

Paper Reference 4MB1/02
Pearson Edexcel
International GCSE

Mathematics B
PAPER 2
(Calculator)

Time: 2 hours 30 minutes

YOU MUST HAVE

Ruler, protractor, compasses, writing and drawing equipment, calculator. Tracing paper may be used.

YOU WILL BE GIVEN

Diagram Booklet
Answer Booklet

Q69489A

INSTRUCTIONS

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

Answer ALL questions.

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

Do NOT write on the Question Paper.

CALCULATORS MAY BE USED.

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.

There may be spare copies of some diagrams in case you need them.

You may be provided with a model for Question 10

ADVICE

Read each question carefully before you start to answer it.

Check your answers if you have time at the end.

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

Answer all ELEVEN questions.

Write your answers in the Answer Booklet or on the separate diagrams.

You must write down all the stages in your working.

1. Look at the table for Question 1 in the Diagram Booklet.

The GDP per capita for a region is defined as follows

$$\text{GDP per capita} = \frac{\text{total GDP}}{\text{population}}$$

Complete the table in the Diagram Booklet, giving each value to **2** significant figures.

There are three spaces to fill.

(Total for Question 1 is 6 marks)

2. \mathcal{E} is the universal set and **A**, **B** and **C** are three sets.

$$\mathcal{E} = \{ p, q, r, s, t \}$$

$$A = \{ q, r, s \}$$

$$B = \{ p, q, t \}$$

- (a) List the members of

(i) $A \cap B$

(ii) $A \cup B$

(iii) $A' \cap B$

(3 marks)

Given that $A \cap C = \{r\}$

- (b) write down all the possibilities for set **C**

(2 marks)

(continued on the next page)

2. continued.

One of the possibilities for set C is selected at random.

(c) Find the probability that this set C is such that

$$\mathbf{B \cap C = \emptyset}$$

(2 marks)

(Total for Question 2 is 7 marks)

3. Given that $2^x \times 4^y = 128$

(a) show that $x + 2y = 7$
(3 marks)

Given that $\frac{8^x}{4^y} = 32$

(b) show that $3x - 2y = 5$
(2 marks)

(c) Hence, or otherwise, solve the simultaneous equations

$$2^x \times 4^y = 128$$

$$\frac{8^x}{4^y} = 32$$

(3 marks)

(Total for Question 3 is 8 marks)

- 4. Look at the table for Question 4 in the Diagram Booklet.**

Sophie conducted a survey on the time spent on the internet per day.

There were 90 people in her survey.

The results are shown in the table in the Diagram Booklet.

- (a) Write down the class interval that contains the median time spent on the internet per day.**

(1 mark)

- (b) Calculate an estimate for the mean time spent on the internet per day.**

(4 marks)

(continued on the next page)

4. continued.

Sophie drew a histogram for the information in the table.

In her histogram, the bar for the class interval $30 \leq t < 60$ is a square with sides of length 3 cm

Given that the bar for the class interval $10 \leq t < 30$ is a rectangle of width W cm and of height h cm,

**(c) find the value of W and the value of h
(3 marks)**

(Total for Question 4 is 8 marks)

5. A closed box is in the shape of a hollow cuboid.

The dimensions of the cuboid are **12 cm** by
4.0 cm by **3.0 cm**

Each length is given to **2** significant figures.

A tin of paint contains enough paint to cover exactly
200 cm²

- (a) Determine if this tin of paint is definitely
enough to cover the **6** outside faces of the
closed box.

(4 marks)

- (b) Calculate the length of the longest straight rod
that can definitely fit inside the box.

Give your answer to **3** significant figures.

Show your working clearly.

(4 marks)

(Total for Question 5 is 8 marks)

6. **A, P and B** are three points on horizontal ground.

A is 1 km due south of **P**

PQ is a vertical tower.

The angle of elevation of **Q** from **A** is 16.9°

(a) Show that the height of the tower, in metres to 3 significant figures, is 304 metres.

(2 marks)

B is 2 km due east of **P**

BC is a vertical radio mast.

The angle of elevation of **Q** from **C**, the top of the radio mast, is 8.2°

(b) Calculate the size, in degrees to one decimal place, of the angle of elevation of **C** from **A**

(5 marks)

(Total for Question 6 is 7 marks)

7. Look at the diagram for Question 7 in the Diagram Booklet.

It is NOT accurately drawn.

It shows quadrilateral **ABCD** such that $\overrightarrow{AB} = \underline{a}$ and $\overrightarrow{AD} = \underline{b}$

E is the point such that **ADE** and **BCE** are straight lines.

Given that $\overrightarrow{BC} = \underline{b} - \frac{1}{3}\underline{a}$

- (a) show that **AB** is parallel to **DC**
(2 marks)

Given also that λ is a scalar such that $\overrightarrow{BE} = \lambda \underline{b} - \underline{a}$

- (b) find the value of λ
(2 marks)

(continued on the next page)

7. continued.

