

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

**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.

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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
<b>1</b>	<b>(a)</b> 37.35 and A	2	M1 for $315 \times 0.05 + 720 \times 0.03$
	<b>(b) (i)</b> \$0.05	1	
	<b>(ii)</b> Large <u>and</u> 0.0485 seen oe	1	
	<b>(c)</b> 890	3	M1 for $\frac{1134.75}{0.85}$ M1 for their $1335 - (375 + 70)$
<b>2</b>	<b>(a)</b> (7, 9)	1	
	<b>(b) (i)</b> $y = 2x - 5$	2	M1 for gradient $\frac{(15 + 21)}{(10 + 8)} (= 2)$
	<b>(ii)</b> Yes <u>and</u> $-9 = 2 \times -2 - 5$	1ft	ft correct conclusion from their equation with the working shown
	<b>(c) (i) (a)</b> (-5, 0)	1	
	<b>(b)</b> $\left(\frac{4p-15}{3}, p\right)$	2	M1 for line through (4, 9) and (6, 6)
<b>3</b>	<b>(a) (i)</b> 10.6 – 10.62	2	M1 for $\tan 37 = \frac{8}{QR}$
	<b>(ii)</b> 192	2	M1 for $4^3$ seen
	<b>(b)</b> 6.40	2	M1 for $\frac{46.62}{0.45}$
	<b>(c)</b> 18	2	M1 for $(k =) 90$ oe or $\frac{3}{5} \times 30$

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4	(a) $4x + 5y + 4x + 5y = 1020$ leading to $4x + 5y = 510$ $6x + 3y + 6x + 3y + 4x + y + 4x + y = 1360$ leading to $5x + 2y = 340$	1	
		1	
	(b) $x = 40, y = 70$	3	M1 for an attempt to make the coefficients of $x$ or $y$ equal M1 for subtracting the two equations
	(c) 0.56	2ft	M1 for figs $0.8 \times 2.1$ and figs $1.6 \times 0.7$ After 0, SC1 for answer figs 56 ft $(2 \times \text{their } x \times \text{their } y) / 10\,000$
5	(a) (i) $\begin{pmatrix} -10 & -4 \\ 15 & 7 \end{pmatrix}$	2	B1 for 3 correct terms
	(ii) $\begin{pmatrix} -0.5 & -1 \\ 1.5 & 2 \end{pmatrix}$	2	B1 for $\frac{1}{2} \times (2 \times 2 \text{ matrix})$ or for $\begin{pmatrix} -1 & -2 \\ 3 & 4 \end{pmatrix}$ soi
	(b) (i) 13	2	M1 for $12^2 + 5^2 (= 169)$
	(ii) $\begin{pmatrix} 8 \\ 6 \end{pmatrix}$	1	
	(c) (i) $\begin{pmatrix} -5 \\ 2 \end{pmatrix}$	1	
	(ii) (18, 9)	1	
	(iii) 22	3ft	M1 for $12 \times (\text{their } 9 - 3)$ M1 for an attempt to subtract area of 3 triangles
6	(a) (i) (a) Translation cao $\begin{pmatrix} 1 \\ -5 \end{pmatrix}$	1	
		1	
	(b) Enlargement cao Scale factor 3, Centre (6, 4)	1	
		1	
	(ii) (a) $(-1, -2)$	1	
	(b) $(-1, 0)$	1	
	(b) (i) Kite	1	
	(ii) $(1, 3)$ $(4, 2)$	1 1	Also $(4, -1)$ is correct for 1

