

Write your name here

Surname

Other names

Centre Number

Candidate Number

**Edexcel IGCSE**

# Further Pure Mathematics

## Paper 1

Monday 13 June 2011 – Afternoon  
**Time: 2 hours**

Paper Reference  
**4PM0/01**

**Calculators may be used.**

Total Marks

### Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Without sufficient working, correct answers may be awarded no marks.
- Answer the questions in the spaces provided  
– *there may be more space than you need.*

### Information

- The total mark for this paper is 100.
- The marks for **each** question are shown in brackets  
– *use this as a guide as to how much time to spend on each question.*

### Advice

- Read each question carefully before you start to answer it.
- Check your answers if you have time at the end.

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**Answer all TEN questions**

**Write your answers in the spaces provided**

**You must write down all stages in your working**

**1** Solve the equations

$$y = x^2 - 3x + 2$$

$$y - x = 7$$

(5)

(Total for Question 1 is 5 marks)



2 (a) Given that  $\log_a x = \frac{\log_b x}{\log_b a}$  show that  $\log_a b = \frac{1}{\log_b a}$  (2)

(b) Hence solve the equation

$$\log_x 8 - 6\log_8 x = 1 \quad x \in \mathbb{Z}^+ \quad (5)$$

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**Question 2 continued**

A series of horizontal dotted lines for writing.

**(Total for Question 2 is 7 marks)**



3 Given that  $y = e^{2x} \sin 3x$

(a) find  $\frac{dy}{dx}$

(3)

(b) show that  $\frac{d^2y}{dx^2} = 2\frac{dy}{dx} - 9y + 6e^{2x} \cos 3x$

(4)

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$$\sin(A+B) = \sin A \cos B + \cos A \sin B$$

$$\cos(A+B) = \cos A \cos B - \sin A \sin B$$

(a) Write down an expression for  $\sin 2A$  in terms of  $\sin A$  and  $\cos A$  (1)

(b) Find an expression for  $\cos 2A$  in terms of  $\sin A$  (2)

(c) Show that  $\sin 3A + \sin A = 4 \sin A - 4 \sin^3 A$  (4)

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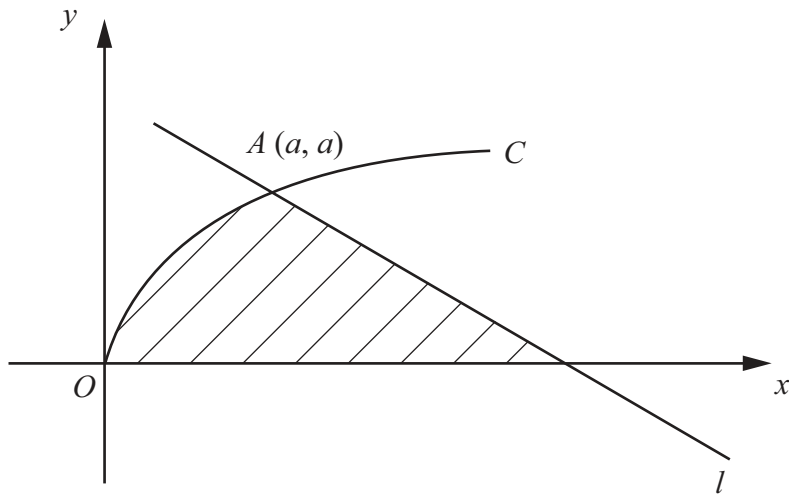
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**Figure 1**

The curve  $C$ , with equation  $y^2 = 5x$  and the line  $l$  intersect at the point  $A$  with coordinates  $(a, a)$ ,  $a \neq 0$ , as shown in **Figure 1**.

(a) Find the value of  $a$ .

(2)

The line  $l$  has gradient  $-\frac{5}{7}$  and intersects the  $x$ -axis at the point  $B$ .

(b) Find the  $x$ -coordinate of  $B$ .

(3)

The shaded region is rotated through  $360^\circ$  about the  $x$ -axis.

(c) Find, in terms of  $\pi$ , the volume of the solid generated.

(5)

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**Question 5 continued**

Dotted lines for writing.

**(Total for Question 5 is 10 marks)**



P 3 8 6 4 7 A 0 1 1 2 8

6 The third term of an arithmetic series is 70 and the sum of the first 10 terms of the series is 450

(a) Calculate the common difference of the series. (4)

The sum of the first  $n$  terms of the series is  $S_n$

Given that  $S_n \geq 350$

(b) find the set of possible values of  $n$ . (6)

A series of horizontal dotted lines provided for writing the solution.



