



Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

MATHEMATICS

0580/41

Paper 4 (Extended)

May/June 2016

MARK SCHEME

Maximum Mark: 130

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.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the May/June 2016 series for most Cambridge IGCSE[®], Cambridge International A and AS Level components and some Cambridge O Level components.

© IGCSE is the registered trademark of Cambridge International Examinations.

This syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of 7 printed pages.

| | | | |
|---------------|--|-----------------|--------------|
| Page 2 | Mark Scheme | Syllabus | Paper |
| | Cambridge IGCSE – May/June 2016 | 0580 | 41 |

Abbreviations

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

| Question | Answer | Mark | Part marks |
|--|--|----------|--|
| 1 | (a) (i) 48 | 2 | M1 for $\frac{72}{3}$ |
| | (ii) 32.4[0] | 1 | |
| | (iii) $\frac{13}{30}$ | 2 | M1 for $\frac{72 - \text{their(ii)} - 8.4}{72}$ oe |
| | (iv) 24 | 3 | M2 for $\frac{19.2}{0.8}$ oe or M1 for recognising 19.2 is 80% |
| | (b) 660 | 3 | M2 for $\frac{550 \times 2 \times 10}{100} + 550$ oe or M1 for $\frac{550 \times 2 \times 10}{100}$ oe |
| | (c) 663.9[0] | 2 | M1 for 550×1.019^{10} oe |
| | (d) 1.5[0] | 3 | M2 for $\sqrt[10]{\frac{638.3[0]}{550}}$ oe or M1 for $550 \times m^{10} = 638.3[0]$ |
| 2 | (a) (i) Triangle drawn, vertices (2, -4), (2, -5), (4, -4) | 2 | SC1 for translation $\begin{pmatrix} 5 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ -2 \end{pmatrix}$ or correct points not joined |
| | (ii) Triangle drawn, vertices (-3, 4), (-3, 5), (-1, 4) | 2 | SC1 for reflection in line $y = k$ or line $x = 1$ or correct points not joined |
| | (iii) Enlargement | 1 | |
| | [factor] 3 | 1 | |
| | [centre] (-6, -5) | 1 | |
| (b) (i) $\begin{pmatrix} 2 & 5 \\ 3 & 10 \end{pmatrix}$ | 1 | | |

| | | | |
|---------------|--|-----------------|--------------|
| Page 3 | Mark Scheme | Syllabus | Paper |
| | Cambridge IGCSE – May/June 2016 | 0580 | 41 |

| Question | Answer | Mark | Part marks |
|-----------|--|---------|--|
| (ii) | $\begin{pmatrix} 10 & 14 \\ 18 & 24 \end{pmatrix}$ final answer | 2 | SC1 for one row or one column correct |
| (iii) | $\frac{1}{4}$ oe | 3 | M2 for $1 \times 4 - 2 \times 3 = 4 \times k - 3 \times 1$ or better or B1 for $1 \times 4 - 2 \times 3$ or $4 \times k - 3 \times 1$ seen |
| (c) (i) | Rotation | 1 | |
| | 90° [anti-clockwise] oe | 1 | |
| | (0, 0) oe | 1 | |
| (ii) | $\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$ | 2 | SC1 for one correct row or column |
| 3 (a) (i) | 400 | 1 | |
| (ii) | 350 | 1 | |
| (iii) | 70 | 1 | |
| (iv) | 170 | 2 | B1 for 30 seen |
| (b) (i) | Mid-values 40, 80, 125, 200 soi | M1 | |
| | Σfx with correct frequencies and x 's in correct intervals or on boundaries of correct intervals | M1 | |
| | $\div 200$ | M1(dep) | Dependent on second M1 |
| | 106 nfw | A1 | SC2 for correct answer without working |
| (ii) | Correct histogram | 4 | B1 for correct widths and B1 for each rectangle of correct height at 0.8, 1.6, 1.6 (up to B3) After 0 scored, SC1 for 3 correct frequency densities seen |
| (iii) | $\frac{10712}{39800}$ oe isw | 2 | M1 for $\frac{104}{200} \times \frac{103}{199}$ oe |
| 4 (a) | 14 137 to 14 137.2 or 14 139 | 2 | M1 for $\frac{4}{3} \times \pi \times 15^3$ |
| (b) (i) | 104 000 or 103 600 to 103 700 | 3 | M2 for $\pi \times 25^2 \times 60 - 14140$ or M1 for $\pi \times 25^2 \times 60$ |

| | | | |
|---------------|--|-----------------|--------------|
| Page 4 | Mark Scheme | Syllabus | Paper |
| | Cambridge IGCSE – May/June 2016 | 0580 | 41 |