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**SECTION B**

<b>7</b>	<p><b>(a)</b> 30.4 to 30.45</p> <p><b>(b)</b> <math>16\cos 25^\circ</math> oe</p> <p><b>(c) (i)</b> 28 www</p> <p><b>(ii)</b> <math>\frac{1}{2} \times 28 \times 14.5 (= 203)</math> or <math>348 - \frac{1}{2} 20 \times 16 \sin 115</math></p> <p><b>(iii)</b> 28.4 to 28.5</p>	<p>4</p> <p>2</p> <p>2</p> <p>1</p> <p>3ft</p>	<p>M1 for <math>16^2 + 20^2 \pm (2) \times 16 \times 20 \cos 115^\circ</math> M1 for <math>\sqrt{656 - 640\cos 115}</math> A1 for 926.(47....)</p> <p>M1 for <math>\cos 25 = \frac{x}{16}</math></p> <p>M1 for <math>\frac{1}{2}(20 + AD) \times 14.5 = 348</math></p> <p><math>\frac{1}{2} 30.4 \times 28 \sin 28.5</math></p> <p>M1 for <math>\frac{1}{2} \times 30.4 \times 28 \times \sin CAD = 203</math> M1 for <math>\sin CAD = \frac{203}{\frac{1}{2} \times 30.4 \times 28}</math> ft their AC and their AD</p>
<b>8</b>	<p><b>(a) (i)</b> <math>y^2 + 18y + 81 = y^2 + y^2 + 10y + 25</math> <math>y^2 - 8y - 56 = 0</math></p> <p><b>(ii)</b> 12.5, -4.5</p> <p><b>(iii)</b> 21.5</p> <p><b>(b) (i) (a)</b> <math>\hat{QOS} = 90 - x</math> and conclusion</p> <p><b>(b)</b> <math>\frac{1}{2}(90 + x)</math> oe cao</p> <p><b>(ii) (a)</b> <math>3 \times \frac{1}{2}(90 - x)</math> <math>= 2 \times \frac{1}{2}(90 + x)</math> leading to <math>180 + 2x</math> <math>= 270 - 3x</math></p> <p><b>(b)</b> 18</p>	<p>2</p> <p>3</p> <p>1ft</p> <p>1</p> <p>2</p> <p>2</p> <p>1</p>	<p>M1 for <math>(y + 9)^2 = y^2 + (y + 5)^2</math> oe</p> <p>M1 for <math>y = \frac{8 \pm \sqrt{8^2 + 4 \times 56}}{2}</math> soi A1 for one solution or 12.48(5)... <u>and</u> -4.48(5)...</p> <p>ft 9 + their positive y</p> <p>M1 for <math>\frac{1}{2}(180 - (90 - x))</math></p> <p>M1 for <math>3 \times \frac{1}{2}(90 - x) = 2 \times</math> their OQS</p>
<b>9</b>	<p><b>(a) (i)</b> Histogram with heights 0.14, 0.56, 0.74, 0.42 and 0.2 widths 100, 50, 50, 50, 100</p> <p><b>(ii)</b> 14 – 16</p> <p><b>(iii)</b> 200 <math>m &lt; 250</math></p> <p><b>(iv)</b> <math>\frac{7}{20}</math> cao</p>	<p>3</p> <p>1</p> <p>1</p> <p>1</p>	<p>B2 for 4 correct columns or B1 for at least 1 correct column After 0, SC2 for “correct” histogram or SC1 for at least 3 “correct” columns (e.g. no vertical or horizontal scale)</p>

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	<p><b>(b)</b> <math>(p =) 35</math></p> <p><b>(c)</b> <b>(i)</b> 1</p> <p><b>(ii)</b> <math>\frac{49k}{750k}</math></p>	<p>3</p> <p>1</p> <p>2ft</p>	<p>M1 for <math>\frac{125 \times 14 + 175p + 225 \times 26}{40 + p} = 183</math></p> <p>M1 <math>183p - 175p = 1750 + 5850 - 7320</math></p> <p>M1 for <math>\frac{7}{20} \times \frac{14}{75}</math></p> <p>ft their <math>\frac{7}{20}</math> and their 75</p>
<b>10</b>	<p><b>(a)</b> 32</p> <p><b>(b)</b> <b>(i)</b> 1.13</p> <p><b>(ii)</b> <b>(a)</b> 56.5 to 56.51</p> <p><b>(b)</b> 53</p> <p><b>(c)</b> 12.9</p>	<p>2</p> <p>3</p> <p>3</p> <p>2ft</p> <p>2</p>	<p>M1 for <math>\frac{200}{6.2}</math></p> <p>B2 for figs 1128.....(or 113) <u>or</u></p> <p>M1 for fig <math>0.2 = \pi r^2</math> fig 5</p> <p>M1 for <math>\pi \times 1.9^2 \times 5</math></p> <p>M1 for their volume – 0.2</p> <p>M1 for <math>\frac{3000}{56.5}</math></p> <p>ft their 56.5 with rounding down to an integer</p> <p>M1 for <math>2 \times \pi \times 1.9 (= 11.9)</math></p>
<b>11</b>	<p><b>(a)</b> <b>(i)</b> 35</p> <p><b>(ii)</b> 360</p> <p><b>(iii)</b> 7</p> <p><b>(b)</b> <b>(i)</b> 10</p> <p><b>(ii)</b> (8.00 , 0) to (8.15 , 10) (8.15 , 10) to (8.23 , 22) (8.23 , 22) to (8.47 , 30)</p> <p><b>(iii)</b> 20</p> <p><b>(c)</b> <b>(i)</b> 12.29 cao</p> <p><b>(ii)</b> <math>247^\circ</math></p> <p><b>(iii)</b> 10.2 to 10.7</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>2ft</p> <p>2ft</p> <p>2</p> <p>1</p> <p>1</p>	<p>B1 for 2 correct lines</p> <p>ft their 10 and their <math>10 + 12</math></p> <p>M1 for <math>\frac{8}{24}(\times 60)</math></p> <p>ft <math>\frac{18 - \text{their } 10}{24/(60)}</math></p> <p>M1 for <math>\sin 55 = \frac{MK}{15}</math> oe</p>