

Please check the examination details below before entering your candidate information

Candidate surname

Other names

Centre Number

Candidate Number

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**Pearson Edexcel International Advanced Level**

**Wednesday 31 May 2023**

Morning (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 10 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.

Turn over ►

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1.

$$g(x) = x^6 + 2x - 1000$$

(a) Show that  $g(x) = 0$  has a root  $\alpha$  in the interval  $[3, 4]$

(2)

Using the iteration formula

$$x_{n+1} = \sqrt[6]{1000 - 2x_n} \quad \text{with } x_1 = 3$$

(b) (i) find, to 4 decimal places, the value of  $x_2$

(ii) find, by repeated iteration, the value of  $\alpha$ .  
Give your answer to 4 decimal places.

(3)





2.

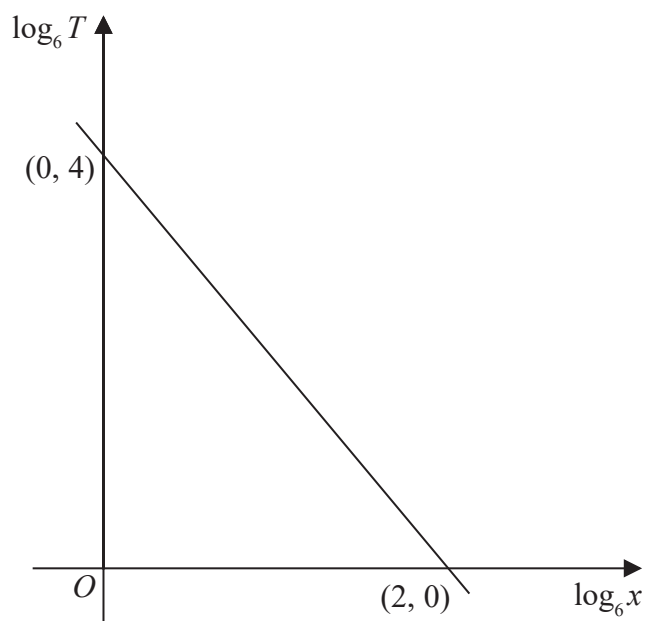
**Figure 1**

Figure 1 shows the linear relationship between  $\log_6 T$  and  $\log_6 x$

The line passes through the points  $(0, 4)$  and  $(2, 0)$  as shown.

(a) (i) Find an equation linking  $\log_6 T$  and  $\log_6 x$

(ii) Hence find the exact value of  $T$  when  $x = 216$

(3)

(b) Find an equation, not involving logs, linking  $T$  with  $x$

(3)



**Question 2 continued**

Lined writing area for the answer to Question 2.

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**(Total for Question 2 is 6 marks)**



3. (i) Find  $\frac{d}{dx} \ln(\sin^2 3x)$  writing your answer in simplest form. (2)

(ii)(a) Find  $\frac{d}{dx}(3x^2 - 4)^6$  (2)

(b) Hence show that

$$\int_0^{\sqrt{2}} x(3x^2 - 4)^5 dx = R$$

where  $R$  is an integer to be found.

*(Solutions relying on calculator technology are not acceptable.)* (3)



**Question 3 continued**

Lined writing area for the answer to Question 3.

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(Total for Question 3 is 7 marks)



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4. The function  $f$  is defined by

$$f(x) = 2x^2 - 5 \quad x \geq 0 \quad x \in \mathbb{R}$$

(a) State the range of  $f$

(1)

On the following page there is a diagram, labelled Diagram 1, which shows a sketch of the curve with equation  $y = f(x)$ .

(b) On Diagram 1, sketch the curve with equation  $y = f^{-1}(x)$ .

(2)

The curve with equation  $y = f(x)$  meets the curve with equation  $y = f^{-1}(x)$  at the point  $P$

Using algebra and showing your working,

(c) find the exact  $x$  coordinate of  $P$

(3)

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Question 5 continued

Lined writing area for the response to Question 5.

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6.

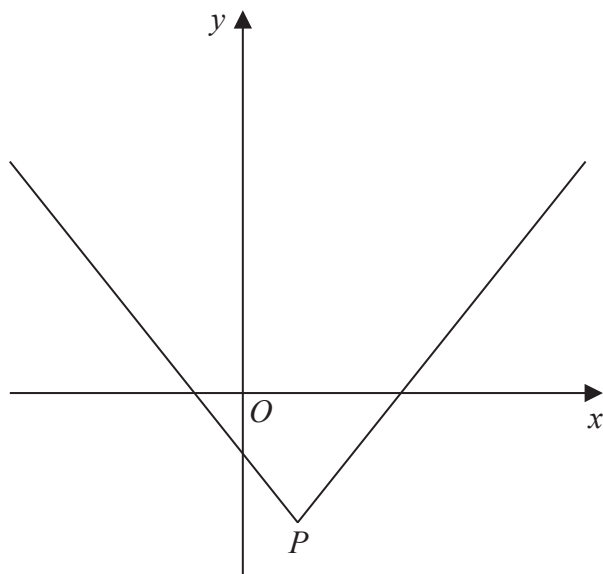


Figure 2

Figure 2 shows a sketch of the graph  $y = f(x)$ , where

$$f(x) = 3|x - 2| - 10$$

The vertex of the graph is at point  $P$ , shown in Figure 2.

(a) Find the coordinates of  $P$

(2)

(b) Find  $ff(0)$

(2)

(c) Solve the inequality

$$3|x - 2| - 10 < 5x + 10$$

(2)

(d) Solve the equation

$$f(|x|) = 0$$

(3)

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