

**MARK SCHEME for the October/November 2010 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
art	anything rounding to
soi	seen or implied

1	(a)	(i) $\frac{1}{8}$ Final ans	1	
		(ii) $5 - 2x$ Final ans	2	<b>B1</b> for $3x^2 - 2x - 3x^2 \pm 5$ or better soi
		(b) 17	2	<b>M1</b> for $3t - 4 = 7 + 2t + 6$ or better
		(c) $(5p - 7q)(x + 2y)$	2	<b>B1</b> for $(5p \pm 7q)(x \pm 2y)$ or <b>M1</b> for $5p(x + 2y) - 7q(x + 2y)$ or $x(5p - 7q) + 2y(5p - 7q)$ or <b>B1</b> for the correct extraction of one common factor at any stage
	(d)	(i) $2 - x$ has the greater value	2	<b>B1</b> for $3x + 4 = -2$ or $2 - x = 4$ seen
		(ii) $x < -0.5$ Final ans	2	<b>B1</b> for $3x + x, 2 - 4$ oe
2	(a)	(i) (\$) 935	1	
		(ii) (€) 600	1	
		(iii) (€) 550	2	<b>M1</b> for Figs $85 \times \frac{121}{187}$
	(b) (Rs) 51.95	2	<b>M1</b> for Figs $\frac{4}{77}$	
(c)	(i) (\$) 375	1		
	(ii) (\$) 1087.5(0)	3	<b>B1</b> for $\frac{15}{100} \times 27\,000 (= 4050)$ soi or <b>M1</b> for $\frac{1}{36}$ (their total interest + 27 000)	

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3	(a)	144	2	<b>B1</b> for $\frac{360}{10}$ or $(10 - 2)180$ or $10 \times 180$ oe seen
	(b)	38	3	<b>B2</b> for all angles by symmetry or <b>B1</b> for any angle deduced by symmetry <b>M1</b> for such as $x + \text{their } AHC + \text{their } HCB + 80 = 360$ oe
	(c)	(i) $\frac{1}{2}(12 + 10)h$ or better (ii) 13	2 2ft	<b>B1</b> for $NY = h$ used as height soi or for $\frac{1}{2}(10 + 12)$ seen $\frac{221}{k + 6}$ ft dependent on their (c)(i) = $kh$ or <b>M1</b> for their (c)(i) + their triangle = 221 or <b>B1</b> for $\frac{1}{2} \times 12 \times h$
4	(a)	(i) 52.1 (ii) 7.37	2 2	Here and elsewhere accept answers rounding to the given 3 significant figure answers. <b>M1</b> for $\tan SPQ = \frac{9}{7}$ oe <b>M1</b> for $\frac{RS}{9} = \cos 35$ oe
	(b)	147 isw	3	<b>M1</b> for $\frac{4}{l} = \sin 20$ oe and <b>A1</b> for 11.69(5...) or <b>B1</b> for $4\pi \times \text{their } l$
	(a)	$90 < m < 95$	1	
5	(b)	$93.2(0), 93 \frac{7}{36}$	3	<b>B1</b> for $10 \times 70 + 16 \times 85 + 20 \times 92.5 + 21 \times 97.5 + 22 \times 105 + 1 \times 120$ and <b>B1</b> for $\div$ by $10 + 16 + 20 + 21 + 22 + 1$
	(c)	(i) 4 (ii) 1 10	1 2	<b>B1</b> for either
	(a)	(i) Length of line $AB$ 14 cm (ii) (a) Perpendicular bisector of $AB$ (b) Circular arc, centre $B$ , radius 9 cm	1 1 1	(a) and (b) long enough to be convincing loci
6	(b)	Correct region shaded ft	1ft	
	(c)	(i) $S_1 S_2$ correctly marked ft (ii) $10^\circ$ (iii) $336^\circ$	2ft 1 1	<b>B1</b> for either or <b>SC1</b> for $S_1, S_2$ on correct bearing from $A$

