CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International General Certificate of Secondary Education

MARK SCHEME for the March 2015 series

0580 MATHEMATICS

0580/42 Paper 4 (Paper 42 – 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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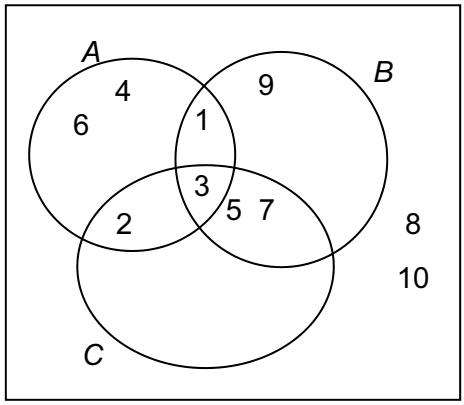
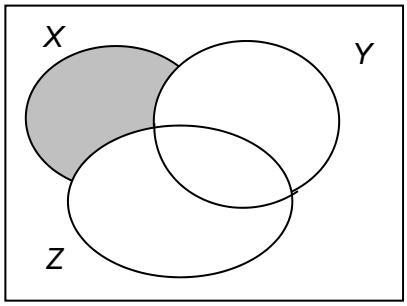
Abbreviations

cao correct answer only
dep dependent
FT follow through after error
isw ignore subsequent working
oe or equivalent
SC Special Case
nfww not from wrong working
soi seen or implied

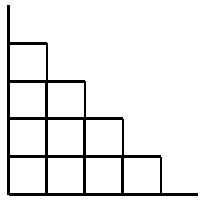
Qu.	Answers	Mark	Part Marks
1 (a)	$\frac{1.5}{100}\times 450\,000$ oe	1	Accept equivalent methods
(b)	6000	3	**M2** for $\frac{6750}{112.5}\times 100$ oe or **M1** for 112.5% associated with 6750 oe
(c)	376.25 cao final answer	2	**B1** for 21.5 and 17.5 seen
(d)	22.4	2	**M1** for 200^2 or 2^2 seen oe
(e)	5184	2	**M1** for $12 \times 16 \times 27$
(f)	9023	3	**M1** for $12000 \div 1.33$ **A1** for 9022.55 to 9022.56 or 9022.6 or 9020 **B1indep** for their answer rounded to the nearest euro if possible
2 (a) (i)		3	**B2** for 8 or 9 numbers correct **B1** for 6 or 7 numbers correct
(ii)	$\in$ cao	1	
	{3}	1FT	FT *their* intersection of all 3 sets – *their* diagram
	$\varnothing$ or {}	1	
(iii)	5	1FT	FT *their* set *B* on diagram
(b) (i)	$\subset$	1	

	(ii)		**1**	
3	**(a)**	2 0 – 2 2	**3**	**B2** for 3 correct **B1** for 2 correct
	(b)	smooth correct curve through correct points	**4**	**B3FT** for 8 or 9 correct plots **B2FT** for 6 or 7 correct plots **B1FT** for 4 or 5 correct plots FT *their* table
	(c)	line $y = \frac{1}{2}(x+1)$ ruled and –2.85 to –2.95 –1 0.85 to 0.95	**4**	Line must be fit for purpose **B3** for correct line and 2 correct values or **B2** for correct line and 1 correct value or **B1** for correct line or **SC2** for no/wrong line and 3 correct values or **SC1** for no/wrong line and 2 correct values
	(d)	tangent ruled	**B1**	No daylight between tangent and curve at point of contact. Consider point of contact as midpoint between two vertices of daylight, the midpoint must be between $x = -1.85$ and $x = -1.65$
		– 1.1 to – 1.5	**2**	dep on **B1** **M1** for rise/run **also dep on** any tangent drawn or close attempt at tangent at any point Must see correct or implied calculation from a drawn tangent Accept **M1** for answer in range 1.1 to 1.5 after **B1**
4	**(a)**	$(11y-m)(11y+m)$ final answer	**2**	**B1** for $11y$ seen
	(b)	$\frac{3x^2+5x-14}{(3x-5)(x-1)}$ final answer	**3**	**B1** for denom $(3x-5)(x-1)$ oe isw and **B1** for $3x^2+6x-5x-10$ soi

