

CAMBRIDGE
INTERNATIONAL EXAMINATIONS

JUNE 2003

INTERNATIONAL GCSE

MARK SCHEME

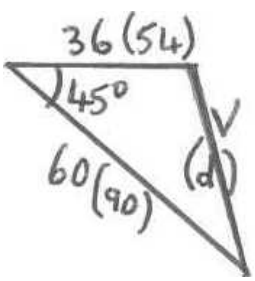
MAXIMUM MARK: 80

SYLLABUS/COMPONENT: 0606/01

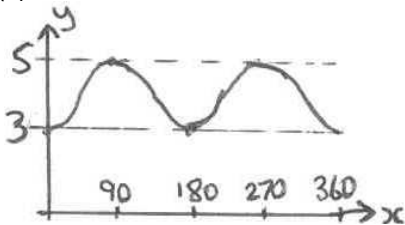
**ADDITIONAL MATHEMATICS
Paper 1**



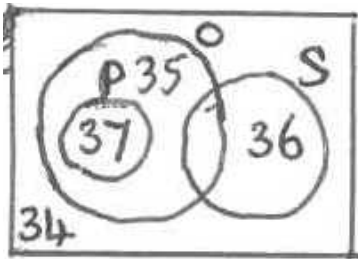
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1. x or y eliminated completely Uses the discriminant b^2-4ac on a quadratic set to 0 Arrives at $k = 0$ from $32k = 0$ Correct answer $k \geq 0$.	M1 M1 A1 A1 [4]	Allow as soon as x or y eliminated. Condone poor algebra – quadratic must be set to 0 – $b^2-4ac = 0, <0, >0$ all ok. For k and 0. For $k \geq 0$.
2. Length = $(1 + \sqrt{6}) \div (\sqrt{2} + \sqrt{3})$ Multiplying top and bottom by $\pm(\sqrt{3} - \sqrt{2})$ $\rightarrow \sqrt{3} + \sqrt{18} - \sqrt{2} - \sqrt{12}$ Reduces $\sqrt{18}$ to $3\sqrt{2}$ or $\sqrt{12}$ to $2\sqrt{3}$ $\rightarrow 2\sqrt{2} - \sqrt{3}$ $\rightarrow \sqrt{8} - \sqrt{3}$	M1 M1 DM1 A1 [4]	Multiply both top and bottom by $\pm(\sqrt{3} - \sqrt{2})$. Allow wherever this comes – not DM. Dependent on first M – collects $\sqrt{2}$ and $\sqrt{3}$. Co.
3. (i) $32 - 80x + 80x^2$ (ii) $(k + x) \times (i)$ Coeff. of x is $-80k + 32$ Equated with $-8 \rightarrow k = \frac{1}{2}$ or 0.5	B1 x 3 M1 A1 [5]	Allow 2^5 for 32 (if whole series is given, mark the 3 terms). Must be 2 terms considered. For solution of $k = (-8 - a) \div (b)$
4. Liner travels 54km or relative speed of lifeboat is 60km/h.  Correct vel./distance triangle Use of cosine rule in triangle $V^2 = 60^2 + 36^2 - 2.60.36\cos 45$ or $d^2 = 90^2 + 54^2 - 2.90.54\cos 45$. $V = 42.9$ or $d = 64.4 \rightarrow V = 42.9$	B1 B1 M1 A1 A1 [5]	Anywhere. Triangle must be correct with 54, 45° , 90 or 36, 45° , 60 or even 36, 45° , 90. Allow for other angles. Unsimplified and allow for 135° as well as 45° . Co.

