UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the May/June 2011 question paper

for the guidance of teachers

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 must be read in conjunction with the question papers and the report on the examination.

- Cambridge will not enter into discussions or correspondence in connection with these mark schemes.

Cambridge is publishing the mark schemes for the May/June 2011 question papers for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.

UNIVERSITY of CAMBRIDGE
International Examinations

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)** 25	1	
	(ii) 15.5 (15.46 to 15.47)	1	
	(iii) 0.05 oe	2	B1 for 1/100 or 0.01 seen
(b)	8812.50 final answer www 3	3	Condone 8812.5 M2 for 7500 × 5 × 0.035 + 7500 oe (implied by final answers 8810, 8812, 8813 or 8812.5(0) seen) or B2 for 1312.5 as final answer or M1 for 7500 × 5 × 0.035 oe (implied by final answers 1310, 1312, 1313)
(c)	**(i)** $2^2 \times 3 \times 5$	2	Allow 2 × 2 × 3 × 5 M1 for any correct <u>product</u> of 3 factors = 60 seen or correct factor ladder or correct tree (condone 1's on tree/ladder)
	(ii) 12	2	M1 for $2^2 \times 3$ or 2 × 2 × 3 oe
	(iii) 240	2	M1 for $2^4 \times 3 \times 5$ or 2 × 2 × 2 × 2 × 3 × 5 oe SC2 only for both correct answers **(ii) (iii)** reversed
2 (a)	3.02 (3.023…) www 4	4	M3 for $\sqrt{2^2 + 1.5^2 + 1.7^2}$ oe may be in two steps or $\sqrt{9.11 \text{ to } 9.15...}$ (3.018 to 3.026..) or M2 for $2^2 + 1.5^2 + 1.7^2$ oe implied by 9.11 to 9.15…. or M1 for any correct Pythag in 1 of the faces e.g. $2^2 + 1.5^2$
(b)	34.1 to 34.3 cao www 3	3	M2 for sin = 1.7/their *EC* or cos = their *EG*/their *EC* or tan = 1.7/their *EG* or complete long method (M1 for *CEG* as required angle – accept on diagram if clear)
(c)	**(i)** 2.95 cao	1	
	(ii) Yes **and** because their **(c)(i)** < their **(a)**	1**ft**	ft their **(a)** and their **(c)(i)**, must say <u>yes</u> or <u>no</u> oe and compare the two distances – numerically or by labels

3 (a)	**(i)** 142 to 150 **(ii)** (0)59 to (0)63 **(iii)** 148° to 152° drawn Distance 6.8 to 7.2 cm drawn **(iv)** 328 to 332° **(v)** 60 www 2	2 1 1 1 1 2	B1 for 7.1 to 7.5 seen Both marks available from the position of *B* as lines don't need to be drawn. M1 for 20^2 or better seen
(b)	667 (666.6 to 666.7) www 3	3	B1 for 2.25 (h), 135 (mins), 8100 (sec) and M1 for 1500 ÷ their time in hours (time must be in range 2.09 to 3.25) (could be implied by 697 to 698)
(c)	(cos =) $\frac{1125^2 + 790^2 - 1450^2}{2 \times 1125 \times 790}$ 96.9 (96.87 to 96.88) www 4	M2 A2	M1 for $1450^2 = 1125^2 + 790^2 - 2 \times 1125 \times 790\cos Q$ A1 for (cos =) –0.1197…(which implies M2)
4 (a)	4 – 5.8 or – 5.75 or – 5.7 – 2	1 1 1	
(b)	10 correct plots ft Correct shape curve through 10 points (condone 2 points slightly missed) Two separate branches not crossing *y*-axis	P3**ft** C1**ft** B1	ft from their values in **(a)** generous with (– 0.25, 12.1) P2 for 8 or 9 correct plots ft or P1 for 6 or 7 correct plots ft ft their points if shape correct – ignore anything between – 0.25 and 0.25 C1 and B1 are independent
(c)	– 2.5 to – 2.3 – 0.5 to – 0.4 2.75 to 2.9	1 1 1	
(d)	Correct tangent drawn at $x = -2$ – 4 to – 2.5	T1 2	Allow slight daylight Dep on T1 M1 Rise/Tread attempt Dep on T1 or SC1 for answer in range 2.5 to 4 after T1

5 (a)	2, 3, 4, 5	3	M2 for $1 < n \leq 5$ seen (M1 for $1 < n$ or $n \leq 5$) Allow $2 \leq n < 6$ in M2 or M1 case If 0, B2 for 3 correct with no extras or 4 correct with 1 extra.
(b)	**(i)** $2x(x + 5y)$	2	B1 for $x(2x + 10y)$ or $2(x^2 + 5xy)$
	(ii) $3(a – 2b)(a + 2b)$	3	B2 for $(3a – 6b)(a + 2b)$ or $(a – 2b)(3a + 6b)$ or correct answer seen in working or B1 for $3(a^2 – 4b^2)$ If B0, SC1 for $a^2 – b^2 = (a – 2b)(a + 2b)$
(c)	**(i)** ½ $x(x + 17) = 84$ or $x(x + 17) = 2 \times 84$	M1	Condone ½ $x \times x + 17 = 84$ but only for M mark No errors or omission of brackets anywhere
	Correct proof of $x^2 + 17x – 168 = 0$	E1	
	(ii) $(x – 7)(x + 24)$	2	SC1 for $(x + a)(x + b)$ where a and b are integers and $a + b = 17$ or $ab = – 168$
	(iii) 7 and –24 ft	1**ft**	Correct or ft from their factors if quadratic
(d)	– 3 www 3	3	B2 for $15 – 6 = x – 4x$ oe or better M1 for $15 – x = 2(3 – 2x)$ or better or $7½ – x/2 = 3 – 2x$
(e)	$\sqrt{(-5)^2 – 4 \times 2 \times -6}$	B1	$(\sqrt{73})$
	$p = – –5$ and $r = 2 \times 2$	B1	Dependent on $\frac{p + \sqrt{q}}{r}$ or $\frac{p – \sqrt{q}}{r}$ or $\left(x – \frac{5}{4}\right)^2$ B1 $\sqrt{3 + \frac{25}{16}}$ B1
	3.39, –0.89 final answers	B1B1	SC1 for 3.4 or 3.386… or 3.39 seen and – 0.9 or – 0.886… or – 0.89 seen

