Paper Reference 1MA1/3H
Pearson Edexcel
Level 1/Level 2 GCSE (9−1)

Total Marks

Mathematics
PAPER 3 (Calculator)
Higher Tier

Monday 13 November 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					

Y69535A

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.

You may be provided with a model for Question 8, three models for Question 19, four formula models for Question 19, and a model for Question 24
They are NOT accurate.

You may be provided with two cutout shapes for Question 18(a) and one cutout shape for Question 18(b).

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) Write

468 000 in standard form.

(1 mark)

(continued on the next page)

1. continued.

(b) Write

$5 \cdot 037 \times 10^{-4}$ as an ordinary number.

(1 mark)

(Total for Question 1 is 2 marks)

2. Look at the diagram for Question 2 in the Diagram Booklet.

It shows a biased spinner.

The table below shows the probabilities that when the spinner is spun it will land on A, on B, on C and on D

Letter	Probability
A	0·4
B	0·21
C	0·32
D	0·07

(continued on the next page)

2. continued.

Luka will spin the spinner 200 times.

Work out an estimate for the number of times the spinner will land on A

(Total for Question 2 is 2 marks)

3. Look at the table for Question 3 in the Diagram Booklet.

Seija works at a weather station.

The table in the Diagram Booklet gives information about the temperature, $T°C$, at midday for each of 50 cities in the UK on Tuesday.

(a) Calculate an estimate for the mean temperature.

(3 marks)

Answer space continues on the next page.

3. (a) continued.

_____ °C

(continued on the next page)

3. continued.

Seija says,

“The median temperature is $22 \cdot 5^{\circ}C$ because $22 \cdot 5$ is the middle number in the middle group.”

(continued on the next page)

3. continued.

(b) Is Seija correct?

Give a reason for your answer.

(1 mark)

(Total for Question 3 is 4 marks)

4. Look at the diagram for Question 4 in the Diagram Booklet.

It shows a number line.

Jenna is asked to show the inequality $-3 < x \leq 4$ on the number line.

Her answer is shown in the Diagram Booklet.

(continued on the next page)

4. continued.

(a) Write down two mistakes Jenna has made.

(2 marks)

1 _____

_____

_____

2 _____

_____

_____

(continued on the next page)

4. continued.

(b) Work out the greatest integer that satisfies the inequality

$$5y - 7 < 16$$

(2 marks)

(Total for Question 4 is 4 marks)

5. Ali buys packs of balloons and boxes of pencils.

There are 30 balloons in each pack.
There are 24 pencils in each box.

Ali buys exactly the same number of balloons and pencils.

Work out how many packs of balloons and how many boxes of pencils she could have bought.
You must show all your working.
(3 marks)
Answer space is on the next two pages.

5. continued.

5. continued.

_____ packs of balloons

_____ boxes of pencils

(Total for Question 5 is 3 marks)

6. A company orders a large number of plates from a factory.

It would take 30 hours to make all the plates using 4 machines.

How many machines are needed to make all the plates in 6 hours?

(2 marks)

Answer space continues on the next page.

6. continued.

(Total for Question 6 is 2 marks)

7. Riley travelled by car and by aeroplane.

He travelled 143 miles by car at an average speed of 55 miles per hour.
Riley then travelled for 5 hours and 20 minutes by aeroplane.

Work out, in hours and minutes, Riley's total travelling time.
(3 marks)
Answer space continues on the next page.

7. continued.

_____ hours _____ minutes

(Total for Question 7 is 3 marks)

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

You may be provided with a model. They show a solid cube placed on a horizontal table.

$$\text{pressure} = \frac{\text{force}}{\text{area}}$$

The pressure on the table due to the cube is $3 \cdot 5$ newtons/cm^2

The force exerted by the cube on the table is 504 newtons.

(continued on the next page)

8. continued.

Show that the total surface area of the cube is less than $900\ cm^2$

(3 marks)

Answer space continues on the next two pages.

8. continued.

8. continued.

(Total for Question 8 is 3 marks)

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

It shows the line L on a grid.

Find an equation for L

(3 marks)

Answer space continues on the next page.

9. continued.

(Total for Question 9 is 3 marks)

10. Make m the subject of

$$k = p + \frac{2m}{5}$$

(3 marks)

Answer space continues on the next page.

