CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the October/November 2012 series

0581 MATHEMATICS

0581/43 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.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the October/November 2012 series for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level components and some Ordinary Level components.

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)** [0]9 15 [am]	**1**	Any acceptable form of time
	(ii) 64.9 or 65.[0] or 64.92 to 64.98	**2**	**M1** for 92 ÷ (1 and 25 mins) or 92/85 × 60 oe or 92 ÷ (1.41 to 1.42)
	(iii) 11.76…or 11.8	**1**	
	(iv) 80	**3**	**M2** for 92 ÷ 1.15 oe or **M1** for 115% associated with 92
	(b) (i) 150 ÷ (11 + 16 + 3) or 150 × 3 oe	**M1**	Correct first step
	then × 3 or ÷ 30	**E1**	Correct conclusion
	(ii) 11 : 9 final answer	**2**	**M1** for 8.25 : (15 – 8.25) oe For **M1** e.g. allow 1 : 0.818 [0.8181 to 0.8182] or 1.22 : 1 [1.222…] **After M0**, **SC1** for 9 : 11 as final answer
2	**(a) (i)** Image at (– 3, 1), (– 7, 7), (– 3, 7)	**2**	**SC1** for translation $\begin{pmatrix}-11\\k\end{pmatrix}$ or $\begin{pmatrix}k\\-1\end{pmatrix}$
	(ii) Image at (– 4, – 1), (– 4, – 4), (– 2, – 4)	**2**	**SC1** for enlargement factor 0.5 and correct orientation **In each part of (b) must be one transformation only – if more then lose all marks for that part**
	(b) (i) Reflection, $y = 1$	**2**	**B1 B1** independent
	(ii) Rotation, (3, 2), 180 oe or enlargement, (3, 2), (factor) – 1	**3**	**B1 B1 B1** independent
	(iii) Stretch, (factor) 0.5, Invariant line y-axis or $x = 0$	**3**	**B1 B1 B1** independent – must be clear on **invariant** line

	(c) $\begin{pmatrix} 0.5 & 0 \\ 0 & 1 \end{pmatrix}$	**2 ft**	**ft** *their* factor in **(b)(iii) only** if stretch not [illegible] **SC1** for $\begin{pmatrix} k & 0 \\ 0 & 1 \end{pmatrix}$ [$k \neq 0$ or 1] **or** $\begin{pmatrix} 1 & 0 \\ 0 & 0.5 \end{pmatrix}$ **ft** *their* factor **only** if stretch in **(b)(iii)**
3	**(a)** 7.407….. or 7.41	**1**	
	(b) 9	**2**	**M1** for 1080 ÷ (12 × 10) oe
	(c) **(i)** 6.36 to 6.37 www	**3**	**M2** for $\sqrt[3]{\frac{1080}{\frac{4}{3}\pi}}$ oe or **M1** for $\frac{1080}{\frac{4}{3}\pi}$ oe [257.7 to 258.7] Accept 4.18 to 4.19 for $4/3\,\pi$
	(ii) 508 to 510	**2**	**M1** for $4 \times \pi \times$ (their **(c)(i)**)^2
	(d) $\sqrt{2}$ or 1.41 [1.414…] www	**2**	Allow over 1 or $\sqrt{2}$: 1 etc **M1** for $(R / r)^2 = 2$ oe or [R^2 =] (2 × *their* **(c)(ii)**)/4 π **or** [R^2 =] 2 × (*their* **(c)(i)**)²
4	**(a)** 5, – 1	**2**	**B1 B1**
	(b) 12 points plotted ft	**P3ft**	**P2ft** for 10 or 11, **P1ft** for 8 or 9
	Smooth curve through at least 12 points	**C1**	In absence of plot[s], allow curve to imply plot[s]. No ruled sections
	Two separate branches	**B1**	Not touching *y*-axis
	(c) **(i)** 0.55 to 0.65	**1**	
	(ii) 0.65 to 0.75	**2**	**M1** for $y = 3x$ drawn (ruled) to cross curve
	(d) $\frac{1}{3}$	**2**	Accept 0.333[3….] or $0.\dot{3}$ **M1** for $\frac{2}{x^2} - 3x = 3x$ or better