6 (a)	**(i)** $45 < t \leqslant 55$	1	Allow any indication e.g. 4th interval
	(ii) 52.6 (52.63…..) www 3	3	M1 for $6 \times 10 + 15 \times 27.5 + 19 \times 40 + 37 \times 50 + 53 \times 62.5 + 20 \times 75$ (= 7895) Allow 1 error/omission and M1 dep for ÷ 150
(b)	**(i)** 40, 77, 130, 150	2	B1 for 2 or 3 correct values
	(ii) Correct scales	S1	
	6 correct plots ft	P3**ft**	ft from **(i)** if increasing values. (35, 21) must be inside square 20 – 22 but (55, 77) may be inside or edge of square P2 for 4 or 5 correct plots ft P1 for 2 or 3 correct plots ft
	Curve or ruled lines through the 6 points	C1**ft**	ft their points if increasing condone graph starting at (20, 6)
(c)	**(i)** 54 to 55	1	
	(ii) 18.5 – 22.5	2	B1 for UQ = 62.5 to 65 or LQ = 42.5 to 44 seen
	(iii) Their reading at 60 – their reading at 50	1	
	(iv) $\frac{150 - \text{their reading at } 50\ (\pm 2)}{150}$ oe	2	SC1 for $\frac{\text{their reading at } 50(\pm 2)}{150}$ oe
	(v) If their **(iv)** is $\frac{k}{150}$, then ft their $\frac{k}{150} \times \frac{k-1}{149}$	2**ft**	In **(iv)** and **(v)**, condone answers as decimals to 3 sf Penalise first occurence only of 2sf decimals isw cancelling/conversion M1 for $\frac{k}{150} \times \frac{k-1}{149}$

7 (a)	87.5 (87.45 to 87.52) www 4	4	M1 for ½ × 2.5 × 9.5 soi by 11.875 or 71.25 and M2 for ½ × 2.5^2 × sin60 × 6 oe (16.23 to 16.24) or M1 for ½ × 2.5^2 × sin60 (2.706..) or 1 trapezium (8.1189..)
(b)	107.9 ….. to 108.0…..www3	3	Must see at least 4 figures M2 for $\frac{55}{360} \times \pi \times 15^2$ or M1 for $\frac{55}{360}$ seen
(c)	**(i)** 2.29 (2.291 to 2.293) www 2	2	M1 for $108 = 15\pi r$ oe allow 107.9 to 108.0… for their 108
	(ii) 14.8 (14.82 to 14.83) cao www 3	3	M2 for $\sqrt{15^2 - \text{their}\,2.29^2}$ (M1 for $h^2 + \text{their}\ 2.29^2 = 15^2$)
(d)	70.9 to 71.5 cao www 3	3	M2 for $\frac{\pi}{3}$ (their 2.29^2 × their 14.8 – their 1.145^2 × their 7.4) (not 15 or 7.5) or $\frac{7}{8} \times \frac{\pi}{3}$ × their 2.29^2 × their 14.8 or M1 for 1/8 oe e.g. $\frac{7.5^3}{15^3}$ or 7/8 or (½ their *R* and ½ their *h*) seen
8 (a)	Correct enlargement	2	B1 for any enlargement of 2 in correct orientation
(b)	**(i)** Stretch only *y*- axis oe invariant (factor) 4	1 1 1	
	(ii) $\begin{pmatrix} 4 & 0 \\ 0 & 1 \end{pmatrix}$	2**ft**	Ft their factor 4 SC1 for $\begin{pmatrix} k & 0 \\ 0 & 1 \end{pmatrix}$ $k \neq 0, \neq 1$ or $\begin{pmatrix} 1 & 0 \\ 0 & 4 \end{pmatrix}$ ft their factor 4
(c)	Shear only *x*-axis oe invariant (factor) 2	1 1 1	

9 (a)	**(i)** 3, 8, 15 in correct positions	2	B1 for 2 correct values in correct positions
	(ii) 12	3	M2 for $12 \times (12 + 2)$ (= 168) or 12, (12 + 2) or M1 for $n^2 + 2n = 168$ then M1 for $(n + a)(n + b)$ where a and b are integers and $ab = -168$ or $a + b = 2$ oe
(b)	**(i)** $2 + 3n$ oe	2	Allow unsimplified e.g. $5 + 3(n - 1)$ B1 for $3n$ oe seen
	(ii) 2^{n-1} oe	2	B1 for 2^k seen
(c)	$a = \frac{1}{2}$, $b = 1\frac{1}{2}$ cao	6	B1 for 12 or 30 seen but if 30 clearly only from Diagram 4 then B0. M1 for any 1 of $a + b + 1 = 3$ oe, $8a + 4b + 2 = 12$ oe, $27a + 9b + 3 = 30$ oe M1 for a 2nd of the above equations M1 (indep) for correctly eliminating a or b from pair of linear equations B1 for one correct value