CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the October/November 2012 series

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.

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)** 5	2	**M1** for $\dfrac{3 \times 15}{(5+3+1)}$
	(ii) 108	2	**M1** for $60 \times \dfrac{9}{5}$ oe
	(b) Correct conversion of money $J \times 0.718$ or $A \div 0.718$	**M1**	Correct conversion of money soi by 146.83[1] rounded or truncated to 3sf or 134.26[1…] rounded or truncated to 3 sf if done 1st
	Correct equalising of weights e.g. $J \times \dfrac{2[0]}{3[0]}$ or $A \times \dfrac{3[0]}{2[0]}$ or $J \div 3$ and $A \div 2$ or $J \div 30$ and $A \div 20$	**M1**	Correct equalising of weights or money Accept other methods that give a pair of comparable values for method and accuracy marks This mark can be implied by values seen correct to 3 sf or better
	97 to 98 or 201[.39…] **and** Ann 48.9[4..] **and** 48.2[0] **and** Ann or 68[.16] to 68.[2] **and** 67[.13] **and** Ann 4.88… to 4.9 **and** 4.82 **and** Ann or 6.8[1..] to 6.82 **and** 6.7[1…] **and** Ann www	**A2**	The underlined values imply **M1** for the money conversion Or **A1** for 97 to 98 or 201[.39…] or a correct pair of values with wrong/no conclusion
	(c) 302 Final answer	3	**M1** for $60 \times 60 \times 4$ soi by 14400 or figs 6048 or figs 3024 and **M1** for $\div (1000 \times 20)$ soi Answer 302.4 implies **M2**
	(d) 13.6[0]	3	**M2** for $\dfrac{15.3[0]}{1.125}$ oe or **M1** for 15.3[0] associated with 112.5%
	(e) 12	1	

2	(a) (i)	$[\cos A=]\dfrac{32^2+64^2-43^2}{2\times32\times64}$	M2	M1 for correct implicit version $43^2=32^2+64^2-2\times32\times64\cos A$
		37.00[...]	A2	A1 for $\dfrac{3271}{4096}$ or 0.798 to 0.799
	(ii)	616 or 616.2 to 616.4…	2	M1 for $\frac{1}{2}\times32\times64\times\sin37$ oe
	(b)	$[\text{Sin }ADC=]\dfrac{64\sin55}{70}$ soi by 48.49…rounded or truncated or $x^2-(73.41\text{ to }73.42)\,x-804\,[=0]$	M2	M1 for correct implicit version of sine rule or cosine rule with x
		$\dfrac{70\sin(125-their\,48.5)}{\sin55}$ or $64^2+70^2-2\times64\times70\cos(125-their\,48.5)$ or solving their 3 term quadratic equation	M2	M1 for implicit sine rule or cosine rule or for one error in quadratic solution Ignore negative solutions
		228 or 228.0 to 228.1 www	A2	A1 for 83.0 to 83.1
3	(a) (i)	$2(2x+1)(x-5)$ final answer	3	**B1** for $2(2x^2-9x-5)$ and **B1** for $(2x+1)(x-5)$ or **SC2** for expansion of brackets gives 3 correct terms e.g. $(2x+1)(2x-10)$ or $(4x+2)(x-5)$ or **SC1** for expansion of brackets gives 2 correct terms e.g. $(2x-1)(2x+10)$ or $(4x-2)(x-4)$
	(ii)	$-1/2$oe , 5	1ft	Correct or ft their 2 brackets
	(b)	$\dfrac{[--]7\pm\sqrt{([-]7)^2-4(2)(-10)}}{2(2)}$	B2	**B1** for $\sqrt{([-]7)^2-4(2)(-10)}$ $[=\sqrt{129}\,]$ If in form $\dfrac{p+\sqrt{q}}{r}$ or $\dfrac{p-\sqrt{q}}{r}$, **B1** for $--7$ and $2(2)$ or better
		-1.09 , 4.59 final answers	B1B1	If **B0**, **SC1** for -1.1 and 4.6 as final answers or $-1.089..$ and $4.589..$ as final answers or -1.09 and 4.59 seen