	(e) (i) **Ruled** line through (– 1, 5) and (3, – 9)	**1**	
	(ii) $y = -3.5x + 1.5$ oe **final answer**	**3**	**B2** for $y = kx + 1.5$ [$k \neq 0$] oe or $y = -3.5x + d$ oe **B1** for gradient = – 3.5 oe accept integer/integer or $y = kx + [1.4 \text{ to } 1.6]$ oe **SC2** for answer $-3.5x + 1.5$ [no '$y =$']
	(iii) Tangent	**1**	
5	**(a)** 0.57	**B4**	Condone use of other variables **M1** for $2w + 3l = 3.6$ oe **and M1** for $l = w + 0.25$ oe **A1** for correct $aw = b$ or $cl = d$ **or M2** for $2w + 3(w + 0.25) = 3.6$ oe or $2(l - 0.25) + 3l = 3.6$ oe or **M1** for $w + 0.25$ or $l - 0.25$ seen **A1** for $2w + 3w = 3.6 - 0.75$ or better or $2l + 3l = 3.6 + 0.5$ or better $l = 0.82$ implies **M2A1** trial & error scores **B4 or zero** accept answer 57 if written **57 cents** **after M0, SC3** if answer 57
	(b) (i) $\frac{5}{x} + \frac{6}{x+2} = 1$ oe	**M2**	e.g. $\left(1 - \frac{5}{x}\right)(x+2) = 6$ **M1** for $\frac{5}{x}$ seen or $\frac{6}{x+2}$ seen or $xy = 5$ **and** $(x + 2)Y = 6$ oe or $xy = 5$ **and** $(x + 2)(1 - y) = 6$ oe
	$5(x + 2) + 6x = x(x + 2)$ oe	**A1**	e.g. $(x - 5)(x + 2) = 6x$ Allow $5x + 10 + 6x = x^2 + 2x$ and allow **all** over correct denominator but must see this line
	$5x + 10 + 6x = x^2 + 2x$ oe $0 = x^2 - 9x - 10$	**E1**	One correctly expanded line seen No errors or omissions
	(ii) $(x - 10)(x + 1)$	**2**	**SC1** for $(x + a)(x + b)$ where $ab = -10$ or $a + b = -9$
	(iii) 21	**2ft**	ft a positive x into $2(x + \frac{5}{x})$ **M1** for 0.5 seen or 5 / *their* positive root

	(c) (i) $(2x+3)^2 = (x+3)^2 + 5^2$ oe	**M1**	
	$4x^2 + 6x + 6x + 9 =$ $x^2 + 3x + 3x + 9 + 25$ oe	**B1** **B1**	for $4x^2 + 6x + 6x + 9$ or $4x^2 + 12x + 9$ for $x^2 + 3x + 3x + 9$ or $x^2 + 6x + 9$
	$3x^2 + 6x - 25 = 0$	**E1**	No errors or omissions
	(ii) $\frac{-6 \pm \sqrt{6^2 - 4(3)(-25)}}{2(3)}$	**B2**	**B1** for $\sqrt{6^2 - 4(3)(-25)}$ or better seen If in form $\frac{p+\sqrt{q}}{r}$ or $\frac{p-\sqrt{q}}{r}$ oe **B1** for $p = -6$ and $r = 2(3)$ or better
	– 4.06, 2.06 final answer	**B2**	**B1 B1** After B0 B0 **SC1** for – 4.1 **and** 2.1 or – 4.055… **and** 2.055... or –4.06 and 2.06 seen
	(iii) 12.63 to 12.65 or 12.6 or 12.7	**2ft**	ft (a positive $x + 3$) × 2.5 **SC1** for 0.5 × *their* positive value × 5 written
6	**(a)** sin [ ]= $\frac{130}{0.5 \times 16 \times 25}$ oe	**M2**	**M1** for 0.5 × 16 × 25 × sin [ ] = 130 oe but if 40.54… reached from implicit method then **M2**
	40.54... = 40.5	**E1**	Must see 40.54.. and conclusion Use of 40.5 alone in implicit expression scores **M1**.
	(b) 16.51 to 16.53… or 16.5 www	**4**	**M2** for $16^2 + 25^2 - 2 \times 16 \times 25 \times \cos(40.5)$ oe [allow 40.54…] (**M1** for $\cos 40.5 = \frac{16^2 + 25^2 - AC^2}{2 \times 16 \times 25}$) [allow 40.54...] **A1** for 272.6 to 273.0…(which implies M2)
	(c) 10.39 to 10.4[0]	**2**	**M1** for 0.5 × 25 × distance = 130 or $\frac{dist}{16} = \sin[40.5]$ oe [allow 40.54….]

