Mathematics FP1

Examiner's use only

Team Leader's use only

1

Past Paper

This resource was created and owned by Pearson Edexcel

6667

Centre No.			Paper Reference				Surname	Initial(s)			
Candidate No.			6	6	6	7	/	0	1	Signature	

Paper Reference(s)

6667/01

Edexcel GCE

Further Pure Mathematics FP1 Advanced/Advanced Subsidiary

Monday 10 June 2013 – Morning

Time: 1 hour 30 minutes

Materials required for examination
Mathematical Formulae (Pink)Items included with question papers
Nil

Candidates may use any calculator allowed by the regulations of the Joint Council for Qualifications. Calculators must not have the facility for symbolic algebra manipulation or symbolic differentiation/integration, or have retrievable mathematical formulae stored in them.

Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, initials and signature. Check that you have the correct question paper.

Answer ALL the questions.

You must write your answer to each question in the space following the question.

When a calculator is used, the answer should be given to an appropriate degree of accuracy.

Information for Candidates

A booklet 'Mathematical Formulae and Statistical Tables' is provided.

Full marks may be obtained for answers to ALL questions.

The marks for individual questions and the parts of questions are shown in round brackets: e.g. (2).

There are 9 questions in this question paper. The total mark for this paper is 75.

There are 32 pages in this question paper. Any blank pages are indicated.

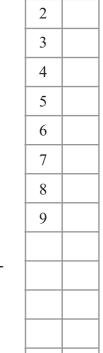
Advice to Candidates

You must ensure that your answers to parts of questions are clearly labelled. You should show sufficient working to make your methods clear to the Examiner. Answers without working may not gain full credit.

This publication may be reproduced only in accordance with Pearson Education Ltd copyright policy. ©2013 Pearson Education Ltd.

Printer's Log. No. P43138A
W850/R6667/57570 5/5/5/5/5





Turn over

Total

PEARSON

Mathematics FP1

www.mystudybro.comThis resource was created and owned by Pearson Edexcel Past Paper

Given that the matrix \mathbf{M} is singular, find the possible values of x .	
	(4)

e.		me	- 2	Λ4	2
ગ	JM	me	ΓZ	UT	- 5

www.mystudybro.com was created and owned by Pearson Edexcel

Question 1 continued	<u> </u>	000
Question 1 continued		Leav
Question 1 continued		blank
		01
		Q1
	(Total 4 marks)	

Mathematics FP1

Past Paper

www.mystudybro.comThis resource was created and owned by Pearson Edexcel

Leave	
hlank	-

		$f(x) = \cos(x^2) - x + 3, \qquad 0 < x < \pi$
	(a)	Show that the equation $f(x) = 0$ has a root α in the interval [2.5, 3]. (2)
	(b)	Use linear interpolation once on the interval [2.5, 3] to find an approximation for α , giving your answer to 2 decimal places.
		(3)
_		

Summer 2013

www.mystudybro.com

t Paper	This resource was created and owned by Pearson Edexcel	66
		Leav blan
Question 2 continue	d	
		Q2
	(Total 5 ma	

Mathematics FP1

■ Past Paper

This resource was created and owned by Pearson Edexcel

6667

Leave blank

3. Given that $x = \frac{1}{2}$ is a root of the equation

$$2x^3 - 9x^2 + kx - 13 = 0, \qquad k \in \mathbb{R}$$

find

(a) the value of k,

(3)

(b) the other 2 roots of the equation.

(4)

-			
-			

Summer 2013

www.mystudybro.com

Paper	This resource was created and owned by Pearson Edexcel	
		Lo bl
Question 3 contin	nued	
		Q3

■ Past Paper

This resource was created and owned by Pearson Edexcel

6667

Leave blank

4. The rectangular hyperbola H has Cartesian equation xy = 4

The point $P\left(2t, \frac{2}{t}\right)$ lies on H, where $t \neq 0$

(a) Show that an equation of the normal to H at the point P is

 $ty - t^3x = 2 - 2t^4$

(5)

The normal to H at the point where $t = -\frac{1}{2}$ meets H again at the point Q.

