

Please check the examination details below before entering your candidate information

Candidate surname		Other names	
Pearson Edexcel International Advanced Level		Centre Number 	Candidate Number
Time 1 hour 30 minutes		Paper reference	WMA13/01
Mathematics International Advanced Level Pure Mathematics P3			
You must have: Mathematical Formulae and Statistical Tables (Yellow), calculator			Total Marks

Candidates may use any calculator permitted 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 9 questions in this question paper. The total mark for this paper is 75.
- 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.
- If you change your mind about an answer, cross it out and put your new answer and any working underneath.
- Good luck with your examination.

Turn over ►



- $$y = x^2 \cos\left(\frac{1}{2}x\right) \quad 0 < x \leq \pi$$

(a) Show, using calculus, that the x coordinate of P is a solution of the equation

$$x = 2 \arctan\left(\frac{4}{x}\right) \quad (4)$$

$$x_{n+1} = 2 \arctan\left(\frac{4}{x_n}\right) \quad x_1 = 2$$

- (b) find the value of x_2 and the value of x_6 , giving your answers to 3 decimal places. (3)

Question 1 continued

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Q1

(Total 7 marks)



$$\frac{1 - \cos 2x}{2 \sin 2x} \equiv k \tan x \quad x \neq (90n)^\circ \quad n \in \mathbb{Z}$$

(3)

$$\frac{9(1 - \cos 2\theta)}{2 \sin 2\theta} = 2 \sec^2 \theta$$

(Solutions based entirely on graphical or numerical methods are not acceptable.)

(6)

Question 2 continued

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Question 2 continued

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Q2

(Total 9 marks)



Question 3 continued

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Question 3 continued

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Q3

(Total 8 marks)



$$g(x) = 5 - 2x^2 \quad x \in \mathbb{R}, \ x \leq 0$$

- (c) Sketch and label, on the same axes, the curve with equation $y = g(x)$ and the curve with equation $y = g^{-1}(x)$. Show on your sketch the coordinates of the points where each curve meets or cuts the coordinate axes. (3)

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Question 4 continued

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Question 4 continued

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Q4

(Total 10 marks)



5.

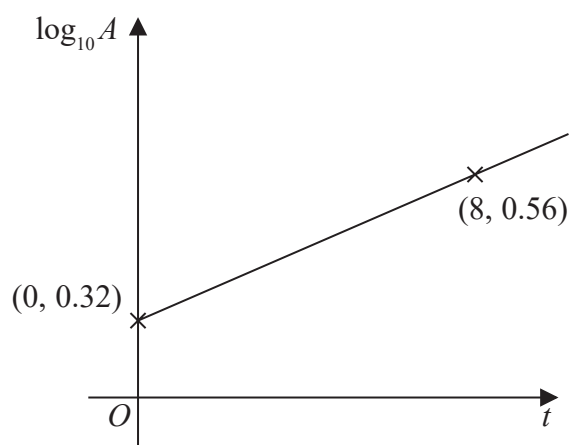


Figure 1

The growth of duckweed on a pond is being studied.

The surface area of the pond covered by duckweed, $A\text{m}^2$, at a time t days after the start of the study is modelled by the equation

$A = pq^t$ where p and q are positive constants

Figure 1 shows the linear relationship between $\log_{10} A$ and t .

The points $(0, 0.32)$ and $(8, 0.56)$ lie on the line as shown.

- (a) Find, to 3 decimal places, the value of p and the value of q .

(4)

Using the model with the values of p and q found in part (a),

- (b) find the rate of increase of the surface area of the pond covered by duckweed, in m^2/day , exactly 6 days after the start of the study.

Give your answer to 2 decimal places.

(3)



Question 5 continued

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Question 5 continued

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Question 5 continued

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Q5

(Total 7 marks)



6. Given that k is a positive constant,

(a) on separate diagrams, sketch the graph with equation

(i) $y = k - 2|x|$

(ii) $y = \left| 2x - \frac{k}{3} \right|$

Show on each sketch the coordinates, in terms of k , of each point where the graph meets or cuts the axes.

(4)

(b) Hence find, in terms of k , the values of x for which

$$\left| 2x - \frac{k}{3} \right| = k - 2|x|$$

giving your answers in simplest form.

(4)

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Question 6 continued

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Q6

(Total 8 marks)



7. Given that

$$x = 6 \sin^2 2y \quad 0 < y < \frac{\pi}{4}$$

show that

$$\frac{dy}{dx} = \frac{1}{A\sqrt{Bx - x^2}}$$

where A and B are integers to be found.

(5)

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Question 7 continued

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Q7

(Total 5 marks)





Question 8 continued

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Question 8 continued

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Q8

(Total 13 marks)



- (3)

$$g(\theta) = 10 + 12 \sin\left(2\theta - \frac{\pi}{6}\right) - 5 \cos\left(2\theta - \frac{\pi}{6}\right) \quad \theta > 0$$

(3)

$$h(\beta) = 10 - (12 \sin \beta - 5 \cos \beta)^2$$

- (2)

Question 9 continued

Handwriting practice area with 25 horizontal lines.

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Question 9 continued

Lined area for writing the answer to Question 9.

Q9

Box for marking the question.

(Total 8 marks)

TOTAL FOR PAPER IS 75 MARKS

END

