**CAMBRIDGE INTERNATIONAL EXAMINATIONS**

**International General Certificate of Secondary Education**

# MARK SCHEME for the May/June 2013 series

## 0580 MATHEMATICS

**0580/43** 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

| | | | | |
|---|---|---|---|---|
| **1** | **(a)** | 2814 final answer | 2 | **M1** for 2345 ÷ 5 soi by 469 or ans = 2810 |
| | **(b)** | 257.95 final answer | 2 | **M1** for 2345 × 0.11 oe or ans = 258 |
| | **(c) (i)** | 280.5[0] final answer | 2 | **M1** for 330 × (1 – 0.15) oe or ans = 281 |
| | **(ii)** | 375 | 3 | **M2** for 330 ÷ (1 – 0.12) oe<br>Or **M1** for 330 = (100 – 12)% oe |
| | **(d)** | 1605.89 or 1605.9[0] | 3 | **M2** for $1500 \times (1 + 0.023)^3$ oe soi by 1605.898751<br>or 1500 × 1.07(05…)<br>Or **M1** for $1500 \times (1 + 0.023)^2$ oe |
| | **(e)** | 23.1 or 23.07 to 23.08 | 3 | **M2** for $\frac{325 - 250}{325} \times 100$ oe<br>Or **M1** for $\frac{325 - 250}{325}$ soi by 0.2307… 3sf or better<br>or $\frac{250}{325} \times 100$ soi by 76.9… |

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| **2** | **(a) (i)** | Perpendicular bisector of $QR$ ruled with 2 correct sets of arcs centred $Q$ and $R$ | 2 | **B1** for correct bisector ruled |
| | | Bisector of angle $SPQ$ ruled with correct arcs. (Marks on $PS$ and $PQ$ and correct pair of arcs) | 2 | **B1** for correct angle bisector ruled |
| | | Compass drawn arc centre $R$ with radius 6 cm (±2 mm) | B2 | **B1** for any compass drawn arc centre $R$ not used in any construction with no feathering |
| | | Correct region shaded cao | 1dep | Dependent on all **B4** marks for the correct loci |
| | **(ii)** | 217 to 221 | 1 | |
| | **(b) (i)** | 6360 or 6361 to 6363 | 2 | **M1** for $\pi \times 45^2$ |
| | **(ii)** | 165 or 164.9 to 165 | 2 | **M1** for $\frac{210}{360} \times 2\pi \times 45$ |
| **3** | **(a) (i)** | $x \geq 5$ | 1 | –1 once for strict inequalities in (i) to (iii) |
| | **(ii)** | $y \geq 11$ | 1 | |
| | **(iii)** | $x + y \geq 20$ | 1 | |
| | **(b)** | $4x + 8y \leq 160$ **and** divide by 4 | 1 | If there is a final inequality it must be the given one |
| | **(c) (i)** | $x = 5$ ruled | 1 | Must be on correct grid line |
| | | $y = 11$ ruled | 1 | Must be on correct grid line |
| | | $x + y = 20$ ruled | 2 | **B1** for one axis intercept correct when extended if necessary but not parallel to an axis |
| | | $x + 2y = 40$ ruled | 2 | **B1** for one axis intercept correct when extended if necessary but not parallel to an axis |
| | | Correct shading of **unwanted** region | 1dep | Dependent on 6 marks earned for the boundaries |
| | **(ii)** | 29 | 2 | **M1** for $x + y$ evaluated where $(x, y)$ is a point in their **quadrilateral and** $x$ and $y$ are integers |

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| **4** | **(a)** | 3080 | 2 | **M1** for ½ × 7 × 22 × 40 |
| | **(b)** | 46.2 or 46.18 to 46.2 www | 4 | **M3** for $\sqrt{7^2 + 22^2 + 40^2}$<br>**or M2** for $7^2 + 22^2 + 40^2$ soi by 2133<br>**or M1** for correct Pythagoras on one face |
| | **(c)** | 8.7 or 8.7 to 8.72 www | 3 | **M2** for $\sin^{-1}\frac{7}{their(b)}$ oe<br>**or M1** for $\sin = \frac{7}{their(b)}$ oe |
| | **(d)** | 217 | 3 | **M1** for $\frac{4}{3}\times\pi\times1.5^3$ soi by 14.1 to 14.14<br>**and M1 dep** for *their* (a) ÷ *their* 14.14 soi by 218. Dependent on **M1** earned |
| | **(e) (i)** | 25.13875 final answer | 2 | **B1** for 4.55 **and** 11.05 seen or 25.13875 seen and then spoiled |
| | **(ii)** | 25.14 | 1FT | **Strict FT** *their* (e)(i) correct to 4s.f. if rounding is possible |
| **5** | **(a)** | –5.04, 1.75, 0 | 3 | **B1** for each correct value |
| | **(b)** | Fully correct curve | 5 | **B3FT** for 10 correct plots from *their* (a)<br>**B2FT** for 8 or 9 correct plots<br>**or B1FT** for 6 or 7 correct plots<br>**and SC1** for two branches not joined |
| | **(c)** | –1.6 to – 1.5<br>–0.4 to –0.3<br>1.8 to 1.9 | 1<br>1<br>1 | |
| | **(d)** | –2.6 to –2.5 www<br>–0.4 to –0.3<br>1 | 1<br>1<br>1 | After **0** scored, **M1** for $y = 2x - 2$ drawn |
| | **(e)** | 3.25 to 4.25 with correct tangent | 3 | **B1** for correct tangent<br>**B2** for answer in range dep on close attempt at tangent<br>**M1dep** for $[-]\frac{\text{rise}}{\text{run}}$ used with values soi from tangent, dep on correct or close attempt at tangent |