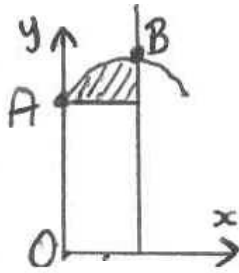
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5. Elimination of x or y. $\rightarrow 4x^2 + 6x - 4 = 0$ or $y^2 - 12y + 11 = 0$ Solution of quadratic = 0. $\rightarrow (0.5, 11)$ and $(-2, 1)$ Length = $\sqrt{(2.5^2 + 10^2)} = 10.3$	M1 A1 DM1 A1 M1A1 [6]	x or y eliminated completely. Correct equation – not necessarily = 0 Usual method for solving quadratic = 0 All correct. Condone incorrect pairing if answers originally correct. Must be correct formula correctly applied.
6. $A^2 = \begin{pmatrix} 2 & -3 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} 2 & -3 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} 4 & -9 \\ 0 & 1 \end{pmatrix}$ $A^{-1} = \frac{1}{2} \times \begin{pmatrix} 1 & 3 \\ 0 & 2 \end{pmatrix}$ $B = A^2 - 4A^{-1} = \begin{pmatrix} 2 & -15 \\ 0 & -3 \end{pmatrix}$	M1A1 B1B1 M1A1 [6]	Do not allow M mark if all elements are squared. If correct, allow both marks. If incorrect, some working is needed to give M mark. B1 for $\frac{1}{2}$, B1 for matrix. M mark is independent of first M. Allow M mark for $4A^{-1} - A^2$.
7. $f(x) = 4 - \cos 2x$ (i) amplitude = ± 1. Period = 180° or π (ii)  Max $(90^\circ, 5)$ and $(270^\circ, 5)$	B1B1 B2,1 B1B1 [6]	Independent of graph. Do not allow "4 to 5". Must be two complete cycles. 0/2 if not. Needs 3 to 5 marked or implied. Needs to start and finish at minimum. Needs curve not lines. Independent of graph (90, 270 gets B1). Allow radians or degrees.

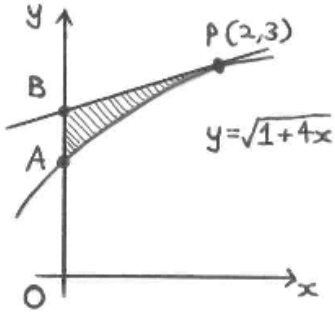
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8.  (i) O, P, S correct (ii) 34, 35, 36, 37 correct $O \cap S = \text{odd squares} \rightarrow 4$ $O \cup S = \text{odd and even squares}$ $\rightarrow 49 + 5 = 54$	B2,1 B2,1 B1 M1A1 [7]	Give B1 if only one is correct. These 2 B marks can only be awarded only if B2 has been given for part (i). Co. Any correct method. Co.
9. (i) $\log_4 2 = \frac{1}{2}$ $\log_8 64 = 2$ $\rightarrow 2x + 5 = 9^{1.5} \rightarrow x = 11$ (ii) Quadratic in 3^y Solution of quadratic = 0 $\rightarrow 3^y = 5 \text{ or } -10$ Solution of $3^y = k$ $y = 1.46 \text{ or } 1.47$	B1B1 M1A1 M1 DM1 M1 A1 [8]	Anywhere. Forming equation and correctly eliminating "log". Co. Recognising that the equation is quadratic. Correct method of solving the equation = 0. Not dependent on first M1. Correct method. Co. (not for $\log 5 \div \log 3$). Ignore ans from $3^y = -10$.

