	2	<b>M1</b> for $360 \div 40$ oe or $\frac{180(n-2)}{n} = 140$ oe
16	1.25	3	<b>M1</b> for $d = \frac{k}{(w+1)^2}$ or better  <b>M1</b> for $[d=] \frac{\text{their } k}{(7+1)^2}$ or <b>M2</b> for $3.2(4+1)^2 = d(7+1)^2$ oe
17	$y = 2x$ oe	3	<b>M1</b> for $\frac{1-3}{12-8}$ oe  <b>M1</b> for perpendicular gradient $\times$ <i>their</i> $\frac{1-3}{12-8} = -1$ oe If zero scored, <b>SC1</b> for answer $y = kx$ $k \neq 2$ or 0
18 (a)	25	1	
(b)	$\frac{x^2-3}{2}$ oe final answer	1	
(c)	$2x + 3$ final answer	2	<b>M1</b> for correct first step, e.g. $x = \frac{y-3}{2}$ or $2y = x - 3$

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Question	Answer	Mark	Part marks
19 (a)	Correct tangent  $2.1 \leq \text{grad} \leq 3.9$	<b>B1</b>  2	No daylight between tangent and curve at point of contact. Consider point of contact as midpoint between two vertices of daylight, the midpoint must be between $x = 0.8$ and $x = 1.2$  dep on <b>B1</b> <b>M1</b> for $\frac{\text{rise}}{\text{run}}$ also dep on any tangent drawn or close attempt at tangent at any point Must see correct or implied calculation from a drawn tangent
(b)	$(-2, 8)$	1	
20 (a)	⊗ 	2	<b>B1</b> for 3 elements in the correct place
(b)	⊗ 	1	
	⊗ 	1	
21 (a)	14.4 or 14.42 to 14.43	2	<b>M1</b> for $\frac{1}{2} \times 6.2 \times 4.7 \times \sin 82$ oe
(b)	30.7 or 30.72...	2	<b>M1</b> for $\sin = \frac{2050}{\frac{1}{2} \times 107 \times 75}$
22	1 3.5 1	4	<b>B3</b> for 2 correct <b>B2</b> for 1 correct or <b>M1</b> for 2, 7, [...] and 2 seen [FDs]
23	$\frac{7n}{2t+3m}$ final answer	4	<b>M1</b> for $7n(6p-1)$ seen and <b>M2</b> for $(2t+3m)(6p-1)$ seen or <b>M1</b> for $2t(6p-1) + 3m(6p-1)$ or $6p(2t+3m) - 1(2t+3m)$

Page 5	Mark Scheme	Syllabus	Paper
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Question	Answer	Mark	Part marks
24	$y \leq -\frac{3}{5}x + 6$ oe $x \geq 2$ oe $y > x$ oe  final answers	5	<b>SC4</b> for $y < -\frac{3}{5}x + 6, x > 2, y \geq x$ oe or <b>B3</b> for $y \leq -\frac{3}{5}x + 6$ oe or <b>B2</b> for $y = -\frac{3}{5}x + 6$ oe or <b>B1</b> for gradient = $-\frac{3}{5}$ oe soi and <b>B2</b> for $x \geq 2$ and $y > x$ oe or <b>B1</b> for either $x \geq 2$ or $y > x$ oe or for $x = 2$ and $y = x$ with incorrect inequalities
25 (a)	<b>CB</b>	1	
(b)	$\begin{pmatrix} 36 & -2 \\ 18 & -1 \end{pmatrix}$	2	<b>B1</b> for two correct entries
(c)	$\frac{1}{47} \begin{pmatrix} 5 & 3 \\ -4 & 7 \end{pmatrix}$ oe isw	2	<b>B1</b> for $k \begin{pmatrix} 5 & 3 \\ -4 & 7 \end{pmatrix}$ seen or det = 47 soi
(d)	The determinant is 0 oe	1	