(c)	$\frac{-2\pm\sqrt{2^2-4(3)(-7)}}{2\times3}$	**2**	**B1** for $\sqrt{2^2-4(3)(-7)}$ or better seen and if in form $\frac{p+or-\sqrt{q}}{r}$ **B1** for $p = -2$ **and** $r = 2\times3$
	– 1.90 1.23 final answers	**1, 1**	**SC1** for –1.9, –1.896 or –1.897 and 1.2 or 1.230 or –1.23 and 1.90 final answers or –1.90 and 1.23 seen in working
(d) (i)	$\frac{1}{2}(x+4+3x+2)(x+1)=15$	**M1**	Allow $\frac{1}{2}(4x+6)(x+1)=15$
	$4x^2+4x+6x+6 = 30$ or $2x^2+2x+3x+3 = 15$	**M1**	Dep on 1st **M1**
	$2x^2+5x-12=0$	**A1**	With no errors or omissions
(ii)	1.5 or $\frac{3}{2}$, –4	**3**	**B2** for $(2x-3)(x+4)$ or $\frac{-5\pm\sqrt{5^2-4(2)(-12)}}{2\times2}$ **or SC1** for $(2x+a)(x+b)$ where a and b are integers and $a + 2b = 5$ or $ab = -12$ or $\sqrt{5^2-4(2)(-12)}$ or $\frac{p+or-\sqrt{q}}{r}$ where $p = -5$ and $r = 2\times2$
(iii)	6.5 or $\frac{13}{2}$	**1FT**	FT 3 × *their* pos root from **(d)(ii)** + 2
5 (a)	$\frac{1}{2}\times16\times5.4\times\sin62$ oe	**M1**	
	38.14...	**A1**	
(b)	95.6 or 95.64 to 95.65	**4**	**M2** for $\frac{6.7\times\sin48}{8.4}$ **or M1** for implicit form **and M1dep** for 180 – 48 – *their* 36.4

	(c)	286 or 285.7 to 285.8	**5**	**B1** for [Angle *APB*=] 83° **M2** for $180^2 + 245^2 - 2\times180\times245\times\cos$ *their* 83 **or M1** for implicit form **and A1** for [AB^2 =] 81676[.1...] After 0 scored, **SC2** for ans 406.87 to 406.88 or 406.9 or 407 if 146° used in cos rule Or **SC1** for $180^2 + 245^2 - 2\times180\times245\times\cos 146$
6	**(a)**	$\frac{4}{15}$	**1**	
	(b)	80	**1FT**	FT 300 × *their* **(a)**
	(c) (i)	$\frac{40}{225}$ oe $\left[\frac{8}{45}\right]$	**3**	**M2** for $\frac{5}{15}\times\frac{4}{15}\times2$ oe or **M1** for $\frac{5}{15}\times\frac{4}{15}$
	(ii)	$\frac{121}{225}$	**3**	**M2** for $\frac{11}{15}\times\frac{11}{15}$ oe or **M1** for $\frac{11}{15}$ or $1-\frac{4}{15}$ seen
	(d) (i)	$\frac{108}{210}$ oe $\left[\frac{18}{35}\right]$	**3**	**M2** for $\frac{6}{15}\times\frac{9}{14}+\frac{9}{15}\times\frac{6}{14}$ oe or **M1** for $\frac{6}{15}\times\frac{9}{14}$ oe or $\frac{9}{15}\times\frac{6}{14}$ oe or $\frac{6}{15}\times\frac{5}{14}$ oe or $\frac{6}{15}\times\frac{4}{14}$ oe
	(ii)	$\frac{148}{210}$ oe $\left[\frac{74}{105}\right]$	**4**	**M3** for $\frac{5}{15}\times\frac{10}{14}+\frac{6}{15}\times\frac{9}{14}+\frac{4}{15}\times\frac{11}{4}$ oe or $1-\frac{5}{15}\times\frac{4}{14}-\frac{6}{15}\times\frac{5}{14}-\frac{4}{15}\times\frac{3}{14}$ or **M2** for equivalent of 2 of above products added together oe or **M1** for one correct relevant product oe
7	**(a) (i)**	Rotation [centre] (0, 0) or origin 90° [anticlockwise] oe	**1** **1** **1**	

