

Centre Number					Candidate Number				
Surname									
Other Names									
Candidate Signature									



General Certificate of Education  
Advanced Subsidiary Examination  
June 2010

# Mathematics

# MFP1

## Unit Further Pure 1

Thursday 27 May 2010 9.00 am to 10.30 am

**For this paper you must have:**

- the blue AQA booklet of formulae and statistical tables.
- You may use a graphics calculator.

**Time allowed**

- 1 hour 30 minutes

**Instructions**

- Use black ink or black ball-point pen. Pencil should only be used for drawing.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- Write the question part reference (eg (a), (b)(i) etc) in the left-hand margin.
- You must answer the questions in the spaces provided. Do not write outside the box around each page.
- Show all necessary working; otherwise marks for method may be lost.
- Do all rough work in this book. Cross through any work that you do not want to be marked.

**Information**

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 75.

**Advice**

- Unless stated otherwise, you may quote formulae, without proof, from the booklet.

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
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TOTAL	



Answer **all** questions in the spaces provided.

**1** A curve passes through the point (1, 3) and satisfies the differential equation

$$\frac{dy}{dx} = 1 + x^3$$

Starting at the point (1, 3), use a step-by-step method with a step length of 0.1 to estimate the  $y$ -coordinate of the point on the curve for which  $x = 1.3$ . Give your answer to three decimal places.

(No credit will be given for methods involving integration.)

(6 marks)

QUESTION  
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4 The variables  $x$  and  $y$  are related by an equation of the form

$$y = ax^2 + b$$

where  $a$  and  $b$  are constants.

The following approximate values of  $x$  and  $y$  have been found.

$x$	2	4	6	8
$y$	6.0	10.5	18.0	28.2

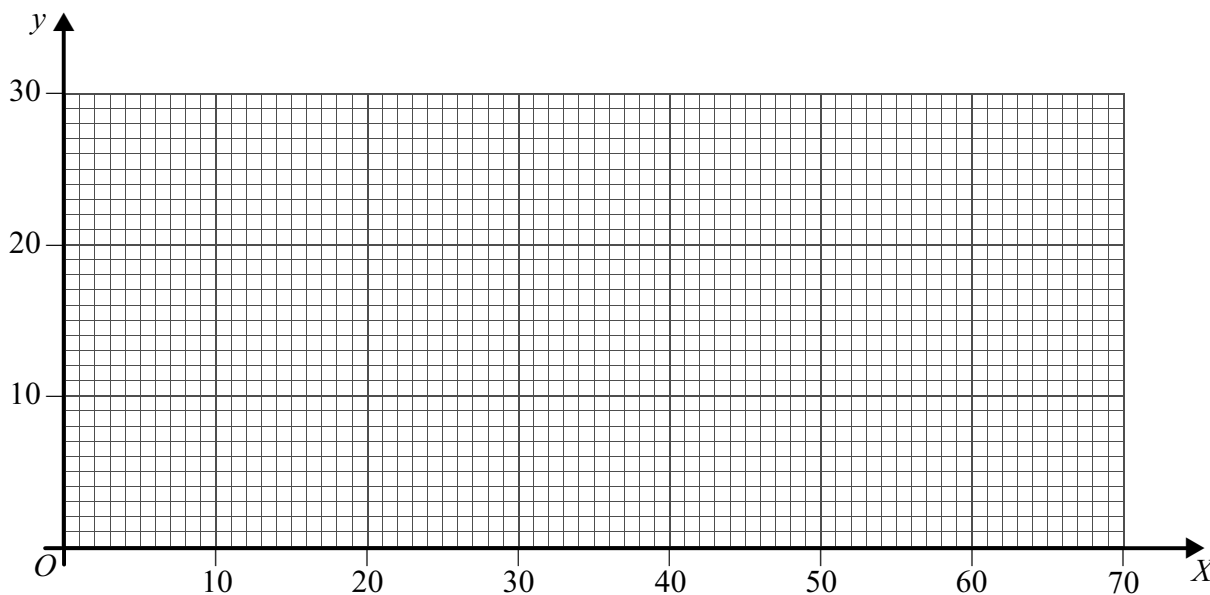
- (a) Complete the table below, showing values of  $X$ , where  $X = x^2$ . (1 mark)
- (b) On the diagram below, draw a linear graph relating  $X$  and  $y$ . (2 marks)
- (c) Use your graph to find estimates, to two significant figures, for:
  - (i) the value of  $x$  when  $y = 15$ ; (2 marks)
  - (ii) the values of  $a$  and  $b$ . (3 marks)

QUESTION  
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(a)

$x$	2	4	6	8
$X$				
$y$	6.0	10.5	18.0	28.2

(b)





**6** The matrices **A** and **B** are defined by

$$\mathbf{A} = \begin{bmatrix} \frac{1}{\sqrt{2}} & -\frac{1}{\sqrt{2}} \\ \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} \end{bmatrix}, \quad \mathbf{B} = \begin{bmatrix} \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} \\ \frac{1}{\sqrt{2}} & -\frac{1}{\sqrt{2}} \end{bmatrix}$$

Describe fully the geometrical transformation represented by each of the following matrices:

- (a) **A**; *(2 marks)*
- (b) **B**; *(2 marks)*
- (c) **A**<sup>2</sup>; *(2 marks)*
- (d) **B**<sup>2</sup>; *(2 marks)*
- (e) **AB**. *(3 marks)*

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7 (a) (i) Write down the equations of the two asymptotes of the curve  $y = \frac{1}{x-3}$ . (2 marks)

(ii) Sketch the curve  $y = \frac{1}{x-3}$ , showing the coordinates of any points of intersection with the coordinate axes. (2 marks)

(iii) On the same axes, again showing the coordinates of any points of intersection with the coordinate axes, sketch the line  $y = 2x - 5$ . (1 mark)

(b) (i) Solve the equation

$$\frac{1}{x-3} = 2x - 5 \quad (3 \text{ marks})$$

(ii) Find the solution of the inequality

$$\frac{1}{x-3} < 2x - 5 \quad (2 \text{ marks})$$

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