

MARK SCHEME for the October/November 2012 series

4024 MATHEMATICS (SYLLABUS D)

4024/22

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	Mar k	Part Marks
1	(a) $57(.0^\circ)$ (b) (i) 5 m 6 cm cao (ii) 66.6 or 66.7 ($^\circ$)	2 3 2ft	M1 for $\tan A\hat{C}B = \frac{10}{6.5}$ oe B2 for $(BD =) 15.1$ or better or M1 for $BD^2 = 16.4^2 - 6.5^2$ and/or SC1 for their $BD - 10$ e.g. accept $\tan^{-1} \frac{\text{their } DB}{6.5}$ M1 for $\cos D\hat{C}B = \frac{6.5}{16.4}$ oe
2	(a) $(2x - 1)(2x + 1)$ (b) (i) 3 (ii) $(R =) \frac{2Q}{P-1}$ asc (c) $x = 7 \quad y = -1$ (d) (i) $3.2x + 16$ (ii) $x > 73.125$ isw (iii) 74	1 1 3 3 2 2 1ft	SC2 for $\frac{2Q}{P+1}$ or $-\frac{2Q}{P+1}$ M2 for $\frac{2Q}{R} = P - 1$ or $PR - R = 2Q$ or M1 for $P = \frac{2Q}{R} + 1$ or $PR = 2Q + R$ soi B2 for one correct M1 for eliminating one variable B1 for $(x + 20) \times 0.8$ oe seen B1 for their answer to (i) > 250
3	(a) (i) 43.2 (0) seen isw (ii) 25 isw (iii) 3.5	1 2 2	SC1 for answer 125% M1 for Figs $\frac{45-36}{36}$ M1 for Figs $\frac{3000 \times 0.45 - 1302.75}{3000 \times 0.45}$

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	(b) 0.6 (0)	3	<p>M2 for $5.40 - \frac{5.40 \times 100}{112.5}$ oe or</p> <p>M1 for $x + \frac{12.5}{100} x = 5.40$ oe and</p> <p>A1 for 5.40 – their x ft or</p> <p>B1 for division by 112.5 seen and dependent</p> <p>B1 for multiplication by 12.5 seen.</p>
4	<p>(a) (i) 102</p> <p>(ii) (i) ft (102)</p> <p>(iii) 180 – (ii) ft (78)</p> <p>(b) (i) Similar triangles established www</p> <p>(ii) 7.2</p>	<p>1</p> <p>1ft</p> <p>1ft</p> <p>2</p> <p>2</p>	<p>B1 for a correct pair of equal angles</p> <p>B1 for corresponding sides in the ratio 5 : 2 soi</p>
5	<p>(a) 220</p> <p>(b) 2130</p> <p>(c) 8.33</p>	<p>3</p> <p>3</p> <p>2</p>	<p>M1 for $\frac{150}{360} \times 2 \pi r$ and</p> <p>B1 for their arc AD + their arc BC + 50</p> <p>M2 for $\frac{150}{360} \pi (45^2 - 20^2)$ or</p> <p>M1 for $\frac{150}{360} \pi r^2$</p> <p>M1 for $2\pi r = \text{their arc } AD$ from (a) soi</p>
6	<p>(a) 158 www</p> <p>(b) (i) $\frac{60}{150}$ oe isw</p> <p>(ii) $\frac{4800}{22350}$ oe isw</p>	<p>3</p> <p>1</p> <p>2</p>	<p>B1 for $10 \times 135 + 30 \times 145 + 20 \times 152.5 + 30 \times 157.5 + 35 \times 165 + 25 \times 180$ and</p> <p>B1 for division by $10 + 30 + 20 + 30 + 35 + 25$</p> <p>B1 for $\frac{60}{150} \times \frac{40}{149}$ seen or</p> <p>$2 \times \frac{60}{150} \times \frac{40}{150} (= \frac{4800}{22500} = 0.213)$</p>

