

**CAMBRIDGE INTERNATIONAL EXAMINATIONS**

Cambridge Ordinary Level

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

### **4024 MATHEMATICS (SYLLABUS D)**

**4024/22**

Paper 2, maximum raw mark 100

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| Question         | Answers                      | Mark     | Part Marks                                                                                                                                                                                                                                            |
|------------------|------------------------------|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1 (a) (i)</b> | 30%                          | <b>2</b> | <b>M1</b> for figs( $5625 \div 18\,750$ )<br>or <b>SC1</b> for 70(%) as final answer                                                                                                                                                                  |
| <b>(ii)</b>      | 305                          | <b>3</b> | <b>M1</b> for $(13125) \times \frac{22}{100}$ oe and<br><b>M1</b> for $\frac{18750 - \text{their } 2887.5}{52}$                                                                                                                                       |
| <b>(iii)</b>     | 15 000                       | <b>2</b> | <b>M1</b> for $x + \frac{25x}{100} = 18750$ oe<br>or <b>B1</b> for $\div 125$                                                                                                                                                                         |
| <b>(b) (i)</b>   | 65400                        | <b>1</b> |                                                                                                                                                                                                                                                       |
| <b>(ii)</b>      | 294                          | <b>1</b> |                                                                                                                                                                                                                                                       |
| <b>(iii)</b>     | 877                          | <b>2</b> | <b>B1</b> for use of the quotient of the rates                                                                                                                                                                                                        |
| <b>2 (a) (i)</b> | 23                           | <b>1</b> |                                                                                                                                                                                                                                                       |
| <b>(ii)</b>      | 90 with reason               | <b>1</b> |                                                                                                                                                                                                                                                       |
| <b>(iii)</b>     | Parallel lines established   | <b>1</b> |                                                                                                                                                                                                                                                       |
| <b>(b)</b>       | Convincing argument          | <b>3</b> | This must have e.g. $XQ = XY$ justified.<br>If there is no justification, then MAX <b>B2</b><br>from <b>B1</b> for $XQ = XY$ oe<br>And <b>B1</b> for relating this to the perimeter of $PXZ$<br>Or <b>B1</b> for equal (alternate or bisected) angles |
| <b>3 (a)</b>     | $\frac{1}{16}$ or 0.0625     | <b>1</b> |                                                                                                                                                                                                                                                       |
| <b>(b)</b>       | $\frac{42}{256}$ or 0.164 oe | <b>3</b> | <b>B2</b> for $(2) \times \frac{7}{16} \times \frac{3}{16}$<br>or <b>B1</b> for both $\frac{7}{16}$ and $\frac{3}{16}$<br>or <b>SC1</b> after 0 for $\frac{7}{40}$                                                                                    |
| <b>(c) (i)</b>   | 26                           | <b>1</b> |                                                                                                                                                                                                                                                       |
| <b>(ii)</b>      | $m = 5 \quad n = -3$         | <b>2</b> | <b>B1</b> for one correct<br>or <b>M1</b> for correct substitution and<br>evaluation of the other variable or for an<br>equation in one variable                                                                                                      |
| <b>(d)</b>       | $p = 17$                     | <b>2</b> | <b>M1</b> for $p \times \text{their } m - 4 \times \text{their } n (= 97)$ oe                                                                                                                                                                         |

