**CAMBRIDGE INTERNATIONAL EXAMINATIONS**

**Cambridge International General Certificate of Secondary Education**

# MARK SCHEME for the October/November 2015 series

## 0580 MATHEMATICS

**0580/41** Paper 4 (Extended), maximum raw mark 130

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 October/November 2015 series for most Cambridge IGCSE®, Cambridge International A and AS Level components and some Cambridge O Level components.



CAMBRIDGE
International Examinations

| Question | Answer | Mark | Part marks |
|---|---|---|---|
| 1 (a) | 6 | 3 | **B2** for $5\frac{1}{4}$ or 5.25 shown in working isw<br>**or M1** for $\frac{3}{4} \times 7$ soi by answer 5 |
| (b) | 21.45 cao final answer | 2 | **M1** for 17.16 × 0.25 or 17.16 × 1.25 |
| (c) | 16.5[0] nfww | 3 | **M2** for 17.16 ÷ 1.04 oe<br>or **M1** for 17.16 associated with 104[%] oe isw |
| (d) | 1.34 cao final answer | 2 | **M1** for 13.32 ÷ 0.72 soi by 18.5[0]<br>or for any correct complete longer method<br>If zero scored, **SC1** for 0.96 [euros] seen |
| (e) (i) | 750 | 1 | |
| (ii) | 4.7 cao | 3 | **B2** for 4.658 to 4.66<br>or **M2** for $\sqrt{\textit{their}\ \textbf{(e)(i)} \div 11\pi}$<br>or **M1** for $11\pi r^2 =$ *their* **(e)(i)** |
| (iii) | 6 | 2 | **M1** for $2^3$ or $\frac{1}{2^3}$ oe seen<br>or for $\pi \times (2 \times \textit{their}\ \textbf{(e)(ii)})^2 \times 22$<br>If zero scored, **SC1** for answer 6 000 |
| (f) | 8 950 | 1 | |
| (g) | 210 | 2 | **M1** for 0.07 × 3 000 |
| (h) | 160 000 | 3 | **M2** for $2 \times 60 \times 100^3 \div 750$ oe<br>or **M1** for figs 16 as answer or $100^3$ seen |
| 2 (a) | 1.62 or 1.62… | 1 | |
| (b) (i) | 7 | 1 | |
| (ii) | 4 | 1 | |
| (iii) | 7 | 1 | |
| (iv) | $\frac{1}{3}$ oe | 1 | |

| Qu | Answers | Mark | Part Marks |
|---|---|---|---|
| (c) (i) | 0.25 oe and 1 | 2 | **B1** for each |
| (ii) | Correct curve | 4 | **B3FT** for 6 or 7 correct plots<br>or **B2FT** for 4 or 5 correct plots<br>or **B1FT** for 2 or 3 correct plots |
| (iii) | 2.3 | 1FT | Correct or **FT** where $y = 5$ on *their* graph |
| (iv) | $y = 3x - 1$ oe 3 term equation | 3 | **B2** for $3x - 1$ or $y = 3x$ [+ $c$]oe<br>or for $m = 3$ and $c = -1$<br>or **M1** for [gradient =] $\frac{8-2}{3-1}$ oe soi by $3x$<br>**and M1** for substitution of (1, 2) or (3, 8) into *their* $y = mx + c$ |
| (v) | –1.7 to –1.5 and 2 | 2 | **B1** for either<br>or **M1** for $y = x + 2$ seen or drawn |
| 3 (a) (i) | 25.4 or 25.35… nfww | 5 | **M2** for $\sqrt{60^2 - 50^2}$ oe soi by 33.1 to 33.2<br>or **M1** for $TB^2 + 50^2 = 60^2$ oe<br>**and**<br>**M2** for tan = $\frac{theirTB}{70}$ oe<br>or **B1** for recognising angle $TCB$ as required angle |
| (ii) | 109 or 109.0 to 109.1 | 4 | **M2** for $50^2 + 70^2 - 2 \times 50 \times 70 \times \cos 130$<br>**M1** for implicit cos rule<br>**A1** for 11 899 to 11 900 |
| (iii) | 1 340 or 1 340.0 to 1 341 | 2 | **M1** for $\frac{1}{2} \times 50 \times 70 \times \sin 130$ oe |
| (b) | 51.5 or 51.50 to 51.51 | 4 | **M3** for $[XY] = \sqrt{45^2 + 22^2 + 12^2}$<br>or **M2** for $[XY^2 =] 45^2 + 22^2 + 12^2$ soi by 2 653<br>or **M1** for $45^2 + 22^2$ oe<br>or $45^2 + 12^2$ oe<br>or $12^2 + 22^2$ oe |

