

**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 $4\pi \times \text{their } l$
5	(a)	$90 < m < 95$	1	
	(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
6	(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
	(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	M2 for $\frac{13}{x} - \frac{13}{x+5} = 3$ or M1 for their (i) – their (ii) = ±3
	(c)	2.78    -7.78	4	B1 for $p = -15$ and $r = 6$ and B1 for $q = 1005$ or $\sqrt{q} = 31.7...$ or B1 for $(x + \frac{5}{2})^{(2)}$ and B1 for $\frac{335}{12}$ or 5.28 and B1 for one correct final ans or both 2.783 and -7.783 or both 2.8, -7.8 SC1 + 1 for 2.78 and -7.78 anw.
	(d)	(i) Accept any correct numerical expression	1	
		(ii) (±)4	2	M1 for their 18.9 – 14.9
8	(a)	6.9	1	
	(b)	6 points ft plotted and joined.	3	P2 for 6 correct plots ft or P1 for at least 4 correct plots and dependent C1 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	L1 for good freehand or a potential L2 that has been spoilt.	
	(ii) 3.5 ft	1		
	(iii) $A = 5$ $B = -60$ soi	2	B1 for one correct www or M1 for $\frac{x^3}{10} - \frac{x}{2} = -x + 6$ or better seen	

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 RS.
		(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 x direction and 3 units in y direction		
11	(a)	(i)	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	<b>M1</b> for $\frac{PX}{4} = \tan 44$ oe <b>A1</b> for 3.86(27) (km)
	(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 $\frac{17}{\text{their } 2.9}$		