10. continued.

(Total for Question 10 is 3 marks)

11. The floor plan of a house is drawn using a scale of $1 : 50$

On the plan, a room in the house has a floor area of $48\ cm^2$

Work out the real area of the floor of this room.

Give your answer in m^2

(3 marks)

Answer space continues on the next page.

11. continued.

_____ m^2

(Total for Question 11 is 3 marks)

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

It shows a shaded sector POQ of a circle with centre O and radius 6·2 cm

PO = OQ = 6·2 cm

An angle is marked on the diagram.

The area of the shaded sector is 82·6 cm^2

(continued on the next page)

12. continued.

Calculate the size of angle **x**

Give your answer correct to

3 significant figures.

(2 marks)

Answer space continues on the next page.

12. continued.

_____ °

(Total for Question 12 is 2 marks)

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

It is a cumulative frequency graph.

Alan grew 80 plants of the same type outside.

The cumulative frequency graph in the Diagram Booklet shows information about the heights, in cm, of these plants.

One of the plants is chosen at random.

(continued on the next page)

13. continued.

(a) Find an estimate for the probability that this plant will have a height greater than

90 cm

(2 marks)

(continued on the next page)

13. continued.

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

(1 mark)

_____ cm

(continued on the next page)

13. continued.

(c) Use the graph to find an estimate for the interquartile range of the heights.

(2 marks)

_____ cm

(continued on the next page)

13. continued.

Alan also grew plants of the same type inside.

The interquartile range of the heights of these plants is 30 cm

(continued on the next page)

13. continued.

(d) Give one comparison between the distribution of the heights of the plants grown inside with the distribution of the heights of the plants grown outside.

(1 mark)

(Total for Question 13 is 6 marks)

14. Here are the first six terms of a quadratic sequence.

5 11 21 35 53 75

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

(2 marks)

Answer space continues on the next page.

14. continued.

(Total for Question 14 is 2 marks)

15. Look at the diagram for Question 15 in the Diagram Booklet.

It shows triangle ABC and triangle AED

BD = 22 cm

DA = 32 cm

AE = 21·6 cm

EC = 58·4 cm

(continued on the next page)

15. continued.

Show that triangle ABC and triangle AED are similar.

(2 marks)

Answer space continues on the next page.

15. continued.

(Total for Question 15 is 2 marks)

16. Zia has to set a 4–digit security passcode on her phone.

Each digit of the passcode is a number from 1 to 9
She can use each number more than once.

Zia tells her friend Amber that
the first digit is a cube number
the second digit is a prime number
the third digit is greater than 6
the fourth digit is an odd number.

(continued on the next page)

16. continued.

One possible 4–digit passcode is shown below.

1 3 8 3

Amber is going to have one attempt at guessing Zia's passcode.

Work out the probability that Amber guesses Zia's passcode on the first attempt.

(3 marks)

Answer space continues on the next two pages.

16. continued.

16. continued.

(Total for Question 16 is 3 marks)

17. (a) (i) Write

$x^2 - 8x + 3$ in the form

$(x - a)^2 - b$ where

a and b are integers.

(2 marks)

(continued on the next page)

17. (a) continued.

(ii) Hence, write down the coordinates of the turning point on the graph of

$y = x^2 - 8x + 3$

(1 mark)

(_____ , _____)

(continued on the next page)

17. continued.

(b) Solve

$$7x^2 + 8x - 5 = 0$$

Give your solutions correct to 3 significant figures.

(3 marks)

Answer space continues on the next page.

17. (b) continued.

(continued on the next page)

17. continued.

Alex has to find the solutions of the quadratic equation

$3k^2 + 10k - 8 = 0$

Here is his working and answer.

$(3k - 2)(k + 4) = 0$

$k = 2$ or $k = -4$

(continued on the next page)

17. continued.

(c) What mistake has Alex made?

(1 mark)

(Total for Question 17 is 7 marks)

18. Look at the diagram for Question 18(a) in the Diagram Booklet.
It shows triangle **P** and triangle **Q** on a grid.

(a) Describe completely the single transformation that maps triangle **P** onto triangle **Q**
Two cutout shapes may be available if you wish to use them.
(2 marks)

(continued on the next page)

18. continued.

