Paper Reference 1MA1/2H
Pearson Edexcel
Level 1/Level 2 GCSE (9−1)

Total Marks

Mathematics
PAPER 2 (Calculator)
Higher Tier

Wednesday 7 June 2023 – Morning

Time: 1 hour 30 minutes

In the boxes below, write your name, centre number and candidate number.

Surname						
Other names						
Centre Number						
Candidate Number						

V75150A

Pearson

YOU MUST HAVE

Ruler, protractor, compasses, writing and drawing equipment, calculator, Formulae Sheet (enclosed). Tracing paper may be used.

YOU WILL BE GIVEN

Diagram Booklet

INSTRUCTIONS

Answer ALL questions.

Answer the questions in the spaces provided in this Question Paper or on the separate diagrams – there may be more space than you need.

You must SHOW ALL YOUR WORKING.

Diagrams are NOT accurately drawn unless otherwise indicated.

CALCULATORS MAY BE USED.

If your calculator does not have a π button, take the value of π to be $3 \cdot 142$ unless the question instructs otherwise.

INFORMATION

The total mark for this paper is 80

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.

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.

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1. (a) Work out the value of

$$\frac{25 - \sqrt{43 \cdot 87}}{6 + 2 \cdot 1^2}$$

Write down all the figures on your calculator display.

(2 marks)

(continued on the next page)

1. continued.

(b) Work out the value of the reciprocal of $0 \cdot 625$

(1 mark)

(Total for Question 1 is 3 marks)

2. Write 60 as a product of its prime factors.

(2 marks)

Answer space continues on the next page.

2. continued.

(Total for Question 2 is 2 marks)

3. There are 48 counters in a bag.

There are only red counters and blue counters in the bag.

number of red counters : number of blue counters = 1 : 2

Helen has to work out how many red counters are in the bag.

She says,

"There are 24 red counters in the bag because 1 is half of 2 and 24 is half of 48"

(continued on the next page)

3. continued.

Is Helen correct?

You must give a reason for your answer.

(Total for Question 3 is 1 mark)

4. $-2 \leq n < 5$

n is an integer.

(a) Write down the greatest possible value of n

(1 mark)

(continued on the next page)

4. continued.

(b) Look at the diagram for Question 4(b) in the Diagram Booklet.

It shows a number line.

On the number line, show the inequality

$-4 \leq m < 1$

(2 marks)

(continued on the next page)

4. continued.

(c) Solve

$$\frac{2}{5}t - 4 < 6$$

(3 marks)

Answer space continues on the next page.

4. (c) continued.

(Total for Question 4 is 6 marks)

5. Look at the diagram for Question 5 in the Diagram Booklet.

It shows a triangle **ABC** and a rectangle **PQRS**

In triangle **ABC**:

AB is marked **6x**

BC is marked **8**

Angle **ABC** is a right angle.

In rectangle **PQRS**:

PQ is marked **5**

PS is marked **4x – 1**

(continued on the next page)

5. continued.

All measurements are in centimetres.

The area of the triangle is $10\ cm^2$ greater than the area of the rectangle.

Work out the value of x

(4 marks)

Answer space continues on the next two pages.

5. continued.

5. continued.

x = _____

(Total for Question 5 is 4 marks)

6. Last year a family recycled 800 kg of household waste.

57% of this waste was paper and glass.

weight of paper recycled : weight of glass recycled = 12 : 7

Calculate the weight of glass the family recycled.

(3 marks)

Answer space continues on the next two pages.

6. continued.

6. continued.

_____kg

(Total for Question 6 is 3 marks)

7. A number, n, is rounded to 1 decimal place.

The result is 12·7

Complete the error interval for n

_____ ≤ n < _____

(Total for Question 7 is 2 marks)

8. Tamsin buys a house with a value of

£150 000

The value of Tamsin's house increases by 4% each year.

Rachel buys a house with a value of

£160 000

The value of Rachel's house increases by 1·5% each year.

