

CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International General Certificate of Secondary Education

MARK SCHEME for the October/November 2014 series

0580 MATHEMATICS

0580/43

Paper 4 (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
nfw	not from wrong working
soi	seen or implied

Qu.	Answers	Mark	Part Marks
1			
(a) (i)	5.37[1...]	2	M1 for $[AD^2 =] 2.6^2 + 4.7^2$ oe or better
(ii)	54.1 or 54.11 to 54.12	3	M2 for $\tan [BCD =] \frac{4.7}{(17-11-2.6)}$ oe or B1 for 3.4 seen
(iii)	65.8	2	M1 for $\frac{11+17}{2} \times 4.7$ oe
(b)	263.2 or 263	3FT	FT <i>their (a)(iii)</i> $\times 4$ correctly evaluated M2 for <i>their (a)(iii)</i> $\times \left(\frac{9.4}{4.7}\right)^2$ oe or M1 for [scale factor =] $\left(\frac{9.4}{4.7}\right)^2$ or $\left(\frac{4.7}{9.4}\right)^2$ soi
2			
(a) (i)	$\frac{920}{8} \times 7$ [=805] oe	1	$\frac{2990}{26} \times 7$ [= 805]
(ii)	30.8 or 30.76 to 30.77	2	M1 for $\frac{8}{(11+8+7)}$ [$\times 100$]
(b)	1211 final answer	5	B4 for 13 926.5[0] [area A total sales] or B3 for 11 040 [area B] and 10 867.50 [area C] or 21 907.5 [area B + area C] or B2 for 11 040 [area B] or 10 867.50 [area C] or M1 for 736 [B tickets] and M1 for 483 [C tickets] After 0 scored SC2 for answer of 1196 or SC1 for 13754 (A total sales)

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(c)	37 720	3	M2 for $\frac{35834}{0.95}$ oe or M1 for 35834 associated with 95[%]
3 (a) (i)	52 Angles in same segment	1 1dep	Accept same arc, same side of same chord
(ii)	104 Angle at centre is twice angle at circumference	1 1	Accept double, $2 \times$ but not middle, edge
(iii)	34 Angle between tangent and radius = 90°	1 1	Accept right angle, perpendicular
(b) (i)	7.65 to 7.651	4	M2 for $8.92 + 72 - 2 \times 8.9 \times 7 \times \cos 56$ or M1 for correct implicit formula and A1 for 58.5 to 58.6
(ii)	49.3 or 49.33 to 49.34...	3	M2 for $[\sin BEC =] \frac{7 \sin 56}{\text{their (b)(i)}} \text{ oe}$ or M1 for $\frac{\sin 56}{\text{their (b)(i)}} = \frac{\sin BEC}{7} \text{ oe}$
4 (a) (i)	Ariven with comparable form for both shown or difference between the two fractions shown	1	Accept probabilities changed to decimals or percentages (to 2sf or better)
(ii)	$\frac{6}{15}$ oe	2	M1 for $\frac{3}{5} \times \frac{2}{3}$
(iii)	$\frac{7}{15}$ oe	3	M2 for $\frac{3}{5} \times \frac{1}{3} + \frac{2}{5} \times \frac{2}{3}$ oe $1 - \text{their (a)(ii)} - \frac{2}{5} \times \frac{1}{3}$ or M1 for $\frac{3}{5} \times \frac{1}{3}$ or $\frac{2}{5} \times \frac{2}{3}$ seen
(b) (i)	Completes tree diagram correctly	3	B2 for 5 values correct or B1 for 1 value correct
(ii)	$\frac{126}{350}$ oe $\left[\frac{9}{25} \right]$	2	M1 for $\frac{3}{5} \times \frac{6}{7} \times \frac{7}{10}$