(b) Find the coordinates of the point Q.

(4)

S Pa

nmer 2013 Paper	www.mystudybro.com This resource was created and owned by Pearson	Mathematics FF Edexcel 66
· 		Leav
Question 4 continued		blan
Question 4 continued		

diffice ZUIS	www.mystudybro.com	Matriciliatics i i i
ast Paper	This resource was created and owned by Pearson Edexcel	6667

Summer 2013

www.mystudybro.con

Paper	This resource was created and owned by Pearson Edexcel	I
Question 4 continued		
		_
		Q

■ Past Paper

This resource was created and owned by Pearson Edexcel

6667

Leave blank

5. (a) Use the standard results for $\sum_{r=1}^{n} r$ and $\sum_{r=1}^{n} r^2$ to show that

$$\sum_{r=1}^{n} (r+2)(r+3) = \frac{1}{3}n(n^2+9n+26)$$

for all positive integers n.

(6)

(b) Hence show that

$$\sum_{r=n+1}^{3n} (r+2)(r+3) = \frac{2}{3}n(an^2 + bn + c)$$

where a, b and c are integers to be found.

(4)

ummer 2013 st Paper	www.mystudybro.com This resource was created and owned by Pearson Edexcel	Mathematic	CS FP 666
Question 5 contin	nued		Leave blank



ulliller 2013	www.iiiystuaybro.com	Matricinatics i i
ast Paper	This resource was created and owned by Pearson Edexcel	66

e.		-	or	20	4	2
ગ	ım	m	er	ZU) [

t Paper	This resource was created and owned by Pearson Edexcel	66
		Leav blan
Question 5 continu	ied	bian
Question e contin		
		Q
		_ []
	(Total 10 ma	ırks) 🔃

Mathematics FP1

■ Past Paper

This resource was created and owned by Pearson Edexcel

Leave blank

6. A parabola C has equation $y^2 = 4ax$, a > 0

The points $P(ap^2, 2ap)$ and $Q(aq^2, 2aq)$ lie on C, where $p \neq 0$, $q \neq 0$, $p \neq q$.

(a) Show that an equation of the tangent to the parabola at P is

$$py - x = ap^2$$

(b) Write down the equation of the tangent at Q.

(1)

(4)

The tangent at P meets the tangent at Q at the point R.

(c) Find, in terms of p and q, the coordinates of R, giving your answers in their simplest form.

(4)

Given that R lies on the directrix of C,

(d) find the value of pq.

(2)

S

nmer 2013 Paper	www.mystudybro.com This resource was created and owned by Pearson Edexcel	Mathematics F
		Lea
Question 6 continu	ued	blas

Julillier ZUIS	www.mystudybro.com	Maniemancs Fr
ast Paper	This resource was created and owned by Pearson Edexcel	66

Question 6 continued	

Sui	mn	۱Δr	201	13
Sui		ıer	ZU	

www.mystudybro.com was created and owned by Pearson Edexcel

apei	This resource was created and owned by Fearson Edexcer	
		Le
		bla
Question 6 continued		
	(Total 11 marks)	

■ Past Paper

This resource was created and owned by Pearson Edexcel

0007

blank

7. $z_1 = 2 + 3i, \quad z_2 = 3 + 2i, \quad z_3 = a + bi, \quad a, b \in \mathbb{R}$

(a) Find the exact value of $|z_1 + z_2|$.

(2)

Given that $w = \frac{z_1 z_3}{z_2}$,

(b) find w in terms of a and b, giving your answer in the form x + iy, $x, y \in \mathbb{R}$

(4)

Given also that $w = \frac{17}{13} - \frac{7}{13}i$,

(c) find the value of a and the value of b,

(3)

(d) find arg w, giving your answer in radians to 3 decimal places.

