

## **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	<b>M1</b> for $[AD^2 = ] 2.6^2 + 4.7^2$ oe or better
	(ii) 54.1 or 54.11 to 54.12	3	<b>M2</b> for $\tan [BCD =] \frac{4.7}{(17-11-2.6)}$ oe or <b>B1</b> for 3.4 seen
	(iii) 65.8	2	<b>M1</b> for $\frac{11+17}{2} \times 4.7$ oe
	(b) 263.2 or 263	3FT	<b>FT</b> <i>their</i> (a)(iii) $\times 4$ correctly evaluated <b>M2</b> for <i>their</i> (a)(iii) $\times \left(\frac{9.4}{4.7}\right)^2$ oe or <b>M1</b> 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	<b>M1</b> for $\frac{8}{(11+8+7)}$ [ $\times 100$ ]
	(b) 1211 final answer	5	<b>B4</b> for 13 926.5[0] [area A total sales] or <b>B3</b> for 11 040 [area B] <b>and</b> 10 867.50 [area C] or 21 907.5 [area B + area C] or <b>B2</b> for 11 040 [area B] <b>or</b> 10 867.50 [area C] or <b>M1</b> for 736 [B tickets] and <b>M1</b> for 483 [C tickets]  After 0 scored <b>SC2</b> for answer of 1196 or <b>SC1</b> 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 <b>same segment</b>	1 1dep	Accept same arc, same side of same chord
(ii)	104 <b>Angle at centre is twice angle at circumference</b>	1 1	Accept double, $2 \times$ but not middle, edge
(iii)	34 Angle between <b>tangent</b> and <b>radius</b> = $90^\circ$	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><b>M2</b> for <math>1 - \text{their } \frac{2}{5} \times \text{their } \frac{1}{7} \times \text{their } \frac{3}{10}</math> oe  or <math>\frac{3}{5} + \frac{2}{5} \times \frac{6}{7} + \frac{2}{5} \times \frac{1}{7} \times \frac{7}{10}</math>  <b>M1</b> for <math>\text{their } \frac{2}{5} \times \text{their } \frac{1}{7} \times \text{their } \frac{3}{10}</math> oe  or identifies the 7 routes  or attempt to add 7 probabilities with at least 5 correct  <math>\frac{9}{25} + \frac{27}{175} + \frac{3}{50} + \frac{9}{350} + \frac{6}{25} + \frac{18}{175} + \frac{1}{25}</math> oe</p>
5	<p>(a) (i) <math>\begin{pmatrix} 0 &amp; -4 \\ 4 &amp; 0 \end{pmatrix}</math></p> <p>(ii) <math>\begin{pmatrix} -1 &amp; 1 \\ 1 &amp; -1 \end{pmatrix}</math></p> <p>(iii) <math>\begin{pmatrix} -1 &amp; 0 \\ 0 &amp; -1 \end{pmatrix}</math></p> <p>(iv) <math>\begin{pmatrix} -13 \\ 5 \end{pmatrix}</math></p> <p>(b) <math>\begin{pmatrix} 1 &amp; 2 \\ 0 &amp; 1 \end{pmatrix}</math></p>	<p>1</p> <p>1</p> <p>2</p> <p>2</p> <p>3</p>	<p><b>B1</b> for three correct elements</p> <p><b>B1</b> for either correct in this form</p> <p><b>M1</b> for understanding to find the inverse of <b>Q</b>  <b>and M1</b> for <math>\det = 1</math> or for <math>k \begin{pmatrix} 1 &amp; 2 \\ 0 &amp; 1 \end{pmatrix} k \neq 0</math>  Alternative  <math>\begin{pmatrix} 1 &amp; -2 \\ 0 &amp; 1 \end{pmatrix} \begin{pmatrix} a &amp; b \\ c &amp; d \end{pmatrix} = \begin{pmatrix} 1 &amp; 0 \\ 0 &amp; 1 \end{pmatrix}</math>  Leading to <math>a - 2c = 1</math> and <math>c = 0</math> then <math>a = 1</math>  and <math>b - 2d = 1</math> and <math>d = 1</math> then <math>b = 2</math>  <b>M2</b> all four equations, <b>M1</b> for a pair of correct equations</p>
6	<p>(a) (i) <math>\frac{x^8}{3}</math> final answer</p> <p>(ii) <math>15x^7y^3</math> final answer</p> <p>(iii) <math>16x^8</math> final answer</p>	<p>1</p> <p>2</p> <p>2</p>	<p><b>M1</b> for 2 elements correct</p> <p><b>M1</b> for <math>16x^k</math> or <math>kx^8</math></p>

