

**CAMBRIDGE INTERNATIONAL EXAMINATIONS**

Cambridge International General Certificate of Secondary Education

## **MARK SCHEME for the May/June 2015 series**

### **0580 MATHEMATICS**

**0580/23**

Paper 2 (Extended), maximum raw mark 70

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### Abbreviations

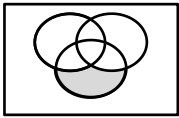
|     |                            |
|-----|----------------------------|
| cao | correct answer only        |
| dep | dependent                  |
| FT  | follow through after error |
| isw | ignore subsequent working  |
| oe  | or equivalent              |
| SC  | Special Case               |
| nfw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

| Question | Answer   | Mark  | Part Marks   |
|----------|--|---|--|
| 1        | 168  | 2   | <b>M1</b> for $240 \div (7 + 3)$ or better   |
| 2        | $3x(3x - 2)$ final answer  | 2   | <b>B1</b> for $3(3x^2 - 2x)$ or $x(9x - 6)$  |
| 3        | 66.4[2...]   | 2   | <b>M1</b> for $\cos [\dots] = \frac{2}{5}$ oe  |
| 4        | 18.45<br>18.75   | 1<br>1                                      | If 0 scored, <b>SC1</b> for 6.15 <b>and</b> 6.25 seen or for correct answers reversed  |
| 5        | $(2x + 1)(x - 3)$  | 2   | <b>B1</b> for $(2x + a)(x + b)$ , where $ab = -3$ or $a + 2b = -5$   |
| 6        | $\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$  | 2   | <b>B1</b> for one correct column   |
| 7        | 1.60 cao   | 3   | <b>B2</b> for 1.597... or 1.6 or <b>M1</b> for $2 \div 1.252$  |
| 8        | $\frac{15}{8}$<br><br>their $\frac{15}{8} \times \frac{9}{5}$ oe<br><br>$\frac{27}{8}$ or $3\frac{3}{8}$ cao | <b>B1</b><br><br><b>M1</b><br><br><b>A1</b> | or $\frac{135}{72}$<br><br>or $\frac{135}{72} \div \frac{40}{72}$ or equivalent division with fractions with common denominators   |
| 9        | 2.8 oe   | 3   | <b>M2</b> for $12 + 2 = 8x - 3x$ or better or <b>M1</b> for $3x + 12$ or $8x - 2$  |
| 10       | 20.6 or 20.58 to 20.59   | 3   | <b>M2</b> for $\frac{85 - 67.5}{85} \times 100$ or $\left(1 - \frac{67.5}{85}\right) \times 100$<br><br>or <b>M1</b> for $\frac{85 - 67.5}{85}$ or $\frac{67.5}{85} \times 100$<br><br>If zero scored <b>SC1</b> for $\frac{67.5 - 85}{85} \times 100$ |

|               |  |                 |              |
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| <b>Question</b> | <b>Answer</b>  | <b>Mark</b>  | <b>Part Marks</b>   |
|-----------------|--|--|---|
| <b>11</b>       | 12.2 or 12.18 to 12.19   | <b>3</b>   | <b>M2</b> for $\frac{24 \sin 30}{\sin 100}$<br>or <b>M1</b> for correct implicit equation<br>e.g. $\frac{\sin 100}{24} = \frac{\sin 30}{BC}$  |
| <b>12 (a)</b>   | 5  | <b>3</b>   | <b>M2</b> for $\frac{u \times 10}{2} + 2u \times 10 = 125$ oe<br>or <b>M1</b> for evidence that area represents distance e.g. $\frac{u \times 10}{2}$ , $2u \times 10$ or $3u \times 10$  |
| <b>(b)</b>      | 2  | <b>1FT</b>   | <b>FT</b> $10 \div$ <i>their</i> $u$ correctly evaluated  |
| <b>13 (a)</b>   | $4x^9$ final answer  | <b>2</b>   | <b>B1</b> for answer $kx^9$ or $4x^k$ ( $k \neq 0$ )  |
| <b>(b)</b>      | $2y^{32}$ final answer   | <b>2</b>   | <b>B1</b> for answer $ky^{32}$ or $2y^k$ ( $k \neq 0$ )   |
| <b>14</b>       | $\sqrt{1^2 - 4(2)(-2)}$<br><br>If in form $\frac{p + \sqrt{q}}{r}$ or $\frac{p - \sqrt{q}}{r}$<br><br>$p = -1$ , $r = 2(2)$ or $4$<br><br>– 1.28<br>0.78 | <b>B1</b><br><br><b>B1</b><br><br><b>B1</b><br><br><b>B1</b> | If completing the square <b>B1</b> for $\left(x + \frac{1}{4}\right)^2$ oe<br><br><b>B1</b> for $x = -\frac{1}{4} + \sqrt{1 + \left(\frac{1}{4}\right)^2}$<br>or $x = -\frac{1}{4} - \sqrt{1 + \left(\frac{1}{4}\right)^2}$<br><br>If <b>0</b> scored for the last two <b>B</b> marks then<br><b>SC1</b> for – 1.3 <b>and</b> 0.8<br>or – 1.281 to – 1.280 <b>and</b> 0.781 or 0.7807 to 0.7808<br>or 1.28 <b>and</b> – 0.78<br>or – 1.28 <b>and</b> 0.78 seen in the working |
| <b>15 (a)</b>   | 4.77 or 4.774 to 4.775   | <b>2</b>   | <b>M1</b> for $30 \div [2]\pi$  |
| <b>(b)</b>      | 35.7 or 35.8 or 35.74 to 35.82   | <b>2</b>   | <b>M1</b> for $0.5 \times \pi \times (\text{their (a)})^2$<br>or $0.5 \times \pi \times (30 \div 2\pi)^2$   |

