CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the October/November 2012 series

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 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

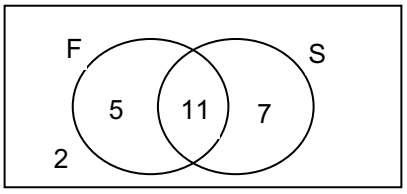
Qu.	Answers	Mark	Part Marks
1	**(a) (i)** 5	**2**	**M1** for $\frac{3\times15}{(5+3+1)}$
	(ii) 108	**2**	**M1** for $60 \times \frac{9}{5}$ oe
	(b) Correct conversion of money J × 0.718 or A ÷ 0.718	**M1**	Correct conversion of money soi by 146.83[1] rounded or truncated to 3sf or 134.26[1…] rounded or truncated to 3 sf if done 1st
	Correct equalising of weights e.g. $J \times \frac{2[0]}{3[0]}$ or $A \times \frac{3[0]}{2[0]}$ or J ÷ 3 and A ÷ 2 or J ÷ 30 and A ÷ 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 × 60 × 4 soi by 14400 or figs 6048 or figs 3024 and **M1** for ÷ (1000 × 20) soi Answer 302.4 implies **M2**
	(d) 13.6[0]	**3**	**M2** for $\frac{15.3[0]}{1.125}$ oe or **M1** for 15.3[0] associated with 112.5%
	(e) 12	**1**	

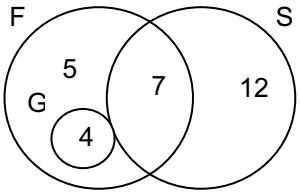
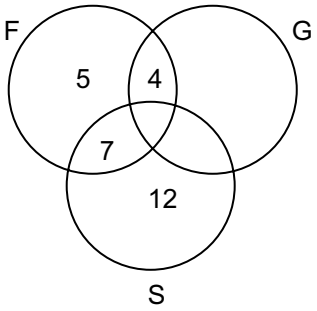
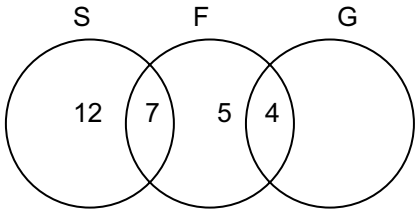
2	**(a) (i)** $[\cos A=]\ \dfrac{32^2+64^2-43^2}{2\times 32\times 64}$	**M2**	**M1** for correct implicit version $43^2 = 32^2 + 64^2 - 2\times 32\times 64\cos A$
	37.00[...]	**A2**	**A1** for $\dfrac{3271}{4096}$ or 0.798 to 0.799
	(ii) 616 or 616.2 to 616.4…	**2**	**M1** for ½ × 32 × 64 × sin 37 oe
	(b) [Sin ADC =] $\dfrac{64\sin 55}{70}$ soi by 48.49…rounded or truncated or x^2 –(73.41 to 73.42) x – 804 [= 0]	**M2**	**M1** for correct implicit version of sine rule or cosine rule with x
	$\dfrac{70\sin(125-\textit{their}\ 48.5)}{\sin 55}$ or $64^2 + 70^2 - 2 \times 64 \times 70\cos(125 - \textit{their}\ 48.5)$ 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) –1/2oe , 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) $\frac{-10}{(3x-1)(x-2)}$ or $\frac{-10}{3x^2-7x+2}$ 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) Angle at centre twice oe angle at circumference	**1**	
	(iv) 22	**1**	
	(v) 68.3 or 68.27 to 68.29	**3**	Allow $\frac{326}{15}\pi$ as final answer **M2** for $\frac{360-34}{360}\times 2\pi\times 12$ or $2\pi\times 12-\frac{34}{360}\times 2\pi\times 12$ or $\pi\times 12+\frac{180-34}{360}\times 2\pi\times 12$ or **M1** for use of $\frac{\theta}{360}\times 2\pi\times 12$ for $\theta \neq$ multiples of 90^o

5	**(a)** 20, 60, 100, 140, 180, 220	**M1**	At least 5 correct mid - values soi
	$(6 \times 20 + 10 \times 60 + 28 \times 100 + 76 \times 140 + 22 \times 180 + 16 \times 220)$	**M1**	$\sum fm$ where m is in the correct interval, allow either end of interval as m
	(= 21640)		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	**1ft**	Strict ft from *their* 16
	rectangular bar of height 1.05	**1ft**	Strict ft from *their* 126
	correct widths of 80 and 120 with no gaps	**1**	
	(c) 135	**3**	**M2** for $\frac{15\times136+3\times130}{15+3}$ 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
	± ¼ or ± ¾ used	**M1**	
	¾ **c** – ¼**b** or ¼ (3**c** – **b**) or $\frac{3\mathbf{c}}{4} - \frac{\mathbf{b}}{4}$	**A2**	**A1** for ½ **b** + ¾ (**c** – **b**) oe Any correct unsimplified After **0** scored **SC2** for 2/3**c** –1/6**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 × x + 45 × 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 ruled. 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) $\frac{11}{25}$	**1ft**	ft *their* 11 from diagram / 25
	(v) $\frac{42}{600}$ oe $= \frac{7}{100}$	**2ft**	isw incorrect cancelling ft *their* 7 from diagram for numerator **M1** for $\frac{their7}{25} \times \frac{their(7-1)}{24}$ After 0 scored, **SC1** for $\frac{their7}{25} \times \frac{their(7)}{25}$

	(b) (i)    **(ii)** 28	**4** **1ft**	**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 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**	