**Summer 2012**
Past Paper

**www.mystudybro.com**
This resource was created and owned by Pearson Edexcel

**Mathematics FP1**
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**

Friday 1 June 2012 – Morning
Time: 1 hour 30 minutes

Examiner's use only

Team Leader's use only

| Question Number | Leave Blank |
| --- | --- |
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
| 8 | |
| 9 | |
| 10 | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| Total | |

**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 10 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.
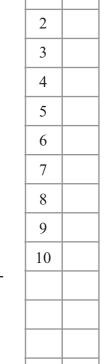
## Advice to Candidates

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.

Printer's Log. No.
**P40688A**

W850/R6667/57570  5/5/4

P 4 0 6 8 8 A 0 1 3 2

*Turn over*

**PEARSON**

Summer 2012
Past Paper

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

Mathematics FP1
6667

Leave blank

1. $$f(x) = 2x^3 - 6x^2 - 7x - 4$$

   (a) Show that $f(4) = 0$

   **(1)**

   (b) Use algebra to solve $f(x) = 0$ completely.

   **(4)**

Summer 2012

Past Paper

www.mystudybro.com

This resource was created and owned by Pearson Edexcel

Mathematics FP1

6667

Leave blank

**Question 1 continued**

Q1

**(Total 5 marks)**

Summer 2012

Past Paper

www.mystudybro.com

This resource was created and owned by Pearson Edexcel

Mathematics FP1

6667

Leave blank

2. (a) Given that

$$A = \begin{pmatrix} 3 & 1 & 3 \\ 4 & 5 & 5 \end{pmatrix} \quad \text{and} \quad B = \begin{pmatrix} 1 & 1 \\ 1 & 2 \\ 0 & -1 \end{pmatrix}$$

find **AB**.

(2)

(b) Given that

$$C = \begin{pmatrix} 3 & 2 \\ 8 & 6 \end{pmatrix}, \quad D = \begin{pmatrix} 5 & 2k \\ 4 & k \end{pmatrix}, \text{ where } k \text{ is a constant}$$

and

$$E = C + D$$

find the value of $k$ for which **E** has no inverse.

(4)

P 4 0 6 8 8 A 0 4 3 2

Summer 2012
Past Paper

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

Mathematics FP1
6667

Leave blank

**Question 2 continued**

**(Total 6 marks)**

Q2

Summer 2012
Past Paper

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

Mathematics FP1
6667

Leave blank

**3.**
$$f(x) = x^2 + \frac{3}{4\sqrt{x}} - 3x - 7, \quad x > 0$$

A root $\alpha$ of the equation $f(x) = 0$ lies in the interval $[3, 5]$.

Taking 4 as a first approximation to $\alpha$, apply the Newton-Raphson process once to $f(x)$ to obtain a second approximation to $\alpha$. Give your answer to 2 decimal places.

**(6)**

P 4 0 6 8 8 A 0 6 3 2

Summer 2012
Past Paper
www.mystudybro.com
This resource was created and owned by Pearson Edexcel
Mathematics FP1
6667

Leave blank

**Question 3 continued**

**(Total 6 marks)**

Q3

**Summer 2012**
Past Paper

**www.mystudybro.com**
This resource was created and owned by Pearson Edexcel

**Mathematics FP1**
6667

Leave
blank

4.  (a)  Use the standard results for $\displaystyle\sum_{r=1}^{n} r^3$ and $\displaystyle\sum_{r=1}^{n} r$ to show that

$$\sum_{r=1}^{n} \left(r^3 + 6r - 3\right) = \frac{1}{4}n^2(n^2 + 2n + 13)$$

for all positive integers $n$.

