

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
GCE Ordinary Level

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

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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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4	(a) $\frac{4(2x-1)-3(x+3)}{(x+3)(2x-1)}$	M1	Single fraction. Brackets not essential. Multiplies the first fraction by $(2x-1)$ and the second fraction by $(x+3)$ Multiplies out the numerator with at least 1 pair of terms correct s.o.i. or used SC1 for both 3.0 to 3.1 and -1.7 to -1.74 seen
	$\frac{8x-4-3x-9}{(x+3)(2x-1)}$	M1	
	$\frac{5x-13}{(x+3)(2x-1)}$ oe as final answer	A1	
	(b) Squares both sides of the equation	M1	
	$m = \frac{k^2 - 3n}{2l}$ as final answer	A1	
	(c) For num $\frac{p \pm \sqrt{q}}{r}$		
	$p = 4$ and $r = 6$	B1	
	$q = 208$ or $\sqrt{q} = 14.4...$	B1	
	$x = 3.07,$ $x = -1.74$ Final answers	B1 B1	
		[9]	
5	(a) (i) $p = 0.5, q = 0.2$ $r = 0.3$	B1 B1	Can be implied by $x + 2x + 54 = 78$
	(ii) (a) 0.25	B1	
	(b) 0.5×0.2 seen 0.2	M1 A1	
	(b) (i) 17	B1	
	(ii) $78 - 54$ soi $x = 8$	M1 A1	
		[8]	
6	(a) Either 136° or 44° correct Other one correct	B2 B1ft	After B0, allow SC1 for $\widehat{ACO} = 22^\circ$, $\widehat{ABC} = 68^\circ$, $\widehat{AEC} = 68^\circ$ or for sum = 180° . Dep
	(b) $\widehat{ABC} = 68^\circ$, $\widehat{BAC} = 44^\circ$ and $\widehat{BCA} = 68^\circ$ Isosceles triangle	B1 B1	
		[5]	

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

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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 167.5cm ²	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 cm ³ (Accept 762 – 766)	B1ft [12]	ft $\frac{1}{3} \times$ their (b)(i)(a) $\times$ their (b)(ii)(a)