**CAMBRIDGE INTERNATIONAL EXAMINATIONS**

**International General Certificate of Secondary Education**

# MARK SCHEME for the May/June 2013 series

## 0580 MATHEMATICS

**0580/42** 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.

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**Abbreviations**

cao correct answer only
cso correct solution only
dep dependent
ft follow through after error
isw ignore subsequent working
oe or equivalent
SC Special Case
www without wrong working
art anything rounding to
soi seen or implied

| Qu | Answers | Mark | Part Marks |
|---|---|---|---|
| **1 (a) (i)** | $\frac{6}{5+6+3}\times 560$ [= 240] | **2** | Accept 'of' used instead of ×<br>**M1** for 560 ÷ (5 + 6 + 3) |
| **(ii)** | 120 | **1** | |
| **(b)** | 90 | **2** | **M1** for $\frac{3}{8}\times 240$ oe |
| **(c) (i)** | 96120 final answer | **2** | **M1** for *their*(*a*)(ii) × 75 + (560 – *their* (*a*)(ii)) × 198 oe |
| **(ii)** | 187.5[0] final answer | **3** | **M2** for $\frac{198}{1+0.056}$ oe<br>or **M1** for (100 + 5.6)[%] = 198 oe seen |
| **(d)** | 184[.2....] | **3** | **M2** for $\frac{36\times 0.75-9.5}{9.5}\times 100$ oe<br>**or M1** for $\frac{36\times 0.75}{9.5}\times 100$ or $36\times 0.75-9.5$ [17.5] used<br>implied by answer 84.2<br>or **SC1** for final answer 284[.2..] |
| **(e)** | 69.4 and 69[.0] cao | **3** | **SC2** for one correct or both correct but reversed<br>**M1** for two of 10.85, 10.95, 23.65 or 23.75 seen<br>or 2(23.7 + 10.9) + 4(0.05)<br>or 2(23.7 + 10.9) – 4(0.05) |

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| 2 | (a) (i) | Translation, $\begin{pmatrix}-5\\8\end{pmatrix}$ oe | 1,1 | Brackets needed for vector<br>Not (–5, 8), (–5 8) |
| | (ii) | correct trapezium at (2, 2) (4 , 3) (4 , 5) (2, 5) | 2 | **SC1** for reflection in $x = -1$ or vertices only |
| | (iii) | correct trapezium at (4, 2) (5, 4) (7, 4) (7, 2) | 3 | **M2** for 4 correct vertices on grid or in working<br>or **M1** for $\begin{pmatrix}0 & -1\\1 & 0\end{pmatrix}\begin{pmatrix}2 & 2 & 4 & 4\\-4 & -7 & -7 & -5\end{pmatrix}$<br>**or SC1** for 3 vertices correct **or** complete shape in correct orientation but wrong position |
| | (b) (i) | Shear | 1 | |
| | | $x$ –axis (oe) invariant | 1 | |
| | | 2 | 1 | |
| | (ii) | rectangle at (–3, 2) (1, 2) (1, 8) (–3, 8) | 2 | **SC1** for all vertices only<br>**or** correct orientation and size, wrong position |
| 3 | (a) | 0, 2, 0, – 3 | 3 | **B2** for 3 correct or **B1** for 2 correct |
| | (b) | Correct curve | B4 | **B3FT** for 8 points<br>**B2FT** for 7 or 6 points<br>**B1FT** for 5 or 4 points |
| | (c) | $y = -1$ indicated | B1 | e.g. Could be mark[s] on curve<br>isw other lines if not clearly used |
| | | $x$ = 1.3 to 1.4 and 4.1 to 4.2 | B1 | |
| | (d) (i) | line drawn from (0, 2) to touch curve | M1 | No daylight at point of contact<br>If short, must cross at (0, 2) within ½ small square when extended |
| | | (2.5 to 2.75, 3 to 3.4) | A1 | |
| | (ii) | rise/run e.g. (their $y$ – 2)/their $x$ | M1 | dep on attempt at a tangent from (0, 2) in (d)(i) and uses scales correctly<br>Can be implied from answer– check on tangent for their rise for a run of 1<br>(½ small square) |
| | | 0.4 to 0.48 | A1 | **ww2** dep on attempt at a tangent from (0, 2) in (d)(i) |