	(ii)	Enlargement [centre] (–2, 1) [s.f.] – 2	**1** **1** **1**	
	(b)	vertices at (–3, 4) (–3, 5) (–3, 6) (–2, 6)	**2**	**SC1** for translation by $\begin{pmatrix}2\\k\end{pmatrix}$ or $\begin{pmatrix}k\\1\end{pmatrix}$
	(c)	vertices at (7, 3) (7, 4) (7, 5) (6, 5)	**2**	**SC1** for reflection in $y = 1$ or reflection in any vertical line
	(d)	reflection x-axis oe	**1** **1**	
8	**(a) (i)**	47.7 or 47.74 to 47.75	**3**	**M1** for [arc =] $68 - 2 \times 24$ or $24 + 24 + \frac{x}{360} \times 2\pi \times 24 = 68$ **M1** for [x =] *their* arc × 360 ÷ (2 × π × 24)
	(ii)	252 or 252.3 to 252.4....	**6**	**M1** for $r = \frac{20}{2\pi}$ or $\left(\frac{their 47.7}{360} \times 2 \times \pi \times 24\right) \div (2\pi)$ **A1** for r = 3.18 or 3.182 to 3.183... or $\frac{10}{\pi}$ **M1** for $h^2 = 24^2 - their\ r^2$ **A1** for h = 23.8 or 23.78... to 23.79 **M1dep** on M1 earned for $V = \frac{1}{3}\pi \times their\ h \times their\ r^2$
	(b)	139 or 139.3 to 139.4... nfww	**5**	**M4** for $8^2 + \frac{1}{4}\pi \times 8^2 + \frac{1}{2}\pi \times \left(\frac{8}{2}\right)^2$ **or M1** for $\frac{1}{4}\pi \times 8^2$ **and M1** for $\frac{1}{2}\pi \times \left(\frac{8}{2}\right)^2$ **and M1** for 8^2 added to at least one term with π
9	**(a)**	$140 < h \leqslant 144$	**1**	
	(b)	144.875 nfww	**4**	**M1** for at least 4 correct mid-values soi **M1** for $\sum fx$ where x is in the correct interval, allow one further error/omission **M1 dep** for ÷ 40 dependent on second method mark

	(c)	4 correct blocks	**4**	**B3** for 3 correct blocks **B2** for 2 correct blocks **B1** for 1 correct block or at least 3 correct frequency densities (1.4, 1, 1, 0.65)
10	**(a)**	$4x + 10y < 80$	**1**	With no errors seen
	(b)	$y > x$	**1**	
		$y \leqslant 6$ or $y < 7$	**1**	Accept $0 \leqslant y \leqslant 6$ or $0 < y \leqslant 6$ or $0 \leqslant y < 7$ or $0 < y < 7$
	(c)	ruled broken line through (5, 6) to (10,4)	**B2**	**SC1** for correct only at (5, 6) or (10, 4)
		ruled broken line $y = x$	**B1**	
		ruled solid line $y = 6$ or broken $y = 7$	**B1**	Must be consistent with *their* **(b)**
		correct region indicated	**B1**	
	(d)	76	**2**	**SC1** for (4, 6) indicated or $4x + 10y$ evaluated for (x, y) in *their* region, x, y integers
11	**(a)**		**1**	
	(b)	30	**1**	
		10	**1**	
	(c)	$n(n+1)$ oe	**2**	**B1** for $an^2 + bn + c$ a, b, c numeric $a \neq 0$
	(d)	$\frac{1}{2}n(n-1)$ oe	**2**	**B1** for using $\frac{1}{2}$ oe in expression of form $\frac{1}{2}(an^2 + bn + c)$ $a \neq 0$ or $kn(n-1)$ $k \neq 0$