UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the October/November 2010 question paper for the guidance of teachers

0581 MATHEMATICS

0581/42 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.

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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)** 432	2	**M1** for $756 \div 7 \times 4$ oe
	(b) **(i)** 8970	2	**M1** for 7800×1.15 oe After 0 scored, **SC1** for 1170 as answer
	(ii) $\frac{\text{their } 9867 - 7800}{7800} (\times 100)$ or 1.15×1.10	M2	Their 9867 is their **(b)(i)** $\times 1.1$ Implied by 1.265 or 0.265 or 126.5 or **M1** for their **(b)(i)** $\times 1.10$ (9867 seen or 2067 seen)
	26.5 % cao	A1	www3
	(c) 8100	3	**M2** for $9720 \div 1.2$ oe or **M1** for 120% = 9720 oe
	(d) 562.43 or 562 or 562.4(0) or 562.432	3	**M2** for 500×1.04^3 or alt complete method or **M1** for 1.04^2 or 1.04^3 oe soi e.g. \$540.80 or 562.(43..) seen in working
2	**(a)** **(i)** 11 **(ii)** 22	1 1	
	(b) $\frac{x+1}{4}$ oe final answer	2	**M1** for $x + 1 = 4y$ or $\frac{g(x)+1}{4}$ or $\frac{y+1}{4}$
	(c) $16x^2 - 8x + 7$ final answer	3	**M1** for $6 + (4x - 1)^2$ and **B1** for $16x^2 - 4x - 4x + 1$ or better seen
	(d) 0.5 or ½ www	3	**M2** for $16x - 4 - 1 = 3$ or better or **M1** for $4(4x - 1) - 1$ (= 3) **Alt method** **M2** allow $g^{-1}g^{-1}(3)$ complete method or **M1** for $g(x) = g^{-1}(3)$

3	**(a) (i)** 63 to 63.5 **(ii)** 50 to 50.5 **(iii)** 21.5 to 22.5	1 1 1	
	(b) 46	2	**B1** for 34 seen (could be on graph)
	(c) (i) 12, 14 **(ii)** {35 × 8 + 45 × their 12 + 55 × 14 + 65 × 22 + 75 × their 14 + 85 × 10} ÷ their 80 (or 80)	1, 1 M3	**M1** for mid-values soi (allow 1 error/omit) and **M1** for use of $\sum fx$ with x in correct boundary including both ends (at least 4 products) (4920 seen implies M2) and **M1** depend on 2nd M for dividing by their 80 (or 80) (not 54 or less)
	61.5 cao	A1	www4
4	**(a) (i)** 218 (217.7 to 218) **(ii)** 501 (500.7 to 501.4) **(iii)** 99	2 1ft 2ft	**M1** for $1/3\pi \times 4^2 \times 13$ ft their **(a)** × 2.3 ft 50 000 ÷ their **(a)(ii)** and truncated to whole number **M1** for 50 000 ÷ their **(a)(ii)** oe or answers 99.8 or 100
	(b) their **(a)(i)** × $\left(\frac{32.5}{13}\right)^3$ oe	M2	or $1/3\pi \times 10^2 \times 32.5$ or **M1** for $(32.5 \div 13)^3$ (=15.625) seen or $(13 \div 32.5)^3$ (= 0.064) seen
	3400 or 3410 (3401 to 3407)	A1	www3
	(c) (r^2 =) 550 ÷ 12π	M2	(14.58 to 14.6) or **M1** for $12\pi r^2 = 550$ or better
	3.82 (3.818 to 3.821)	A1	www3