(continued on the next page)

8. continued.

At the end of 2 years, whose house has the greater value?

You must show how you get your answer.

(4 marks)

Answer space continues on the next two pages.

8. continued.

8. continued.

(Total for Question 8 is 4 marks)

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

It shows a grid.

The cumulative frequency table on the next page gives information about the ages of 80 people working for a company.

(continued on the next page)

9. continued.

Age (A years)	Cumulative frequency
$20 < A \leq 30$	20
$20 < A \leq 40$	50
$20 < A \leq 50$	65
$20 < A \leq 60$	75
$20 < A \leq 70$	80

(continued on the next page)

9. continued.

(a) On the grid in the Diagram Booklet, draw a cumulative frequency graph for the information on the previous page.

(2 marks)

(continued on the next page)

9. continued.

(b) Use your graph to find an estimate for the median age.

(1 mark)

_____ years

(Total for Question 9 is 3 marks)

10. Look at the table for Question 10 in the Diagram Booklet.

A biased dice is thrown 60 times.

The table shows information about the number that the dice lands on each time.

Gethin throws the dice twice.

(continued on the next page)

10. continued.

(a) Work out an estimate for the probability that the dice will land on 6 both times.

(3 marks)

(continued on the next page)

10. continued.

Sally is going to throw the same dice n times and record the number it lands on each time.

She will use her results to work out a more reliable estimate for the probability in part (a).

(continued on the next page)

10. continued.

(b) What can you say about the value of n?

(1 mark)

(Total for Question 10 is 4 marks)

11. Use algebra to solve the simultaneous equations

$$2x + 6y = 5$$

$$3x - 4y = -12$$

(4 marks)

Answer space continues on the next two pages.

11. continued.

11. continued.

x = _____

y = _____

(Total for Question 11 is 4 marks)

12. Look at the diagram for Question 12 in the Diagram Booklet.

It shows the points **A**, **B**, **C** and **D** on the circumference of a circle, centre **O**

ABCD is a rectangle.

AB = 8 cm

AD = 10 cm

(continued on the next page)

12. continued.

Work out the circumference of the circle.

Give your answer correct to 3 significant figures.

(4 marks)

Answer space continues on the next page.

12. continued.

_____ cm

(Total for Question 12 is 4 marks)

13. Look at the diagram for Question 13 in the Diagram Booklet.

It shows triangle **ABC**

AB = 15 cm

AC = 18 cm

Angle **ABC = 70°**

Calculate the size of angle **BAC**

Give your answer correct to **1** decimal place.

(4 marks)

Answer space continues on the next two pages.

13. continued.

13. continued.

(Total for Question 13 is 4 marks)

14. Show that

$$\frac{x^2 - x - 6}{2x^2 - 5x - 3}$$

can be written in the form

$$\frac{ax + b}{cx + d}$$

where a, b, c and d are integers.

(3 marks)

Answer space continues on the next page.

14. continued.

(Total for Question 14 is 3 marks)

15. Here are the first four terms of a quadratic sequence.

3 9 17 27

Find an expression, in terms of n, for the nth term of this sequence.

(3 marks)

Answer space continues on the next page.

15. continued.

(Total for Question 15 is 3 marks)

16. Look at the diagram for Question 16 in the Diagram Booklet.

It shows a histogram.

The histogram gives information about the number of hours some students used their phones last week.

The histogram is incomplete.

30 students used their phones for between 30 and 40 hours.

20 students used their phones for between 40 and 60 hours.

(continued on the next page)

16. continued.

(a) Use this information to complete the histogram in the Diagram Booklet.

(2 marks)

(continued on the next page)

16. continued.

No student used their phone for more than 60 hours.

(b) Work out the total number of students.

(2 marks)

Answer space continues on the next page.

16. (b) continued.