7			Accept fraction, %, dec equivalents [3sf throughout but not in ratio or words **Isw incorrect cancelling or converting and accept ratios or words** Pen –1 once for 2sf answers ft probability if $0 < p < 1$
	(a) (i) $\frac{2}{20}$ oe	**2**	**M1** for $\frac{2}{5} \times \frac{1}{4}$ oe
	(ii) $\frac{6}{20}$ oe	**3**	**M2** for $2 \times \frac{1}{5} \times \frac{1}{4} + 2 \times \frac{2}{5} \times \frac{1}{4}$ oe **M1** for pairs 1, 4 **and** 2, 3 clearly identified and no other incorrect pairings **or** for one appropriate product isw
	(iii) $\frac{14}{20}$ oe	**1ft**	ft 1 – *their* **(a)(ii)** or recovery to correct ans
	(b) (i) 7	**1**	
	(ii) 42	**1**	
	(iii) $\frac{7}{50}$	**1ft**	ft *their* 7/50 from Venn diagram or correct recovery
	(iv) $\frac{7}{9}$ [0.777[7].. or 0.778]	**1ft**	ft *their* 7/*their* 9 from Venn diagram or correct recovery
8	**(a)** 24	**3**	**M2** for 24 at *B* **or** 128 at *X* **and** 28 at *D*. or **M1** for 28 at *D* **or** 128 at *X* allow on diagram
	(b) 5 www	**3**	**M2** for $360 - 22x = 2 \times 25x$ oe or better or $22x = 2(180 - 25x)$ oe or better or $11x + 25x = 180$ oe or better or **M1** for $P = 11x$ or reflex $O = 360 - 22x$ or reflex $O = 50x$ allow on diagram

	(c) 6.32 to 6.34 www	**5**	**B1** for *OLM* 90° (seen or implied) allow on diagram and **M1** for *LM* = 8tan44 [7.7255…] or *OM* = 8 ÷ cos44 [11.1213…] and **M1dep** on previous **M** for 0.5 × 8 × *their LM* or 0.5 × 8 × (*their OM*) sin44 and **M1** for $\frac{44}{360} \times \pi \times 8^2$ oe [24.5 to 24.6]
9	**(a) (i)** 72	**1**	
	(ii) 68	**1**	
	(iii) 8	**1**	
	(iv) 164	**2**	**M1** for 36 seen may be on the graph
	(b) (i) 11	**1**	
	(ii) 35, 45, 55, 65, 75, 85	**M1**	At least 5 correct mid - values soi
	(9 × 35 + *their* 11 × 45 + 16 × 55 + 28 × 65 + 108 × 75 + 28 × 85) [13990]	**M1**	$\sum fx$ where x is in the correct interval allow one further slip
	÷ 200 or *their* $\sum f$	**M1dep**	Depend on second method
	69.95 or 69.9 or 70[.0] cao	**A1**	isw conversion to mins/secs & reference to classes **SC2** for correct answer without working
10	**(a)** *A* 1, $13 - 2n$ oe	**3**	**B1, B2** (**M1** for $k - 2n$) oe
	B 36, n^2 oe	**2**	**B1, B1**
	C 42, $n(n + 1)$ oe	**3**	**B1, B2** (**B1** for a quadratic in n)
	D 729, 3^n oe	**2**	**B1, B1**
	E 687 , $3^n - n(n + 1)$ oe	**2ft**	**B1ft** *their D – their C* , **B1ft** *their D – their C* only if both in terms of n

	(b) (i) – 187	**1ft**	ft if A is linear
	(ii) 10 100	**1ft**	ft if C is quadratic
	(c) 8	**1**	
	(d) 58 939	**1**	