CAMBRIDGE INTERNATIONAL EXAMINATIONS

Pre-U Certificate

MARK SCHEME for the May/June 2013 series

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 should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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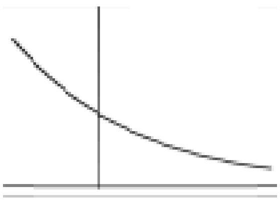
1	**(i)**	$1 - 14x + 84x^2$	M1 A1	 **[2]**	1 and correct method for another term All correct, ignore extra terms
	(ii)	Substitute $x = 1/35$	M1		Subs reasonable x into their answer
		Get 117/175	A1	**[2]**	Or extract fractional equivalent
2	**(i)**		M1 A1	**[2]**	Decreasing curve, not below x-axis Correct including apparently asymptotic to axis to right, allow $x › 0$ only
	(ii)	$\ln y = \ln 2 + 0.7x$	M1		Law of logs used correctly once
		$x = \frac{1}{\ln 0.7}(\ln y - \ln 2)$	A1	**[2]**	Final answer, aef, allow $\log_{0.7}(y/2)$
3	**(i)**	338 350	B1	**[1]**	
	(ii)	1 353 400	B1√	**[1]**	**(i)** × 4, f.t. from **(i)**
	(iii)	338 450	B1√	**[1]**	**(i)** + 100, f.t. from **(i)**
4	**(i)**	$A = 27$	B1		27 seen anywhere
		$k = \frac{1}{2}\ln 1.5$ or 0.203	M1		Rearrange and take ln
			A1	**[3]**	Answer, aeef or a.r.t. 0.203
	(ii)	$12 \times \left(\frac{2}{3}\right)^2$	M1		Or substitute into formula
		$= 5\frac{1}{3}$	A1	**[2]**	Answer, aef, allow 5.33 or better
5	**(i)**		M1		Use $b^2 - 4ac$, 0
		$k^2 - 12k$, 0	A1		This inequality, ae *simplified* f
		$k(k - 12)$, 0	M1		Method for solution (*not* “, 0, , 12”)
		0 , k , 12	A2	**[5]**	One error, A1 only

6	**(i)**	$\sqrt{4^2+2^2}$ $=2\sqrt{5}$	M1 A1	Use Pythagoras Allow $\sqrt{20}$ or exact equivalent
	(ii)	$AC = 2\sqrt{5}-3$	B1√	*Their* (i) – 3 seen [if circle equation used, need to reject $C'(-6 \div \sqrt{5}, 3-6 \div \sqrt{5})$]
		$\frac{1}{2}AD \times \left(2\sqrt{5}-3\right)=22$	M1	Use Δ and make *AD* subject of formula
		$AD=\frac{44}{2\sqrt{5}-3}=\frac{44\left(2\sqrt{5}+3\right)}{11}$ $=12+8\sqrt{5}$	M1 A1√ A1 **[5]**	Multiply by conjugate of $q\sqrt{r}-p$ Correct on *their* (i) if form $q\sqrt{r}-p$ *used* CAO, aef provided of form $a+b\sqrt{c}$ with *a, b, c* integer
7		$\int_1^4 x^{1/2}+\frac{2}{x}\,\mathrm{d}x=\left[\frac{2x^{3/2}}{3}+2\ln x\right]_1^4$ [=7.439] Area of trapezium = 8.25 Difference 0.811 (3 SF)	M1 B1 B1 M1 A1 A1 **[6]**	Attempt to integrate curve, limits 1, 4 One term correct Fully correct indefinite integral Method for trapezium, e.g. integration [*y*-coords 3 and 2.5] 8.25 seen or implied 0.811 or better, final answer +ve $\left[=\frac{43}{12}-2\ln 4\right]$
8	**(i)**	Velocity 20 (+ve *x*) Initial position	B1 B1 **[2]**	One fact about velocity One fact about position
	(ii)	$(20t-250)^2+(15t-500)^2$ $625t^2-25\,000t+312\,500$ **AG**	M1 A1 **[2]**	Use Pythagoras; correctly simplify to **AG**, at least one intermediate line
	(iii)	$625[t^2-40t+500]$ $=625[(t-20)^2+100]$ Minimum distance $\sqrt{625\times100}$ $=250$ Time $t=20$	M1 A1 M1 A1√ A1√ **[5]**	Take out factor and halve *t* term Fully correct, allow 625 omitted Use *their b* $\sqrt{625\times \textit{their } b}$ *their a*

9	**(i)**	$y' = 2x - 3$	M1	Differentiate correctly
		$= 3$	A1	Obtain $m = 3$
		$x = 3 - 3y$	M1	Use $\frac{-1}{m}$ and method for finding q
			A1 **[4]**	Answer, ae simplified f
	(ii)	$y = (3 - 3y)^2 - 3(3 - 3y)$	M1	Subs *their* x or y into quadratic
		or $x^2 - 3x = 1 - \frac{x}{3}$		
		$10y = 9y^2$ or $3x^2 - 8x - 3 = 0$	A1	This equation, ae simplified form
		$\left(-\frac{1}{3}, \frac{10}{9}\right)$	A1	Get $\frac{10}{9}$ or $-\frac{1}{3}$ (with or without others)
			A1 **[4]**	Both coordinates, no others
	(iii)	**(a)** $(5, 0)$, $\left(\frac{5}{3}, \frac{10}{9}\right)$	M1 A1√	Coords translated ±2, x or y: M1
		(b) $(3, 0)$, $\left(-\frac{1}{3}, -\frac{10}{9}\right)$	M1 A1√	Coords reflected, either axis: M1
		(c) $(6, 0)$, $\left(-\frac{2}{3}, \frac{20}{9}\right)$	M1 A1√ **[6]**	× 2 or ÷ 2, any combination: M1 All √ on *their* (ii)
10	**(i)**	$\frac{d^2P}{dv^2} = 6v^2 + 3 - \frac{18}{v^2}$	M1 A1 **[2]**	Differentiate Fully correct
	(ii)	$= 0$ at $6v^4 + 3v^2 - 18 = 0$ $3(2v^2 - 3)(v^2 + 2) = 0$	M1 M1	Polynomial and equate to 0 Method for solving quadratic in v^2
		$v^2 = \frac{3}{2}$	A1	$\frac{3}{2}$ seen or implied
		$v = 1.22\ (474\ldots)$	A1	$v = 1.22$ or better and nothing else
		$P = 22.0\ (454)$	A1 **[5]**	$P = 22.0$ or better
	(iii)	$\frac{d^2P}{dv^2} = 12v + \frac{36}{v^3}$. 0 $\therefore$ minimum	B1 **[1]**	Correctly show minimum, needn't justify ". 0", can use numerical gradients or other complete argument