

**MARK SCHEME for the May/June 2012 question paper
for the guidance of teachers**

9794 MATHEMATICS

9794/01

Paper 1 (Pure Mathematics 1), maximum raw mark 80

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.

Cambridge is publishing the mark schemes for the May/June 2012 question papers for most IGCSE, Pre-U, GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.



Page 2	Mark Scheme: Teachers' version	Syllabus	Paper
	Pre-U – May/June 2012	9794	01

1	(i)	Use of correct sum formula. Obtain correct unsimplified form $\frac{16(1-0.8^{12})}{1-0.8}$ Obtain 74.5 or rounding to 74.5 but not 74 or 75 (74.50244)	M1 A1 A1	[3]	[5]
	(ii)	Use correct formula Obtain 80.	M1 A1	[2]	
2	(i)	$f(1) = 0$ clearly shown. Attempt method for division by $(x-1)$ only Obtain $x^2 - 2x - 15$ Obtain $(x-1)(x+3)(x-5)$	B1 M1 A1 A1	[4]	[6]
	(ii)	State any two correct roots. State $x = -3, 1, 5$	B1 [✓] B1	[2]	
3	(i)	Attempt differentiation of at least one term. Obtain $3x^2 + 2x - 1$	M1 A1	[2]	[6]
	(ii)	State or imply their derivative equal to 0 Attempt to solve quadratic. Obtain $x = -1$ and $1/3$ Obtain $y = 4$ and $\frac{76}{27}$ (= 2.81) NIS	B1 M1 A1 A1	[4]	
4	(i)	Attempt $f(0) = 2$ and $f(1) = -3$ or equiv Conclude correctly.	M1 A1	[2]	[5]
	(ii)	Attempt to use iterative formula and no other method 0.5, 0.3541666, 0.340737425, 0.339926715, 0.339879765, 0.339877052. Conclude 0.3399	M1 A1 A1	[3]	
5	(i)	It is a many-one function or equiv.	B1	[1]	[5]
	(ii)	Attempt to form $gf(x)$ Obtain $7x^2 - 2$ only	M1 A1	[2]	
	(iii)	Attempt to make x the subject. Obtain $\frac{1}{7}(x+2)$ only.	M1 A1	[2]	
6	(i)	State $3 - i$	B1	[1]	[5]
	(ii)	Show $3 + i$ on an Argand diagram Show $3 - i$	B1 B1 [✓]	[2]	
	(iii)	Show $9 + 6i - 1$. $= 8 + 6i$	B1 B1	[2]	

Page 3	Mark Scheme: Teachers' version	Syllabus	Paper
	Pre-U – May/June 2012	9794	01

7	<p>(i) State $1 - (0.5)(2x)$ State $(0.5)(0.5)(-0.5)(2x)^2$ Attempt $\frac{\left(\frac{1}{2}\right)\left(\frac{-1}{2}\right)\left(\frac{-3}{2}\right)}{3!}(\pm 2x)^3$ Obtain $-0.5x^3$</p> <p>(ii) $x < 0.5$ or equiv</p> <p>(iii) Obtain $2 - x$ correctly by partial expansion of their bracket State $a = -2$ correctly by partial expansion of their bracket Attempt to multiply $(2 + x)$ and their expansion. Must show at least 7 terms State $b = -1.5$</p>	<p>B1 B1</p> <p>M1</p> <p>A1 [4]</p> <p>B1 [1]</p> <p>B1 B1 M1 A1 [4]</p>	<p>[9]</p>
8	<p>(i) Attempt to eliminate fractions by choosing suitable x values or sim eqns Obtain $2x + 11 = A(x + 3) + B(2x + 1)$ OR $A + 2B = 2$ and $3A + B = 11$ Obtain $A = 4$ $B = -1$</p> <p>(ii) Attempt integration to obtain at least one \ln term, either $P \ln(2x + 1)$ or $Q \ln(x + 3)$ Obtain $2 \ln(2x + 1) - \ln(x + 3)$ Use limits of 2 and 0 in correct order in any function Attempt use of any log law once on their exact expression Obtain $\ln 15$ NIS</p>	<p>M1</p> <p>A1 A1 A1 [4]</p> <p>M1</p> <p>A1 M1 M1 A1 [5]</p>	<p>[9]</p>
9	<p>(i) Obtain ± 111 anywhere Obtain at least one of $\sqrt{198}$ or $\sqrt{285}$ Attempt $\cos \theta = \frac{\vec{CA} \cdot \vec{CB}}{ \vec{CA} \vec{CB} }$ Obtain $\frac{111}{\sqrt{198} \times \sqrt{285}}$ Obtain 62.14° (62.14276°)</p> <p>(ii) Use 0.5 (their AC)(their CB)$\sin ACB$ Obtain 105</p> <p>(iii) Attempt $\mathbf{b} - \mathbf{a} = \begin{pmatrix} 13 \\ 9 \\ 1 \end{pmatrix} - \begin{pmatrix} 1 \\ 0 \\ 7 \end{pmatrix}$ or $\mathbf{a} - \mathbf{b}$. Obtain $\begin{pmatrix} 12 \\ 9 \\ -6 \end{pmatrix} = 3 \begin{pmatrix} 4 \\ 3 \\ -2 \end{pmatrix}$ or $\begin{pmatrix} -12 \\ -9 \\ 6 \end{pmatrix} = -3 \begin{pmatrix} 4 \\ 3 \\ -2 \end{pmatrix}$ in column vector form or aef Obtain $\mathbf{r} = \mathbf{i} + 0\mathbf{j} + 7\mathbf{k} + \lambda(4\mathbf{i} + 3\mathbf{j} - 2\mathbf{k})$ AG</p>	<p>M1 B1</p> <p>M1</p> <p>A1</p> <p>A1 [5]</p> <p>M1</p> <p>A1 [2]</p> <p>M1</p> <p>A1</p> <p>A1 [3]</p>	<p>[10]</p>

