

**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 $(OAC =) 90$

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		B1 for areas 20×30 , their 16×20 and their 16×30 ft for $600 + 100 \times$ their (a)(ii)
		(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 (b) 487.5 (ii) (a) $x^2 + 34x - 225 = 0$ (b) 5.67 -39.67 (c) 44.0 cao	3 1ft 2 4 1ft	<p>M1 for $27 \times 25 \times \frac{15}{10}$</p> <p>A1 for 1012.5</p> <p>SC1 for answer 3 anw</p> <p>ft their (a) $\times 500$ – their 1012.5</p> <p>M1 for $(27 + 3x)(25 + x) = 2 \times 27 \times 25$ oe</p> <p>B1 for $p = -34$ and $r = 2$</p> <p>B1 for $q = 2056$ or $\sqrt{q} = 45.3(4\dots)$</p> <p>or</p> <p>B1 for $(x + 17)^2$</p> <p>B1 for 22.67 or 514</p> <p>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</p> <p>SC1 + 1 for 5.67 and -39.67 anw</p> <p>ft $27 + 3 \times$ their +ive x but lost if negative value given as well</p>