Cambridge Pre-U

Cambridge International Examinations
Cambridge Pre-U Certificate

MATHEMATICS (STATISTICS WITH PURE MATHEMATICS) (SHORT COURSE) **1347/01**

Paper 1 Pure Mathematics **For Examination from 2016**

SPECIMEN MARK SCHEME

1 hour 45 minutes

MAXIMUM MARK: 65

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 3 Pre-U Certificate.

This document consists of **4** printed pages.

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Mark Scheme Notes

Marks are of the following three types:

M Method mark, awarded for a valid method applied to the problem. Method marks are not lost for numerical errors, algebraic slips or errors in units. However it is not usually sufficient for a candidate just to indicate an intention of using some method or just to quote a formula; the formula or idea must be applied to the specific problem in hand, e.g. by substituting the relevant quantities into the formula. Correct application of a formula without the formula being quoted obviously earns the M mark and in some cases an M mark can be implied from a correct answer.

A Accuracy mark, awarded for a correct answer or intermediate step correctly obtained. Accuracy marks cannot be given unless the associated method mark is earned (or implied).

B Mark for a correct result or statement independent of method marks.

The following abbreviations may be used in a mark scheme:

AG Answer Given on the question paper (so extra checking is needed to ensure that the detailed working leading to the result is valid)
CAO Correct Answer Only (emphasising that no "follow through" from a previous error is allowed)
aef Any equivalent form
art Answers rounding to
cwo Correct working only (emphasising that there must be no incorrect working in the solution)
ft Follow through from previous error is allowed
o.e. Or equivalent

1	**(i)**	$[y = (x-3)^2 - 11]$ $a = 3$ $b = 11$	 B1 B1
	(ii)	-11 (*their* $-b$) $x = 3$ (*their* a)	B1ft B1ft
	(iii)	Translation 3 in x-direction, 11 in negative y-direction (ft on a, b)	M1 A1ft
2	**(i)**	One correct term $y' = 10x - 3x^2$	M1 A1
	(ii)	Substitute $x = 4$ to get numerical answer $m = -8$ Through (4, 9) $y = -8x + 41$	M1 B1 A1
3		At least one ${}^nC_r$, x^5 and 2^5 Both expansions fully correct $64 + 160x^2 + 20x^4$ (Fully simplified answer, can imply M1 A1 cwo)	M1 A1 A1
4		Integrate to get at least 1 correct term Both x terms correct and $+ c$ or equivalent Use $x = 2$, $y = 19$ to find c $y = 2x^2 + 3x + 5$ (Allow "$c = 5$" if $y = 2x^2 + 3x + c$ seen)	M1 A1 M1 A1
5		One law of logs correctly applied Another law correctly applied $\ln\left(\frac{(x+1)(x-1)}{x^2}\right)$ aef	M1 A1 A1
6		Differentiate at least one term correctly $\frac{dC}{dt} = 800 - 20000t^{-2}$ aef $= 0$ and solve to get $t = 5$ (or -5, ignore) Substitute into C equation to get (£)8000 and no other solution Correctly show minimum, cwo E.g. $\frac{d^2C}{dt^2} = 40000t^{-3} > 0$	M1 A1 A1 A1 B1
7	**(i)**	$xy = 12000$, $x + y = 230$ Both equations, allow $2x + 2y = 460$ Algebraic method for solution $x(230 - x) = 12000$ $x^2 - 230x + 12000 = 0$ 150 or 80 (At least one solution) Dimensions 150 × 80 CAO	 B1 M1 A1 A1 A1
	(ii)	Quadratic equation with P or equiv (e.g. $q = P/2$) Correct quad = 0, e.g. $2x^2 - Px + 24000 = 0$ $q^2 \geqslant 4 \times 12000$ $P = 2q \geqslant 2\sqrt{48000} = 80\sqrt{30}$ Correct quad = 0, e.g. $2x^2 - Px + 24000 = 0$ Correctly obtain AG, $P \geqslant 80\sqrt{30}$, "cannot be less than" must be justified	M1 A1 M1 A1

8	**(i)**	Turn into $x^4 - 10x^2 + 9 = 0$ o.e. Solve quadratic in x^2 $(x^2 - 1)(x^2 - 9) = 0$ $x = 1, 3$, **AG** $-1, -3$ and nothing else	B1 M1 A1 A1
	(ii)	Attempt to integrate function, limits 1 and 3 $\int_1^3 \frac{10}{x} - \frac{9}{x^3}\,dx$ (Correct indefinite integral, allow $(9/2)x^{-2}$) $= \left[10\ln x + \frac{9}{2x^2}\right]_1^3$ $\int_1^3 x dx = 4$, e.g. trapezium Difference = $10\ln 3 - 8$ Final answer, any *exact* equivalent, not negative	M1 B1 M1 A1 A1
9	**(a)**	$15 + 15 \times \frac{2\times4}{5} + ... + 15 \times \frac{5\times1}{5}$ Evidence for at least 2 correct terms, added = 105 CAO	 M1 A1
	(b)(i)	$a = 15$ $b = 1.04$ (Allow 1.040001 or more SF)	B1 B1
	(ii)	ln(20/15) ÷ ln(1.04) 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]	M1 A1
	(iii)	$15e^{(\ln 1.04)t}$ or 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 ft	M1 M1 M1 A1ft
10	**(i)**	(4, 5) (Must be simplified)	B1
	(ii)	Grad $AC = 2$, so grad $BD = -½$ $(-1/(\text{their } m_{AC}))$ $y = -½x + 7$ aef	B1 M1 A1
	(iii)	Solve simultaneously (Needs correct substitution/elimination) $B(-2, 8)$ $D(10, 2)$ (Allow A1 A0 for two correct coordinates)	M1 A1 A1
	(iv)	Use Pythagoras once correctly $AC = \sqrt{(4^2 + 8^2)}$ [$=\sqrt{80}$], $BM = \sqrt{(6^2 + 3^2)}$ [$=\sqrt{45}$] Both answers exact (can be implied) Multiply answers, allow × 2 or × ½ = 60 cwo	M1 A1 M1 A1