

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

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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	<p>(a) $\frac{1.5}{100} \times 450\,000$ oe</p> <p>(b) 6000</p> <p>(c) 376.25 cao final answer</p> <p>(d) 22.4</p> <p>(e) 5184</p> <p>(f) 9023</p>	<p>1</p> <p>3</p> <p>2</p> <p>2</p> <p>2</p> <p>3</p>	<p>Accept equivalent methods</p> <p>M2 for $\frac{6750}{112.5} \times 100$ oe or M1 for 112.5% associated with 6750 oe</p> <p>B1 for 21.5 and 17.5 seen</p> <p>M1 for 200^2 or 2^2 seen oe</p> <p>M1 for $12 \times 16 \times 27$</p> <p>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</p>
2	<p>(a) (i)</p> <p>(ii) \in cao {3} \emptyset or {}</p> <p>(iii) 5</p> <p>(b) (i) \subset</p>	<p>3</p> <p>1</p> <p>1FT</p> <p>1</p> <p>1FT</p> <p>1</p>	<p>B2 for 8 or 9 numbers correct B1 for 6 or 7 numbers correct</p> <p>FT <i>their</i> intersection of all 3 sets – <i>their</i> diagram</p> <p>FT <i>their</i> set B on diagram</p>

(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 <i>their</i> 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 - 1.1 to - 1.5	B1 2	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 $x = -1.65$ 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

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<p>(c)</p> $\frac{-2 \pm \sqrt{2^2 - 4(3)(-7)}}{2 \times 3}$ <p>- 1.90 1.23 final answers</p> <p>(d) (i)</p> $\frac{1}{2}(x+4+3x+2)(x+1)=15$ $4x^2 + 4x + 6x + 6 = 30$ <p>or $2x^2 + 2x + 3x + 3 = 15$</p> $2x^2 + 5x - 12 = 0$ <p>(ii)</p> <p>1.5 or $\frac{3}{2}$, -4</p> <p>(iii)</p> <p>6.5 or $\frac{13}{2}$</p>	<p>2</p> <p>B1 for $\sqrt{2^2 - 4(3)(-7)}$ or better seen</p> <p>and if in form $\frac{p+or-\sqrt{q}}{r}$</p> <p>B1 for $p = -2$ and $r = 2 \times 3$</p> <p>1, 1</p> <p>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</p> <p>M1</p> <p>Allow $\frac{1}{2}(4x+6)(x+1)=15$</p> <p>M1</p> <p>Dep on 1st M1</p> <p>A1</p> <p>With no errors or omissions</p> <p>3</p> <p>B2 for $(2x-3)(x+4)$ or $\frac{-5 \pm \sqrt{5^2 - 4(2)(-12)}}{2 \times 2}$</p> <p>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 $r = 2 \times 2$</p> <p>1FT</p> <p>FT 3 \times <i>their</i> pos root from (d)(ii) + 2</p>	<p>B1 for $\sqrt{2^2 - 4(3)(-7)}$ or better seen</p> <p>and if in form $\frac{p+or-\sqrt{q}}{r}$</p> <p>B1 for $p = -2$ and $r = 2 \times 3$</p> <p>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</p> <p>Allow $\frac{1}{2}(4x+6)(x+1)=15$</p> <p>Dep on 1st M1</p> <p>With no errors or omissions</p> <p>B2 for $(2x-3)(x+4)$ or $\frac{-5 \pm \sqrt{5^2 - 4(2)(-12)}}{2 \times 2}$</p> <p>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 $r = 2 \times 2$</p> <p>FT 3 \times <i>their</i> pos root from (d)(ii) + 2</p>
<p>5 (a)</p> $\frac{1}{2} \times 16 \times 5.4 \times \sin 62$ <p>38.14...</p> <p>(b)</p> <p>95.6 or 95.64 to 95.65</p>	<p>M1</p> <p>A1</p> <p>4</p>	<p>M2 for $\frac{6.7 \times \sin 48}{8.4}$</p> <p>or M1 for implicit form</p> <p>and M1dep for $180 - 48 - \textit{their} 36.4$</p>

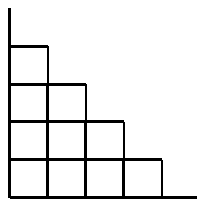
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(c)	286 or 285.7 to 285.8	5	<p>B1 for [Angle $APB=$] 83°</p> <p>M2 for $180^2 + 245^2 - 2 \times 180 \times 245 \times \cos \text{their } 83$</p> <p>or M1 for implicit form and A1 for [$AB^2 =$] 81676[.1...]</p> <p>After 0 scored, SC2 for ans 406.87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

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	(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 =] <i>their</i> arc $\times 360 \div (2 \times \pi \times 24)$
	(ii) 252 or 252.3 to 252.4....	6	M1 for $r = \frac{20}{2\pi}$ or $\left(\frac{\text{their } 47.7}{360} \times 2 \times \pi \times 24\right) \div (2\pi)$ A1 for $r = 3.18$ or 3.182 to 3.183... or $\frac{10}{\pi}$ M1 for $h^2 = 24^2 - \text{their } r^2$ A1 for $h = 23.8$ or 23.78... to 23.79 M1dep on M1 earned for $V = \frac{1}{3}\pi \times \text{their } h \times \text{their } r^2$
	(b) 139 or 139.3 to 139.4... nfw	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) $140 < h \leq 144$	1	
	(b) 144.875 nfw	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 $\div 40$ dependent on second method mark

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(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	
	$y \leq 6$ or $y < 7$	1	Accept $0 \leq y \leq 6$ or $0 < y \leq 6$ or $0 \leq y < 7$ 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 <i>their (b)</i>
	correct region indicated	B1	
(d)	76	2	SC1 for (4, 6) indicated or $4x + 10y$ evaluated for (x, y) in <i>their</i> 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 $kn(n-1)$ $k \neq 0$