

**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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<b>Page 2</b>	<b>Mark Scheme</b>	<b>Syllabus</b>	<b>Paper</b>
	<b>Cambridge IGCSE – October/November 2014</b>	<b>0580</b>	<b>43</b>

### 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
<b>1</b>			
<b>(a) (i)</b>	5.37[1...]	<b>2</b>	<b>M1</b> for $[AD^2 = ] 2.6^2 + 4.7^2$ oe or better
<b>(ii)</b>	54.1 or 54.11 to 54.12	<b>3</b>	<b>M2</b> for $\tan [BCD = ] \frac{4.7}{(17-11-2.6)}$ oe or <b>B1</b> for 3.4 seen
<b>(iii)</b>	65.8	<b>2</b>	<b>M1</b> for $\frac{11+17}{2} \times 4.7$ oe
<b>(b)</b>	263.2 or 263	<b>3FT</b>	<b>FT</b> <i>their (a)(iii)</i> $\times 4$ correctly evaluated <b>M2</b> for <i>their (a)(iii)</i> $\times \left(\frac{9.4}{4.7}\right)^2$ 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
<b>2</b>			
<b>(a) (i)</b>	$\frac{920}{8} \times 7$ [=805] oe	<b>1</b>	$\frac{2990}{26} \times 7$ [= 805]
<b>(ii)</b>	30.8 or 30.76 to 30.77	<b>2</b>	<b>M1</b> for $\frac{8}{(11+8+7)}$ [ $\times 100$ ]
<b>(b)</b>	1211 final answer	<b>5</b>	<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)

Page 3	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2014	0580	43

(c)	37720	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 $\frac{3}{5} \times \frac{6}{7} \times \frac{7}{10}$

Page 4	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2014	0580	43

	(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</p> <p>or <math>\frac{3}{5} + \frac{2}{5} \times \frac{6}{7} + \frac{2}{5} \times \frac{1}{7} \times \frac{7}{10}</math></p> <p><b>M1</b> for <math>\text{their } \frac{2}{5} \times \text{their } \frac{1}{7} \times \text{their } \frac{3}{10}</math> oe</p> <p>or identifies the 7 routes</p> <p>or attempt to add 7 probabilities with at least 5 correct</p> <p><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></p> <p><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></p> <p>Alternative</p> <p><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></p> <p>Leading to <math>a - 2c = 1</math> and <math>c = 0</math> then <math>a = 1</math></p> <p>and <math>b - 2d = 1</math> and <math>d = 1</math> then <math>b = 2</math></p> <p><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>

Page 5	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2014	0580	43

<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><b>B1</b></p> <p><b>B1</b></p> <p><b>B1B1</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>(c)</p> $\frac{x+5}{x^2}$ <p>or <math>\frac{1}{x} + \frac{5}{x^2}</math> final answer nfww</p>		<p><b>3</b></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>

Page 6	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2014	0580	43

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>(b)(i)</b> 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>(b)(i)</b> / <i>their</i> <b>(b)(ii)</b> evaluated correctly to 2dp  <b>M1</b> for <i>their</i> <b>(b)(i)</b> / <i>their</i> <b>(b)(ii)</b> or $\frac{480}{6.4} \times 1.28 \div 60$	

Page 7	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2014	0580	43

(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> <i>their</i> 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></p> <p><b>B1</b></p> <p><b>M1</b></p> <p><b>M1</b></p> <p><b>A1</b></p> <p><b>A1</b></p>	<p>8a – 3b = 18.5</p> <p>5a + 4b = 26.25</p> <p>or rearranges one of <i>their</i> equations to make a or b the subject</p> <p>e.g. <math>a = \frac{3b + 18.5}{8}</math></p> <p><b>Dep</b> on previous method</p> <p>or correctly substitutes into the second equation</p> <p>e.g. <math>\frac{5(3b + 18.5)}{8} + 4b = 26.25</math></p> <p>After <b>M0</b> scored</p> <p><b>SC1</b> for 2 correct values with no working</p> <p>or for two values that satisfy one of their original equations</p>