

JUNE 2004

INTERNATIONAL GCSE

MARK SCHEME

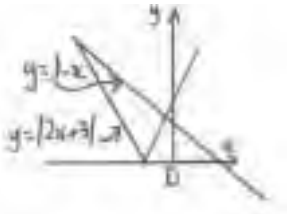
MAXIMUM MARK: 80

SYLLABUS/COMPONENT: 0606/01

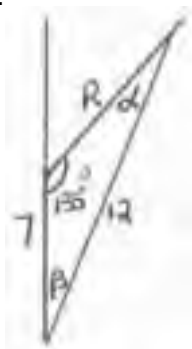
**ADDITIONAL MATHEMATICS
Paper 1**



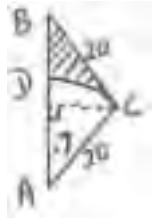
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1. (i) $y = (3x-2) \div (x^2+5)$ $dy/dx = \frac{(x^2+5)3 - (3x-2)2x}{(x^2+5)^2}$ (ii) Num = $15 + 4x - 3x^2 = 0$ when $\rightarrow x = -5/3$ or $x = 3$	M1 A1 M1 A1 [4]	Formula must be correct - allow unsimplified. Setting to 0 + attempt to solve. Both correct.
2. $x^3 = 5x-2$ $x^3 - 5x + 2 = 0$ Tries to find a value $x = 2$ fits $\div (x-2) \rightarrow x^2 + 2x - 1 = 0$ Solution $\rightarrow x = -1 \pm \sqrt{2}$	M1 A1 M1 DM1 A1 [5]	Equating + attempt at a value by TI Co - allow for $(x-2)$ or for $f(2)$ Must be $\div$ by $(x-\text{his value})$ As by quadratic scheme Co
3. (i)  $y = 2x+3$ -ve then +ve slope Vertex at $(-h, 0)$ $y = 1 - x$ Line, -ve m, $(k, 0)$ (ii) $x + 2x + 3 = 1 \rightarrow x = -2/3$ $(-0.65 \text{ to } -0.70)$ $x - (2x+3) = 1 \rightarrow x = -4$ $(-3.9 \text{ to } -4.1)$	B1 DB1 B1 [3] B1 M1 A1 [3]	Must be 2 parts – ignore -2 to -1 V shape-Vertex on -ve x-axis + lines -ve slope, crosses axes at x,y +ve – allow if only in 1st or 2nd quadrants From graph, or calculation or guess B2 if correct. M mark for any method. Squares both sides M1 quadratic A1 Answers A1
4. $x = \text{asin}(bx)+c$ (i) $a = 2$ and $b = 3$ (ii) $c = 1$ (iii) 3 cycles (0 to 360) -1 to 3  Period 120° + all correct.	B1 B1 B1 B1 B1 DB1 [6]	Wrong way round - no marks. No labels - allow B1 if both correct. Co Even if starting incorrectly. Needs to be marked - allow for any trig graph. Everything in relatively correct position - needs both B's

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5. $xy + 24 = 0$ and $5y + 2x = 1$ Makes x or y the subject and subs $\rightarrow 5y^2 = y + 48$ or $2x^2 - x = 120$ Solution of quadratic = 0 $\rightarrow (8, -3)$ and $(-7.5, 3.2)$ $d = \sqrt{(15.5^2 + 6.2^2)} = 16.7$	M1 A1 DM1 A1 M1 A1 $\checkmark$ [6]	x or y removed completely – condone poor algebra. A1 co. By scheme for quadratic = 0 Co M mark ind of anything before. A1 $\checkmark$ on his 2 points.
6. $(300 \ 240) \begin{pmatrix} .6 & .3 & .1 \\ .5 & .4 & .1 \end{pmatrix} \begin{pmatrix} 4 \\ 6 \\ 8 \end{pmatrix}$ $\left[\text{or } (4 \ 6 \ 8) \begin{pmatrix} .6 & .5 \\ .3 & .4 \\ .1 & .1 \end{pmatrix} \begin{pmatrix} 300 \\ 240 \end{pmatrix} \right]$ $(300 \ 186 \ 54) \begin{pmatrix} 4 \\ 6 \\ 8 \end{pmatrix} \text{ or } (300 \ 240) \begin{pmatrix} 5 \\ 5.2 \end{pmatrix}$ Final answer $\rightarrow \\$2748$	B2, 1.0 M1 A1 M1 B1 [6]	For 3 correct matrices – independent of whether they are conformable – allow with or without the factor of 100. 1st product. Co. Matrices must be written in correct order – for M mark, the 2x3 or 3x2 must be used. 2nd product. By any method, inc numerical. Omission of 100 loses last B1 only.
7.  $\frac{\sin \alpha}{7} = \frac{\sin 135}{12}$ $\rightarrow \alpha = 24.4^\circ$ = 20.6°. Bearing is 020.6°	B1 M2 A1 A1 [5]	Correct triangle of velocities - must be 7, 12 and 135° opposite 12. Sine rule used in his triangle. If 45° or 135° between 7 and 12, allow M1 for cos rule, M1 for sine rule Co. Co. Allow 21°.

