

Please check the examination details below before entering your candidate information

Candidate surname

Other names

Pearson Edexcel
Level 3 GCE

Centre Number

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Candidate Number

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Mock Paper – Set 2

(Time: 2 hours)

Paper Reference **9MA0/02**

Mathematics

Advanced

Paper 2: Pure Mathematics 2

You must have:

Mathematical Formulae and Statistical Tables, calculator

Total Marks

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

Instructions

- Use **black** ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B).
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions and ensure that your answers to parts of questions are clearly labelled.
- Answer the questions in the spaces provided
– *there may be more space than you need.*
- You should show sufficient working to make your methods clear. Answers without working may not gain full credit.
- Inexact answers should be given to three significant figures unless otherwise stated.

Information

- A booklet 'Mathematical Formulae and Statistical Tables' is provided.
- There are 15 questions in this question paper. 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.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

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Pearson

1. (a) Given that

$$2\log(3 - x) - \log(21 - 2x) = 0$$

show that

$$x^2 - 4x - 12 = 0$$

(3)

- (b) (i) Write down the roots of $x^2 - 4x - 12 = 0$

- (ii) Which of these two roots is **not** a solution of

$$2\log(3 - x) - \log(21 - 2x) = 0$$

giving a reason for your answer.

(2)

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Question 1 continued

Lined area for writing the answer to Question 1.

(Total for Question 1 is 5 marks)



2.

$$f(x) = 3x^4 + 2x^2 - 12x + 8$$

Given that $y = f(x)$ has a single turning point at $x = \alpha$,

(a) show that α is a solution of the equation

$$x = \sqrt[3]{1 - \frac{x}{3}} \quad (3)$$

The iterative formula

$$x_{n+1} = \sqrt[3]{1 - \frac{x_n}{3}}$$

is used with $x_1 = 1$ to find an approximate value for α .

(b) Calculate the value of x_2 and the value of x_5 , giving each answer to 4 decimal places. (3)

(c) Using a suitable interval and a suitable function that should be stated, show that to 3 decimal places α is 0.889

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Question 2 continued

Lined area for writing the answer to Question 2.

(Total for Question 2 is 8 marks)



Diagram not
drawn to scale

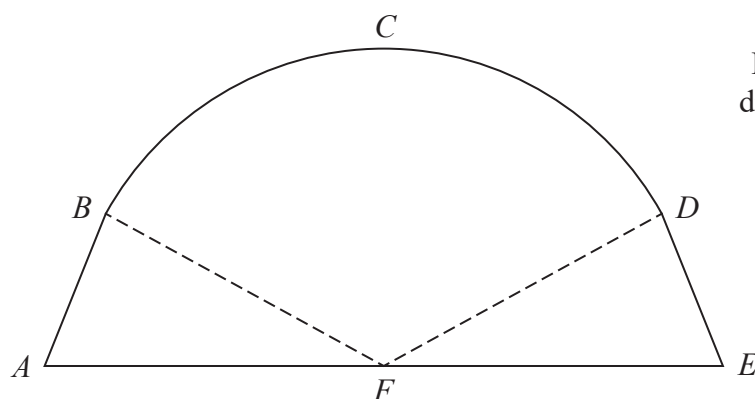


Figure 1

Figure 1 shows the plan view of a design for a stage at a concert.

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AFE is a straight line

$$AF = FE = 10.7 \text{ m}$$

$$BF = FD = 9.2 \text{ m}$$

angle $BFD = 1.82$ radians

find

- (a) the perimeter of the stage, in metres, to one decimal place,

- (b) the area of the stage, in m^2 , to one decimal place. (4)

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Question 3 continued

Lined area for writing the answer to Question 3.

(Total for Question 3 is 9 marks)



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(4)

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8



Question 4 continued

Lined area for writing answers.

(Total for Question 4 is 11 marks)



Question 5 continued

Lined area for writing the answer to Question 5.

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Question 5 continued

Lined area for writing the answer to Question 5.

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Question 5 continued

Lined area for writing the answer to Question 5.

(Total for Question 5 is 5 marks)



- 6.** A small company which makes batteries for electric cars has a 10-year plan for growth.

- In year 1 the company will make 2 600 batteries
- In year 10 the company aims to make 12 000 batteries

In order to calculate the number of batteries it will need to make each year, from year 2 to year 9, the company considers two models, Model *A* and Model *B*.

