

**MARK SCHEME for the October/November 2010 question paper  
for the guidance of teachers**

**4024 MATHEMATICS (SYLLABUS D)**

4024/21

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) -55	1	
		(ii) $(Q =) \frac{4}{7}(P - 15)$ oe	2	<b>M1</b> for $\frac{7}{4}Q = P - 15$ , or $4P = 7Q + 4 \times 15$ or better <b>SC1</b> for $\frac{4P - 15}{7}$ , $\frac{4(P + 15)}{7}$ or $4(\frac{P}{7} - 15)$ oe
		(b) (i) $7(c - 2d)(c + 2d)$	2	<b>B1</b> for $7(c^2 - 4d^2)$ or $(7c + 14d)(c - 2d)$ or $(7c - 14d)(c + 2d)$ or $(c - 2d)(c + 2d)$ seen
		(ii) $(3x + 2)(x - 3)$	2	<b>B1</b> for one correct factor seen or signs reversed
	(c)	6.2 oe	2	<b>M1</b> for $4 = 5(7 - y)$ soi
2	(a)	(i) 74.8 or 74.7	2	Here and elsewhere accept answers rounding to the given 3 significant figure answers. No obvious wrong working seen. <b>M1</b> for $\tan BAC = \frac{180}{49}$ oe soi
		(ii) 15.2 or 90 – their (a)(i)	1ft	
		(b) (i) 500	2	<b>M1</b> for $(LP^2 =) 1300^2 - 1200^2$ soi
		(ii) 293 cao	3	<b>M1</b> for $\sin LPS = \frac{1200}{1300}$ or $\cos LSP = \frac{1200}{1300}$ or for correct use of their (b)(i) <b>A1</b> for $LPS = 67.4$ cao or $LSP = 22.6$ cao <b>B1</b> for $360 -$ their LPS or $270 +$ their LSP
	(iii)	9.75	2	<b>M1</b> for figs $\frac{13}{1604 - 1556}$
3	(a)	(i) 38	1	
		(ii) 38	1ft	Their (i) (must be $< 90^\circ$ )
		(iii) 74	1	
		(iv) 68	1ft	$180 -$ (their (iii) + their (i) or (ii)) or $106 -$ their (i) dep on positive ans.
	(b)	$(y =) \frac{1}{2}(90 - x)$ oe	3	<b>B2</b> for $y + y + 90 + x = 180$ or better <b>B1</b> for $ABO = y$ or $(OAC =) 90$

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4	(a)	(i) $P$ correct	1	In (a) ignore numbers outside the given range <b>B1</b> for 21 correct <b>B1</b> for at least two non-empty subsets correct (ignoring the position of 21) If 0 scored then allow <b>SC2</b> if all the elements other than 21 are correctly placed.
		(ii) All 10 elements correctly placed	3	
		(b)		
	(i)	10	1	
	(ii)	{b, c, d, f, g}	1	
	(iii)	2	1	
	(iv)	$\frac{3}{5}$ oe	1	
	(c)			
	(i)	3	1	
	(ii)	51	1	
5	(a)	25	1	
	(b)	(i) 2376.12	2	<b>B1</b> for $212.67 \times 36 (= 7656.12)$
		(ii) 15	3ft	<b>B1</b> for $5280 \times \frac{x}{100}$ soi or their (b)(i)/5280 soi <b>M1</b> for $5280 \times \frac{x}{100} \times 3 =$ their 2376.12 oe
(c)	1625 cao	3	<b>M2</b> for $\frac{30}{130} \times 7040$ oe <b>M1</b> for $130\% = 7040$ soi	
6	(a)	(i) 2.25 isw	2	<b>M1</b> for $(1 \times 8 + 2 \times 17 + 3 \times 12 + 4 \times 3) \div 40$
		(ii) 2 www	1ft	
	(b)	(i) Correct pie chart	3	<b>B2</b> for 2 angles correct or 1 angle correct with all “correct” labels <b>B1</b> for 1 angle correct with wrong or no labels or <b>B1</b> for at least 2 angles calculated
	(ii)	6	1	
7	(a)	(i) 9.6	1	<b>M1</b> for $\frac{9600}{20 \times 30}$
		(ii) 16 cm	2	
		(iii) 2 200 cm <sup>2</sup>	2ft	
	(iv) 191	3	<b>B1</b> for $\pi \times 0.8^2 \times 25$ soi <b>M1</b> for their $(\pi \times 0.8^2 \times 25) \times t = 9600$	
	(b)	(i) 11 or 10.8(3...)	2	<b>B1</b> for figs $\frac{25 \times 26}{2 \times 3}$ soi
	(ii) 0.853 cm	2	<b>M1</b> for $\frac{3 \times 2.6}{4\pi}$	

