

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					

## **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  $\pi$  button, take the value of  $\pi$  to be  $3.142$  unless the question instructs otherwise.**

**Turn over**

## **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  $0.625$   
(1 mark)

---

(Total for Question 1 is 3 marks)

---

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

---

(Total for Question 2 is 2 marks)

---

Turn over

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)

---

- (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)

---

(Total for Question 4 is 6 marks)

---

Turn over

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  **$4x - 1$**

All measurements are in centimetres.

The area of the triangle is  **$10 \text{ cm}^2$**  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)

---

Turn over

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 page.

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  $n$

$$\underline{\hspace{2cm}} \leq n < \underline{\hspace{2cm}}$$

(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.

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 page.

8. continued.

(Total for Question 8 is 4 marks)

---

Turn over

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

It shows a grid.

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

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)**

**(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.**

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

**(3 marks)**

---

**(continued on the next page)**

**Turn over**

**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).**

**(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 page.**



11. continued.

$x =$  \_\_\_\_\_

$y =$  \_\_\_\_\_

(Total for Question 11 is 4 marks)

---

Turn over

**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.**

$$\mathbf{AB = 8\text{ cm}}$$

$$\mathbf{AD = 10\text{ cm}}$$

**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)

---

Turn over

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

It shows triangle **ABC**

$$AB = 15 \text{ cm}$$

$$AC = 18 \text{ cm}$$

$$\text{Angle } ABC = 70^\circ$$

Calculate the size of angle **BAC**

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

(4 marks)

Answer space continues on the next page.

13. continued.

\_\_\_\_\_o

(Total for Question 13 is 4 marks)

---

Turn over

14. Show that

$$\frac{x^2 - x - 6}{2x^2 - 5x - 3} \text{ can be written in the form}$$

$$\frac{ax + b}{cx + d} \text{ where } a, b, c \text{ and } d \text{ are integers.}$$

(3 marks)

Answer space continues on the next page.

**14. continued.**

**(Total for Question 14 is 3 marks)**

---

**Turn over**

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

3            9            17            27

Find an expression, in terms of  $n$ , for the  $n$ th 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.**

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

**(continued on the next page)**

**Turn over**

**16. continued.**

**No student used their phone for more than  
60 hours.**

**(b) Work out the total number of students.  
(2 marks)**

---

**(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

$$x_0 = 1.5$$

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 page.

17. (b) continued.

---

(Total for Question 17 is 4 marks)

---

Turn over

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 page.

**18. continued.**

**(Total for Question 18 is 3 marks)**

---

**Turn over**



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  $x$**

**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 page.**

19. continued.

o

(Total for Question 19 is 3 marks)

Turn over

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**

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

Give your answer in its simplest form.

(4 marks)

Answer space continues on the next page.

**20. continued.**

---

**(Total for Question 20 is 4 marks)**

---

**Turn over**

**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  $n \geq 2$**

**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)**

---

**Turn over**

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.

$$\mathbf{AB : BC : CD = 1 : 2 : 3}$$

Show that

$$\text{area of } \mathbf{ABG} : \text{area of } \mathbf{BCFG} : \text{area of } \mathbf{CDEF} \\ = \mathbf{1 : 8 : 27}$$

(3 marks)

Answer space continues on the next page.



**23. continued.**

**(Total for Question 23 is 3 marks)**

---

**Turn over**

**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.**

**Give your answer in the form**

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

**You must show all your working.**

**(5 marks)**

**Answer space continues on the next three pages.**

24. continued.

Turn over

24. continued.

Turn over

24. continued.

---

(Total for Question 24 is 5 marks)

---

**TOTAL FOR PAPER IS 80 MARKS**

**END OF PAPER**

---