

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										



General Certificate of Education
Advanced Subsidiary Examination
June 2009

Mathematics

MFP1

Unit Further Pure 1

Specimen paper for examinations in June 2010 onwards

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 space 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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7	
8	
TOTAL	

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

1 The equation

$$2x^2 + x - 8 = 0$$

has roots α and β .

(a) Write down the values of $\alpha + \beta$ and $\alpha\beta$. *(2 marks)*

(b) Find the value of $\alpha^2 + \beta^2$. *(2 marks)*

(c) Find a quadratic equation which has roots $4\alpha^2$ and $4\beta^2$. Give your answer in the form $x^2 + px + q = 0$, where p and q are integers. *(3 marks)*

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2 A curve has equation

$$y = x^2 - 6x + 5$$

The points A and B on the curve have x -coordinates 2 and $2 + h$ respectively.

- (a) Find, in terms of h , the gradient of the line AB , giving your answer in its simplest form. (5 marks)
- (b) Explain how the result of part (a) can be used to find the gradient of the curve at A . State the value of this gradient. (3 marks)

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4 The variables x and y are known to be related by an equation of the form

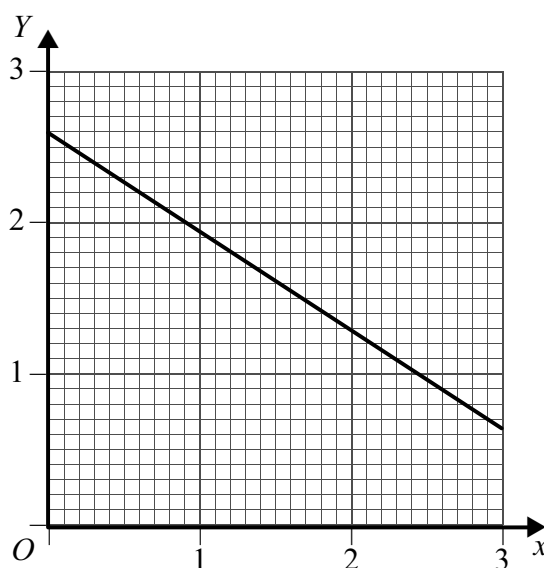
$$y = ab^x$$

where a and b are constants.

(a) Given that $Y = \log_{10}y$, show that x and Y must satisfy an equation of the form

$$Y = mx + c \quad (3 \text{ marks})$$

(b) The diagram shows the linear graph which has equation $Y = mx + c$.



Use this graph to calculate:

- (i) an approximate value of y when $x = 2.3$, giving your answer to one decimal place;
- (ii) an approximate value of x when $y = 80$, giving your answer to one decimal place.

(You are not required to find the values of m and c .) (4 marks)

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6 An ellipse E has equation

$$\frac{x^2}{3} + \frac{y^2}{4} = 1$$

(a) Sketch the ellipse E , showing the coordinates of the points of intersection of the ellipse with the coordinate axes. (3 marks)

(b) The ellipse E is stretched with scale factor 2 parallel to the y -axis.
Find and simplify the equation of the curve after the stretch. (3 marks)

(c) The **original** ellipse, E , is translated by the vector $\begin{bmatrix} a \\ b \end{bmatrix}$. The equation of the translated ellipse is

$$4x^2 + 3y^2 - 8x + 6y = 5$$

Find the values of a and b . (5 marks)

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Area for answer writing with horizontal dotted lines.



8 A curve has equation

$$y = \frac{x^2}{(x-1)(x-5)}$$

(a) Write down the equations of the three asymptotes to the curve. (3 marks)

(b) Show that the curve has no point of intersection with the line $y = -1$. (3 marks)

(c) (i) Show that, if the curve intersects the line $y = k$, then the x -coordinates of the points of intersection must satisfy the equation

$$(k-1)x^2 - 6kx + 5k = 0 \quad (2 \text{ marks})$$

(ii) Show that, if this equation has equal roots, then

$$k(4k+5) = 0 \quad (2 \text{ marks})$$

(d) Hence find the coordinates of the two stationary points on the curve. (5 marks)

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