

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

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

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

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9	(a) 59.2	3	<p>M2 for $(AB =) \frac{65 \sin 60}{\sin(180 - (60 + 48))}$ or</p> <p>M1 for $\frac{AB}{\sin 60} = \frac{65}{\sin(180 - (60 + 48))}$ oe</p>
	(b) 2360	2	M1 for $\frac{1}{2} \times 84 \times 65 \sin((180 -) 60)$
	(c) 129	4	<p>M3 for</p> <p>$\sqrt{84^2 + 65^2 - 2 \times 84 \times 65 \cos(180 - 60)}$ or</p> <p>M2 for $84^2 + 65^2 - 2 \times 84 \times 65 \cos(180 - 60)$ or</p> <p>M1 for $84^2 + 65^2 + 2 \times 84 \times 65 \cos(180 - 60)$ and a dep</p> <p>A1 for 76.3</p>
	(d) 31.9°	3	<p>M2 for $\tan^{-1} \frac{35}{65 \sin 60}$ oe or</p> <p>M1 for $\tan^{-1} \frac{35}{d}$ or $\frac{d}{35}$ and</p> <p>B1 for for 65sin60 (= 56.3)</p>

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10	(a) $\frac{320}{x}$ oe isw	1	
	(b) $\frac{320}{x-80}$ isw	2	B1 for $x - 80$ seen
	(c) $x^2 - 80x - 10240 = 0$ correctly obtained	3	M2 for $\frac{320}{x-80} - \frac{320}{x} = \frac{5}{2}$ oe M1 for (a) - (b) = \pm their $2\frac{1}{2}$
	(d) 148.8 - 68.8	4	B1 for $\sqrt{(-80)^2 - 4 \times 1 \times (-10240)}$ soi and B1 for $\frac{-(-80) \pm \sqrt{\text{their } 47360}}{2 \times 1}$ soi and After BOB1 , allow SC1 for a correct ft. or B2 for 148.8 and - 68.8 Final answer or B1 for one correct solution seen or 148.81. and - 68.81 or 149 and - 69.
	(e) 2 h 9 mins	2ft	B1 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	B1 for unsimplified
	(ii) Equal and Parallel	1	
	(b) (i) Correct triangle	2	B1 for two correct vertices or triangle correct size and orientation
	(ii) Correct triangle	2	B1 for two correct vertices or triangle correct size and orientation
	(iii) Complete description www	3	B1 for Rotation B1 for either 90 anticlockwise or centre (0,3)