**Cambridge International Examinations**
Cambridge International General Certificate of Secondary Education

**MATHEMATICS** **0580/23**

Paper 2 (Extended) **October/November 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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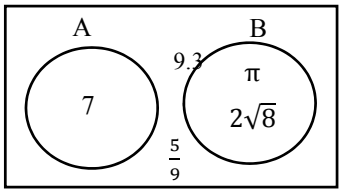
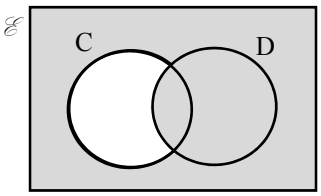
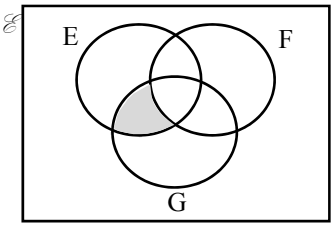
This syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

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

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

| Question | Answer | Mark | Part marks |
|---|---|---|---|
| 19 (a) | Correct tangent | B1 | 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 $x = 1.2$ |
| | $2.1 \leqslant \text{grad} \leqslant 3.9$ | 2 | dep on **B1**<br>**M1** for $\frac{rise}{run}$ also dep on any tangent drawn or close attempt at tangent at any point<br>Must see correct or implied calculation from a drawn tangent |
| (b) | (–2, 8) | 1 | |
| 20 (a) |  | 2 | **B1** for 3 elements in the correct place |
| (b) |  | 1 | |
| |  | 1 | |
| 21 (a) | 14.4 or 14.42 to 14.43 | 2 | **M1** for $\frac{1}{2} \times 6.2 \times 4.7 \times \sin 82$ oe |
| (b) | 30.7 or 30.72… | 2 | **M1** for $\sin = \frac{2050}{\frac{1}{2} \times 107 \times 75}$ |
| 22 | 1 3.5 1 | 4 | **B3** for 2 correct<br>**B2** for 1 correct<br>or **M1** for 2, 7, […] and 2 seen [FDs] |
| 23 | $\frac{7n}{2t+3m}$ final answer | 4 | **M1** for $7n(6p - 1)$ seen<br>and<br>**M2** for $(2t + 3m)(6p - 1)$ seen<br>or **M1** for $2t(6p - 1) + 3m(6p - 1)$<br>or $6p(2t + 3m) - 1(2t + 3m)$ |

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