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	(c) Correct Histogram	3	H2 for 3 correct additional columns H1 for 1 correct additional column After 0 SC2 for all additional heights correct SC1 for 3 additional heights correct
7	(a) (i) 874 (ii) 3070 (b) (i) 77 (.0) (ii) 500 (iii) 2410	3 2ft 1 3ft 3	M2 for (2) $\pi r^2 + 2\pi r \times 8$ or M1 for either (2) πr^2 or $2\pi rh$ M1 for Figs [(their 874 + 150) \times 3] or B1 for $\div 10^4$ M2 for $\pi R^2 - 4\pi r^2 + 4(\mathbf{b})(\mathbf{i})$ or M1 for $\pi R^2 - 4\pi r^2$ or $4(\mathbf{b})(\mathbf{i})$ M2 for $\pi R^2 \times 8 - 4 \times \frac{2}{3} \times \pi \times r^3$ or M1 for $\pi R^2 \times 8$ or $4 \times \frac{2}{3} \times \pi \times r^3$
8	(a) - 2.1 (b) Correct plots and curve (c) - a ft 1 cao b ft (d) -3.5 to -2 (e) (1.7) ft (f) $1 < k < 2$. ft	1 3 2 2 2ft 2ft	P2 for 7 or 8 correct plots ft or P1 for at least 4 correct plots and dependent C1 for a smooth curve through all plotted points B1 for at least one solution ft M1 for the correct tangent drawn M1 for $y = x$ drawn. B1 for one correct end point ft or clearly using TP's.

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9	<p>(a) 42.3</p> <p>(b) 83.9</p> <p>(c) 814</p> <p>(d) 17.2</p>	<p>3</p> <p>4</p> <p>2</p> <p>3</p>	<p>M2 for $\frac{30 \sin 58}{\sin 37}$ or</p> <p>M1 for $\frac{AB}{\sin 58} = \frac{30}{\sin 37}$ oe</p> <p>M3 for $\sqrt{30^2 + 64^2 - 2 \times 30 \times 64 \cos(180 - 58)}$</p> <p>M2 for $30^2 + 64^2 - 2 \times 30 \times 64 \cos(180 - 58)$</p> <p>or</p> <p>M1 for $30^2 + 64^2 + 2 \times 30 \times 64 \cos(180 - 58)$</p> <p>and</p> <p>A1 for 54.4</p> <p>M1 for $\frac{1}{2} \times 30 \times 64 \sin((180 -)58)$ oe</p> <p>M2 for $30 \sin 58 \tan 34$ or</p> <p>M1 for $\frac{H}{\text{their } AP} = \tan 34$ or $\tan 56$ or</p> <p>B1 for $AP = 30 \sin 58 (= 25.4)$ oe soi</p>
10	<p>(a) Congruency established</p> <p>(b) (i) $40 - x$</p> <p>(ii) $(y =) 2x^2 - 80x + 1600$ correctly obtained</p> <p>(c) (i) $x^2 - 40x + 250 = 0$</p> <p>(ii) 7.8 32.2</p> <p>(d) Accurately drawn quadrilaterals</p>	<p>3</p> <p>1</p> <p>2</p> <p>1</p> <p>3</p> <p>2ft</p>	<p>B2 for $\widehat{SAP} = \widehat{PBQ}$ and $AP = BQ$ or $AS = PB$ or</p> <p>B1 for the equal angle or either pair of sides</p> <p>M1 for $\frac{1}{2} \times x \times (b)(i)$ or $\sqrt{(40 - x)^2} + x^2$ seen</p> <p>B2 for 7.8 and 32.2 or better or</p> <p>B1 for $\sqrt{(-40)^2 - 4 \times 1 \times 250}$ soi and</p> <p>B1 for $\frac{-(-40) \pm \sqrt{\text{their } 600}}{2 \times 1}$ soi and</p> <p>After B0 B1, allow SC1 for a correct ft for both roots or B1 for one correct solution or both 8 and 32.</p> <p>B1 for one correct ft or both mirror images</p>

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11	(a) (i) (a) $-p + q$	1	
	(b) $\frac{1}{3}(4q - p)$ oe isw	1ft	
	(c) $2q - \frac{1}{2}p$ oe isw	1	
	(ii) E, C and D lie on a straight line CD is $\frac{2}{3}$ of ED oe	2	B1 for either
	(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) Rotation clockwise 90 centre (0,3)	3	B1 for rotation soi and B1 for clockwise 90 or centre (0,3)