

**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

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
art	anything rounding to
soi	seen or implied

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

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3	(a)	144	2	B1 for $\frac{360}{10}$ or $(10 - 2)180$ or 10×180 oe seen
	(b)	38	3	B2 for all angles by symmetry or B1 for any angle deduced by symmetry M1 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	B1 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 M1 for their (c)(i) + their triangle = 221 or B1 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. M1 for $\tan SPQ = \frac{9}{7}$ oe M1 for $\frac{RS}{9} = \cos 35$ oe
	(b)	147 isw	3	M1 for $\frac{4}{l} = \sin 20$ oe and A1 for 11.69(5...) or B1 for $4\pi \times \text{their } l$
	(a)	$90 < m < 95$	1	
5	(b)	$93.2(0), 93 \frac{7}{36}$	3	B1 for $10 \times 70 + 16 \times 85 + 20 \times 92.5 + 21 \times 97.5 + 22 \times 105 + 1 \times 120$ and B1 for \div by $10 + 16 + 20 + 21 + 22 + 1$
	(c)	(i) 4 (ii) 1 10	1 2	B1 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° (iii) 336°	2ft 1 1	B1 for either or SC1 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	

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