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8	(a)	15, 8, 3, 0, -1, 0, 3, 8, 15	2	<b>B1</b> for at least 7 correct
	(b)	All points plotted ft and curve drawn	3ft	<b>P2</b> for 9 correct plots ft <b>P1</b> for at least 5 correct ft and <b>C1</b> for a smooth curve dependent on at least <b>P1</b>
	(c)	(i) Correct straight line	2	<b>L1</b> for a correct but short line or with a correct section at least 6cm long but deviates elsewhere.
		(ii) -1	2ft	<b>M1</b> for $x = \frac{y+7}{2}$ soi or $3 = \frac{x+7}{2}$ ft from their line
	(iii) (a) -1.9    2.4 (b) $2x^2 - x - 9 (= 0)$	1ft 2	ft from their graphs <b>M1</b> for $\frac{y+7}{2} = x^2 - 1$ <b>SC1</b> for $x^2 - 0.5x - 4.56$	
9	(a)	(i) 26	1	
		(ii) 11.8	2	<b>M1</b> for $\frac{BC}{\sin \text{their } 26} = \frac{15}{\sin 34}$
	(b)	(i) 104	4	<b>M1</b> for $55^2 + 70^2 \pm 2 \times 55 \times 70 \cos 112$ <b>M1</b> for $\sqrt{55^2 + 70^2 - 2 \times 55 \times 70 \cos 112}$ <b>A1</b> for 10809(.4). or 71.0 <b>SC2</b> for 104 anw
		(ii) (a) 11    14 (b) 71.4	1 2ft	<b>M1</b> for $\frac{1}{2} \times 11 \times 14 \sin 112$ ft from their 11 and 14
	(c) 810	2	<b>B1</b> for use of the factor with figs 25	
10	(a)	(i) $\begin{pmatrix} 14 \\ -4 \end{pmatrix}$	1	
		(ii) 14.6	2	<b>M1</b> for $\sqrt{\text{their } 14^2 + \text{their } (-4)^2}$
		(iii) Convincing demonstration	2	<b>B1</b> for $\overrightarrow{EF} = \begin{pmatrix} 3 \\ 4 \end{pmatrix}$ or $\overrightarrow{HG} = \begin{pmatrix} 3 \\ 4 \end{pmatrix}$
	(b)	Full description	3	<b>B1</b> for enlargement <b>B1</b> for centre (-2, 4) <b>B1</b> for scale factor 2
	(c)	(i) (5, 0) (7,3) (2,3)	2	<b>B1</b> for two correct or <b>M1</b> for $\begin{pmatrix} 5 & 2 \\ 0 & 3 \end{pmatrix} \begin{pmatrix} 1 & 1 & 0 \\ 0 & 1 & 1 \end{pmatrix}$ seen
		(ii) $\frac{1}{15} \begin{pmatrix} 3 & -2 \\ 0 & 5 \end{pmatrix}$	2	<b>B1</b> for determinant 15 or $\frac{1}{15}$ seen or $\begin{pmatrix} 3 & -2 \\ 0 & 5 \end{pmatrix}$ seen Or <b>M1</b> for $\begin{pmatrix} a & b \\ c & d \end{pmatrix} \begin{pmatrix} 5 & 7 & 2 \\ 0 & 3 & 3 \end{pmatrix} = \begin{pmatrix} 1 & 1 & 0 \\ 0 & 1 & 1 \end{pmatrix}$

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<b>11</b>	<b>(a)</b>	3 : 1000	1	
	<b>(b)</b>	<b>(i) (a)</b> 3 www  <b>(b)</b> 487.5 <b>(ii) (a)</b> $x^2 + 34x - 225 = 0$ <b>(b)</b> 5.67            -39.67   <b>(c)</b> 44.0 cao	3  1ft 2 4   1ft	<b>M1</b> for $27 \times 25 \times \frac{15}{10}$ <b>A1</b> for 1012.5 <b>SC1</b> for answer 3 anw ft their <b>(a)</b> $\times 500$ – their 1012.5 <b>M1</b> for $(27 + 3x)(25 + x) = 2 \times 27 \times 25$ oe <b>B1</b> for $p = -34$ and $r = 2$ <b>B1</b> for $q = 2056$ or $\sqrt{q} = 45.3(4\dots)$ or <b>B1</b> for $(x + 17)^2$ <b>B1</b> for 22.67 or 514 <b>B1</b> for one correct final answer or both 5.671... and -39.671...seen (possibly with no working) or both 5.7 and -39.7 <b>SC1</b> + 1 for 5.67 and -39.67 anw  ft $27 + 3 \times$ their +ive $x$ but lost if negative value given as well