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| **4** | **(a)** | 227 or 226.95 to 227.01 | **2** | **M1** for $\pi \times 8.5^2$ |
| | **(b)** | 5.35 | **1** | |
| | **(c)** | 39.0[0] to 39.0[1] | **2** | **M1** for sin [*MOB*]= $\frac{their\ b}{8.5}$ oe<br>Dep on their $b < 8.5$ |
| | **(d)** | 30.2 or 30.3 or 30.24 to 30.27 | **3** | **M2** for $\frac{360-4\times39}{360}\times2\times\pi\times8.5$ oe<br>or **M1** for $\frac{a}{360}\times2\times\pi\times8.5$ oe<br>where $0 < a < 360$<br><br>Implied by 5.78 to 5.79 or 11.5 to 11.6 or 23.14 to 23.15 or 23.1 or 23.2 or 41.83 to 41.84 or 41.8 |
| | **(e)** | *AB* = *BC*<br>*TA* = *TC*<br>*TB* = *TB* | **1**<br>**1**<br>**1** | isw comments or reasons<br><br>If **0** scored **SC1** for "all <u>three sides</u> the same" oe [SSS] and no mention of angles |
| **5** | **(a)** | $\frac{27}{x}$ final answer | **1** | |
| | **(b)** | $\frac{25}{x-2}$ final answer | **1** | |
| | **(c)** | $\frac{25}{x-2}-4=\frac{27}{x}$ oe | **M1** | **FT** *their* (b) – 4 = *their* (a) oe must be eqn in *x* |
| | | $25x-4x(x-2)=27(x-2)$ oe | **M1** | **FT** $\frac{25}{x-2}+4=\frac{27}{x}$ oe **<u>only</u>** for 2nd and 3rd M mark<br>If all on one side then condone omission of '= 0' |
| | | $4x^2+27x-25x-8x-54[=0]$ oe | **M1dep** | Dep on 2nd M1<br>Must see brackets expanded before this award and terms on one side of eqn |
| | | $2x^2-3x-27=0$ without error seen | **A1** | Must see $4x^2-6x-54=0$ first |
| | **(d)** | – 3, 4.5 | **3** | **B2** for $(2x-9)(x+3)$<br>**or SC1** for $(2x+a)(x+b)$ where *a* and *b* are integers and $a + 2b = -3$<br>or $ab = -27$ |
| | **(e)** | 6 cao | **1** | |

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| **6** **(a)** **(i)** | $\frac{12^2+21^2-15^2}{2\times12\times21}$<br>44.41 to 44.42 | **M2**<br>**A2** | **M1** for $15^2 = 12^2 + 21^2 - 2.12.21\cos M$<br>**A1** for [cos =] 0.714 or 0.7142 to 0.7143 or $\frac{360}{504}$ oe |
| **(ii)** | 88.2 or 88.15 to 88.19 | **2** | **M1** for 0.5 × 12 × 21 × sin (44.4) oe |
| **(b)** | 7.74 or 7.736 to 7.737…. www | **4** | **B1** for 55 soi<br>**M2** $\frac{6.4}{\sin(their\,R)}\times\sin 82$ oe<br>**or M1** for $\frac{6.4}{\sin(their R)}=\frac{PR}{\sin 82}$ oe |
| **7** **(a)** **(i)** | $\begin{pmatrix}15\\21\end{pmatrix}$ | **1** | |
| **(ii)** | not possible oe | **1** | |
| **(iii)** | (2) final answer | **2** | **M1** for 30 – 28 |
| **(iv)** | $\begin{pmatrix}4 & 13\\0 & 0\end{pmatrix}$ | **1** | |
| **(v)** | $\begin{pmatrix}-5 & -9\\1 & 0\end{pmatrix}$ | **2** | **B1** for one correct row or column |
| **(b)** | $\frac{1}{2}\begin{pmatrix}3 & -4\\-1 & 2\end{pmatrix}$ or better isw | **2** | **B1** for $k\begin{pmatrix}3 & -4\\-1 & 2\end{pmatrix}$ seen or implied<br>or $\frac{1}{2}\begin{pmatrix}a & b\\c & d\end{pmatrix}$ seen |
| **8** **(a)** | hat $\frac{5}{8}$, $\frac{3}{8}$<br>scarf $\frac{2}{3}$ $\frac{1}{3}$<br>$\frac{1}{6}$ $\frac{5}{6}$ | **1**<br>**1**<br>**1** | 1 mark per pair in correct place |
| **(b)** **(i)** | $\frac{15}{48}$ oe $\left[\frac{5}{16}\right]$ | **2FT** | **FT** *their* $\frac{3}{8}\times\frac{5}{6}$ correctly evaluated<br>**M1** $\frac{3}{8}\times\frac{5}{6}$ FT from *their* tree |
| **(ii)** | $\frac{5}{24}$ | **2FT** | **FT** *their* $\frac{5}{8}\times\frac{1}{3}$ correctly evaluated<br>**M1** $\frac{5}{8}\times\frac{1}{3}$ FT from *their* tree |

