

**CAMBRIDGE INTERNATIONAL EXAMINATIONS**  
GCE Ordinary Level

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## **MARK SCHEME for the October/November 2012 series**

### **4024 MATHEMATICS (SYLLABUS D)**

**4024/21**

Paper 2, maximum raw mark 100

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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Qu	Answers	Mark	Part Marks
1	(a) 4.28  (b) (i) 36 (.0)  (ii) 5.68 or 5.69	2  2  4ft	M1 for $PQ = 4.5\cos 18^\circ$ oe  M1 for $\sin \widehat{ABC} = \frac{6}{10.2}$ oe  M3 for $\sqrt{14.3^2 - (10.2^2 - 6^2)} - 6$ oe or M2 for a complete method for CD or M1 for $BC^2 = 10.2^2 - 6^2$ or $DC^2 = 14.3^2 -$ their $BC^2$ oe SC1 for their $CD - 6$
2	(a) (i) $10p + 1$  (ii) $x < -1$  (b) (i) 3  (ii) $(x =) \frac{A}{y-2}$  (c) (i) $y = 6x - 5$ correctly derived  (ii) $y = 2x + 19$ correctly derived  (iii) $x = 6$ $y = 31$ isw	2  2  1  3    1  1  2	B1 for $5p - 1 + 5p + 2$  B1 for $-2x, 5 - 3$ oe correctly isolated.  SC 2 for $\frac{A}{y+2}$ or $\frac{A}{2-y}$  M2 for $\frac{A}{x} = y - 2$ or $yx - 2x = A$ or  M1 for $y = \frac{A}{x} + 2$ or $yx = A + 2x$ .    B1 for one correct or M1 for eliminating one variable
3	(a) (i) 30  (ii) 29 (.0)    (b) 950	1  3ft    3	SC 2 for the answer 51.7 or 51.8 or  For the answer 129 M2 for Figs $\frac{(200 - a(i)) - 131.8}{131.8}$ or M1 for $200 - a(i)$ or  for Figs $\frac{200 - 131.8}{131.8}$  M2 for $x - \frac{15}{100} \times -647.5 = 160$ oe or B1 for 807.50 soi and B1 for division by 85.

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4	(a) (i) $20^\circ$	1	<b>B1</b> for Rectangle stated <b>B1</b> for establishing a right angle using $20^\circ$ and $70^\circ$ <b>B1</b> for 3 right angles stated.
	(ii) $70^\circ$	1	
	(iii) Rectangle stated and justified	3	
	(b) (i) Similar triangles established	2	<b>B1</b> for $\frac{CO}{DO} = \frac{AO}{BO}$ oe or for $C\hat{O}A = D\hat{O}B$
	(ii) 1.8	1	
5	(a) 15.7	1	<b>M2</b> for $\frac{1}{2}\pi r^2 - (d)(i)$ or <b>M1</b> for area of a circle $\pi r^2$ soi
	(b) 25.7	1ft	
	(c) (i) Correct 4 lines drawn	1	
	(ii) 4	1	
	(d) (i) 25	1	
	(ii) 14.3	3ft	
6	(a) 98.2	3	<b>B1</b> for $4 \times 70 + 10 \times 85 + 14 \times 92.5 + 20 \times 97.5 + 24 \times 105 + 8 \times 120$ and <b>B1</b> for division by $4+10+14+20+24+8$
	(b) (i) $\frac{28}{80}$ oe	1ft	<b>B1</b> for $\frac{32}{80} \times \frac{31}{79}$ seen or $\frac{32 \times 31}{80 \times 80} = \frac{992}{6400} = 0.155$
	(ii) $\frac{992}{6320}$ oe	2ft	
	(c) Correct histogram	3	<b>H2</b> for 3 correct additional columns <b>H1</b> for 1 correct additional column