**(5)**

(b)  Hence find the exact value of

$$\sum_{r=16}^{30} \left(r^3 + 6r - 3\right)$$

**(2)**

P 4 0 6 8 8 A 0 8 3 2

Summer 2012
Past Paper

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

Mathematics FP1
6667

Leave blank

**Question 4 continued**

**Q4**

(Total 7 marks)
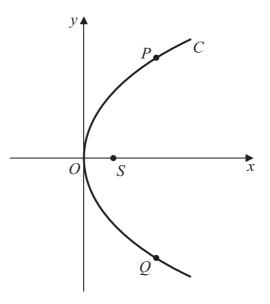
Leave
blank

**5.**



**Figure 1**

Figure 1 shows a sketch of the parabola $C$ with equation $y^2 = 8x$.
The point $P$ lies on $C$, where $y > 0$, and the point $Q$ lies on $C$, where $y < 0$
The line segment $PQ$ is parallel to the $y$-axis.

Given that the distance $PQ$ is 12,

(a) write down the $y$-coordinate of $P$,

**(1)**

(b) find the $x$-coordinate of $P$.

**(2)**

Figure 1 shows the point $S$ which is the focus of $C$.
The line $l$ passes through the point $P$ and the point $S$.

(c) Find an equation for $l$ in the form $ax + by + c = 0$, where $a$, $b$ and $c$ are integers.

**(4)**

Summer 2012
Past Paper

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

Mathematics FP1
6667

Leave blank

**Question 5 continued**

**Turn over**

Summer 2012

Past Paper

www.mystudybro.com

This resource was created and owned by Pearson Edexcel

Mathematics FP1

6667

Leave blank

**Question 5 continued**

Summer 2012

Past Paper

www.mystudybro.com

This resource was created and owned by Pearson Edexcel

Mathematics FP1

6667

Leave blank

**Question 5 continued**

(Total 7 marks)

Q5

**Summer 2012**
Past Paper

**www.mystudybro.com**
This resource was created and owned by Pearson Edexcel

**Mathematics FP1**
6667

Leave blank

**6.**

$$f(x) = \tan\left(\frac{x}{2}\right) + 3x - 6, \quad -\pi < x < \pi$$

(a) Show that the equation $f(x) = 0$ has a root $\alpha$ in the interval $[1, 2]$.

**(2)**

(b) Use linear interpolation once on the interval $[1, 2]$ to find an approximation to $\alpha$. Give your answer to 2 decimal places.

**(3)**

P 4 0 6 8 8 A 0 1 4 3 2

Summer 2012
Past Paper

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

Mathematics FP1
6667

Leave
blank

**Question 6 continued**

**(Total 5 marks)**

Q6

P 4 0 6 8 8 A 0 1 5 3 2

**Summer 2012**
Past Paper

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

**Mathematics FP1**
6667

Leave
blank

7.

$$z = 2 - i\sqrt{3}$$

(a) Calculate arg $z$ , giving your answer in radians to 2 decimal places.

**(2)**

Use algebra to express

(b) $z + z^2$ in the form $a + bi\sqrt{3}$, where $a$ and $b$ are integers,

**(3)**

(c) $\dfrac{z + 7}{z - 1}$ in the form $c + di\sqrt{3}$, where $c$ and $d$ are integers.

**(4)**

Given that

$$w = \lambda - 3i$$

where $\lambda$ is a real constant, and $\arg(4 - 5i + 3w) = -\dfrac{\pi}{2}$,

(d) find the value of $\lambda$.

**(2)**

P 4 0 6 8 8 A 0 1 6 3 2

Summer 2012
Past Paper
www.mystudybro.com
This resource was created and owned by Pearson Edexcel
Mathematics FP1
6667

**Question 7 continued**

**Turn over**

Summer 2012
Past Paper

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

Mathematics FP1
6667

Leave blank

**Question 7 continued**

P40688A01832

Summer 2012
Past Paper

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

Mathematics FP1
6667

Leave
blank

**Question 7 continued**

**Q7**

**(Total 11 marks)**

**Summer 2012**
Past Paper
**www.mystudybro.com**
This resource was created and owned by Pearson Edexcel

**Mathematics FP1**
6667

Leave
blank

8.  The rectangular hyperbola $H$ has equation $xy = c^2$, where $c$ is a positive constant.

The point $P\left(ct, \dfrac{c}{t}\right)$, $t \neq 0$, is a general point on $H$.