| Qu | Answers | Mark | Part Marks |
|---|---|---|---|
| 4 (a) (i) | $x \geqslant 5$ oe<br>$y \leqslant 8$ oe<br>$x + y \leqslant 15$ oe<br>$y > x$ oe or $y \geqslant x + 1$ | 4 | Condone $5 \leqslant x \leqslant 15$<br>Condone $0 < y \leqslant 8$<br>**B1** for each<br>– 1 for first occurrence of strict inequalities used in first 3 inequalities |
| (ii) | $x = 5$ ruled<br>$y = 8$ ruled<br>$x + y = 15$ ruled<br>$y = x$ ruled broken line | 1<br>1<br>1<br>1 | Allow $y = x + 1$ ruled only after $y \geqslant x + 1$ in **(a)(i)** |
| | Correct region indicated | 1dep | Dependent on all marks for lines earned<br>Accept R written in correct quadrilateral or any other unambiguous indication<br>or accept in triangle if $y = x + 1$ used and all marks for lines earned |
| (b) | 78 | 2 | **B1** for (7, 8) chosen<br>or **M1** for a calculation shown of the form $6x + 4.5y$ where $(x, y)$ is clearly in *their* region and both $x$ and $y$ are integers |
| 5 (a) | 37 or [angle] *BAD* | 1 | |
| | [Angles in ] same segment [are equal] | 1dep | Dependent on 37 or [angle] *BAD* |
| (b) | 74 or 2 [× angle] *BAD* or<br>2 [× angle] *BED* | 1 | |
| | Angle at <u>centre</u> is twice angle at <u>circumference</u> | 1dep | Dependent on 2 × 37 or 2 [× angle] *BAD* or 2 [× angle] *BED*<br>Must use the terms circumference, centre and angle |
| (c) | 143 or 180 – [angle] *BAD*<br>or 180 – [angle] *BED* | 1 | |
| | [Opposite angles of] cyclic quad [are supplementary] | 1dep | Dependent on 180 – 37<br>or 180 – [angle] *BAD* or<br>180 – [angle] *BED* |

| Qu | Answers | Mark | Part Marks |
|---|---|---|---|
| 6 (a) | 1.35 nfww | 4 | **M1** for 0.5, 1.5, 2.5, 3.5, 4.5, 5.5 soi,<br>**M1** for $\Sigma fm$ soi by 162 where $m$ is in correct interval including boundaries<br>**M1**dep for $\Sigma fm \div 120$ or $\Sigma fm \div \Sigma f$ dependent on **second M1** earned |
| (b) (i) | 93, 102, 113, 118 | 2 | **SC1FT** for 1 error |
| (ii) | Correct diagram | 3 | **B1FT** for correct vertical plots<br>and<br>**B1** for correct horizontal plots<br>and<br>**B1FT dep on at least B1** for reasonable increasing curve or polygon through *their* 6 points<br><br>If zero scored**, SC1FT** for 5 out of 6 correct plots |
| (iii) (a) | 0.6 to 0.85 | 1 | |
| (b) | 1.3 to 1.7 | 2 | **B1** for UQ = 1.7 to 1.9 or LQ = 0.2 to 0.4 |
| (c) | 0.3 to 0.6 | 2FT | Allow in correct range provided there is no evidence of reading at 35<br>or **FT** *their* reading at 42<br>**B1** for 42 soi |
| (c) (i) | 30 and 18 | 2 | **B1** for each |
| (ii) | 0.75 and 0.3 | 3FT | **FT** (*their* 30) ÷ 40 and (*their* 18) ÷ 60<br>**B2FT** for either 0.75 or 0.3<br>or **M1** for *their* 30 ÷ 2 or ÷ 20<br>or for *their* 18 ÷ 3 or ÷ 20 |
| 7 (a) | 123 to 127 | 1 | |
| (b) | 288 to 292 | 1 | |
| (c) | [1:] 1 000 000 | 1 | |

