

Paper Reference 4PM1/02
Pearson Edexcel
International GCSE

Further Pure
Mathematics
PAPER 2
(Calculator)

Time: 2 hours plus your additional time allowance.

ITEMS INCLUDED WITH QUESTION PAPER

Diagram Book
Answer Book
Formulae Pages

V66025A

Calculators may be used.

INSTRUCTIONS

In the boxes on the Answer Book and on the Diagram Book, write your name, centre number and candidate number.

Answer ALL questions.

Without sufficient working, correct answers may be awarded no marks.

Answer the questions in the Answer Book or on the separate diagrams – there may be more space than you need.

Do NOT write on the Question Paper.

You must NOT write anything on the Formulae Pages. Anything you write on the Formulae Pages will gain NO credit.

Turn over

INFORMATION

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.

You may be provided with a model for Question 9

It is NOT accurate.

There may be spare copies of some diagrams.

ADVICE

Read each question carefully before you start to answer it.

Check your answers if you have time at the end.

Good luck with your examination.

Answer all ELEVEN questions.

**Write your answers in the
Answer Book.**

**You must write down all the
stages in your working.**

1. Find the set of values for x for which

(a) $8x - 7 < 5x + 5$

(2 marks)

(b) $2x^2 - 5x - 3 > 0$

(3 marks)

**(c) BOTH $8x - 7 < 5x + 5$ AND
 $2x^2 - 5x - 3 > 0$**

(1 mark)

(Total for Question 1 is 6 marks)

Turn over

2. $f(x) = 2 + \frac{4}{5}x - \frac{1}{25}x^2$

Given that $f(x)$ can be expressed in the form $A - B(x + C)^2$ where A , B and C are constants,

- (a) find the value of A , the value of B and the value of C
(4 marks)

(continued on the next page)

2. continued.

(b) Hence write down

(i) the maximum value of $f(x)$,

**(ii) the value of x for which this
maximum occurs.**

(2 marks)

(Total for Question 2 is 6 marks)

Turn over

3. Look at the diagram for Question 3(a) in the Diagram Book.

It is NOT accurately drawn.

It shows a sector OPQ of a circle with centre O

The radius of the circle is 18 cm and the angle POQ is $\frac{2\pi}{3}$ radians.

- (a) Find the length of the arc PQ, giving your answer as a multiple of π**
(2 marks)

(continued on the next page)

Turn over

3. continued.

Look at the diagram for Question 3(b) in the Diagram Book.

It is NOT accurately drawn.

It shows the sector OPQ and the kite $OPTQ$

PT is the tangent to the circle at P and QT is the tangent at Q , such that angle $PTQ = \alpha$ radians.

(continued on the next page)

3. continued.

**(b) (i) Find α in terms of π
(1 mark)**

**(ii) Calculate, to
3 significant figures, the area
of the region, shown shaded
in the diagram, which is
bounded by the arc PQ and
the tangents PT and QT
(6 marks)**

(Total for Question 3 is 9 marks)

4. The point **A** has coordinates $(-4, -10)$ and the point **B** has coordinates $(3, 11)$

The line **L** passes through **A** and **B**

- (a) Find an equation of **L**
(2 marks)

The point **P** lies on **L** such that
 $AP : PB = 3 : 4$

- (b) Find the coordinates of **P**
(2 marks)

(continued on the next page)

4. continued.

The point Q with coordinates (m, n) , where $m < 0$, lies on the line through P that is perpendicular to L

Given that the length of PQ is $\sqrt{10}$

**(c) find the coordinates of Q
(6 marks)**

(continued on the next page)

4. continued.

**The point R has coordinates
 $(-11, -21)$**

(d) Show that

**(i) AB and RQ are equal in
length,**

(ii) AB and RQ are parallel.

(4 marks)

(continued on the next page)

4. continued.