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8. $y = (ax+3)\ln x$ On x-axis, $y = 0$ $ax + 3 = 0 \rightarrow x$ is -ve $\rightarrow$ no soln But $\ln x = 0 \rightarrow x = 1$ $dy/dx = a\ln x + (ax+3).(1/x)$ Use of $m_1 m_2 = -1$ Gradient of tangent = $-1 \div (-1/5)$ $\rightarrow a = 2$	M1 A1 M1 B1 M1 A1 A1 [7]	Needs an attempt at solution. Ignore other solutions at this stage. Correct use of "uv" formula. For $d/dx(\ln x)$, even if M0 given above. Could equate m with $-1 \div (dy/dx)$ Co. Co.
9. (a) $\left(x - \frac{1}{2x^5}\right)^{18}$ ${}^{18}C_{15} (x)^{15} (1/2x^5)^3$ $\rightarrow 18.17.16(-1/8) \div 6$ $\rightarrow -102$ (b) $(1 + kx)^n$ Coeff of $x^2 = {}_nC_2 k^2$ Coeff of $x^3 = {}_nC_3 k^3$ Equating and changing to factorials $\rightarrow k = 3/(n-2)$ or equivalent without factorials	B1 B1 B1 [3] B1 B1 M1 A1 [4]	For ${}^{18}C_3$ or ${}^{18}C_{15}$ For $(\pm 1/2)^3$ – even if in $(1/2x)^3$ Co Co. Co. Needs attempt at nCr Co
10. (i) Area = Δ – sector BCA = $\pi - 1.4$ or height = $20\sin 0.7$ $\Delta = \frac{1}{2} \cdot 20^2 \sin(\pi - 1.4)$ or $\frac{1}{2}bh = 197.1$  Sector = $\frac{1}{2}20^2 \cdot 0.7 = 140$ $\rightarrow$ Area = 57.1 (ii) DC = $20 \times 0.7 (=14)$ AB = $2 \times 20\cos 0.7$ or cos rule BD = AB – 20 = 10.6 $\rightarrow$ Perimeter = 44.6 Could be [5] + [3] if AB used in part (i)	M1 M1 M1 A1 [4] M1 M1 M1 A1 [4]	Award for either of these. Correct method for area of Δ Use of $\frac{1}{2}r^2\theta$ Co Use of $s = r\theta$ Correct trig – could gain this in (i) Co

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11. (i) $m = -a/x^3 \rightarrow y = \frac{1}{2}ax^{-2} (+c)$ Puts in (2, 3.5) $\rightarrow 28 = a + 8c$ Puts in (5, 1.4) $\rightarrow 70 = a + 50c$ Solution $\rightarrow a = 20, c = -1$ (ii) $\int (10x^{-2} + 1)dx = -10x^{-1} + x$ $A = []^p - []^2 = -10/p + p + 3$ $B = []^5 - []^p = 10/p - p + 3$ $P = \sqrt{10}$ or 3.16	M1 A1 DM1 M1 A1 [5] M1 A1√ M1 M1 A1 [5]	Any attempt to integrate. Co. Substitutes one of his points – even if +c missing Correct method of soln. Both co. (beware fortuitous ans. $a = 20$ given) N.B: assumes $a = 20$ without checking that both points work (M1A0DM1M0A1) Integrates his "curve" Use of limits correctly in either A or B or in A+B (2 to 5). Award M1 for each. (Can get these if only one integration) co
12 EITHER 12 questions – 3 trig, 4 alg, 5 calc Answer 8 from 12. (a) (i) ${}_{12}C_8 = 495$ (ii) T and A $\rightarrow 0$ T and C $\rightarrow 1$ A and C $\rightarrow 9$ Total = 10 8 dresses, A $\rightarrow$ H (b) (i) ${}_8P_5 = 6720$ (ii) $\frac{1}{8}$ of (i) = 840 or ${}_7P_4$ (iii) $\frac{5}{8}$ of (i) = 4200 or 5 x (ii) or ${}_8P_5 - {}_7P_5$	M1 A1 M1 A1 [4] M1 A1 M1 A1√ M1 A1√ [6]	${}_{12}C_8$ gets M1. Answer only gets both marks. Needs to have considered 2 of the possibilities. Must be ${}_8P_5$ for M1 – co for A1. Any method ok. √ on (i) if appropriate Any method ok. √ on (i) or (ii)

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12 OR							
x	2	4	6	8	10		
y	9.8	19.4	37.4	74.0	144.4		
lgy	0.99	1.29	1.57	1.87	2.16		
(i) Finds values of lgy Draws graph accurately. (ii) $lgy = lgA + xlgb$ $m = lgb \rightarrow b = 1.4 (\pm 0.05)$ $c = lgA \rightarrow A = 5.0 (\pm 0.2)$ (iii) $lgy = xlg2$ i.e Straight line $Y = 0.301x$ $x = 4.5 (\pm 0.2)$ Use of simultaneous eqns in part (ii) gets B1 only, unless both points used are on his line, in which case allow marks if to correct accuracy.							
DM 1 for quadratic equation. Equation must be set to 0 if using formula or factors.							
<u>Formula</u> Must be correct – ignore arithmetic and algebraic slips.				<u>Factors</u> Must attempt to put quadratic into 2 factors. Each factor then equated to 0.			