(a)  Show that an equation for the tangent to $H$ at $P$ is

$$x + t^2 y = 2ct$$

(4)

The tangent to $H$ at the point $P$ meets the $x$-axis at the point $A$ and the $y$-axis at the point $B$.

Given that the area of the triangle $OAB$, where $O$ is the origin, is 36,

(b)  find the exact value of $c$, expressing your answer in the form $k\sqrt{2}$, where $k$ is an integer.

(4)

Summer 2012
Past Paper

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

Mathematics FP1
6667

Leave
blank

**Question 8 continued**

**Turn over**

Summer 2012
Past Paper
www.mystudybro.com
This resource was created and owned by Pearson Edexcel
Mathematics FP1
6667

Leave blank

**Question 8 continued**

Summer 2012
Past Paper

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

Mathematics FP1
6667

Leave
blank

**Question 8 continued**

**Q8**

**(Total 8 marks)**

**Summer 2012**
Past Paper

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

**Mathematics FP1**
6667

Leave blank

9.
$$M = \begin{pmatrix} 3 & 4 \\ 2 & -5 \end{pmatrix}$$

(a)  Find det **M**.

**(1)**

The transformation represented by **M** maps the point $S(2a - 7, a - 1)$, where $a$ is a constant, onto the point $S'(25, -14)$.

(b)  Find the value of $a$.

**(3)**

The point $R$ has coordinates $(6, 0)$.

Given that $O$ is the origin,

(c)  find the area of triangle $ORS$.

**(2)**

Triangle $ORS$ is mapped onto triangle $OR'S'$ by the transformation represented by **M**.

(d)  Find the area of triangle $OR'S'$.

**(2)**

Given that

$$A = \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$$

(e)  describe fully the single geometrical transformation represented by **A**.

**(2)**

The transformation represented by **A** followed by the transformation represented by **B** is equivalent to the transformation represented by **M**.

(f)  Find **B**.

**(4)**

Summer 2012

Past Paper

www.mystudybro.com

This resource was created and owned by Pearson Edexcel

Mathematics FP1

6667

Leave blank

**Question 9 continued**

P40688A02532

Summer 2012
Past Paper
www.mystudybro.com
This resource was created and owned by Pearson Edexcel
Mathematics FP1
6667

Leave blank

**Question 9 continued**

Summer 2012

Past Paper

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

Mathematics FP1

6667

**Question 9 continued**

**Turn over**

Summer 2012
Past Paper
www.mystudybro.com
This resource was created and owned by Pearson Edexcel
Mathematics FP1
6667

Leave blank

**Question 9 continued**

Summer 2012
Past Paper
www.mystudybro.com
This resource was created and owned by Pearson Edexcel
Mathematics FP1
6667

Leave blank

**Question 9 continued**

**Q9**

**(Total 14 marks)**

P40688A02932

Summer 2012
Past Paper

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

Mathematics FP1
6667

Leave
blank

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

$$f(n) = 2^{2n-1} + 3^{2n-1} \text{ is divisible by 5.}$$

**(6)**

Summer 2012

Past Paper

www.mystudybro.com

This resource was created and owned by Pearson Edexcel

Mathematics FP1

6667

Leave blank

**Question 10 continued**

P 4 0 6 8 8 A 0 3 1 3 2

Summer 2012
Past Paper
www.mystudybro.com
This resource was created and owned by Pearson Edexcel
Mathematics FP1
6667

Leave blank

**Question 10 continued**

**Q10**

**(Total 6 marks)**

**TOTAL FOR PAPER: 75 MARKS**

**END**

P 4 0 6 8 8 A 0 3 2 3 2