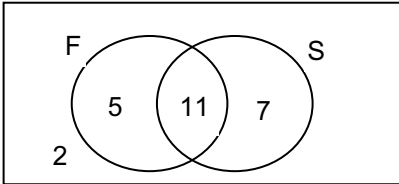|						
	(c)		$\dfrac{-10}{(3x-1)(x-2)}$ or $\dfrac{-10}{3x^2-7x+2}$ as final answer	3	**M1** for $6(x-2)-2(3x-1)$ or better. Allow recovery after missing bracket[s] and **B1** for $(3x-1)(x-2)$ as common denominator seen (may be as two fractions)	
4	(a)	(i)	148	2	**B1** for tangent/radius = 90° seen. May be on diagram	
		(ii)	74	1ft	ft *their* **(a)(i)** ÷ 2 dep on **(a)(i)** < 180	
		(iii)	21	2	**M1** for 360 – 90 – 143 – 32 – *their* **(ii)** oe e.g. using quadrilateral *AOCD*	
		(iv)	20.9 or 20.92…	3	**M2** for 6 tan 74 oe or explicit sine rule Or **M1** for implicit version	
	(b)	(i)	51	2	**M1** for *ABC* = 90°. May be on diagram.	
		(ii)	56	2	**M1** for 39 + 17 or 180 – (73 + *their* 51) or [*AXB*=] 180 – (39 + 17)	
		(iii)	<u>Angle</u> at <u>centre</u> <u>twice</u> oe angle at <u>circumference</u>	1		
		(iv)	22	1		
		(v)	68.3 or 68.27 to 68.29	3	Allow $\dfrac{326}{15}\pi$ as final answer **M2** for $\dfrac{360-34}{360}\times 2\pi\times 12$ or $2\pi\times 12-\dfrac{34}{360}\times 2\pi\times 12$ or $\pi\times 12+\dfrac{180-34}{360}\times 2\pi\times 12$ or **M1** for use of $\dfrac{\theta}{360}\times 2\pi\times 12$ for $\theta\neq$ multiples of $90^{\,o}$	

5	(a)	20, 60, 100, 140, 180, 220	M1	At least 5 correct mid - values soi
		$(6 \times 20 + 10 \times 60 + 28 \times 100 + 76 \times 140 + 22 \times 180 + 16 \times 220)$ $(= 21640)$	M1	$\sum fm$ where m is in the correct interval, either end of interval as m allow one further slip
		$\div 158$ or $\sum f$	M1	Depend on second method
		137 or 136.9 to 137.0	A1	SC2 for 137 or better ww
	(b) (i)	16, 126	1, 1	
	(ii)	rectangular bar of height 0.2 rectangular bar of height 1.05	1ft 1ft	Strict ft from *their* 16 Strict ft from *their* 126
		correct widths of 80 and 120 with no gaps	1	
	(c)	135	3	M2 for $\dfrac{15 \times 136 + 3 \times 130}{15 + 3}$ or M1 for 15 × 136 and 3 × 130 [2040] and [390]
6	(a)	5.83 or 5.830 to 5.831	2	Allow $\sqrt{34}$ as final answer M1 for $(3^2 + ([-]5)^2)$
	(b) (i)	Vector drawn from P to Q at (14, 3)	1	Must have arrow in correct direction
	(ii)	Points at (8, 11) and (13, 14)	1, 1	SC1 for points at (8, 5) and (3, 2)
	(c)	$3\mathbf{a} - 2\mathbf{b}$	2	M1 for $\mathbf{a} - 3\mathbf{b} + 2\mathbf{a} + \mathbf{b}$ or $\overrightarrow{CD} + \overrightarrow{DE}$ oe Allow mixtures of vector notation.
	(d)	$\begin{pmatrix} 7 \\ -6 \end{pmatrix}$	1 1	
	(e) (i)	$\mathbf{b} - \mathbf{c}$ oe	1	Allow unsimplified