(Total for Question 16 is 4 marks)

17. (a) Show that the equation $x^4 - x^2 - 5 = 0$ can be written in the form

$$x = \sqrt[4]{x^2 + 5}$$

(1 mark)

(continued on the next page)

17. continued.

(b) Starting with

$$x_0 = 1 \cdot 5$$

use the iteration formula

$$x_{n+1} = \sqrt[4]{x_n^2 + 5}$$

three times to find an estimate for a solution of

$$x^4 - x^2 - 5 = 0$$

(3 marks)

Answer space continues on the next two pages.

17. (b) continued.

17. (b) continued.

(Total for Question 17 is 4 marks)

18. $2p : 5r = 6 : 25$

$4q : 7r = 20 : 21$

Show that

$p + q : q + r = 17 : 20$

(3 marks)

Answer space continues on the next two pages.

18. continued.

18. continued.

(Total for Question 18 is 3 marks)

19. Look at the diagram for Question 19 in the Diagram Booklet.

It shows a right–angled triangle **ABC**

AB = 9·3 cm correct to the nearest **mm**

AC = 12·6 cm correct to the nearest **mm**

Angle **ABC** is a right angle.

Angle **ACB** is marked **x**

(continued on the next page)

19. continued.

Calculate the lower bound for the size of the angle marked **x**

You must show all your working.

(3 marks)

Answer space continues on the next two pages.

19. continued.

Turn over

19. continued.

$\_\_\_\_\_^{\circ}$

(Total for Question 19 is 3 marks)

20. Look at the diagram for Question 20 in the Diagram Booklet.

It shows a triangle ORT

$\overrightarrow{OT} = \underline{a}$

$\overrightarrow{RT} = \underline{b}$

M is the point on OR such that

OM : MR = 2 : 3

$\rightarrow$

Express MT in terms of $\underline{a}$ and $\underline{b}$

Give your answer in its simplest form.

(4 marks)

Answer space is on the next two pages.

20. continued.

20. continued.

(Total for Question 20 is 4 marks)

21. (a) Look at the diagram for Question 21(a) in the Diagram Booklet.

It shows the graph of $y = f(x)$

On the diagram, draw the graph of $y = f(x) - 4$

(1 mark)

(b) Look at the diagram for Question 21(b) in the Diagram Booklet.

It shows the graph of $y = f(x)$

On the diagram, draw the graph of $y = f(-x)$

(1 mark)

(Total for Question 21 is 2 marks)

22. There are only blue pens and red pens in a box.

The number of blue pens is four times the number of red pens.

Rita takes at random one pen from the box.
She records the colour of the pen and then replaces it in the box.
Rita does this n times, where $n \geq 2$

(continued on the next page)

22. continued.

Write down an expression, in terms of n, for the probability that Rita gets a blue pen at least once and a red pen at least once.

(2 marks)

Answer space continues on the next page.

22. continued.

(Total for Question 22 is 2 marks)

23. Look at the diagram for Question 23 in the Diagram Booklet.

It shows three similar triangles, **ABG**, **ACF** and **ADE**

ABCD and **AGFE** are straight lines.

$AB : BC : CD = 1 : 2 : 3$

Show that

area of **ABG** : area of **BCFG** : area of **CDEF** = 1 : 8 : 27

(3 marks)

Answer space is on the next two pages.

23. continued.

23. continued.

(Total for Question 23 is 3 marks)

24. Look at the diagram for Question 24 in the Diagram Booklet.

It shows 8 identical regular octagons joined to enclose a shaded shape.

Each octagon has sides of length t

Find, in terms of t, an expression for the area of the shaded shape.

(continued on the next page)

24. continued.

Give your answer in the form

$p\left(2+\sqrt{2}\right)t^2$ where p is an integer.

You must show all your working.

(5 marks)

Answer space continues on the next four pages.

24. continued.

24. continued.

24. continued.

24. continued.

(Total for Question 24 is 5 marks)

TOTAL FOR PAPER IS 80 MARKS

END OF PAPER