UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

Pre-U Certificate

MARK SCHEME for the May/June 2012 question paper

for the guidance of teachers

1347 MATHEMATICS (STATISTICS WITH PURE MATHEMATICS)

1347/01 Paper 1 (Pure Mathematics), maximum raw mark 65

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.

Mark schemes must be read in conjunction with the question papers and the report on the examination.

- Cambridge will not enter into discussions or correspondence in connection with these mark schemes.

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Note: since there were no candidates this session, this mark scheme is a draft, and has not been modified in light of candidates' responses.

1 **(i)**	$y = (x-3)^2 - 11$	B1 B1 **[2]**	Or $a = 3$, $b = 11$. B1 each.
(ii)	-11; $x = 3$	B1√ B1√ **[2]**	Minimum value their $-b$ $x =$ their a
(iii)	Translation 3 in x-direction, 11 in negative y-direction	M1 A1√ **[2]**	"Translation" mentioned Both fully correct, √ on a, b
2 **(i)**	$y' = 10x - 3x^2$	M1 A1 **[2]**	One correct term; completely correct
(ii)	$m = -8$ Through (4, 9) $y = -8x + 41$	M1 B1 A1 **[5]**	Substitute $x = 4$ to get numerical answer This point identified CAO, any simplified form
3	$32 + 80x + 80x^2 + 40x^3 + 10x^4 + x^5$ $32 - 80x + 80x^2 - 40x^3 + 10x^4 - x^5$ $64 + 160x^2 + 20x^4$	M1 A1 A1 **[3]**	At least one ${}^nC_r$, x^5 and 2^5 Both expansions fully correct Fully simplified answer, can imply M1 A1 cwo
4	$y = 2x^2 + 3x + c$ Use $x = 2$, $y = 19$ to find c $y = 2x^2 + 3x + 5$	M1 A1 M1 A1 **[4]**	Integrate to get at least 1 correct term Both x terms correct and $+ c$ or equivalent Valid method for c Allow "$c = 5$" if $y = 2x^2 + 3x + c$ seen
5	$\ln[(x+1)\times(x-1)]$ $\ln x^2$ $\ln\left(\frac{(x+1)(x-1)}{x^2}\right)$	M1 A1 A1 **[3]**	One law of logs correctly applied Another law correctly applied Fully correct, any equivalent simplified form
6	$\frac{dC}{dt} = 800 - 20000t^{-2}$ $= 0$ and solve to get $t = 5$ $C = 8000$ E.g. $\frac{d^2C}{dt^2} = 40000t^{-3} > 0$	M1 A1 A1 A1 B1 **[5]**	Differentiate at least one term correctly Both correct, aef Solve quadratic, $t = 5$ (or -5, ignore) Substitute into C equation to get (£)8000 and no other solution Correctly show minimum, cwo
7 **(i)**	$xy = 12000$, $x + y = 230$ $x(230 - x) = 12000$ $x^2 - 230x + 12000 = 0$ 150 or 80 Dimensions 150×80	B1 M1 A1 A1 A1 **[5]**	Both equations, allow $2x + 2y = 460$ Algebraic method for solution Correct quadratic equation in one variable At least one solution Correct answer, both (not "or")
(ii)	$x(q - x) = 12000$ $(q = P/2)$ $x^2 - xq + 12000 = 0$ $q^2 \geq 4 \times 12000$ $P = 2q \geq 2\sqrt{48000} = 80\sqrt{30}$	M1 A1 M1 A1 **[4]**	Quadratic equation with P or equiv Correct quad = 0, e.g. $2x^2 - Px + 24000 = 0$ Use $b^2 \geq 4ac$, or $b^2 - 4ac$, allow = here Correctly obtain AG, $P \geq 80\sqrt{30}$, "cannot be less than" must be justified

8 **(i)**	$x^4 - 10x^2 + 9 = 0$ $(x^2 - 1)(x^2 - 9) = 0$ $x = 1, 3,$ $-1, -3$	B1 M1 A1 A1 **[4]**	Turn into this quartic or equiv Solve quadratic in x^2 Only positive answers 1, 3 [**AG**]; –1, –3 and nothing else
(ii)	$\int_1^3 \frac{10}{x} - \frac{9}{x^3}\,dx = \left[10\ln x + \frac{9}{2x^2}\right]_1^3$ $\int_1^3 x\,dx = 4$, e.g. trapezium Difference = 10ln3 – 8	M1 B1 M1 A1 A1 **[5]**	Attempt to integrate fn, limits 1 and 3 Correct indefinite integral, allow $(9/2)x^{-2}$ Correctly deal with straight line part 10ln3 – 4 or 4, can be implied, needs M2 Final answer, any *exact* equivalent, not –
9 **(a)**	$15 + 15 \times \frac{2\times4}{5} + ... + 15 \times \frac{5\times1}{5}$ = 105	M1 A1 **[2]**	Evidence for at least 2 correct terms, added, e.g. 15 + 24 + 27 + 24 + 15 Answer 105 only
(b) **(i)**	$a = 15$ $b = 1.04$	B1 B1 **[2]**	 Allow 1.040001 or more SF
(ii)	ln(20/15) ÷ ln(1.04) = 7.33	M1 A1 **[2]**	Use ln correctly, their *a*, *b* 7.33 or 7 years 4 months or better [T&I: 7.33 or 7y 4m or better: B2, else B0]
(iii)	$15e^{(\ln 1.04)t}$ or $c = 15$, $k = 0.0392$ $15ke^{kt}$ 0.784(43)(thousand)	M1 M1 M1 A1√ **[4]**	c = their a k = ln (their b) or decimals to 3 SF Correctly differentiate ce^{kt}, numerical c, k In range [0.784, 0.785] or × 1000 or $20k$√
10 **(i)**	(4, 5)	B1 **[1]**	Must be simplified
(ii)	Grad $AC = 2$, so grad $BD = -½$ $y = -½x + 7$	B1 M1 A1 **[3]**	 $-1/(\text{their } m_{AC})$ AEF
(iii)	Solve simultaneously $B(-2, 8)$ $D(10, 2)$	M1 A1 A1 **[3]**	Needs correct substitution/elimination Allow A1 A0 for two correct coordinates
(iv)	$AC = \sqrt{(4^2 + 8^2)}$ [$=\sqrt{80}$] $BM = \sqrt{(6^2 + 3^2)}$ [$=\sqrt{45}$] $\sqrt{80} \times \sqrt{45}$ = 60	M1 A1 M1 A1 **[4]**	Use Pythagoras once correctly Both answers exact, can be implied Multiply answers, allow × 2 or × ½ Final answer 60, cwo, must be this method