(e) Find the area of the quadrilateral

ABQR

(2 marks)

(Total for Question 4 is 16 marks)

- 5. The n th term of a geometric series with common ratio r is u_n**

Given that $u_2 + u_4 = 212 \cdot 5$ and that $u_3 + u_4 = 62 \cdot 5$

- (a) find the two possible values of r
(5 marks)**

Given that the series is convergent with sum to infinity S ,

- (b) find the exact value of S
(2 marks)**

(Total for Question 5 is 7 marks)

6. $f(x) = x^3 + (p + 1)x^2 - 10x + q$

where p and q are integers.

Given that $(x - 3)$ is a factor of $f(x)$

(a) show that $9p + q + 6 = 0$

(3 marks)

(continued on the next page)

6. continued.

Given that $(x + p)$, where $p > 0$, is also a factor of $f(x)$

**(b) show that $p^2 + 10p + q = 0$
(3 marks)**

**(c) Hence find the value of p and
the value of q
(5 marks)**

**(d) Using your values of p and q ,
factorise $f(x)$ completely.
(2 marks)**

(Total for Question 6 is 13 marks)

- 7. (a) Look at the table for Question 7(a) in the Diagram Book.**

Complete the table of values for

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

Give your answers to 2 decimal places where appropriate.

There are three spaces to fill.

(2 marks)

(continued on the next page)

7. continued.

(b) Look at the diagram for Questions 7(b) and (c) in the Diagram Book.

It shows a grid.

On the grid, draw the graph of

$$y = 3^{\frac{x}{4}} + 2 \quad \text{for } 0 \leq x \leq 5$$

(2 marks)

(continued on the next page)

7. continued.

(c) By drawing a suitable straight line on the grid, obtain an estimate, to one decimal place, of the root of the equation

$$\log_3(6 - 2x)^4 - x = 0$$

in the interval $0 \leq x \leq 5$

(5 marks)

(Total for Question 7 is 9 marks)

8. Use an algebraic method to solve the simultaneous equations

$$\log_4 a + 3 \log_8 b = \frac{5}{2}$$

$$2^a = \frac{16^4}{4^{b^2}}$$

(Total for Question 8 is 8 marks)

9. Look at the diagram for Question 9 in the Diagram Book.

You may be provided with a model.

They are NOT accurate.

They show a metal solid S

The solid is a right triangular prism.

The cross section of S is an equilateral triangle with sides of length x cm

The length of S is $4x$ cm

(continued on the next page)

Turn over

9. continued.

The prism is being heated so that the cross sectional area is increasing at a constant rate of $0.03 \text{ cm}^2/\text{s}$

(a) Find, giving your answer to 3 significant figures, $\frac{dx}{dt}$ when $x = 2$

(5 marks)

(b) Find the rate of increase, in cm^3/s , of the volume of S when $x = 2$

(3 marks)

(Total for Question 9 is 8 marks)

Turn over

10. (a) Solve the equation

$$\tan x^\circ = -3 \quad \text{for } 0 \leq x < 360$$

**Give your solutions to the
nearest whole number.**

(3 marks)

(continued on the next page)

10. continued.

Given that

$$7 \sin^2 \theta + \sin \theta \cos \theta = 6$$

(b) show that

$$\tan^2 \theta + \tan \theta - 6 = 0$$

(3 marks)

(continued on the next page)

Turn over

10. continued.

(c) Hence solve the equation

$$7 \sin^2 y^\circ + \sin y^\circ \cos y^\circ = 6$$

for $0 \leq y < 360$

**Give your solutions to the
nearest whole number.**

(4 marks)

(Total for Question 10 is 10 marks)

Turn over

11. Look at the diagram for Question 11 in the Diagram Book.

It is NOT accurately drawn.

It shows a graph.

The region R , shown shaded in the diagram, is bounded by the curve with equation $y = e^x$, the curve with equation $y = 4e^{-x}$, the straight line with equation $x = a$, the x -axis and the y -axis.

(continued on the next page)

11. continued.

When the region R is rotated through 360° about the x -axis, the volume of the solid generated is

$$k - 8\pi e^{-4}$$

where k is a constant.

Using algebraic integration, find a possible value of a and the exact corresponding value of k

(Total for Question 11 is 8 marks)

TOTAL FOR PAPER IS 100 MARKS

END OF PAPER
