

**MARK SCHEME for the May/June 2011 question paper  
for the guidance of teachers**

**4024 MATHEMATICS (SYLLABUS D)**

**4024/22**

Paper 2, maximum raw mark 100

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### Abbreviations

cao	correct answer only
cso	correct solution only
dep	dependent
ft	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
www	without wrong working

### SECTION A

Qu.	Answers	Mark	Comments
1	(a) (i) $\frac{1}{10x}$ cao	1	
	(ii) $\frac{11x-12}{x(x-3)}$ final answer	2	M1 for $\frac{4(x-3)+7x}{x(x-3)}$
	(b) (i) $\frac{1}{4}$ or 0.25	1	
	(ii) $c = 2$ cao $d = 1.5$ oe	2	If 0, B1 for $(f^{-1}(x)) = \frac{4x+3}{2}$
	(iii) $g = \frac{1}{2}$ or 0.5	2	M1 for $\frac{2g-3}{4} = -g$
2	(a) (i) $c = \frac{2A}{h} - d$ or $\frac{2A-hd}{h}$ final answer	2	M1 for $c + d = \frac{2A}{h}$ or $\frac{1}{2}hc = A - \frac{1}{2}hd$ oe or SC1 for $c = \frac{A}{\frac{1}{2}h} - d$
	(ii) 3	1	
	(b) (i) 102	2	M1 for 31.5 and 19.5 used
	(ii) 322	3	M2 for $(32.5 \times 20.5) - (25.5 \times 13.5)$ or M1 for $(32.5 \times 20.5)$ or $(25.5 \times 13.5)$
3	(a) $\frac{1}{3}$	1	
	(b) (i) $\frac{1}{20}$	2	M1 for $\frac{1}{6} \times \frac{3}{5} \times \frac{2}{4}$ seen
	(ii) $\frac{3}{20}$	2	SC1 for $\frac{5}{36}$ M1 for $\left(\frac{3}{6} \times \frac{2}{5} \times \frac{1}{4}\right) + \left(\frac{3}{6} \times \frac{2}{5} \times \frac{2}{4}\right)$ seen

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4	(a) (i) $(u_n) = 3n + 1$ oe	1	ft their $u_n$ with $n = 20$
	(ii) 61	1ft	
	(b) (i) $(v_n) = 17 - 2n$ oe	1	
	(ii) $(k = ) 49$ cao	1	
5	(a) 11 30 cao	1	B1 for 12 27 or 1 hour 12 minutes seen or 1.2 hours or 72 minutes or for line from (11.15,0) to (12.15,15)
	(b) 39 minutes	1	
	(c) 8 km	1	
	(d) 24 km/h	1	
	(e) park and shopping centre	1	
	(f) Salim and 9 minutes	2	
6	(a) (£)1350	1	ft their (a) 6 ft $\frac{405}{\text{their(a)}} \times 360$ or $\frac{405}{\text{their(b)}} \times 60$ SC1 for $120^\circ$ or £450 seen. B1 for (£)70.20 or M1 for $(1 - 0.26) \times 270$ oe M2 for figs $\frac{3645}{405}$ or $\frac{11745}{405}$ or $\frac{28755}{405}$ seen SC1 for 81 or 324 seen M1 for 108 % 270 soi
	(b) (£)225	1ft	
	(c) $108^\circ$	1ft	
	(d) (£)300	2	
	(e) (£)199.80	2	
	(f) 9(%)	3	
	(g) (£)250	2	
7	(a) (i) 2	1	ft 140 – their (b)(i) ft 125 – their (b)(ii)
	(ii) (a) $q - r$	1	
	(b) $2p - q - r$	1	
	(c) $1 \frac{1}{2} p - r$	1	
	(d) $\frac{1}{2} p - q + \frac{1}{2} r$	1	
	(b) (i) $45^\circ$	1	
	(ii) $95^\circ$	1ft	
	(iii) $80^\circ$	1ft	