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<b>7</b>	<p><b>(a)</b> 130 g tin</p> <p><b>(b)</b> <b>(i)</b> 423 to 424</p> <p><b>(ii)</b> 319</p> <p><b>(iii)</b> 1050</p> <p><b>(c)</b> 7.2</p>	<p><b>2</b></p> <p><b>2</b></p> <p><b>3</b></p> <p><b>2ft</b></p> <p><b>3</b></p>	<p><b>B1</b> for one correct rate such as 1.3 (g) 0.769 (cent/g) seen.</p> <p><b>M1</b> for <math>\pi \times r^2 \times 11</math>.</p> <p><b>M2</b> for <math>2\pi r^2 + 2\pi r11</math> or <b>M1</b> for either of these</p> <p><b>M1</b> for Figs (their 319 + 30)×3 <b>B1</b> for <math>\div 10^4</math></p> <p><b>M2</b> for <math>\frac{x}{9} = \sqrt[3]{\frac{512}{1000}}</math> oe or <b>B1</b> for <math>\sqrt[3]{512} : \sqrt[3]{1000}</math> soi</p>
<b>8</b>	<p><b>(a)</b> 4.1</p> <p><b>(b)</b> Correct plots and curve.</p> <p><b>(c)</b> <math>a</math> ft 1 cao <math>b</math> ft</p> <p><b>(d)</b> 1 to 2</p>	<p><b>1</b></p> <p><b>3</b></p> <p><b>2ft</b></p> <p><b>2</b></p>	<p><b>P2</b> for 7 or 8 correct plots ft or <b>P1</b> for at least 4 correct plots ft and (dep) <b>C1</b> for a smooth curve through all plotted points</p> <p><b>B1</b> for at least one solution</p> <p><b>B1</b> for the correct tangent drawn</p>
	<p><b>(e)</b> <b>(i)</b> -1</p> <p><b>(ii)</b> -1 1 2</p>	<p><b>1</b></p> <p><b>3ft</b></p>	<p><b>B2</b> for at least one ft and line drawn or <b>M1</b> for their <math>y = x + a</math> drawn. <b>SC1</b> for all three found by solving the equation</p>

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9	(a) 59.2	3	<p><b>M2</b> for <math>(AB =) \frac{65 \sin 60}{\sin(180 - (60 + 48))}</math> or</p> <p><b>M1</b> for <math>\frac{AB}{\sin 60} = \frac{65}{\sin(180 - (60 + 48))}</math> oe</p>
	(b) 2360	2	<p><b>M1</b> for <math>\frac{1}{2} \times 84 \times 65 \sin((180 -) 60)</math></p>
	(c) 129	4	<p><b>M3</b> for</p> <p><math>\sqrt{84^2 + 65^2 - 2 \times 84 \times 65 \cos(180 - 60)}</math> or</p> <p><b>M2</b> for <math>84^2 + 65^2 - 2 \times 84 \times 65 \cos(180 - 60)</math> or</p> <p><b>M1</b> for <math>84^2 + 65^2 + 2 \times 84 \times 65 \cos(180 - 60)</math> and a dep</p> <p><b>A1</b> for 76.3</p>
	(d) 31.9°	3	<p><b>M2</b> for <math>\tan^{-1} \frac{35}{65 \sin 60}</math> oe or</p> <p><b>M1</b> for <math>\tan^{-1} \frac{35}{d}</math> or <math>\frac{d}{35}</math> and</p> <p><b>B1</b> for for <math>65 \sin 60 (= 56.3)</math></p>

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10	(a) $\frac{320}{x}$ oe isw	1	
	(b) $\frac{320}{x-80}$ isw	2	<b>B1</b> for $x - 80$ seen
	(c) $x^2 - 80x - 10240 = 0$ correctly obtained	3	<b>M2</b> for $\frac{320}{x-80} - \frac{320}{x} = \frac{5}{2}$ oe <b>M1</b> for (a) - (b) = $\pm$ their $2\frac{1}{2}$
	(d) 148.8 - 68.8	4	<b>B1</b> for $\sqrt{(-80)^2 - 4 \times 1 \times (-10240)}$ soi and <b>B1</b> for $\frac{-(-80) \pm \sqrt{\text{their } 47360}}{2 \times 1}$ soi and  After <b>B0B1</b> , allow <b>SC1</b> for a correct ft. or <b>B2</b> for 148.8 and - 68.8 Final answer or <b>B1</b> for one correct solution seen or 148.81. and - 68.81 or 149 and - 69.
	(e) 2 h 9 mins	2ft	<b>B1</b> for 2.15
11	(a) (i) (a) $\frac{1}{2}\mathbf{p} + \frac{1}{2}\mathbf{r}$	1	
	(b) $\mathbf{r} + \mathbf{p} - \mathbf{q}$	1	
	(c) $\frac{1}{2}\mathbf{p} + \frac{1}{2}\mathbf{r}$	2ft	<b>B1</b> for unsimplified
	(ii) Equal and Parallel	1	
	(b) (i) Correct triangle	2	<b>B1</b> for two correct vertices or triangle correct size and orientation
	(ii) Correct triangle	2	<b>B1</b> for two correct vertices or triangle correct size and orientation
(iii) Complete description www	3	<b>B1</b> for Rotation <b>B1</b> for either 90 anticlockwise or centre (0,3)	