In Model A the number of batteries made will increase by the same **number** each year.

- (a) Using Model A , determine the number of batteries the company will make in year 2 (3)

In Model *B* the number of batteries made will increase by the same **percentage** each year.

- (b) Using Model *B*, determine the number of batteries the company will make in year 2.

Give your answer to the nearest 10 batteries. (3)

Sam calculates the total number of batteries made from year 1 to year 10 inclusive using each of the two models.

- (c) Calculate the difference between the two totals, giving your answer to the nearest 100 batteries. (3)



Question 6 continued

Lined area for writing the answer to Question 6.

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Question 6 continued

Lined area for writing the answer to Question 6.

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Question 6 continued

Lined area for writing the answer to Question 6.

(Total for Question 6 is 9 marks)



7.

$$g(x) = 4x^3 + ax^2 + 4x + b$$

where a and b are constants.

Given that

- $(2x + 1)$ is a factor of $g(x)$
- the curve with equation $y = g(x)$ has a point of inflection at $x = \frac{1}{6}$

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

(5)

(b) Show that there are no stationary points on the curve with equation $y = g(x)$.

(2)

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Question 7 continued

Lined area for writing the answer to Question 7.

(Total for Question 7 is 7 marks)



8. (a) Sketch the curve with equation

$$y = k - \frac{1}{2x} \quad \text{where } k \text{ is a positive constant}$$

State, in terms of k , the coordinates of any points of intersection with the coordinate axes and the equation of the horizontal asymptote.

(3)

The straight line l has equation $y = 2x + 3$

Given that l cuts the curve in two distinct places,

- (b) find the range of values of k , writing your answer in set notation.

(6)

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Question 8 continued

Lined area for writing the answer to Question 8.

(Total for Question 8 is 9 marks)



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Question 9 continued

Lined area for writing the answer to Question 9.

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Question 9 continued

Lined area for writing the answer to Question 9.

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Question 9 continued

Lined area for writing the answer to Question 9.

(Total for Question 9 is 9 marks)



10.

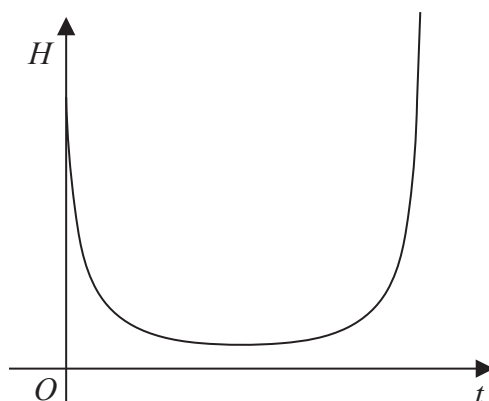


Figure 4

A scientist is studying the flight of seabirds in a colony.

She models the height above sea level, H metres, of one of the birds in the colony by the equation

$$H = \frac{140}{A + 45\sin 2t^\circ - 28\cos 2t^\circ} \quad 0 \leq t \leq T$$

where t seconds is the time after the bird leaves its nest and A and T are constants.

Figure 4 is a sketch showing the graph of H against t .

Given that this seabird's nest is 20 m above sea level,

- (a) find a complete equation for H . (3)

Given that

$$45\sin 2t^\circ - 28\cos 2t^\circ \equiv 53\sin(2t - \alpha)^\circ \quad 0 < \alpha < 90$$

- (b) find the value of α to one decimal place. (2)

Find, according to this model,

- (c) the minimum height of the seabird above sea level giving your answer to the nearest cm, (2)
- (d) the limitation on the value of T . (2)



Question 10 continued

Lined area for writing the answer to Question 10.

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Question 10 continued

Lined area for writing the answer to Question 10.

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Question 10 continued

Lined area for writing the answer to Question 10.

(Total for Question 10 is 9 marks)



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Question 11 continued

Lined area for writing the answer to Question 11.

(Total for Question 11 is 7 marks)



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Question 12 continued

Handwriting practice area with 28 horizontal lines.

(Total for Question 12 is 8 marks)



13. Prove by contradiction that there are no positive integers a and b with a odd such that

$$a + 2b = \sqrt{8ab}$$

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Question 13 continued

Lined area for writing the answer to Question 13.

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Question 13 continued

Lined area for writing the answer to Question 13.

(Total for Question 13 is 4 marks)

TOTAL FOR PAPER IS 100 MARKS

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