

**CAMBRIDGE INTERNATIONAL EXAMINATIONS**

Cambridge International General Certificate of Secondary Education

## **MARK SCHEME for the October/November 2014 series**

### **0580 MATHEMATICS**

**0580/42**

Paper 4 – Extended, maximum raw mark 130

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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            |

| Qu.      | Answer  | Mark       | Part marks  |
|----------|---|------------|---|
| <b>1</b> | <b>(a) (i)</b> 49.5[0]                              | <b>3</b>   | <b>M2</b> for $16.5[0] \div 5 \times (5 + 3 + 7)$<br>or <b>M1</b> for $16.5[0] \div 5$  |
|          | <b>(ii)</b> 66                                      | <b>1FT</b> | <b>FT</b> <i>their (a)(i)</i> $\div 75 \times 100$ to 3 sf or better  |
|          | <b>(b)</b> 2 hours 39 mins 45 secs                  | <b>3</b>   | <b>B2</b> for 159.75 oe, e.g. 2.6625 [h] 9585 [s]<br>or <b>M1</b> for 3 hrs 33 mins oe / (2 + 9 + 1) oe   |
|          | <b>(c)</b> 18.75 <b>final answer</b>                | <b>3</b>   | <b>M2</b> for $16.5[0] \div 0.88$ oe<br>or <b>M1</b> for 16.5[0] associated with 88[%]  |
| <b>2</b> | <b>(a)</b> $x > 0.5$ oe <b>final answer nfww</b>    | <b>3</b>   | <b>B2 nfww</b> for 0.5 with no/incorrect inequality or equals sign as answer<br>or <b>M2</b> for $7x + 15x > 6 + 5$ or better<br>or $-6 - 5 > -7x - 15x$ or better<br>or <b>M1</b> for $6 - 15x$ seen |
|          | <b>(b) (i)</b> $(p - 2)(q + 4)$ <b>final answer</b> | <b>2</b>   | <b>M1</b> for $q(p - 2) + 4(p - 2)$ or $p(q + 4) - 2(q + 4)$  |
|          | <b>(ii)</b> $(3p - 5)(3p + 5)$ <b>final answer</b>  | <b>1</b>   |   |
|          | <b>(c)</b> $(5x - 9)(x + 2)$                        | <b>M2</b>  | <b>M1</b> partial factorisation, e.g. $x(5x - 9) + 2(5x - 9)$<br>or <b>SC1</b> for $(5x + a)(x + b)$ where $ab = -18$<br>or $a + 5b = 1$  |
|          | $\frac{9}{5}$ oe and $-2$ <b>final answer</b>       | <b>B1</b>  |   |

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|      |   |  |                                     |  |   |
|------|---|--|-------------------------------------|--|---|
| 3    | (a)   | $35 < t \leq 40$   | 1                                   |  |   |
|      | (b)   | 22.5, 27.5, 32.5, 37.5, 42.5, 47.5   | M1                                  | At least 4 correct mid-values soi  |   |
|      |   | $(2 \times 22.5 + 6 \times 27.5 + 7 \times 32.5 + 19 \times 37.5 + 9 \times 42.5 + 7 \times 47.5)$ | M1                                  | $\sum fx$ where $x$ is in the correct interval allow one further slip<br>[45 + 165 + 227.5 + 712.5 + 382.5 + 332.5 = 1865] |   |
|      | (c)   | (i)  | $\div 50$ or their $\sum f$<br>37.3 | M1dep  | Dependent on second method  |
|      |   | (ii)   | 15, 19, 16                          | A1   | SC2 for correct answer with no working  |
| 4    | (a)   | Enlargement<br>[SF] $-\frac{1}{2}$ oe<br>[centre] (2, 5)   | 3                                   | B1 for each  |   |
|      | (b)   | (i)  | Image at (-2, 6), (-8, 3), (-4, 3)  | 2  | SC1 for reflection in any vertical line<br>or for 3 correct points not joined   |
|      |   | (ii)   | Image at (3, -2), (3, 2), (6, 4)    | 2  | SC1 for rotation $90^\circ$ [anti clockwise] around<br>origin at (-3, 2) (-3, -2) (-6, -4)<br>or for 3 correct points not joined                |
|      | (c)   | (iii)  | Image at (-5, 1), (-3, -2), (1, -2) | 2  | SC1 for translation by $\begin{pmatrix} -1 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ -5 \end{pmatrix}$<br>or for 3 correct points not joined |
|      | (i)   | $\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$  | 2                                   | B1 for a correct row or column   |   |
| (ii) | Rotation, $90^\circ$<br>[anticlockwise] oe<br>origin oe | 2  | B1 for two elements correct         |  |   |