The area of triangle **ABE** is **x** square units.

Given that the area of quadrilateral **ABCD** is **P** square units,

(c) find an expression for **P** in terms of **x**
(3 marks)

(Total for Question 7 is 7 marks)

8. Look at the diagram for Question 8 in the Diagram Booklet.

It is NOT accurately drawn.

It shows the design for a garden feature.

In the middle of the feature is a circular pond.

The pond is surrounded by 6 identical flower beds.

Each flower bed is in the shape of an isosceles trapezium.

- (a) Calculate the area, in m^2 to 3 significant figures, of one of the flower beds.
(3 marks)

(continued on the next page)

8. continued.

Each flower bed needs to be filled with compost to a depth of 10 cm

The compost is sold in bags containing 50 litres of compost.

(b) Show that 16 bags of compost will be needed to fill all six flower beds to a depth of 10 cm

Show your working clearly.

(4 marks)

(c) Find the area of the circular pond.

Give your answer in m^2 to 3 significant figures.

(4 marks)

$$\text{Area of trapezium} = \frac{1}{2}(a + b)h$$

(Total for Question 8 is 11 marks)

Turn over

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

[In this question the coordinates of the points are given in centimetres]

- (a) The vertices of quadrilateral **A** have been plotted on the grid in the Diagram Booklet.

Write down the coordinates of the four vertices.
(1 mark)

- (b) Describe fully the transformation of quadrilateral **A** to quadrilateral **B**
(2 marks)

(continued on the next page)

9. continued.

Quadrilateral **B** is transformed to quadrilateral **C** under the transformation with matrix **M** where

$$\mathbf{M} = \begin{pmatrix} 1 & 3 \\ 1 & 1 \end{pmatrix}$$

(c) Write down the coordinates of quadrilateral **C**
(3 marks)

(d) Calculate the determinant of **M**
(1 mark)

$$\left[\text{Determinant of matrix} \begin{pmatrix} a & b \\ c & d \end{pmatrix} = ad - bc \right]$$

(e) Calculate the area of quadrilateral **A**
(2 marks)

(Total for Question 9 is 9 marks)

Turn over

10. Look at Diagram 1 and Diagram 2 for Question 10 in the Diagram Booklet.

You may be provided with a model.

They are NOT accurate.

Diagram 1 shows a rectangle with dimensions 20 cm by 10 cm from which a square with sides of length x cm is removed from each of the corners.

The shape in Diagram 1 is then folded along the dotted lines to form a box, without a lid, in the shape of a cuboid, shown by Diagram 2 and the model.

The volume of the box is $V \text{ cm}^3$

**(a) Show that $V = 4x^3 - 60x^2 + 200x$
(2 marks)**

**(b) Find, to 3 significant figures, the value of x
such that $\frac{dV}{dx} = 0$
(4 marks)**

(continued on the next page)

Turn over

10. continued.

(c) Look at the table for Question 10(c) in the Diagram Booklet.

Complete the table of values in the Diagram Booklet for

$$\mathbf{V = 4x^3 - 60x^2 + 200x}$$

There are two spaces to fill.

(2 marks)

(continued on the next page)

10. continued.

Look at the diagram for Questions 10(d), 10(e) and 10(f) in the Diagram Booklet.

(d) On the grid in the Diagram Booklet, plot the points from your completed table and, using your answer to part (b), join them to form a smooth curve.

(2 marks)

(e) By drawing on the grid in the Diagram Booklet a tangent to the curve, find an estimate of the gradient of the curve at the point where $x = 1.5$

(2 marks)

(continued on the next page)

10. continued.

Starting with a square of side 15 cm and removing a square with sides of length x cm from each corner, a second box without a lid is formed by folding as in part (a).

**The volume of this box is $B \text{ cm}^3$ where
 $B = 4x^3 - 60x^2 + 225x$**

Given that $B = 200$

- (f) find, by drawing a suitable straight line on the grid in the Diagram Booklet, estimates, to one decimal place, of the possible values of x**
(3 marks)

(Total for Question 10 is 15 marks)

11. The function f is defined as

$$f: x \mapsto \frac{3x + 1}{x - 1}$$

(a) Find $f(3)$

(2 marks)

(b) State the value of x that must be excluded from any domain of the function f

(1 mark)

(c) Find the inverse of the function f

Give your answer in its simplest form.

(4 marks)

(continued on the next page)

11. continued.

The function g is such that

$$fg(x) = \frac{x-1}{3x+1}$$

- (d) Find the value of a such that $gf(a) = fg(a)$
(7 marks)

(Total for Question 11 is 14 marks)

TOTAL FOR PAPER IS 100 MARKS

END OF PAPER
