

**MARK SCHEME for the May/June 2010 question paper
for the guidance of teachers**

4024 MATHEMATICS (SYLLABUS D)

4024/21

Paper 21, 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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Section A

Qu	Answers	Mark	Comments
1	(a) $f(7) = 1$ as final answer (b) $\frac{t-2}{5} = t$ $t = -\frac{1}{2}$ (c) Attempt to make x the subject $f^{-1}(x) = 5x + 2$	B1 M1 A1 M1 A1 [5]	Forms an equation in t and attempts to solve SC1 for $(x=)5y + 2$
2	(a) $\frac{66-48}{48} (\times 100)$ 37.5% (b) 130% oe soi $\frac{19.5}{1.3}$ o.e (\$)15 (c) (i) \$88 (ii) \$79.20 \$2.8(0) cao	M1 A1 M1 M1 A1 B1 B1√ft B1 [8]	Accept –2.8
3	(a) Rectangle 13 cm by 8 cm (b) (i) Constructs perpendicular bisector of ZY Arc of circle radius 9 centre X (ii) Labels the correct region (c) (i) P and Q correctly positioned (ii) (a) 42 ± 1 m cao (b) $107^\circ (\pm 2^\circ)$ cao	B1 B1 B1 B1 B1ft B1 B1 [7]	to cross rectangle across rectangle No need to shade – but must be correct Dep on correct P and Q

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7	(a) Mid value used o.e. Sum of (value × frequency) / 80 3.45 (hours)	M1 M1 A1	
	(b) 73, 78	B1	
	(c) Correct scale, points correct and smooth curve	S1 P1 C1	Minus 1 each error P1 for 5 plots which could form ogive C1 reasonable curve
	(d) (i) 3.3 (hours)	B1ft	Read at 40 ft within 0.1
	(ii) Upper quartile and lower quartile used 2.5 (hours)	M1 A1ft[10]	Upper quartile – 2 ft within 0.1

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Section B

Qu	Answers	Mark	Comments
8	(a) $p = -2.6$ stated	B1	Lost for ruled lines, incomplete, very thick
	(b) Scales	S1	
	Five points plotted ft Smooth curve	P1ft C1	
	(c) $x = 2.55$ to 2.65	X1	
	(d) (i) $y = x$	L1	
	(ii) Line drawn and attempt to read at intersect $x = 2.4(0)$ to $2.5(0)$	M1 A1	
	(e) -4	G1	
	(f) (i) Correct line drawn	T1	
	(ii) $(0, 12)$	Y1ft	
	(iii) $y = -4x + 12$	E1ft [12]	
9	(a) (i) $\frac{90}{360} \times \pi \times 16$	M1	Correct formula and 90° used
	+16	M1	Indep. Attempt to add $2 \times$ radius
	28.56 to $28.6(0)$ cm	A1	
	(ii) $\frac{90}{360} \times \pi \times 8^2$	M1	Area of cross-section
	[Their $\frac{90}{360} \times \pi \times 8^2$] $\times h$	M1	Indep. Forms equation
	$= 800$ soi		
	$h = 15.9(0)$ to 15.92 cm	A1	
	(b) (i) (a) $MN = 2x$	B1	Expect justification and a subtraction
	(b) Area of triangle = $\frac{1}{2}$ their $(2x \times x)$	M1	
	Area of sector = 16π and Subtraction	A1	
	(ii) $20(16\pi - x^2) = 800$	M1	Forms equation
	$x^2 = 10.2...$ to 10.3	A1	Correct method of solution
	$x = 3.2(0)$ to 3.21 cm	A1 [12]	

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10	(a) (i) 140°	B1	Correct method leading to solution
	(ii) $\frac{6 \times 180 - 4 \times 140}{4}$ or $3 \times 180 - 410$ or $180 - 50$ oe 130°	M1 A1	
	(b) (i) $\tan 40^\circ = \frac{CT}{23}$ oe $CT = 19.29$ to $19.3(0)$ cm	M1 A1	
	(ii) 73×39.3 or 50×39.3 $\frac{1}{2} \times 23 \times (\text{their } CT)$ or $\frac{1}{2} (20 + 20 + \text{their } CT) \times 23$ 2640 to 2650 cm^2	M1 A1	Accept $20 +$ their CT for 39.3
	(iii) 10560 to 10600	B1ft	$4 \times$ their (b)(ii)
	(iv) (a) 146 cm 79 cm	B1 B1ft	$40 + 2 \times$ their (b)(i) rounded up
	(b) 930 to 980 cm^2 cao	B1 [12]	
11	(a) (i) $\begin{pmatrix} 6 \\ -5 \end{pmatrix}$	B1	Accept $-\frac{6}{5}$ but not $6, -5$ or $(6, -5)$
	(ii) Enlargement Scale factor $\frac{1}{2}$ Centre $(4, 1)$	M1 A1 A1	A1 and A1 not lost if transformation stated, when SC1 SC1 scored
	(iii) Shear	B1	
	(iv) $y = x (+ c)$ $y = x + 1$	M1 A1	Knowing the equation has gradient 1
	(b) (i) x -coordinate $-q$ y -coordinate $-p$	B1 B1	SC1 for $\begin{pmatrix} -q \\ -p \end{pmatrix}$
	(ii) x -coordinate q y -coordinate $-p$	B1 B1	SC1 for $\begin{pmatrix} q \\ -p \end{pmatrix}$
	(iii) $\mathbf{W} = \begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$	B1 [12]	

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12	(a) (i) $p - q$	B1	Correct method
	(ii) $\frac{1}{2}(p - q) + \frac{1}{4}p$	M1	
	$\frac{3}{4}p - \frac{1}{2}q$ cao	A1	
	(b) (i) (a) $\frac{1}{2} \times 24 \times 17 \times \sin 55^\circ$	M1	Correct formula and sign and correct algebra soi SC1 for 396 to 397 seen
	167 to 167.5cm²	A1	
	(b) Attempt at cosine rule	M1	
	$XY^2 = 865 - 816 \cos 55$	M1	Value of 6 and correct use of Pythagoras
	19.9 to 19.93 (cm)	A2	
	(ii) (a) $VZ^2 = 15^2 - 6^2$	M1	
	$VZ = 13.7$ to 13.75 cm	A1	
	(b) 766 cm³ (Accept 762 – 766)	B1ft [12]	ft $\frac{1}{3} \times$ their (b)(i)(a) $\times$ their (b)(ii)(a)