Page 4	Mark Scheme: Teachers' version	Syllabus	Paper
	Pre-U – May/June 2012	9794	01

10 (i)	Write the bracketed expression in terms of sin and cos. $\left(\frac{\cos^2 \theta}{\sin^2 \theta} - \frac{\sin^2 \theta}{\cos^2 \theta}\right)$	M1		
	Sight of $\sin^2 2\theta = k \sin^2 \theta \cos^2 \theta$ Obtain $4(\cos^4 \theta - \sin^4 \theta)$ AG Factorise $\cos^4 \theta - \sin^4 \theta$ State explicitly $\cos^2 \theta + \sin^2 \theta = 1$ to obtain $4 \cos 2\theta$ AG	M1 A1 M1 A1	[5]	
(ii)	Divide by 4 and \cos^{-1} in correct order for at least one angle	M1		
	Divide angles by 2	M1		
	Obtain two angles from correct working	A1		
	Obtain 30, 150, 210 and 330	A1	[4]	[9]

Page 5	Mark Scheme: Teachers' version	Syllabus	Paper
	Pre-U – May/June 2012	9794	01

11 (i)	Use $f' = 1$ and $g = \ln x$ and apply the correct formula for integration by parts Obtain correctly $\int \ln x dx = x \ln x - x + c$ AG	M1 A1	[2]	
(ii) (a)	METHOD 1 INTEGRATION BY PARTS USING $(\ln x)^2$ AS $f' = \ln x$ and $g = \ln x$ Obtain $(\ln x)(x \ln x - x) - \int f(x) dx$ Obtain $g(x) = \int \frac{x \ln x - x}{x} dx$ Attempt to simplify integral and substitute result from (i) Obtain $\int (\ln x - 1) dx = x \ln x - x - x$ and hence $x(\ln x)^2 - 2x \ln x + 2x (+ c)$. METHOD 2 INTEGRATION BY PARTS USING $(\ln x)^2$ AS $1 \times (\ln x)^2$ Obtain $x(\ln x)^2 - \int f(x) dx$ Obtain $g(x) = \int \frac{2x \ln x}{x} dx$ Attempt to simplify integral and substitute result from (i) Obtain $2 \int \ln x dx = 2(x \ln x - x)$ and hence $x(\ln x)^2 - 2x \ln x + 2x (+ c)$. METHOD 3 INTEGRATION BY PARTS TWICE USING $(\ln x)^2 = u^2$ Obtain $u^2 e^u - \int f(x) dx$ Obtain $g(x) = \int 2ue^u du$ Attempt to integrate again Obtain $\int 2ue^u du = 2(ue^u - e^u)$ and hence $x(\ln x)^2 - 2x \ln x + 2x (+ c)$.	B1 B1 M1 A1 B1 B1 M1 A1 B1 B1 M1 A1	[4]	
(ii) (b)	METHOD 1 USING PARTS Attempt integration by parts as $g(x) = \int f(x) dx$ Obtain $(\ln x)(\ln(\ln x)) - \int f(x) dx$ Obtain $g(x) = \int \frac{1}{x} dx$ Obtain $(\ln x)(\ln(\ln x)) - \ln x + c$ Sight of $+ c$ in last two parts METHOD 2 USING SUBSTITUTION Attempt to obtain an integral in u by stating or implying $u = \ln x$ AND $du = \frac{1}{x} dx$ OR $u = \ln x$ AND $x = e^u$ AND $dx = e^u du$ Obtain directly $\int \ln u du$ OR $\int \frac{\ln u}{e^u} e^u du$ and cancel to obtain $\int \ln u du$ Obtain $u(\ln u) - u$ Obtain $(\ln x)(\ln(\ln x)) - \ln x (+ c)$ Use $+ c$ in (b)(i) and (ii)	M1 A1 A1 A1 B1 M1 A1 A1 A1 B1	[5]	[11]