5	**(a) (i)** $x^2 + (x + 7)^2 = 17^2$ oe	B1	Must be seen
	$x^2 + x^2 + 7x + 7x + 49 = 17^2$ or better	B1	
	$2x^2 + 14x - 240 = 0$		Must be shown – correct 3 terms
	$x^2 + 7x - 120 = 0$	E1	With no errors seen
	(ii) $(x + 15)(x - 8)$	2	**M1** for $(x + a)(x + b)$ where a and b are integers and $a \times b = -120$ or $a + b = 7$ Ignore solutions after factors given
	(iii) –15 and 8	1ft	Correct or ft dep on at least **M1** in **(ii)**
	(iv) 15	1ft	Correct or ft their positive root from **(ii)** + 7 dep on a positive and negative root given
	(b) (i) $3x(2x - 1) = (2x + 3)^2$ oe	M1	e.g. $6x^2 - 3x = 4x^2 + 12x + 9$ must see equation before simplification
	$4x^2 + 6x + 6x + 9$ or better seen	B1	Indep
	$6x^2 - 3x = 4x^2 + 12x + 9$ oe $2x^2 - 15x - 9 = 0$	E1	With no errors seen and both sets of brackets expanded
	(ii) $\frac{(--)15 \pm \sqrt{((-)15)^2 - 4(2)(-9)}}{2(2)}$ oe	1 1	In square root **B1** for $((-)15)^2 - 4(2)(-9)$ or better (297) If in form $\frac{p + \sqrt{q}}{r}$ or $\frac{p - \sqrt{q}}{r}$, **B1** for –(–15) and 2(2) or better
	8.06 and -0.56 cao	1, 1	**SC1** for –0.6 or –0.558… and 8.1 or 8.058…
	(iii) 76.5 (76.46 to 76.48)	1ft	ft 8 times a positive root to **(b)(ii)** add 12
6	**(a) (i)** $5480^2 + 3300^2 - 2 \times 5480 \times 3300 \times \cos 165$	M2	(75 856 005) **M1** for implicit version
	8709.5..	E2	If E0, **A1** for 75800000 to 75900000
	(ii) $(\sin L =) \frac{\sin 165}{8710} \times 3300$ (0.09806…)	M2	**M1** for $\frac{\sin L}{3300} = \frac{\sin 165}{8710}$ oe (allow 8709.5.) Could use cosine rule using 8710 or better – **M2** for explicit form or **M1** for implicit form (allow 5.6 to 5.63 for A mark)
	5.6 (5.62 to 5.63)	A1	www3
	(b) 22 35 or 10 35 pm	2	Accept 22 35 pm **B1** for 15 35 or 3 35 pm seen or answers 22h 35 mins or (0)8 35(am) or 10 35(am)
	(c) 8710 ÷ 800	M1	
	10.88 to 10.9 with no conversion to h/min or 10 (hrs) 52 (mins) to 10 (hrs) 54 (mins) oe	A1	Implied by correct final ans 2hrs 52 mins if not shown
	13 hrs 45 mins – their time in hrs and mins oe or 13.75 – their decimal time **and** a correct conversion to hrs and mins or minutes	M1	Dep on first **M1** e.g. 13 hrs 45mins – 11 hrs 29 mins or 13.75 – 10.9 then 2hrs 51 mins
	2 hr 52 mins cao	A1	www4 (2 hrs 51.75 mins)