| Qu | Answers | Mark | Part Marks |
|---|---|---|---|
| **(d)** | Correct ruled perpendicular bisector of *CB* with correct arcs<br>Correct two pairs of arcs | **2** | **B1** for correct perpendicular bisector without/wrong arcs |
| | Correct ruled bisector of angle *ACB* with correct pair of arcs | **2** | **B1** for correct bisector of angle *ACB* without/wrong arcs |
| | Ruled line parallel to *CB* in triangle | **1** | Provided this line is not the perpendicular bisector of *AC* |
| | 1.3 to 1.7 cm from *CB* in triangle | **1** | |
| | Correct region indicated | **1dep** | Dependent on at least B1,B1,1,1 earned |
| **(e)** | 40 | **2** | **M1** for $0.4 \times 10^2$ oe |
| **8** **(a)** | $(x – 5)(x + 2)$ final answer | **2** | **B1** for $(x – 5)(x + 2)$ seen and then spoiled<br>or **M1** for $(x + a)(x + b)$<br>where $a + b = – 3$ or $ab = –10$ [$a$, $b$ integers] |
| **(b)** **(i)** | $x(x + 2) + 3(x + 1) = 3x(x + 1)$ or $x^2 + 2x + 3x + 3 = 3x^2 + 3x$ | **M2** | **M1** for $x(x + 2) + 3(x + 1)$ or better seen<br>Allow recovery of omitted brackets for M marks but not A mark |
| | $0 = 2x^2 – 2x – 3$ | **A1** | Brackets expanded correctly and/or no errors or omission of brackets seen |
| **(ii)** | $\frac{[--]2 \pm \sqrt{([-]2)^2 - 4(2)(-3)}}{2(2)}$<br>or $0.5 \pm \sqrt{1.75}$ | **B2** | **B1** for $\sqrt{([-]2)^2 - 4(2)(-3)}$ or $\sqrt{28}$ or $\sqrt{1.75}$ oe in completion of square<br>**and B1** for in form $\frac{p + \sqrt{q}}{r}$ or $\frac{p - \sqrt{q}}{r}$, $p = - –2$ **and** $r = 2(2)$ or better<br>or $(x – 0.5)^2$ oe in completion of square |
| | – 0.823 and 1.823 final answer | **B1 B1** | If **B0B0** for answers,<br>**SC1** for – 0.82 or – 0.822… and 1.82 or 1.822.. as final answers<br>or – 0.823 and 1.823 seen<br>or –1.823 and 0.823 as final answers |

| Qu | Answers | Mark | Part Marks |
|---|---|---|---|
| (c) | $\frac{x^2+3x+3}{(x+2)(x+1)}$ or $\frac{x^2+3x+3}{x^2+3x+2}$ final answer nfww | 4 | **M1** for $(2x + 3)(x + 1) - x(x + 2)$ oe isw<br>**B1** for common denominator $= (x + 2)(x + 1)$ isw or $x^2 + 3x + 2$ isw<br>**B1** for $2x^2 + 2x + 3x + 3$ or better or $-x^2 - 2x$ or $x^2 + 3x + 3$ |
| 9 (a) (i) | 16 | 1 | |
| (ii) | $n^2$ | 1 | |
| (b) (i) | 43 | 1 | |
| (ii) | 7 | 1 | |
| (c) | $a = \frac{5}{2}$ oe, $b = \frac{5}{6}$ oe with supporting working | 6 | **M1** for any correct substitution eg $\frac{2}{3}(2)^3 + 2^2a + 2b$<br>**A1** for **one** of<br>eg $\frac{2}{3} + a + b = 4$ or better<br>eg $\frac{16}{3} + 4a + 2b = 17$ or better<br>eg $\frac{54}{3} + 9a + 3b = 43$ or better<br>**A1** for **another** of<br>eg $\frac{2}{3} + a + b = 4$ or better<br>eg $\frac{16}{3} + 4a + 2b = 17$ or better<br>eg $\frac{54}{3} + 9a + 3b = 43$ or better<br>**M1** for correctly eliminating one variable from two of *their* equations in $a$ and $b$<br>**A1** for $a = \frac{5}{2}$ oe<br>**A1** for $b = \frac{5}{6}$ oe<br>After zero scored, **SC2** for 2 correct answers without supporting working or **SC1** for 2 of 17, 43, 86, 150, 239 seen |

| Qu | Answers | Mark | Part Marks |
|---|---|---|---|
| 10 (a) | $\mathbf{b} - \mathbf{a}$ or $-\mathbf{a} + \mathbf{b}$ | 1 | |
| (b) | $\frac{4}{5}\mathbf{b} - \frac{3}{10}\mathbf{a}$ or $\frac{1}{10}(8\mathbf{b} - 3\mathbf{a})$ | 4 | **B3** for correct unsimplified expression in **a** and **b**<br><br>or<br><br>**M1** for $\overrightarrow{XA} + \overrightarrow{AC} + \overrightarrow{CM}$ or $\overrightarrow{XB} + \overrightarrow{BM}$<br>or $-\frac{1}{5}$(*their* **(a)**) + **b** – $\frac{1}{2}$ **a**<br>or $\frac{4}{5}$(*their* **(a)**) + $\frac{1}{2}$ **a**<br><br>**and M1** indep<br>for $\pm\frac{1}{5}$ oe or $\pm\frac{4}{5}$ oe used<br><br>After zero scored**, SC2** for answer<br>$\frac{1}{4}(3\mathbf{b} - \mathbf{a})$ or $\frac{3}{4}\mathbf{b} - \frac{1}{4}\mathbf{a}$ |