|        |                                 |          |       |
|--------|---------------------------------|----------|-------|
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| Question   | Answer  | Mark | Part Marks  |
|------------|---|------|---|
| 16 (a) (i) | 14  | 2    | M1 for any two of 1, 11, 14, 4 correctly placed on Venn diagram or for $1 + 25 - x + x + 18 - x = 30$ oe  |
| (ii)       | $\frac{11}{30}$ oe  | 1FT  | FT $\frac{25 - \text{their (a)(i)}}{30}$ or $\frac{\text{their } 11}{30}$ from diagram  |
| (iii)      | $\frac{11}{12}$ oe  | 1FT  | FT their diagram e.g. $\frac{\text{their } 11}{12}$ or $\frac{25 - \text{their (a)(i)}}{12}$  |
| (b)        |  | 1    |   |
| 17 (a)     | 6   | 1    | M1 for 7 identified as the UQ or 5 identified as the LQ<br>or both lines drawn from the 150 and 50 across and down to the horizontal axis   |
| (b)        | 2   | 2    |   |
| (c)        | 180   | 2    |   |
| 18         | 912 or 912.2...   | 5    | M4 for $4 \times 0.5 \times 20 \times \sqrt{8^2 + 10^2} + 20 \times 20$ or better<br>or<br>M3 for $4 \times 0.5 \times 20 \times \sqrt{8^2 + 10^2}$ or better<br>or<br>M1 for $\sqrt{8^2 + 10^2}$<br>and<br>M1 for $0.5 \times 20 \times \sqrt{8^2 + 10^2}$<br>and<br>M1 for $20 \times 20$ |

|        |                                 |          |       |
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| Question | Answer  | Mark  | Part Marks  |    |
|----------|---|---|---|----|
| 19       | (a) (i) $-\mathbf{b} + \mathbf{a}$  | 1   |   |    |
|          | (ii) $\mathbf{b} + \frac{1}{2}\mathbf{a}$   | 1   |   |    |
|          | (b)   | $[\overrightarrow{OX} =] \mathbf{b} + \frac{1}{3}(-\mathbf{b} + \mathbf{a})$ oe |   | M1 |
|          |   | $\frac{1}{3}\mathbf{a} + \frac{2}{3}\mathbf{b}$ oe                              |   | A1 |
|          | 2 statements from:<br>$\overrightarrow{OM} = \mathbf{b} + \frac{1}{2}\mathbf{a}$ oe<br>or<br>$[\overrightarrow{OX} =] \frac{2}{3}(\mathbf{b} + \frac{1}{2}\mathbf{a})$ oe<br>or $\overrightarrow{OX} = \frac{2}{3}\overrightarrow{OM}$ oe | B2  | B1 for any one of these statements  |    |
| 20       | 9.37 or 9.370 to 9.371  | 6   | M2 for $\sin[P] = \frac{38.5}{0.5 \times 9 \times 10}$<br>or M1 for $0.5 \times 10 \times 9 \times \sin = 38.5$<br>M3 for $\sqrt{(9^2 + 10^2 - 2 \times 9 \times 10 \times \cos(\text{their } P))}$<br>or M2 for $9^2 + 10^2 - 2 \times 9 \times 10 \times \cos(\text{their } P)$<br>or M1 for a correct implicit expression<br>e.g. $\cos(\text{their } P) = \frac{9^2 + 10^2 - RQ^2}{2 \times 9 \times 10}$<br>Note: 87.8, 87.81[...] or 87.7[55...] score 4 marks<br>or<br>M is foot of perpendicular from R to PQ<br>M2 for perp.ht = $38.5 \div \frac{1}{2} \times 10$ or 7.7<br>or M1 for $\frac{1}{2} \times 10 \times [...] = 38.5$<br>M1 for $PM = \sqrt{(9^2 - 7.7^2)} [= 4.659... \text{ or } 4.66]$<br>M1 for $QM = 10 - \text{their } 4.659... [= 5.34...]$<br>M1 for $QR = \sqrt{((\text{their } QM)^2 + 7.7^2)}$ |    |