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10.	<table><tr><td>x</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr><tr><td>y</td><td>9.2</td><td>8.8</td><td>9.4</td><td>10.4</td><td>11.6</td></tr><tr><td>xy</td><td>18.4</td><td>26.4</td><td>37.6</td><td>52.0</td><td>69.6</td></tr><tr><td>x²</td><td>4</td><td>9</td><td>16</td><td>25</td><td>36</td></tr></table> (i) Plots xy against x² or x² against xy to get a line c = 12 to 12.5 or -7.25 to -7.75 m = 1.55 to 1.65 or 0.62 to 0.63 xy = 1.6x² + 12 or x² = 0.625xy - 7.5 → y = 1.6x + 12/x (ii) Reads off at xy = 45 → x = 4.5 to 4.6	x	2	3	4	5	6	y	9.2	8.8	9.4	10.4	11.6	xy	18.4	26.4	37.6	52.0	69.6	x ²	4	9	16	25	36	M1 A2,1 B1 B1 M1 A1 M1A1 [9]	Knows what to do. Points accurate – single line with ruler Allow if y = mx + c used. Allow if y = mx + c used. Must be xy = mx² + c or x² = mxy + c. Algebra is also ok as long as xy = 45 is solved with an equation given M1 above.
x	2	3	4	5	6																						
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11. y = xe ^{2x}	(i) d/dx(e^{2x}) = 2e^{2x} dy/dx = e^{2x} + x.2 e^{2x} sets to 0 → x = -0.5 (ii) d²y/dx² = 2 e^{2x} + [2 e^{2x} + 4x e^{2x}] = 4 e^{2x}(1 + x) → k = 4 (iii) when x = -0.5, d²y/dx² is +ve (0.74) → Minimum	B1 M1 M1A1 M1A1 A1 M1A1 [9]	Anywhere – even if dy/dx = 2x e^{2x} or 2 e^{2x}. Use of correct product rule. Not DM mark. Allow for stating his dy/dx = 0. Use of product rule needed. Allow if he reaches 4e^{2x}(1 + x). No need for figures but needs correct x and correct d²y/dx².																								
12. EITHER	 At A, y = 4 dy/dx = 2cosx - 4sinx dy/dx = 0 when tanx = ½ At B, x = 0.464 or 26.6°	B1 M1A1 M1A1 A1	Anywhere. Any attempt at differentiation. Sets to 0 and recognises need for tangent. Co. Accept radians or degrees here.																								

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$\int (2\sin x + 4\cos x)dx = -2\cos x + 4\sin x$ Area under curve = $[]_{0.464} - []_0$ $\rightarrow -(-2) = 2.$ Reqd area = $2 - (4 \times 0.464) = 0.144$ (5 or 6).	M1A1 DM1 M1A1 [11]	Any attempt with trig. functions. x-limits used correctly. If “0” ignored or automatically set to 0, give DM0. Plan mark – must be radians for both M and A.
12. OR  $dy/dx = \frac{1}{2}(1+4x)^{-\frac{1}{2}} \times 4$ At P, $m = \frac{2}{3}$ Eqn of tangent $y - 3 = \frac{2}{3}(x - 2)$ At B, $x = \frac{1}{3}$ $\int \sqrt{1+4x}dx = (1+4x)^{1.5} \times \frac{2}{3} \div 4$ Area under curve = $[]^2 - []^0 = 4\frac{1}{3}$ Shaded area = Area of trapezium - $4\frac{1}{3} = \frac{1}{3}$ Or Area under $y = \frac{2}{3}x + \frac{1}{3} - 4\frac{1}{3} = \frac{1}{3}$ [or $\int xdy = \int (\frac{1}{4}y^2 - \frac{1}{4})dy$ $= \frac{y^3}{12} - \frac{y}{4}$ area to left of curve = $[]_3 - []_1 = \frac{1}{3}$ shaded area = $\frac{1}{3} - \text{triangle } (\frac{1}{2} \cdot 2 \cdot \frac{1}{3})$ $= \frac{1}{3}$]	M1A1 M1A1 M1A1 A1 DM1A1 M1 A1 [M1A1 A1 DM1A1 M1 A1] [11]	Any attempt with dy/dx – not for $\sqrt{1+4x} = 1 + 2\sqrt{x}$. A mark needs everything. Not for normal. Not for “ $y + y_1$ ” or for m on wrong side. Allow A for unsimplified. Any attempt at integration with $(1+4x)$ to a power. Other fn of x included, M1 only. Use of limits 0 to 2 only. Must attempt a value at 0. Plan mark independent of M marks. A1 co. Attempt at differentiation. A1 for each term. Must be limits 1 to 3 used correctly. Plan mark independent of other Ms.
DM1 for quadratic equation. Equation must be set to 0. Formula – must be correctly used. Allow arithmetical errors such as errors over squaring a negative number. Factors – must be an attempt at two brackets. Each bracket must then be equated to 0 and solved. Completing the square – must result in $(x \pm k)^2 = p$. Allow if only one root considered.		