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MARK SCHEME for the October/November 2014 series

0581 MATHEMATICS

0581/43

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
- nfwf 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</i> (a)(iii) $\times 4$ correctly evaluated M2 for <i>their</i> (a)(iii) $\times \left(\frac{9.4}{4.7}\right)^2$ 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)

(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 $\frac{3}{5} \times \frac{6}{7} \times \frac{7}{10}$

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

<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 or for $\left(x - \frac{7}{6}\right)^2$</p> <p>B1 Must see $\frac{p + \sqrt{q}}{r}$ or $\frac{p - \sqrt{q}}{r}$ or both or for $\frac{7}{6} \pm \sqrt{4 + \left(\frac{7}{6}\right)^2}$</p> <p>B1B1 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>3 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 $\frac{1}{12} \times \pi \times r^2 - \frac{1}{4} \times r^2$ $\frac{1}{4} r^2 \left(\frac{1}{3} \pi - 1 \right)$</p> <p>(ii)</p> <p>20.6 or 20.7 or 20.55 to 20.71</p>		<p>M1 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>A1</p> <p>3 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>3 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>M2 M1 for $\frac{30}{360} \times \pi \times r^2$ or $\frac{1}{2} \times r^2 \times \sin 30$</p> <p>A1</p> <p>A1 Dep on M2 A1 and no errors seen</p> <p>3 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>

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 $\frac{480}{6.4} \times 1.28 \div 60$

(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>$40a - 15b = 92.5$ $40a + 32b = 210$</p> <p>or</p> <p>$32a - 12b = 74$ $15a + 12b = 78.75$</p> <p>Adds or subtracts to eliminate</p> <p>$47b = 117.5$ $47a = 152.75$</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>	