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	(iii)	$\frac{344}{350}$ oe	3	<p>M2 for $1 - \text{their } \frac{2}{5} \times \text{their } \frac{1}{7} \times \text{their } \frac{3}{10}$ oe</p> <p>or $\frac{3}{5} + \frac{2}{5} \times \frac{6}{7} + \frac{2}{5} \times \frac{1}{7} \times \frac{7}{10}$</p> <p>M1 for $\text{their } \frac{2}{5} \times \text{their } \frac{1}{7} \times \text{their } \frac{3}{10}$ oe</p> <p>or identifies the 7 routes</p> <p>or attempt to add 7 probabilities with at least 5 correct</p> <p>$\frac{9}{25} + \frac{27}{175} + \frac{3}{50} + \frac{9}{350} + \frac{6}{25} + \frac{18}{175} + \frac{1}{25}$ oe</p>
5	(a) (i)	$\begin{pmatrix} 0 & -4 \\ 4 & 0 \end{pmatrix}$	1	
	(ii)	$\begin{pmatrix} -1 & 1 \\ 1 & -1 \end{pmatrix}$	1	
	(iii)	$\begin{pmatrix} -1 & 0 \\ 0 & -1 \end{pmatrix}$	2	B1 for three correct elements
	(iv)	$\begin{pmatrix} -13 \\ 5 \end{pmatrix}$	2	B1 for either correct in this form
	(b)	$\begin{pmatrix} 1 & 2 \\ 0 & 1 \end{pmatrix}$	3	<p>M1 for understanding to find the inverse of Q</p> <p>and M1 for $\det = 1$ or for $k \begin{pmatrix} 1 & 2 \\ 0 & 1 \end{pmatrix} k \neq 0$</p> <p>Alternative</p> <p>$\begin{pmatrix} 1 & -2 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} a & b \\ c & d \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$</p> <p>Leading to $a - 2c = 1$ and $c = 0$ then $a = 1$</p> <p>and $b - 2d = 1$ and $d = 1$ then $b = 2$</p> <p>M2 all four equations, M1 for a pair of correct equations</p>
6	(a) (i)	$\frac{x^8}{3}$ final answer	1	
	(ii)	$15x^7y^3$ final answer	2	M1 for 2 elements correct
	(iii)	$16x^8$ final answer	2	M1 for $16x^k$ or kx^8

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<p>(b)</p> $\sqrt{([-7]^2 - 4.3 - 12)}$ <p>or better and $p = [- -]7$ and $r = 2(3)$ oe</p> <p>3.48, -1.15 cao</p> <p>(c)</p> $\frac{x+5}{x^2}$ <p>or $\frac{1}{x} + \frac{5}{x^2}$ final answer nfww</p>		<p>B1</p> <p>B1</p> <p>B1B1</p> <p>3</p>	<p>or for $\left(x - \frac{7}{6}\right)^2$</p> <p>Must see $\frac{p + \sqrt{q}}{r}$ or $\frac{p - \sqrt{q}}{r}$ or both</p> <p>or for $\frac{7}{6} \pm \sqrt{4 + \left(\frac{7}{6}\right)^2}$</p> <p>After B0, SC1 for answer 3.5 and -1.1 or 3.482... and -1.149 to -1.148 seen or for 3.48, -1.15 seen or for answer -3.48 and 1.15</p> <p>B1 for $(x + 5)(x - 5)$ and B1 for $x^2(x - 5)$</p>
<p>7 (a)</p> $\frac{1}{2} \times 8 \times 8 \times \sin 56$ <p>oe 26.52 to 26.53</p> <p>(b) (i)</p> <p>72.[0] or 71.87 to 72.0</p> <p>(ii)</p> <p>21.1 or 21.2 or 21.14 to 21.17</p> <p>(c) (i)</p> $\frac{30}{360} \times \pi \times r^2 - \frac{1}{2} \times r^2 \times \sin 30$ <p>oe</p> $\frac{1}{12} \times \pi \times r^2 - \frac{1}{4} \times r^2$ $\frac{1}{4} r^2 \left(\frac{1}{3} \pi - 1 \right)$ <p>(ii)</p> <p>20.6 or 20.7 or 20.55 to 20.71</p>	<p>M1</p> <p>A1</p> <p>3</p> <p>3</p> <p>M2</p> <p>A1</p> <p>A1</p> <p>3</p>	<p>or $[\frac{1}{2} \times 2] 8 \sin 28 \times 8 \cos 28$ or $[\frac{1}{2} \times 2] \times 7.06... \times 3.75...$</p> <p>M2 for $26.5 / (\pi \times 6.5^2) \times 360$ oe or M1 for $\frac{x}{360} \times \pi \times 6.5^2 = 26.5$ or better</p> <p>M2 for $\frac{\text{their (b)(i)}}{360} \times \pi \times 2 \times 6.5 + 2 \times 6.5$ oe or M1 for $\frac{\text{their (b)(i)}}{360} \times \pi \times 2 \times 6.5$ oe or $\frac{\text{their (a)}}{0.5 \times 6.5}$</p> <p>M1 for $\frac{30}{360} \times \pi \times r^2$ or $\frac{1}{2} \times r^2 \times \sin 30$</p> <p>Dep on M2 A1 and no errors seen</p> <p>M2 for $[r^2 =] \frac{5}{\frac{1}{4} \left(\frac{1}{3} \pi - 1 \right)}$ or M1 for one correct rearrangement step to r from $\frac{1}{4} r^2 \left(\frac{1}{3} \pi - 1 \right) = 5$</p>	

