

**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	M1 for $\frac{7}{4}Q = P - 15$, or $4P = 7Q + 4 \times 15$ or better SC1 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	B1 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	B1 for one correct factor seen or signs reversed
	(c)	6.2 oe	2	M1 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. M1 for $\tan BAC = \frac{180}{49}$ oe soi
		(ii) 15.2 or 90 – their (a)(i)	1ft	
		(b) (i) 500	2	M1 for $(LP^2 =) 1300^2 - 1200^2$ soi
	(ii)	293 cao	3	M1 for $\sin LPS = \frac{1200}{1300}$ or $\cos LSP = \frac{1200}{1300}$ or for correct use of their (b)(i) A1 for $LPS = 67.4$ cao or $LSP = 22.6$ cao B1 for $360 -$ their LPS or $270 +$ their LSP
	(iii)	9.75	2	M1 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	B2 for $y + y + 90 + x = 180$ or better B1 for $ABO = y$ or $(OAC =) 90$

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4	(a)	(i) P correct	1	In (a) ignore numbers outside the given range B1 for 21 correct B1 for at least two non-empty subsets correct (ignoring the position of 21) If 0 scored then allow SC2 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	B1 for $212.67 \times 36 (= 7656.12)$
		(ii) 15	3ft	B1 for $5280 \times \frac{x}{100}$ soi or their (b)(i)/5280 soi M1 for $5280 \times \frac{x}{100} \times 3 =$ their 2376.12 oe
(c)	1625 cao	3	M2 for $\frac{30}{130} \times 7040$ oe M1 for $130\% = 7040$ soi	
6	(a)	(i) 2.25 isw	2	M1 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	B2 for 2 angles correct or 1 angle correct with all “correct” labels B1 for 1 angle correct with wrong or no labels or B1 for at least 2 angles calculated
	(ii)	6	1	
7	(a)	(i) 9.6	1	M1 for $\frac{9600}{20 \times 30}$
		(ii) 16 cm	2	
		(iii) 2 200 cm ²	2ft	
	(iv) 191	3	B1 for $\pi \times 0.8^2 \times 25$ soi M1 for their $(\pi \times 0.8^2 \times 25) \times t = 9600$	
	(b)	(i) 11 or 10.8(3...)	2	B1 for figs $\frac{25 \times 26}{2 \times 3}$ soi
	(ii) 0.853 cm	2	M1 for $\frac{3 \times 2.6}{4\pi}$	

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8	(a)	15, 8, 3, 0, -1, 0, 3, 8, 15	2	B1 for at least 7 correct
	(b)	All points plotted ft and curve drawn	3ft	P2 for 9 correct plots ft P1 for at least 5 correct ft and C1 for a smooth curve dependent on at least P1
	(c)	(i) Correct straight line	2	L1 for a correct but short line or with a correct section at least 6cm long but deviates elsewhere.
		(ii) -1	2ft	M1 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 M1 for $\frac{y+7}{2} = x^2 - 1$ SC1 for $x^2 - 0.5x - 4.56$	
9	(a)	(i) 26	1	
		(ii) 11.8	2	M1 for $\frac{BC}{\sin \text{their } 26} = \frac{15}{\sin 34}$
	(b)	(i) 104	4	M1 for $55^2 + 70^2 \pm 2 \times 55 \times 70 \cos 112$ M1 for $\sqrt{55^2 + 70^2 - 2 \times 55 \times 70 \cos 112}$ A1 for 10809(.4). or 71.0 SC2 for 104 anw
		(ii) (a) 11 14 (b) 71.4	1 2ft	M1 for $\frac{1}{2} \times 11 \times 14 \sin 112$ ft from their 11 and 14
(c)	810	2	B1 for use of the factor with figs 25	
10	(a)	(i) $\begin{pmatrix} 14 \\ -4 \end{pmatrix}$	1	
		(ii) 14.6	2	M1 for $\sqrt{\text{their } 14^2 + \text{their } (-4)^2}$
		(iii) Convincing demonstration	2	B1 for $\overrightarrow{EF} = \begin{pmatrix} 3 \\ 4 \end{pmatrix}$ or $\overrightarrow{HG} = \begin{pmatrix} 3 \\ 4 \end{pmatrix}$
	(b)	Full description	3	B1 for enlargement B1 for centre (-2, 4) B1 for scale factor 2
	(c)	(i) (5, 0) (7,3) (2,3)	2	B1 for two correct or M1 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	B1 for determinant 15 or $\frac{1}{15}$ seen or $\begin{pmatrix} 3 & -2 \\ 0 & 5 \end{pmatrix}$ seen Or M1 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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11	(a)	3 : 1000	1	
	(b)	(i) (a) 3 www	3	M1 for $27 \times 25 \times \frac{15}{10}$ A1 for 1012.5 SC1 for answer 3 anw
		(b) 487.5	1ft	ft their (a) $\times 500$ – their 1012.5
	(ii)	(a) $x^2 + 34x - 225 = 0$	2	M1 for $(27 + 3x)(25 + x) = 2 \times 27 \times 25$ oe
		(b) 5.67 -39.67	4	B1 for $p = -34$ and $r = 2$ B1 for $q = 2056$ or $\sqrt{q} = 45.3(4\dots)$
				or B1 for $(x + 17)^2$ B1 for 22.67 or 514 B1 for one correct final answer or both 5.671... and -39.671...seen (possibly with no working) or both 5.7 and -39.7 SC1 + 1 for 5.67 and -39.67 anw
		(c) 44.0 cao	1ft	ft $27 + 3 \times$ their +ive x but lost if negative value given as well