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|   |         |  |   |   |
|---|---------|--|---|---|
| 5 | (a) (i) | 8  | 1   |   |
|   | (ii)    | 4  | 2   | <b>M1</b> for $[g(17) =] \frac{7}{14}$ or $2\left(\frac{7}{x-3}\right)^2 + 7\left(\frac{7}{x-3}\right)$   |
|   | (b)     | 4 or -4  | 3   | <b>M2</b> for $x^2 = 16$ or $x^2 - 16 = 0$<br>or <b>M1</b> for $7 = (x-3)(x+3)$ or better   |
|   | (c)     | $2x^2 + 7x - 11 [= 0]$ soi<br><br>$\frac{-7 \pm \sqrt{(7)^2 - 4(2)(-11)}}{2(2)}$ | <b>B1</b><br><br><b>B1FT</b><br><b>B1FT</b> | <b>FT</b> $2x^2 + 7x \pm$ their $k$ [ $k \neq 0$ ] oe<br><b>B1FT</b> for $\sqrt{7^2 - 4(2)(-11)}$ or better or $\left(x + \frac{7}{4}\right)^2$<br>oe<br>If in form $\frac{p + \sqrt{q}}{r}$ or $\frac{p - \sqrt{q}}{r}$ ,<br><b>B1FT</b> for -7 and 2(2) or better or<br>$-\frac{7}{4} +$ or $-\sqrt{\frac{137}{16}}$ oe |
|   |         | -4.68, 1.18 <b>final answers</b>   | <b>B1B1</b>                                 | If <b>B0</b> , <b>SC1</b> for answers -4.7 and 1.2<br>or -4.676... and 1.176.. seen<br>or for -4.68 and 1.18 seen<br>or for answer 4.68 and -1.18   |
|   | (d)     | $\frac{x+2}{5}$ or $\frac{x}{5} + \frac{2}{5}$                                   | 2   | <b>M1</b> for correct first step or better, e.g. $5y = x + 2$<br>or $x = \frac{y+2}{5}$ or $x = 5y - 2$ or $y + 2 = 5x$ or<br>$\frac{y}{5} = x - \frac{2}{5}$   |
|   | (e)     | -2   | 1   |   |

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|   |         |  |                        |  |
|---|---------|--|------------------------|--|
| 6 | (a)     | -3, 7.375, 8.875   | 1, 1, 1                | Accept 7.4 or 7.37 or 7.38 for 7.375 and 8.9 or 8.87 or 8.88 for 8.875   |
|   | (b)     | Correct curve  | 4                      | <b>B3FT</b> for 8 or 9 correct plots<br><b>B2FT</b> for 6 or 7 correct plots<br><b>B1FT</b> for 4 or 5 correct plots<br>Point must touch line if exact or be in correct square if not exact (including boundaries) |
|   | (c) (i) | Any integer less than 7 or greater than 10   | 1                      |  |
|   | (ii)    | 7, 8 or 9  | 1                      |  |
|   | (d)     | $y = 15x + 2$ ruled and fit for purpose  | <b>B2</b>              | <b>B1</b> for short line but correct or freehand full length correct line or for ruled line through (0, 2) (but not $y = 2$ ) or for ruled line with gradient 15 (acc $\pm 1$ mm vertically for 1 horizontal unit) |
|   | (e)     | -1.45 to -1.35 and 0.4 to 0.5<br>Tangent ruled at $x = 1.5$  | <b>B2</b><br><b>B1</b> | <b>B1</b> for each<br>No daylight at point of contact. Consider point of contact as midpoint between two vertices of daylight, the midpoint must be between $x = 1.4$ and 1.6                                      |
| 7 | (a) (i) | $120 \times 55 \times 75 [= 495000]$<br>$\div 1000 [= 495]$<br>or $495[1] \times 1000 = 495000[\text{ml}]$ | <b>M1</b><br><b>M1</b> |  |
|   | (b) (i) | 11   | 2                      | <b>M1</b> for $495000 \div 750 [= \div 60]$ oe [660]<br>After 0 scored, <b>SC1</b> for answer figs 11  |
|   | (ii)    | 37.5 or 37.50 to 37.51   | 3                      | <b>M2</b> for $\sqrt{\frac{\text{figs}495}{112\pi}}$ oe<br>or <b>M1</b> for $[112r^2 = ] \frac{\text{figs}495}{\pi}$ or<br>$[\pi r^2 = ] \frac{\text{figs}495}{112}$ or better                                     |