	(ii)	$MX = MB + BX$	**M1**	Any order for the M marks For a correct route	
		$\pm\,¼$ or $\pm\,¾$ used	**M1**		
		$¾\,\mathbf{c} - ¼\mathbf{b}$ or $¼\,(3\mathbf{c} - \mathbf{b})$ or $\dfrac{3\mathbf{c}}{4} - \dfrac{\mathbf{b}}{4}$	**A2**	**A1** for $½\,\mathbf{b} + ¾\,(\mathbf{c} - \mathbf{b})$ oe Any correct unsimplified After **0** scored **SC2** for $2/3\mathbf{c} - 1/6\mathbf{b}$	
7	**(a)**	**(i)** $x \geq 5$		**B1** for each correct inequality Penalise the first occurrence only when strict inequalities used	
		$y \leq 8$			
		$x + y \leq 14$			
		$y \geq ½\,x$ oe	**4**		
		(ii) $x = 5$ ruled $y = 8$ ruled $x + y = 14$ ruled $y = ½\,x$ ruled region indicated	**1** **1** **1** **1** **1dep**	Each line long enough to be boundary of region Check at intercepts Check at (10, 5) **Dependent** on 4 lines correct	
	(b)	**(i)** 480	**2**	**M1** for $20 \times x + 45 \times y$ where x and y are integers and (x, y) is in their quadrilateral	
		(ii) 6, 8	**1**	In correct order	
8	**(a)**	**(i)** Tangent drawn at $x = 2.5$	**1**	reasonable tangent at correct point, no daylight, or chord, crossing x-axis between 1.7, 2.0 when extended if necessary	
		(ii) 1.55 to 2.2	**2dep**	**Dependent** on correct tangent or close attempt at tangent at $x = 2.5$ **M1dep** attempts y step / x step with correct scales	
	(b)	1.42 to 1.45 and 2.8 to 2.82	**1, 1**		
	(c)	**(i)** 4.4, 2.5, 1.5	**2**	**B1** for 2 correct values	

		(ii)	6 correct points plotted	**P2ft**	**P1ft** for 4 or 5 correct plots
			curve through all 6 points and correct shape	**C1**	Smooth curve but last 3 points may be rule[...] In absence of plot[s], allow curve to imply plot[s]
		(iii)	0.75 to 0.9	**1**	Solutions may be in any order
			1.6 to 1.7	**1**	
			2.6 to 2.7	**1**	
9	**(a)**	**(i)**		**2**	**B1** for 2 outside of circles in diagram or all three of 5, 11, 7 correctly placed
		(ii)	9	**1ft**	ft *their* 2 + *their* 7
		(iii)	14	**1**	
		(iv)	$\dfrac{11}{25}$	**1ft**	ft *their* 11 from diagram / 25
		(v)	$\dfrac{42}{600}$ oe $= \dfrac{7}{100}$	**2ft**	isw incorrect cancelling ft *their* 7 from diagram for numerator **M1** for $\dfrac{their\,7}{25} \times \dfrac{their\,(7-1)}{24}$ After 0 scored, **SC1** for $\dfrac{their\,7}{25} \times \dfrac{their\,(7)}{25}$

(b) (i)

	4	**B1** for any correct diagram with blanks or zeros where needed and labelled unambiguously **B1** for 4 in correct place **B1** for 12 in correct place **B1** for 5 and 7 in correct place
(ii) 28	**1ft**	Correct or ft from *their* diagram

10	**(a) (i)** 20	**1**	
	(ii) $n - 4$ oe $n + 4$ oe $n + 6$ oe	**2**	Accept unsimplified **B1** for two correct
	(iii) $(n - 4)(n + 4) - (n - 6)(n + 6)$	**M1**	ft from their algebraic expressions can be implied by $n^2 - 4n + 4n - 16 - (n^2 - 6n + 6n - 36)$ or $n^2 - 16 - (n^2 - 36)$
	$n^2 - 4n + 4n - 16 - (n^2 - 6n + 6n - 36)$ or better		Must have a line of algebra
	20	**E1**	With no errors or omission of brackets
	(b) (i) 24	**1**	

	(ii)	$(n-5)(n+5) - (n-7)(n+7)$ isw or $n^2 - 25 - (n^2 - 49)$ isw or $n^2 - 25 - n^2 + 49$ isw	**2**	**M1** for $n-5$, $n+5$, $n-7$, $n+7$ seen
	(c)	$(11 \times 23) - (9 \times 25)$ $253 - 225$ $[= 28]$	**E1**	Allow algebraic solution from $(n-6)(n+6) - (n-8)(n+8)$
	(d)	$4t$ oe	**1**	Accept unsimplified e.g. $n^2 - (t-1)^2 - [n^2 - (t+1)^2]$
	(e)	$c = 28$ and $d = 30$ 52	**1** **1**	