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SECTION B

8	(a) (i) $\begin{pmatrix} 3 & 2 \\ 1 & 4 \end{pmatrix}$	2	B1 for 3 correct terms
	(ii) $\begin{pmatrix} -1 & -2 \\ 1.5 & 2.5 \end{pmatrix}$ or $\frac{1}{2}\begin{pmatrix} -2 & -4 \\ 3 & 5 \end{pmatrix}$	2	B1 for $k\begin{pmatrix} -2 & -4 \\ 3 & 5 \end{pmatrix} k = \frac{1}{2}$ or $\frac{1}{2} \times (2 \times 2 \text{ matrix})$
	(b) (i) Reflection $y = 1$	1 1	
	(ii) Enlargement Scale factor $\frac{1}{2}$ Centre $(-5,0)$	1 1	
	(iii) $(-2, 3)$ $(-4, 5)$ $(-4, 7)$	2	B1 for 2 correct vertices or for $\begin{pmatrix} -2 & -4 & -4 \\ 3 & 5 & 7 \end{pmatrix}$
	(iv) Rotation $90^\circ$ anticlockwise about $(0,0)$	1 1	
9	(a) $-5, -6$	1	
	(b) All points plotted correctly <u>and</u> a smooth curve – generous quadratic	2ft	B1 for 5 or more points correct ft from their table
	(c) (i) $x = -2.2$ to $-2.35$ and $1.65$ to $1.85$	1	
	(ii) $-6.4$ $mv < -6.0$	1	
	(iii) 8 to 10	2	M1 for tangent
	(d) (i) $2x^2 + 4x - 3x - 6 = 1 - 2x$ leading to $2x^2 + 3x - 7 = 0$	1	
(ii) $x = 1.27, -2.77$	4	B3 for one solution or $x = 1.26$ to $1.3$ <b>and</b> $-2.76$ to $-2.8$ or if in form $\frac{p \pm (or + or -)\sqrt{q}}{r}$ B1 for $p = -3, r = 4$ B1 for $q = 65$ or $\sqrt{q} = 8.06$	

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10	<p>(a) (i) 74.95 → 75.05</p> <p>(ii) 336.5 → 337.5</p> <p>(iii) 44.2 → 44.3</p> <p>(b) (i) 241 → 241.5</p> <p>(ii) 12050 – 12100</p> <p>(iii) 225</p>	<p>1</p> <p>3</p> <p>3</p> <p>2</p> <p>2ft</p> <p>1</p>	<p>M1 for <math>250^2 + 300^2 \pm 2 \times 250 \times 300 \cos 75</math></p> <p>M1 for <math>\sqrt{152500 - 150000 \cos 75} (= \sqrt{113677})</math></p> <p>M2 for <math>\sin \theta = \frac{300 \sin 75}{\text{their } 337}</math></p> <p>SC1 for <math>(C\hat{S}B = ) 45.7 \rightarrow 45.8</math> seen</p> <p>M1 for <math>\cos 15 = \frac{DB}{250}</math> oe</p> <p>B1 for <math>\frac{1}{2} \times 200 \times 241 \times \sin 30</math></p> <p>ft 50 × their (b)(i)</p>
11	<p>(a) <math>\frac{7\pi r^2 H}{9}</math></p> <p>(b) (i) <math>\sqrt{15^2 + 10^2} = 18(.0)</math></p> <p>(ii) 62.8 → 62.9 or <math>20\pi</math></p> <p>(iii) <math>\theta = \frac{62.8 \times 360}{36\pi} = 200^\circ</math></p> <p>(iv) 2760 → 2770</p>	<p>3</p> <p>2</p> <p>2</p> <p>2</p> <p>3</p>	<p>B1 for <math>\frac{2\pi r^2 H}{3}</math> and</p> <p>B1 for <math>\frac{\pi r^2 H}{9}</math></p> <p>M1 for <math>15^2 + 10^2</math></p> <p>M1 for <math>2 \times \pi \times 10</math></p> <p>M1 for <math>\frac{\theta}{360} \times \pi \times 18 \times 2 = \text{their (ii)}</math></p> <p>M1 for <math>\frac{200}{360} \times \pi \times 18^2 (= 565.5)</math></p> <p>M1 for <math>30 \times \text{their (ii)} (= 1884)</math></p>
12	<p>(a) 220, 288, 312, 320</p> <p>(b) (i) 7 correct plots and smooth ogive</p> <p>(ii) (a) 83 → 85</p> <p>(b) 13.5 → 16.5</p> <p>(c) 15 to 19%</p> <p>(iii) (a) 76 cao</p> <p>(b) 25% cao</p> <p>(c) More pupils took longer (so) previous test was probably harder</p>	<p>1</p> <p>3</p> <p>1ft</p> <p>2</p> <p>2</p> <p>1</p> <p>1</p> <p>1</p>	<p>B2 for 5 or 6 correct plots and smooth ogive or</p> <p>B1 for 5 or 6 correct plots</p> <p>ft from their graph</p> <p>M1 for readings at 80 and 240 seen</p> <p>SC1 for 48 → 60 or 81 → 85 seen</p>