| Question | Answer | Mark | Part marks |
|-----------------|--|-------------|--|
| (ii) | 52.8 or 52.75 to 52.81... | 2 | M1 for <i>their</i> (b)(i) $\div (\pi \times 25^2)$ or $14\,140 \div (\pi \times 25^2)$ |
| (c) (i) | 15.8 or 15.81..... | 3 | M2 for $[r^2 =] \frac{14140}{\frac{1}{3} \times \pi \times 54}$ or M1 for $\frac{1}{3} \times \pi \times r^2 \times 54 = 14\,140$ oe |
| (ii) | 3580 or 3576 to 3581 nfw | 4 | M1 for $(\textit{their} (c)(i))^2 + 54^2$ M1 for $\pi \times (\textit{their} (c)(i)) \times \sqrt{\{(\textit{their} (c)(i))^2 + 54^2\}}$ M1 for $\pi \times (\textit{their} (c)(i))^2$ |
| 5 (a) | 9 10.5 | 1 1 | |
| (b) | Fully correct curve | 5 | SC4 for correct curve, but branches joined B3 FT for 9 or 10 points plotted or B2 FT for 7 or 8 points plotted or B1 FT for 5 or 6 points plotted and B1 for two separate branches not touching or cutting y-axis |
| (c) | 2.1 to 2.6 | 1 | |
| | 8.5 to 9 | 1 | |
| (d) | 2, 3, 5, 7 | 2 | SC1 for correct 4 values and no more than one extra positive integer or $\pm 2, \pm 3, \pm 5, \pm 7$ or 3 correct values and no extras |
| (e) | (-2, -12) | 1 | |
| (f) (i) | $20 + x^2 = x^3$ | M1 | Multiplication by x |
| | $x^3 - x^2 - 20 = 0$ | A1 | No errors or omissions |
| (ii) | Fully correct curve $y = x^2$ | 2 | SC1 for U – shaped parabola, vertex at origin |
| (iii) | 2.5 to 3.5 | 1 | |
| (iv) | 3.[0] to 3.1 or FT their answer to (iii) | 1FT | FT dep on (iii) > 0 |

| | | | |
|--------|---------------------------------|----------|-------|
| Page 5 | Mark Scheme | Syllabus | Paper |
| | Cambridge IGCSE – May/June 2016 | 0580 | 41 |

| Question | Answer | Mark | Part marks | |
|----------|----------|---|--------------|---|
| 6 | (a) (i) | [y =] $\frac{1}{2}(80 - 2x)$ | M1 | 40 - x is enough |
| | | $A = \text{their } \frac{1}{2}(80 - 2x) \times x$ oe | M1 | |
| | (ii) | $A = 40x - x^2$ and $x^2 - 40x + A = 0$ | A1 | No errors or omissions |
| | | $(x - 30)(x - 10)$ | B2 | B1 for $x(x - 30) - 10(x - 30) [= 0]$ or $x(x - 10) - 30(x - 10) [= 0]$ or SC1 for $(x + a)(x + b)$ where $ab = 300$ or $a + b = -40$ |
| | (iii) | 30, 10 | B1 | |
| | | $\sqrt{(-40)^2 - 4(1)(200)}$ or better | B1 | or for $(x - 20)^2$ |
| | | $p = -40$ and $r = 2(1)$ | B1 | Must see $\frac{p + \sqrt{q}}{r}$ or $\frac{p - \sqrt{q}}{r}$ or both or for $20 \pm \sqrt{200}$ |
| | (b) (i) | 5.86 34.14 | B1 B1 | If B0, SC1 for 5.9 or 5.857 to 5.858 and 34.1 or 34.14... or 5.86 and 34.14 seen in working or -5.86 and -34.14 as final answers |
| | | $\frac{200}{x} - \frac{200}{x + 10}$ $\frac{200(x + 10) - 200x}{x(x + 10)} = \frac{2000}{x(x + 10)}$ | M2 A1 | or M1 for $\frac{200}{x}$ or $\frac{200}{x + 10}$ soi No errors or omissions |
| | (b) (ii) | 16 [min] 40 [s] | 3 | B2 for $0.2\dot{7}$ or 0.278 or 0.2777 to 0.2778 or $\frac{5}{18}$ [h] oe or $16.\dot{6}$ or 16.7 or 16.66 to 16.67 or $\frac{50}{3}$ [min] or M1 for $2000 \div 80(80 + 10)$ or $\frac{200}{80} - \frac{200}{90}$ |

| | | | |
|--------|---------------------------------|----------|-------|
| Page 7 | Mark Scheme | Syllabus | Paper |
| | Cambridge IGCSE – May/June 2016 | 0580 | 41 |

| Question | Answer | Mark | Part marks |
|----------|-------------------------------|------|---|
| (b) (i) | 1.73 or 1.732.. or $\sqrt{3}$ | 3 | M2 for $\frac{k^2}{4} = \frac{3}{4}$ or better or M1 for $\frac{2^2}{16} + \frac{k^2}{4} = 1$ oe |
| (ii) | 81.8 or 81.78 to 81.79 | 3 | M2 for $2 \times \tan^{-1}\left(\frac{\text{their}\sqrt{3}}{2}\right)$ oe or M1 for $\tan = \frac{\text{their}\sqrt{3}}{2}$ oe |
| (c) (i) | 8π final answer | 1 | |
| (ii) | 72π final answer | 2FT | FT <i>their</i> (c)(i) $\times 9$ in terms of π M1 for area factor of 3^2 or 9 or [new a] = 12, [new b] = 6 |