(b) Look at the diagram for Question 18(b) in the Diagram Booklet.
It shows triangle **P** and triangle **R** on a grid.
Triangle **P** is transformed by a rotation of 90° anticlockwise about the origin to give triangle **R**
Triangle **R** is then translated.

Exactly one vertex of triangle **P** is invariant under the combined transformation.

(continued on the next page)

18. (b) continued.

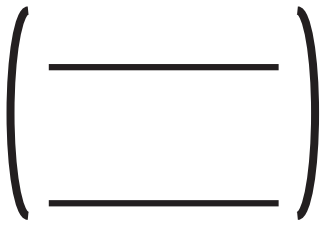
Find one possible column vector for the translation.

A cutout shape may be available if you wish to use it.

(1 mark)

Answer space continues on the next page.

18. (b) continued.



(Total for Question 18 is 3 marks)

19. Look at the diagrams and the formulae for Question 19 in the Diagram Booklet.

You may be provided with three models for this question and additional formula models.

The frustum **F** of a cone is made by removing a small cone with height **10 cm** from a larger solid cone with height **15 cm** and base diameter **24 cm** as shown by Diagram 1, Diagram 2 and the models.

(continued on the next page)

19. continued.

Diagram 3 and Diagram 4 show the solid **S** made by removing the frustum **F** from a solid hemisphere.

The hemisphere has diameter **24 cm**

Calculate the volume of solid **S**

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

(4 marks)

Answer space continues on the next two pages.

19. continued.

19. continued.

_____ cm^3

(Total for Question 19 is 4 marks)

20. The turning point on the graph of $y = g(x)$ has coordinates $(-3, 6)$

(a) Write down the coordinates of the turning point on the graph of $y = g(x - 7)$

(1 mark)

(_____ , _____)

(continued on the next page)

20. continued.

Look at the diagram for Question 20(b) in the Diagram Booklet.

It shows the graph of $y = f(x)$ on a grid.

(b) On the grid in the Diagram Booklet, sketch the graph of

$y = f(-x) + 3$

(2 marks)

(Total for Question 20 is 3 marks)

21. Look at the diagram for Question 21 in the Diagram Booklet.

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

AC is a diameter of the circle.

ADE and BCE are straight lines.

Angle DAC = 35°

Angle AEB = 28°

(continued on the next page)

21. continued.

Work out the size of angle BDC

Write down any circle theorems that you use.

(4 marks)

Answer space continues on the next page.

21. continued.

(Total for Question 21 is 4 marks)

22. Look at the information for Question 22 in the Diagram Booklet.

Ebony makes some bracelets to sell.

The minimum hourly rate of pay for someone of Ebony's age is £8·20

By considering bounds, determine if Ebony's hourly rate of pay was definitely more than £8·20

Use the information shown in the Diagram Booklet.

You must show all your working.

(4 marks)

Answer space is on the next two pages.

22. continued.

22. continued.

(Total for Question 22 is 4 marks)

23. Given that

$$\frac{2x^2 + y^2}{4x^2 - y^2} = \frac{43}{11}$$

where $x > 0$ and $y > 0$

find, in its simplest form, the ratio

$x : y$

(4 marks)

Answer space continues on the next three pages.

23. continued.

23. continued.

23. continued.

(Total for Question 23 is 4 marks)

24. Look at Diagram 1 and Diagram 2 for Question 24 in the Diagram Booklet.

You may be provided with a model.

Diagram 1 and the model show a triangular prism with a horizontal rectangular base **ABCD**

Diagram 2 shows face **TAD** of the triangular prism.

M is the midpoint of **AD**

The vertex **T** of the prism is vertically above **M**

AB = DC = 14·7 cm

DA = BC = 3·8 cm

MT = 2·3 cm

(continued on the next page)

24. continued.

P is the point on AB such that

$AP : PB = 5 : 2$

Calculate the size of the angle between TP and the base ABCD of the prism.

Give your answer correct to 1 decimal place.

(4 marks)

Answer space continues on the next two pages.

24. continued.

24. continued.

_____ °

(Total for Question 24 is 4 marks)

TOTAL FOR PAPER IS 80 MARKS

END OF PAPER