**Question 6 continued**

Ruled writing area consisting of 35 horizontal dotted lines for answer writing.

**(Total for Question 6 is 10 marks)**



7 (a) Solve

$$5p^2 - 11p + 2 = 0$$

(2)

(b) Hence solve  $5(3^{2x}) - 11(3^x) + 2 = 0$  giving your answers to 3 significant figures.

(4)

The curve with equation  $y = 5(3^{2x}) - 6(3^x)$  intersects the curve with equation  $y = 5(3^x) - 2$  at two points.

(c) Find the coordinates of each of these two points, giving your answers to 3 significant figures where appropriate.

(4)

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**Question 7 continued**

A series of horizontal dotted lines provided for writing the answer to Question 7.

**(Total for Question 7 is 10 marks)**



8 The points  $A$  and  $B$  have coordinates  $(1,5)$  and  $(9,7)$  respectively.

(a) Find an equation of  $AB$ , giving your answer in the form  $y = ax + b$ , where  $a$  and  $b$  are rational numbers.

(3)

The line  $l$  is the perpendicular bisector of  $AB$ .

(b) Find an equation of  $l$ .

(4)

The point  $C$  has coordinates  $(3,q)$ . Given that  $C$  lies on  $l$

(c) find the value of  $q$ .

(2)

The line  $l$  meets the  $x$ -axis at the point  $D$ .

(d) Find the exact area of the kite  $ACBD$ .

(4)





**Question 8 continued**

Handwriting practice area with 25 horizontal dotted lines.



**Question 8 continued**

A series of horizontal dotted lines for writing.



**Question 8 continued**

Dotted lines for writing.

(Total for Question 8 is 13 marks)



9 A curve has equation

$$y = \frac{2x^2 - 6}{3x - 6} \quad x \neq 2$$

(a) Write down an equation of the asymptote to the curve which is parallel to the  $y$ -axis.

(1)

(b) Find the coordinates of the stationary points on the curve.

(7)

The curve crosses the  $y$ -axis at the point  $A$ .

(c) Find an equation of the normal to the curve at  $A$ .

(3)

The normal at  $A$  meets the curve again at  $B$ .

(d) Find the  $x$ -coordinate of  $B$ .

(4)

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**Question 9 continued**

A series of horizontal dotted lines for writing.



**Question 9 continued**

A series of horizontal dotted lines for writing.





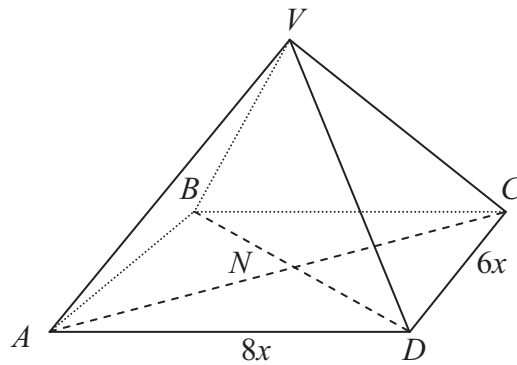


Figure 2

Figure 2 shows the pyramid  $VABCD$ . The base  $ABCD$  is a rectangle with  $CD = 6x$  cm and  $AD = 8x$  cm. The diagonals of the base intersect at the point  $N$ . The edges  $VA, VB, VC$  and  $VD$  are all of equal length. The angle between  $VA$  and the base  $ABCD$  is  $60^\circ$ .

Find, in terms of  $x$ ,

(a) the height,  $VN$ , of the pyramid, (4)

(b) the length of  $VA$ . (3)

Find, in degrees to the nearest  $0.1^\circ$ ,

(c) the size of the angle between the planes  $AVB$  and  $ABCD$ , (3)

(d) the size of the angle between the planes  $BVD$  and  $AVC$ . (3)

The volume of the pyramid is  $1110 \text{ cm}^3$ .

(e) Find, to the nearest whole number, the value of  $x$ . (3)

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**Question 10 continued**

Ruled writing area with horizontal dashed lines for text entry.



**Question 10 continued**

Dotted lines for writing.



**Question 10 continued**

Ruled area for writing the answer to Question 10.