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|   |         |                                                 |     |                                                                                                                                                                                                                                                                         |
|---|---------|-------------------------------------------------|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4 | (a) (i) | 105                                             | 2   | <b>B1</b> for $\left(\frac{1}{2}\right) \times 7 \times 3 \times 10$<br>or <b>M1</b> for Area of cross section $\times 10$ soi                                                                                                                                          |
|   | (ii)    | 197.2 (m <sup>2</sup> )                         | 4   | <b>M1</b> for $3^2 + 7^2$<br>and <b>M1</b> for area of one triangular face<br>and <b>M1</b> for area of one rectangular face                                                                                                                                            |
|   | (b) (i) | 0.845                                           | 2   | <b>M1</b> for $\frac{h}{2} = \sin 25$ oe                                                                                                                                                                                                                                |
|   | (ii)    | 0.280                                           | 2   | <b>M1</b> for $\frac{y}{0.6} = \tan[\dots]$ oe<br>or <b>SC1</b> for 25                                                                                                                                                                                                  |
| 5 | (a)     | 63.7 or 63.6 (m)                                | 2   | <b>M1</b> for $\pi \times \frac{d}{2} = 100$                                                                                                                                                                                                                            |
|   | (b)     | 9540 to 9560                                    | 3ft | <b>M1</b> for $\pi r^2$ soi<br>and <b>M1</b> for <i>their</i> circular area + $100 \times \text{their (a)}$                                                                                                                                                             |
|   | (c) (i) | 18.7 to 19.0 (m)                                | 3ft | <b>M1</b> for $2\pi R$<br>And <b>M1</b> for <i>their</i> $2\pi R - 200$ or $\pi R - 100$                                                                                                                                                                                |
|   | (ii)    | 30.8 to 31.1                                    | 2ft | <b>M1</b> for $\frac{\theta}{360} \times 2\pi r$ oe                                                                                                                                                                                                                     |
| 6 | (a)     | Correct shape ABCD                              | 4   | <b>B1</b> for $\widehat{ABC} = 56$<br><b>B1</b> for $\widehat{BAD} = 104$<br><b>M1</b> line $CD \parallel AB$<br><b>A1</b> for perpendicular length 4.5                                                                                                                 |
|   | (b)     | 115 – 125 m                                     | 2ft | <b>M1</b> for <i>their</i> CD                                                                                                                                                                                                                                           |
| 7 | (a) (i) | Convincing argument                             | 3   | www e.g. need to see <b>b – a</b> and $\frac{5}{3}(\mathbf{b} - \mathbf{a})$<br><b>B1</b> for $\overrightarrow{DE} = \mathbf{b} - \mathbf{a}$ oe<br><b>B1</b> for $\overrightarrow{DB} = \frac{2}{3}\mathbf{a}$ or $\overrightarrow{EC} = \frac{2}{3}\mathbf{b}$ oe soi |
|   | (ii)    | 9 : 25 oe                                       | 2   | <b>B1</b> for at least 3 : 5 oe seen                                                                                                                                                                                                                                    |
|   | (b) (i) | Triangle with vertices (6, 1), (10, 1), (10, 4) | 2   | <b>B1</b> for two vertices correct                                                                                                                                                                                                                                      |
|   | (ii)    | Stretch(ing)                                    | 1   |                                                                                                                                                                                                                                                                         |
|   | (iii)   | $\begin{pmatrix} 2 & 0 \\ 2 & 1 \end{pmatrix}$  | 2   | <b>B1</b> for one error or<br><b>M1</b> for multiplication in the correct order                                                                                                                                                                                         |