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| **6** | **(a)** | $\frac{3}{10}$ correctly placed | 1 | Accept 0.3 |
| | | $\frac{6}{9}$ and $\frac{3}{9}$ correctly placed | 1 | Accept 0.667 or better and 0.333 or better |
| | | $\frac{7}{9}$ and $\frac{2}{9}$ correctly placed | 1 | Accept 0.778 or better and 0.222 or better |
| | **(b)** | $\frac{42}{90}$ or $\frac{21}{45}$ or $\frac{14}{30}$ or $\frac{7}{15}$ | 3 | **M2** for $\frac{7}{10} \times \frac{3}{9} + \frac{3}{10} \times \frac{7}{9}$ soi by 0.467 or better<br>**or M1** for $\frac{7}{10} \times \frac{3}{9}$ **or** $\frac{3}{10} \times \frac{7}{9}$ soi by 0.233 or better |
| **7** | **(a) (i)** | Triangle at (1, 3) (1, 9) (3, 3) | 2 | **SC1** for correct vertices not joined or triangle(1, 1) (3, 1) (1, 7) |
| | **(ii)** | $\begin{pmatrix} 1 & 0 \\ 0 & 3 \end{pmatrix}$ | 2 | **SC1** for $\begin{pmatrix} 1 & 0 \\ 0 & k \end{pmatrix}$, $k \neq \pm 1$ or 0 or $\begin{pmatrix} 3 & 0 \\ 0 & 1 \end{pmatrix}$ |
| | **(b) (i)** | Shear<br>*x*-axis oe invariant<br>[factor] 2 | 1<br>1<br>1 | |
| | **(ii)** | $\begin{pmatrix} 1 & 2 \\ 0 & 1 \end{pmatrix}$ | 2FT | **FT** from *their* 2 in (b)(i)<br>**SC1** for $\begin{pmatrix} 1 & k \\ 0 & 1 \end{pmatrix}$, $k \neq 0$ or $\begin{pmatrix} 1 & 0 \\ 2\text{FT} & 1 \end{pmatrix}$ |
| **8** | **(a) (i)** | 27 | 1 | |
| | **(ii)** | 54 | 1 | |
| | **(iii)** | 153 | 1 | |
| | **(b) (i)** | 59.6 or 59.57… www | 4 | **M2** for $45^2 + 32^2 - 2 \times 45 \times 32 \times \cos 100$<br>**or M1** for implicit cos rule<br>**and A1** for 3549…. |
| | **(ii)** | 22.[0] or 21.99… www | 3 | **M2** for $324 \div (\frac{1}{2} \times 32 \times \sin 67)$<br>**or M1** for [324 =] $\frac{1}{2} \times 32 \times x \times \sin 67$ |
| | **(iii)** | 81[.0] | 2 | **B1** for $2^2$ or $(\frac{1}{2})^2$ oe seen<br>or $\frac{1}{2} \times 16 \times \frac{1}{2}$ *their*(b)(ii) × sin67 |

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| **9** | **(a) (i)** | 14 | 1 | |
| | **(ii)** | 8 | 1 | |
| | **(iii)** | 30 – *their* (ii) | 1FT | |
| | **(b)** | $\frac{11}{80}$ | 2 | **SC1** for $\frac{69}{80}$ |
| | **(c)** | 16, 4 | 2 | **B1** for each correct value |
| | **(d)** | 18.0625 rot to 3sf or better or 18.1 www | 3 | **M1** for $\Sigma mf$ for $m$ as mid values of 5, 12.5, 22.5, 35 and 45 (= 1445)<br>**and M1 dep** for $\Sigma mf \div 80$, dep on **M1** earned |
| | **(e)** | Correct widths with no gaps<br>2nd block w = 5, fd = 2.4<br>3rd block w = 15 fd = 1.2<br>4th block w = 10 and fd = 1.6<br>5th block w = 10 and fd = 0.4 | 1<br>1<br>1<br>1FT<br>1FT | <br><br><br>**Strict FT** from *their* (c)<br>**Strict FT** from *their* (c)<br>After **0** scored for blocks, **SC1** for 4 correct fds soi by correct heights |
| **10** | **(a) (i)** | 4.5 or 4½ | 3 | **M2** for a complete correct method<br>**or M1** for one correct step at any stage. |
| | **(ii)** | $(x – 6)(x – 1)$ | M2 | **M1** for $(x + a)(x + b)$ where $ab = 6$<br>**or** $a + b = -7$ |
| | | 1, 6 | A1FT | **FT** their brackets **dep** on **M1** earned<br>After **M0** scored **SC1** for 1, 6 as answer |
| | **(iii)** | 6 | 4 | **B1** for $2(3x – 2) + x + 2 = 4 \times 10$ oe<br>**and B1** for correct multiplication of a bracket<br>**and M1** for correct rearrangement of their linear equation without brackets to $ax = b + c + d$ or better |
| | **(b)** | $a = 1/3$ oe, $b = 1/2$ oe | 6 | **B1** for any one of<br>$1 = a + b + 1/6$ oe<br>$5 = 8a + 4b + 2/6$ oe<br>$14 = 27a + 9b + 3/6$ oe<br>$30 = 64a + 16b + 4/6$ oe<br>Or any other correct equation<br>**and B1** for another of the above equations<br>**and M1** for equating one coefficient<br>or correct rearrangement to give $a$ or $b$ as subject<br>**and M1** for subtracting to eliminate $a$ or $b$<br>or correct substitution for *their* $a$ or their $b$<br>**A1** for $a = 1/3$ oe or $b = 1/2$ oe |

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