(2)

Summer 2013

www.mystudybro.com

Guillille 2013	www.iiiystuaybio.com	Mathematics I I I
Past Paper	This resource was created and owned by Pearson Edexcel	6667

Question 7 continued	blank

Julillier Zu i J	www.iiiystuuybio.com	Mathematics FF
Past Paper	This resource was created and owned by Pearson Edexcel	666

Question 7 continued	blank

Summer	201	3
Past Paper		

st Paper	This resource was created and owned by Pearson Edexcel	666
Question 7 continues	4	Leave blank
Question 7 continued	.1	
		Q7
	(Tota	al 11 marks)

Mathematics FP1

Past Paper

This resource was created and owned by Pearson Edexcel

Leave

8.

$$\mathbf{A} = \begin{pmatrix} 6 & -2 \\ -4 & 1 \end{pmatrix}$$

and **I** is the 2×2 identity matrix.

(a) Prove that

$$\mathbf{A}^2 = 7\mathbf{A} + 2\mathbf{I}$$

(2)

(b) Hence show that

$$\mathbf{A}^{-1} = \frac{1}{2}(\mathbf{A} - 7\mathbf{I})$$

(2)

The transformation represented by A maps the point P onto the point Q.

Given that Q has coordinates (2k + 8, -2k - 5), where k is a constant,

(c) find, in terms of k, the coordinates of P.

(4)

S Pa

nmer 2013 Paper	www.mystudybro.com This resource was created and owned by Pearson Edexcel	Mathematics	666 666
•	,		Leave
Question 8 continue	d		blank

Summer 2013 www.mystudybro.com watnemat	CS FP
Past Paper This resource was created and owned by Pearson Edexcel	666

	Leave
Question 8 continued	blank
Question o continueu	

e.		me	- 2	Λ4	2
ગ	ım	me	r Z	UT	1

www.mystudybro.com was created and owned by Pearson Edexcel

	This resource was created and owned by Fearson Edexcer	000
		Leave
		blank
Question 8 continued	d	
		-
		_
		_
		_
		_
		_
		_
		_
		_
		_
		_
		-
		_
		_
		_
		_
		_
		_
		_
		_
		_
		_
		_
		_
		_
		_
		_
		_
		_
		Q8
	(Total 8 marks	_

(5)

■ Past Paper

This resource was created and owned by Pearson Edexcel

6667

Leave blank

9. (a) A sequence of numbers is defined by

$$u_1 = 8$$

 $u_{n+1} = 4u_n - 9n, \quad n \ge 1$

Prove by induction that, for $n \in \mathbb{Z}^+$,

$$u_n = 4^n + 3n + 1 ag{5}$$

(b) Prove by induction that, for $m \in \mathbb{Z}^+$,

$$\begin{pmatrix} 3 & -4 \\ 1 & -1 \end{pmatrix}^m = \begin{pmatrix} 2m+1 & -4m \\ m & 1-2m \end{pmatrix}$$

S

nmer 2013 Paper	www.mystudybro.com This resource was created and owned by Pearson Edexcel	Mathematics	66
	,		Leav
Question 9 continued	I .		blan

Summer 2013	www.mystudybro.com	Mathematics I	-P1
Past Paper	This resource was created and owned by Pearson Edexcel	(6667
		Le	eave

	blank
Question 9 continued	
Anonon's common	

S

nmer 2013 Paper	www.mystudybro.com This resource was created and owned by Pearson Edexcel	Mathematics	66
-1			Leav
Question 9 continue	ed		olan

Sı				20	4	4
ગ	JM	ım	er	ZU) [_

Paper	This resource was created and owned by Pearson Edexcel	6
		Lea
Question 9 continue	d	bla
Question > continue	u	
		_
		_
		_
		-
		_
		-
		_
		-
		_
		_
		_
		_
		_
		_
		_
		_
		-
		_
		_
		_
		_
		_
		_
		_
		_
		_
	(T-4-110)	,
	(Total 10 marks)
		l l
		\mathbf{s}
	TOTAL FOR PAPER: 75 MARK	S