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|              |   |   |   |
|--------------|---|---|---|
| (c)          | 15  | 4                                       | <b>B3</b> for answer 60<br>or <b>M3</b> for $75 - \sqrt{145^2 - (55^2 + 120^2)}$ oe<br><b>M2</b> for $\sqrt{145^2 - (55^2 + 120^2)}$ oe<br>or <b>M1</b> for $\sqrt{55^2 + 120^2}$   |
| (d)          | 24.4[4..] to 24.45  | 3                                       | <b>M2</b> for $\cos^{-1}(\sqrt{55^2 + 120^2}/145)$ oe, e.g.<br>or $\sin^{-1}(75 - \text{their (c)})/145$<br>or $\tan^{-1}((75 - \text{their (c)})/\sqrt{55^2 + 120^2})$<br>or <b>M1</b> for $\cos = \sqrt{55^2 + 120^2}/145$ oe<br>or $\sin = (75 - \text{their (c)})/145$<br>or $\tan = (75 - \text{their (c)})/\sqrt{55^2 + 120^2}$ |
| <b>8</b> (a) | Angle $LPQ = 32$ soi<br>$58^2 + 74^2 - 2 \times 58 \times 74 \cos \text{their } P$<br><br>39.50[1...] | <b>B1</b><br><b>M2</b><br><br><b>A2</b> | <b>M1</b> for correct implicit cos rule<br><br><b>A1</b> for 1560.3 to 1560.4 or 1560   |
| (b)          | $\sin PQL = \frac{58 \sin \text{their } P}{39.5}$ oe<br><br>51.1 or 51.08 to 51.09                    | <b>M2</b><br><br><b>B1</b>              | <b>M1</b> for $\frac{\sin PQL}{58} = \frac{\sin(\text{their } P)}{39.5}$ oe<br><br><b>B1</b>  |
| (c) (i)      | 322   | <b>2</b>                                | <b>M1</b> for $180 + 142$ oe  |
| (ii)         | [0]13[.1] or 13.08 to 13.09   | <b>1FT</b>                              | <b>FT</b> <i>their (b)</i> – 38   |
| (d)          | 17.8 or 17.77 to 17.78  | <b>3</b>                                | <b>M1</b> for $74 \div 2.25$ oe soi by 32.888... to 3 sf or better<br><b>M1</b> for dist or speed $\div 1.85$   |
| (e)          | 30.7 or 30.73 to 30.74...   | <b>3</b>                                | <b>M2</b> for $58 \sin \text{their } P$ oe or $39.5 \sin \text{their (b)}$<br>or <b>M1</b> for $\frac{x}{58} = \sin \text{their } P$ oe<br>or $\frac{x}{39.5} = \sin \text{their (b)}$  |
| <b>9</b> (a) | 28 45<br>17 21<br>45 66   | <b>1, 1</b><br><b>1</b><br><b>1</b>     |   |
| (b) (i)      | $4n - 3$ oe   | <b>2</b>                                | <b>M1</b> for $4n + k$  |
| (ii)         | 237   | <b>1</b>                                |   |
| (iii)        | 50  | <b>2FT</b>                              | <b>FT</b> <i>their (b)(i)</i> = 200 solved and then answer truncated <b>dep</b> on linear expression of form $an + k$<br><b>M1</b> for <i>their</i> $4n - 3 = 200$ or <i>their</i> $4n - 3 \leq 200$  |

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|            |  |   |  |
|------------|--|---|--|
| (c)        | $p = 2$ and $q = -5$ with some correct supporting working leading to the solutions | 5 | <p><b>M2</b> for any 2 of <math>p + q + 3 = 0</math> oe,<br/> <math>2^2 p + 2q + 3 = 1</math> oe, <math>3^2 p + 3q + 3 = 6</math> oe,<br/> <math>4^2 p + 4q + 3 = 15</math> oe ,<br/> <math>5^2 p + 5q + 3 = \text{their } 28</math> oe, etc.<br/> or <b>M1</b> for any one of these<br/> <b>M1</b> indep for correctly eliminating <math>p</math> or <math>q</math> from pair of linear equations<br/> <b>A1</b> for one correct value<br/> If 0 scored <b>SC1</b> for 2 values that satisfy one of their original equations<br/> After <b>M0</b>, 2 correct answers <b>SC1</b></p>                         |
| (d)        | $2n^2 - n$ or $n(2n - 1)$  | 2 | <p><b>B1</b> for answer <math>2n^2 + k[n]</math><br/> or <b>M1</b> for <i>their quadratic</i> from (c) + <i>their linear</i> from (b)(i)</p>   |
| 10 (a) (i) | $\frac{1}{36}$ final answer  | 2 | <b>M1</b> for $\frac{1}{6} \times \frac{1}{6}$   |
| (ii)       | $\frac{1}{12}$ final answer  | 3 | <p><b>M2</b> for <math>3\left(\frac{1}{6} \times \frac{1}{6}\right)</math> oe<br/> or <b>M1</b> for identifying 3 correct pairs (4, 6), (6, 4) and (5, 5)</p>  |
| (b)        | 7  | 1 |  |
|            | Refers to most combinations oe   | 1 | <b>Dependent</b> on previous mark  |
| (c)        | $\frac{141}{1296}$ oe $\left[\frac{47}{432}\right]$                                | 5 | <p><b>M4</b> for <math>\frac{2}{36} + \left(\left[1 - \frac{3}{36}\right] \times \frac{2}{36}\right) + \left(\frac{1}{36} \times \frac{3}{36}\right)</math> oe<br/> or <b>M3</b> for 2 correct probabilities shown <u>added</u> from those above</p> <p>or <b>M1</b> for <math>\left(1 - \frac{3}{36}\right) \times \frac{2}{36}</math> seen oe<br/> And <b>M1</b> for <math>\frac{1}{36} \times \frac{3}{36}</math> seen oe<br/> or <math>\frac{1}{6} \times \frac{1}{6} \times \frac{1}{6} \times \frac{1}{6}</math> oe alone or added to a<br/> probability not of the form <math>\frac{n}{36}</math></p> |