| | | | |
|---|---|---|---|
| **(iii)** | $\frac{13}{48}$ cao | **2** | **M1** for *their* $\frac{3}{8}\times\frac{1}{6}$ + *their* (b)(ii) soi |
| **(c)** | $\frac{170}{240}$ or $\frac{85}{120}$ *or* $\frac{34}{48}$ *or* $\frac{17}{24}$ cao | **3** | **M2** for $1-\frac{5}{8}\times\frac{2}{3}\times\frac{7}{10}$ FT *their* tree or $\frac{3}{8}+\frac{5}{8}\times\frac{1}{3}+\frac{5}{8}\times\frac{2}{3}\times\frac{3}{10}$ oe<br>**or M1** for<br>["wears all" = ] $\frac{5}{8}\times\frac{2}{3}\times\frac{7}{10}$ FT *their* tree seen |
| **9 (a)** | 371 or 371.1... | **4** | **M3** for $(6\times4\times12)+(2\times6\times0.5\times4\times4\times\sin60)$ oe<br>**or M2** for area of 1 or 2 hexagons<br>**or M1** for area of one relevant triangle or trapezium or rectangle within hexagon<br>If **0** scored **SC1** for 288 shown |
| **(b) (i)** | 1740 or 1743.6 to 1744.2 | **4** | **M3** for $\frac{12000}{4}\div(\pi\times0.74^2)$ oe<br>or **SC2** for figs 174[3..] or 174[4..]<br>or **B1** for $\pi\times0.74^2$ seen [1.72..]<br>or **B1** for 12000 / 4 soi by 3000 |
| **(ii)** | 87 cao www 5 | **5** | **B4** for 87.39 to 87.43<br>or **M3** for [$r$=] $\sqrt{\frac{figs\,12}{\pi\times figs\,5}}$ oe<br>or **M2** for [$r^2$ =] = $\frac{figs\,12}{\pi\ figs\,5}$ oe<br>or **M1** for figs$12=\pi r^2\times figs5$ |
| **10 (a) (i)** | final answer $\frac{25-8x}{20}$ | **2** | **M1** for $\frac{5\times5-4\times2x}{5\times4}$ or better seen |
| **(ii)** | final answer $\frac{2x^2+5x+9}{3(x+3)}$ | **3** | **B1** for $2x^2+6x-x-3$ soi<br>**and B1** for denom $3(x+3)$ or $3x+9$ seen |
| **(b)** | $x=\frac{2}{3}$ oe or 0.667 or 0.6666 to 0.6667<br>$y=-3$ | **3** | **M1** for correct method to eliminate one variable<br>**A1** for $x=\frac{2}{3}$ oe or 0.667 or 0.6666 to 0.6667<br>or $y=-3$ |

| | | | | |
|---|---|---|---|---|
| | **(c)** | final answer $\frac{7}{2x+3}$ www | **4** | **B1** for $7(x+3)$ in numerator<br>and **B2** for $(2x+3)(x+3)$ in denominator<br>or **SC1** for $(2x+a)(x+b)$ where $a$ and $b$ are integers and $a + 2b = 9$ or $ab = 9$<br>After **B1** scored, **SC1** for final answer $\frac{7}{2(x+1.5)}$ *or* $\frac{3.5}{x+1.5}$ |
| **11** | **(a)** | $3^2 + 1^2$ | **1** | Ignore attempt to evaluate $\sqrt{10}$ |
| | **(b) (i)** | $\frac{\sqrt{10}}{3}$ final answer | **1** | |
| | **(ii)** | $\frac{10}{3}$ final answer | **2** | **M1** for *their* $\frac{\sqrt{10}}{3} \times \sqrt{10}$ or<br>*their* $\left(\frac{\sqrt{10}}{3}\right)^2 + \left(\sqrt{10}\right)^2$<br>implied by 3.33 seen |
| | **(c)** | $\frac{100}{27}$ or $3\frac{19}{27}$ isw conversion<br>or 3.7[03] to 3.7[04] | **2** | **M1** for $3 \times \left(\frac{\sqrt{10}}{3}\right)^n$ oe where $n$ is 3 or 4<br>or for $[OP_4 =] \sqrt{\frac{1000}{81}}$<br>or for their (b)(ii) $\times \left(\frac{\sqrt{10}}{3}\right)^n$ where $n$ is 1 or 2 |
| | **(d) (i)** | 18.43... | **2** | **M1** for $\tan [P_1OP_2] = \frac{1}{3}$ oe |
| | **(ii)** | 18.4[3…] | **1** | |
| | **(iii)** | 20 | **3** | **SC2** for 19<br>**or M1** for $\frac{360}{18.4[3...]}$ |