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|           |                                                        |     |                                                                                                                                                                                                                                    |
|-----------|--------------------------------------------------------|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| (iv)      | $\begin{pmatrix} 1 & 0 \\ 2 & \\ -1 & 1 \end{pmatrix}$ | 2ft | <b>B1</b> for $\frac{1}{2}$ or $\begin{pmatrix} 1 & 0 \\ -2 & 2 \end{pmatrix}$ or <i>their</i> ft values                                                                                                                           |
| 8 (a) (i) | 2.24                                                   | 1   |                                                                                                                                                                                                                                    |
| (ii)      | $(h=)\frac{T^2 g}{4\pi^2}$ oe                          | 3   | <b>M1</b> for $T^2 = \frac{4\pi^2 h}{g}$ oe<br>and <b>M1</b> for any correct transposition at any stage                                                                                                                            |
| (b)       | 14                                                     | 2   | <b>B1</b> for 42 or 16<br>or <b>M1</b> for $45 - p - 3 = 2p$                                                                                                                                                                       |
| (c)       | -5.5 oe                                                | 3   | <b>M1</b> for $3(2x - 3) + 4(5 - x)$ oe soi<br>and <b>M1</b> for $6x - 4x = 9 - 20$ soi oe                                                                                                                                         |
| (d)       | -0.41 -3.26                                            | 3   | <b>B1</b> for $\sqrt{11^2 - 4 \times 3 \times 4}$ soi<br>and <b>B1</b> for $\frac{-11 \pm \sqrt{their 73}}{2 \times 3}$<br><br>After <b>B1</b> or <b>B0</b> so far<br><b>M1</b> for both real values of $\frac{p \pm \sqrt{q}}{r}$ |
| 9 (a) (i) | 11.05 confirmed                                        | 1   |                                                                                                                                                                                                                                    |
| (ii)      | 39.1° or 39.2°                                         | 2   | <b>M1</b> for $\frac{1}{2} \times 5 \times 7 \times \sin PQR$                                                                                                                                                                      |
| (iii)     | 136.3°                                                 | 3   | <b>M1</b> for $8 \times 2 \times \sin ZWX = \frac{1}{2} \times 4 \times 6 \times \sin 67$<br>oe<br>and <b>A1</b> for 43.7° soi<br>or <b>M1</b> for $180 - their 43.7$ soi                                                          |
| (b) (i)   | 6.16                                                   | 3   | <b>M2</b> for $9^2 + 12^2 - 2 \times 9 \times 12 \times \cos 30$ soi<br>or <b>M1</b> for cosine formula with 1 error<br>and <b>A1</b> for 412 (soi by 20.3), 131.5 (soi by 11.5) or 117 (soi by 10.8)                              |
| (ii)      | 41.4                                                   | 3   | <b>M2</b> for $\cos CAM = \frac{9^2 + 12^2 - 12.5^2}{2 \times 9 \times 12}$ oe<br>or <b>M1</b> for $12.5^2 = 9^2 + 12^2 - 2 \times 9 \times 12 \cos \theta$ oe<br>After 0, <b>SC1</b> for <i>their</i> A - 30, or one of M or C    |

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|----------------|-------------------------------------------|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>10 (a)</b>  | 11 11                                     | <b>1</b>   |                                                                                                                                                                                                       |
| <b>(b)</b>     | correct scales, plots (ft) and curve      | <b>3</b>   | <b>P2</b> correct scales and at least 7 plots (ft) or<br>All plots correct ft<br>or <b>P1</b> for atleast 7 plots (ft) or<br>Correct scales drawn                                                     |
| <b>(c)</b>     | 2 ( $\pm 0.5$ )                           | <b>2ft</b> | Dependent on tangent drawn at $x = 3$<br><b>M1</b> for tangent at $x = 3$                                                                                                                             |
| <b>(d) (i)</b> | -5 cao                                    | <b>1</b>   |                                                                                                                                                                                                       |
| <b>(ii)</b>    | <b>(a)</b> -1<br><b>(b)</b> 5             | <b>2</b>   | <b>B1</b> for either                                                                                                                                                                                  |
| <b>(e)</b>     | (0.6) (3.4)                               | <b>3ft</b> | <b>B1</b> for $x^2 - 4x - 1 = -3$ soi<br>and <b>B1</b> for the line $y = -3$<br>or <b>M1</b> for $x^2 - 4x - 1 = k$<br>and <b>A1</b> for the line $y = k$<br><br><b>SC3</b> for 0 for new curve drawn |
| <b>11 (a)</b>  | histogram correct                         | <b>3</b>   | <b>H2</b> for four columns correct<br>or <b>H1</b> for one correct frequency density                                                                                                                  |
| <b>(b) (i)</b> | correct plots and give curve              | <b>2</b>   | <b>P1</b> for at least 4 correct plots                                                                                                                                                                |
| <b>(ii)</b>    | <b>(a)</b> (195)(g)                       | <b>1ft</b> |                                                                                                                                                                                                       |
|                | <b>(b)</b> 72 to 88(g)                    | <b>2ft</b> | <b>B1</b> for 152 to 158 and 230 to 240<br>Or <b>M1</b> for UQ – LQ                                                                                                                                   |
| <b>(iii)</b>   | 50 78 72 32 4                             | <b>1</b>   |                                                                                                                                                                                                       |
| <b>(iv)</b>    | <b>(a)</b> 36 cao                         | <b>1</b>   |                                                                                                                                                                                                       |
|                | <b>(b)</b> 85 or 86 or ft (th Percentile) | <b>2ft</b> | <b>B1</b> for 15 or 14.4 or ft<br>Or <b>M1</b> for subtraction from 240 or 250                                                                                                                        |