<p>(b)</p> $\sqrt{([-7]^2 - 4.3 - 12)}$ <p>or better and <math>p = [- -]7</math> and <math>r = 2(3)</math> oe</p> <p>3.48, -1.15 cao</p> <p>(c)</p> $\frac{x+5}{x^2}$ <p>or <math>\frac{1}{x} + \frac{5}{x^2}</math> final answer nfw</p>		<p><b>B1</b></p> <p><b>B1</b></p> <p><b>B1B1</b></p> <p><b>3</b></p>	<p>or for <math>\left(x - \frac{7}{6}\right)^2</math></p> <p>Must see <math>\frac{p + \sqrt{q}}{r}</math> or <math>\frac{p - \sqrt{q}}{r}</math> or both</p> <p>or for <math>\frac{7}{6} \pm \sqrt{4 + \left(\frac{7}{6}\right)^2}</math></p> <p>After <b>B0</b>, <b>SC1</b> 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><b>B1</b> for <math>(x + 5)(x - 5)</math> and <b>B1</b> for <math>x^2(x - 5)</math></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><b>M1</b></p> <p><b>A1</b></p> <p><b>3</b></p> <p><b>3</b></p> <p><b>M2</b></p> <p><b>A1</b></p> <p><b>A1</b></p> <p><b>3</b></p>	<p>or <math>[\frac{1}{2} \times 2] 8 \sin 28 \times 8 \cos 28</math> or <math>[\frac{1}{2} \times 2] \times 7.06... \times 3.75...</math></p> <p><b>M2</b> for <math>26.5 / (\pi \times 6.5^2) \times 360</math> oe or <b>M1</b> for <math>\frac{x}{360} \times \pi \times 6.5^2 = 26.5</math> or better</p> <p><b>M2</b> for <math>\frac{\text{their (b)(i)}}{360} \times \pi \times 2 \times 6.5 + 2 \times 6.5</math> oe or <b>M1</b> for <math>\frac{\text{their (b)(i)}}{360} \times \pi \times 2 \times 6.5</math> oe or <math>\frac{\text{their (a)}}{0.5 \times 6.5}</math></p> <p><b>M1</b> for <math>\frac{30}{360} \times \pi \times r^2</math> or <math>\frac{1}{2} \times r^2 \times \sin 30</math></p> <p>Dep on <b>M2 A1</b> and no errors seen</p> <p><b>M2</b> for <math>[r^2 =] \frac{5}{\frac{1}{4} \left( \frac{1}{3} \pi - 1 \right)}</math> or <b>M1</b> for one correct rearrangement step to <math>r</math> from <math>\frac{1}{4} r^2 \left( \frac{1}{3} \pi - 1 \right) = 5</math></p>

8	(a) (i)	(1, 2)	1+1		
	(ii)	$y = 3x - 1$ cao final answer	3	<b>M1</b> for gradient = $\frac{8 - -4}{3 - -1}$ oe and <b>M1</b> 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	<b>SC1</b> for $(x + a)(x + b)$ where $ab = -10$ or $a + b = 3$	
	(ii)	[a =] -5 [b =] 2 [c =] -10	3FT	<b>B1FT</b> for each of <i>their</i> 5 and <i>their</i> -2 from (b)(i) and <b>B1</b> for $c = -10$	
	(iii)	$x = -1.5$	1FT	<b>FT</b> $x = (\text{their } (a + b))/2$	
	(c)	Inverted parabola  $x$ -axis intercepts at -2 and 9  $y$ -axis intercept at 18	<b>B1</b>  <b>B2</b>  <b>B1</b>	<b>B1</b> for each After <b>B0</b> allow <b>SC1</b> for $(9 - x)(2 + x)$ oe	
	(d) (i)	$p = 6$ $q = 43$	3	<b>B2</b> for $(x + 6)^2 - 43$ or $p = 6$ or $q = 43$ or <b>M1</b> for $(x + 6)^2$ or $x^2 + px + px + p^2$ and <b>M1</b> for $-7 - (\text{their } 6)^2$ or $p^2 - q = -7$ or $2p = 12$	
	(ii)	-43	1FT	<b>FT</b> - <i>their</i> $q$	
	9	(a) (i)	7	4	<b>M2</b> 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 <b>M1</b> for sum of two correct products or better or for [total =] $11 + 10 + 4 + 8 + p$ and <b>B1</b> for $582 + 18p = 17.7(33 + p)$
		(ii)	17	1FT	<b>STRICT FT</b> median for <i>their</i> $p$ if integer
(b) (i)		64	2	<b>M1</b> for $\frac{320}{6.4} \times 1.28$ oe	
(ii)		40	2	<b>M1</b> for $\frac{320}{480} \times 60$ oe	
(iii)		1.6[0]	2FT	<b>FT</b> <i>their</i> (b)(i) / <i>their</i> (b)(ii) evaluated correctly to 2dp  <b>M1</b> 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><b>B4</b> for answer 9912.5</p> <p>or</p> <p><b>M1</b> for 25 to 35 × 290 to 310 oe</p> <p>and <b>B1</b> for 32.5 used and <b>B1</b> for 305 or 5 mins 5 secs used</p> <p>and <b>M1</b> indep for any correct conversion seen m to km</p>
10 (a) (i)	5x + 14 final answer	2	<b>M1</b> for 5x + k or kx + 14
(ii)	14.2	3	<b>M1</b> for 5x = 32 – 14 <b>FT</b> their expression in (a)(i) <b>A1FT</b> 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><b>B1</b> 8a – 3b = 18.5</p> <p><b>B1</b> 5a + 4b = 26.25</p> <p><b>M1</b> or rearranges one of their equations to make a or b the subject</p> <p>e.g. <math>a = \frac{3b + 18.5}{8}</math></p> <p><b>M1</b> <b>Dep</b> on previous method or correctly substitutes into the second equation</p> <p>e.g. <math>\frac{5(3b + 18.5)}{8} + 4b = 26.25</math></p> <p><b>A1</b></p> <p>After <b>M0</b> scored</p> <p><b>A1</b> <b>SC1</b> for 2 correct values with no working or for two values that satisfy one of their original equations</p>	