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7	(a)	(i) $\frac{13}{x}$	1	
		(ii) $\frac{13}{x+5}$	1	After 0 + 0, SC1 for AB and PQ implicit
	(b)	$3x^2 + 15x - 65$	3	<b>M2</b> for $\frac{13}{x} - \frac{13}{x+5} = 3$ or <b>M1</b> for their (i) – their (ii) = ±3
	(c)	2.78    -7.78	4	<b>B1</b> for $p = -15$ and $r = 6$ and <b>B1</b> for $q = 1005$ or $\sqrt{q} = 31.7\dots$ or <b>B1</b> for $(x + \frac{5}{2})^{(2)}$ and <b>B1</b> for $\frac{335}{12}$ or 5.28 and <b>B1</b> for one correct final ans or both 2.783 and -7.783 or both 2.8, -7.8 <b>SC1</b> + 1 for 2.78 and -7.78 anw.
	(d)	(i) Accept any correct numerical expression	1	
		(ii) (±)4	2	<b>M1</b> for their 18.9 – 14.9
8	(a)	6.9	1	
	(b)	6 points ft plotted and joined.	3	<b>P2</b> for 6 correct plots ft or <b>P1</b> for at least 4 correct plots and dependent <b>C1</b> for a smooth curve
	(c)	2.5 ft	1	
	(d)	(i) 0.4	1	
		(ii) Tangent drawn parallel to the chord.	1	
	(e)	(i) Correct straight line	2	<b>L1</b> for good freehand or a potential L2 that has been spoilt.
	(ii) 3.5 ft	1		
	(iii) $A = 5$ $B = -60$ soi	2	<b>B1</b> for one correct www or <b>M1</b> for $\frac{x^3}{10} - \frac{x}{2} = -x + 6$ or better seen	

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9	(a)	5	1		
	(b)	(i)	20.8, $20\frac{5}{6}$	2	<b>B1</b> for $\frac{1}{2} \times 5 \times 5$
		(ii)	21.6	3	<b>M2</b> for $\frac{1}{2}$ their $(\sqrt{5^2 + 5^2})^2 \sin 60$ or <b>B1</b> for $x^2 = 5^2 + 5^2$ oe or <b>M1</b> for $\frac{1}{2} \times$ their $x^2 \times \sin 60$
(c)	(iii)	2.89 (cm) ft	3ft	ft for $(3 \times$ their <b>(i)</b> ) $\div$ their <b>(ii)</b> evaluated or <b>M2</b> for $h = \frac{3 \times \text{their (i)}}{\text{their (ii)}}$ or <b>M1</b> for $\frac{1}{3} \times$ their <b>(ii)</b> $\times h =$ their <b>(i)</b>	
9	(c)	(i)	14	1	
		(ii)	24	1	
		(iii)	36	1	
10	(a)	(i)	Complete description	3	<b>B1</b> for Rotation or Enlargement <b>B1</b> for $180^\circ$ or SF -1 <b>B1</b> for centre the midpoint of <i>RS</i> .
		(ii)	Equal and parallel	1	
	(b)	(i)	$\begin{pmatrix} 2 \\ 3 \end{pmatrix}$	1	
		(ii)	(0,0) (2,0) (0,1)	2	<b>B1</b> for two correct
		(iii)	(2,3), (4,3) (2,4) ft	1ft	ft from <b>(ii)</b> and / or <b>(i)</b>
(iv)	(a) $\begin{pmatrix} 2 & 0 \\ 0 & 3 \end{pmatrix}$	2	<b>B1</b> for either column correct or <b>M1</b> for $\begin{pmatrix} a & b \\ c & d \end{pmatrix} \begin{pmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} = \begin{pmatrix} 0 & 2 & 0 \\ 0 & 0 & 3 \end{pmatrix}$		
(b)	(b) Complete description	2	<b>B1</b> for Stretching <b>B1</b> for 2 units in <i>x</i> direction and 3 units in <i>y</i> direction		
11	(a)		19.6	4	<b>M1</b> for $17^2 + 4^2 \pm 2 \times 17 \times 4 \cos 125$ soi <b>M1</b> for $\sqrt{17^2 + 4^2 - 2 \times 17 \times 4 \cos 125}$ <b>A1</b> for 383.0... seen or 15.1
		(b)	(i)	3 900 or 3.9 km	3
	(ii)	(a)	14 21	2	<b>B1</b> for 42 (mins) or 14 23 and 54 (secs) seen or <b>M1</b> for 15 03 – 39 min 6 sec soi
(b)	(b)	352	3	<b>M2</b> for $\frac{17}{\text{their } 2.9} \times 60$ <b>M1</b> for $\frac{17}{\text{their } 2.9}$	