7	**(a)** –3, –4.25, –3	1, 1, 1	Allow – 4.2 or – 4.3 for – 4.25
	(b) 10 correct points plotted	P3ft	**P2ft** for 8 or 9 correct **P1ft** for 6 or 7 correct
	Smooth curve through their 10 points and correct shape	C1	Correct shape not ruled, (curves could be joined)
	Two separate branches	B1ft	Indep but needs two 'curves' on either side of y-axis
	(c) **(i)** 0.7 to 0.85	1	–1 each extra
	(ii) Any value of k such that $k \leqslant -3$ and **must** be consistent with their graph	1ft	ft consistent with their graph (If curves are joined then $k = -3$ only)
	(d) $y = 5x$ drawn	L1	Ruled and long enough to meet curves
	– 0.6 to –0.75, 0.55 to 0.65	1, 1	Indep –1 each extra
	(e) Tangent drawn at $x = -2$	T1	Must be a reasonable tangent, not chord, no clear daylight
	y change / x change attempt	M1	Depend on **T** and uses scales correctly. Mark intention – allow **one** slight slip e.g. sign error from coords but not scale misread If no working shown and answer is out of range – check their tangent for method
	2.7 to 4.3	A1	Answer in range gets 2 marks after **T1** earned
8	**(a)** **(i)** Correct translation to (3, –5), (5, –6) and (4, –4)	2	**SC1** for translation of $\begin{pmatrix}3\\k\end{pmatrix}$ or $\begin{pmatrix}k\\-7\end{pmatrix}$ or vertices only
	(ii) Correct reflection to (4, 1), (5, 3) and (6, 2)	2	**SC1** for reflection in $y = 3$ or vertices only
	(iii) Correct rotation to (–2, 0), (–1, 2) and (–3, 1)	2	**SC1** for rotation 90 clockwise around (0, 0) or vertices only
	(iv) Correct enlargement to (0, –3), (–8, 1) and (–4, –7)	2	**SC1** for two correct points or vertices only
	(b) 16 cao	1	
	(c) **(i)** Correct transformation to (–4, 0), (5, 3) and (–2, 0)	3	**B2** for 3 correct points shown in working but not plotted **or B1** for incorrect shear drawn with x-axis invariant **or** two correct points shown
	(ii) Shear only	1	If more than one transformation given – no marks available
	x-axis oe invariant	1	Accept fixed, constant oe for invariant
	(factor) 3	1	
	(iii) $\begin{pmatrix}1 & -3\\0 & 1\end{pmatrix}$ oe	2	**B1** for determinant = 1 **or** $k\begin{pmatrix}1 & -3\\0 & 1\end{pmatrix}$ oe

9	**(a)** $\frac{4}{11}$ **and** $\frac{4}{10}$, $\frac{7}{10}$ $\frac{3}{10}$	1 1, 1	**Accept** fraction**,** %, dec equivalents (3sf or better) throughout but not ratio or words i.s.w. incorrect cancelling/conversion to other forms Pen –1 once for 2 sf answers
	(b) (i) $\frac{7}{11} \times \frac{6}{10}$	M1	
	$\frac{42}{110}$ oe $\left(\frac{21}{55}\right)$	A1	www2 0.382 (0.3818…)
	(ii) $\frac{7}{11} \times \frac{4}{10} + \frac{4}{11} \times \frac{7}{10}$	M2	ft their tree **M1** for either pair seen
	$\frac{56}{110}$ oe $\left(\frac{28}{55}\right)$	A1	www3 0.509(0..)
	(c) (i) $\frac{7}{11} \times \frac{6}{10} \times \frac{5}{9}$ **or** their **(b)(i)** $\times \frac{5}{9}$	M1	
	$\frac{210}{990}$ oe $\left(\frac{7}{33}\right)$	A1	www2 0.212(1..)
	(ii) $1 - \left(\frac{4}{11} \times \frac{3}{10} \times \frac{2}{9}\right)$ oe	M2	Longer methods must be complete **M1** for 4/11, 3/10 and 2/9 seen
	$\frac{966}{990}$ oe $\left(\frac{161}{165}\right)$	A1	www3 0.976 (0.9757…)
10	**(a)** 21 and 34	1	
	(b) –5 8	1 + 1	
	(c) (i) 4, 6	3	**M1** for $2 + d = e$ oe or $d + e = 10$ oe seen and either **M1** for a correct eqn in d or e seen e.g. $2e = 12$ oe or $2d = 8$ oe or **B1** for either correct
	(ii) $x = 28$ $y = –5$ $z = 23$	5	**B4** for any two correct or **M3** for **any** of $18 = 3x – 66$ oe or $3y + 33 = 18$ oe or $33 – 3z = -36$ oe or **M1** for **2** of $y = x – 33$ oe or $y + z = 18$ oe or $x + y = z$ oe and **M1** for combining two of the previous equations correctly isw (does not have to be simplified) after 0 scored **SC1** for –33 + their x = their y or their x + their y = their z or their y + their z = 18