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8	(a) (i)	(1, 2)	1+1		
	(ii)	$y = 3x - 1$ cao final answer	3	M1 for gradient = $\frac{8 - -4}{3 - -1}$ oe and M1 for substituting (3, 8) or (-1, -4) into <i>their</i> $y = 3x + c$ or for finding y -intercept is -1	
	(b) (i)	$(x + 5)(x - 2)$ isw solutions	2	SC1 for $(x + a)(x + b)$ where $ab = -10$ or $a + b = 3$	
	(ii)	[a =] -5 [b =] 2 [c =] -10	3FT	B1FT for each of <i>their</i> 5 and <i>their</i> -2 from (b)(i) and B1 for $c = -10$	
	(iii)	$x = -1.5$	1FT	FT $x = (\text{their } (a + b))/2$	
	(c)	Inverted parabola x -axis intercepts at -2 and 9 y -axis intercept at 18	B1 B2 B1	B1 for each After B0 allow SC1 for $(9 - x)(2 + x)$ oe	
	(d) (i)	$p = 6$ $q = 43$	3	B2 for $(x + 6)^2 - 43$ or $p = 6$ or $q = 43$ or M1 for $(x + 6)^2$ or $x^2 + px + px + p^2$ and M1 for $-7 - (\text{their } 6)^2$ or $p^2 - q = -7$ or $2p = 12$	
	(ii)	-43	1FT	FT - <i>their</i> q	
	9	(a) (i)	7	4	M2 for $\frac{16 \times 11 + 17 \times 10 + 18p + 19 \times 4 + 20 \times 8}{11 + 10 + 4 + 8 + p} = 17.7$ or better or M1 for sum of two correct products or better or for [total =] $11 + 10 + 4 + 8 + p$ and B1 for $582 + 18p = 17.7(33 + p)$
		(ii)	17	1FT	STRICT FT median for <i>their</i> p if integer
(b) (i)		64	2	M1 for $\frac{320}{6.4} \times 1.28$ oe	
(ii)		40	2	M1 for $\frac{320}{480} \times 60$ oe	
(iii)		1.6[0]	2FT	FT <i>their</i> (b)(i) / <i>their</i> (b)(ii) evaluated correctly to 2dp M1 for <i>their</i> (b)(i) / <i>their</i> (b)(ii) or $\frac{480}{6.4} \times 1.28 \div 60$	

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(c)	9.9125 cao	5	<p>B4 for answer 9912.5</p> <p>or</p> <p>M1 for 25 to 35 × 290 to 310 oe</p> <p>and B1 for 32.5 used and B1 for 305 or 5 mins 5 secs used</p> <p>and M1 indep for any correct conversion seen m to km</p>
10 (a) (i)	5x + 14 final answer	2	M1 for 5x + k or kx + 14
(ii)	14.2	3	M1 for 5x = 32 – 14 FT <i>their</i> expression in (a)(i) A1FT for x = 3.6
(b)	<p>8a – 3b + 14 = 32.5 or better</p> <p>5a + 4b + 13.5 = 39.75 or better</p> <p>Equates coefficients of either a or b</p> <p>40a – 15b = 92.5</p> <p>40a + 32b = 210</p> <p>or</p> <p>32a – 12b = 74</p> <p>15a + 12b = 78.75</p> <p>Adds or subtracts to eliminate</p> <p>47b = 117.5</p> <p>47a = 152.75</p> <p>[a =] 3.25</p> <p>[b =] 2.5</p>	<p>B1 8a – 3b = 18.5</p> <p>B1 5a + 4b = 26.25</p> <p>M1 or rearranges one of <i>their</i> equations to make a or b the subject</p> <p>e.g. $a = \frac{3b + 18.5}{8}$</p> <p>M1 Dep on previous method or correctly substitutes into the second equation</p> <p>e.g. $\frac{5(3b + 18.5)}{8} + 4b = 26.25$</p> <p>A1</p> <p>After M0 scored</p> <p>A1 SC1 for 2 correct values with no working or for two values that satisfy one of their original equations</p>	