

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

Total Marks

Mathematics
PAPER 3 (Calculator)
Higher Tier

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 π button, take the value of π 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 to use them.

**You may be provided with a model for Question 18
It is NOT accurate.**

Turn over

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.

Good luck with your examination.

6

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

Turn over

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

It shows a right-angled triangle,
ABC

$$AB = 4 \text{ cm}$$

$$AC = 8.5 \text{ cm}$$

$$BC = x \text{ cm}$$

Angle **ABC** is a right angle.

Work out the value of **x**

(2 marks)

Answer space continues on the next
two pages.

Turn over

1. continued.

Turn over

1. continued.

X = _____

(Total for Question 1 is 2 marks)

Turn over

2. $T = 4m^2 - 11$

(a) Work out the value of T when
 $m = -3$

(2 marks)

Answer space continues on the
next page.

2. (a) continued.

$T =$ _____

(continued on the next page)

Turn over

2. continued.

**(b) Make p the subject of the
formula $n = 3p + 4$
(2 marks)**

(Total for Question 2 is 4 marks)

Turn over

- 3. Look at the information for Question 3 in the Diagram Booklet. Rick, Selma and Tony are playing a game with counters.**

Work out the value of p as shown in the ratio.

(5 marks)

Answer space continues on the next two pages.

3. continued.

Turn over

3. continued.

p = _____

(Total for Question 3 is 5 marks)

Turn over

- 4. Look at the information for Question 4 in the Diagram Booklet. Jo is going to buy 15 rolls of wallpaper.**

The information in the Diagram Booklet shows the cost of rolls of wallpaper from each of two shops.

Jo wants to buy the 15 rolls of wallpaper as cheaply as possible.

(continued on the next page)

4. continued.

**Should Jo buy the wallpaper from
Chic Decor or from Style Papers?**

**You must show how you get your
answer.**

(4 marks)

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

4. continued.

Turn over

4. continued.

(Total for Question 4 is 4 marks)

Turn over

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

It shows a frequency polygon.

(continued on the next page)

5. continued.

The table below gives information about the lengths, in **cm**, of some pieces of string.

Length (t cm)	Frequency
$0 < t \leq 10$	15
$10 < t \leq 20$	20
$20 < t \leq 30$	50
$30 < t \leq 40$	25
$40 < t \leq 50$	5

(continued on the next page)

Turn over

5. continued.

**Amos draws the frequency polygon
in the Diagram Booklet for the
information in the table.**

**Write down TWO mistakes that Amos
has made.**

1

2

(Total for Question 5 is 2 marks)

Turn over

6. Jessica runs for **15** minutes at an average speed of **6** miles per hour. She then runs for **40** minutes at an average speed of **9** miles per hour.

It takes Amy **45** minutes to run the same total distance that Jessica runs.

Work out Amy's average speed.

Give your answer in miles per hour.

(4 marks)

Answer space continues on the next two pages.

6. continued.

Turn over

6. continued.

_____ miles per hour

(Total for Question 6 is 4 marks)

Turn over

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

It shows rectangle **STUV**

TQU and **SRV** are straight lines.

All measurements are in **cm**

$$\text{TQ} = 2y \text{ cm}$$

$$\text{TS} = 4y \text{ cm}$$

$$\text{SR} = 3y \text{ cm}$$

$$\text{RV} = 5 \text{ cm}$$

The trapezium **QUVR** is shaded.

The area of trapezium **QUVR** is

$$A \text{ cm}^2$$

(continued on the next page)

Turn over

7. continued.

Show that $A = 2y^2 + 20y$

(3 marks)

**Answer space continues on the
next page.**

7. continued.

(Total for Question 7 is 3 marks)

Turn over

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

It shows a graph.

An electricity company charges the same fixed amount for each unit of electricity used.

David uses the graph in the Diagram Booklet to work out the total cost of the electricity he has used.

(continued on the next page)

8. continued.

**(a) Work out the gradient of the
straight line.**

(2 marks)

(continued on the next page)

Turn over

8. continued.

(b) What does the gradient of this line represent?

(1 mark)

(Total for Question 8 is 3 marks)

9. (a) Express

$$\sqrt{\frac{10^{360}}{10^{150} \times 10^{90}}} \text{ as a power of } 10$$

(3 marks)

Answer space continues on the
next page.

Turn over

9. (a) continued.

(continued on the next page)

Turn over

9. continued.

Liam was asked to express $(12^{50})^2$
as a power of 12

Liam wrote

$$(12^{50})^2 = 12^{50^2} = 12^{2500}$$

(continued on the next page)

9. continued.

Liam's method is wrong.

(b) Explain why.

(1 mark)

(Total for Question 9 is 4 marks)

- 10. Jane bought a new car three years ago.**

**At the end of the first year the value of the car had decreased by 12.5%
The value of the car then decreased by 10% each year for the next two years.**

At the end of the three years, the value of the car was £17 010

(continued on the next page)

10. continued.

**Work out the value of the car when
Jane bought it three years ago.**

(3 marks)

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

10. continued.

Turn over

10. continued.

£ _____

(Total for Question 10 is 3 marks)

Turn over

11. Rayheem has

16 shirts

5 pairs of jeans

3 jackets

Rayheem chooses an outfit to wear.

**An outfit is 1 shirt, 1 pair of jeans
and 1 jacket.**

**Work out how many different outfits
Rayheem can choose.**

(2 marks)

**Answer space continues on the
next page.**

11. continued.

(Total for Question 11 is 2 marks)

Turn over

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

ABC and **ACD** are right-angled triangles with a common side **AC**

$$DC = 8 \text{ cm}$$

$$\text{Angle } ADC = 45^\circ$$

$$\text{Angle } ABC = 20^\circ$$

Angle **ACD** and angle **ACB** are right angles.

Work out the length of **AB**

Give your answer correct to 3 significant figures.

(3 marks)

Answer space is on the next two pages.

Turn over

12. continued.

Turn over

12. continued.

_____ cm

(Total for Question 12 is 3 marks)

Turn over

13. **a** and **b** are vectors such that

$$\mathbf{a} = \begin{pmatrix} 2 \\ -3 \end{pmatrix} \quad \text{and} \quad 3\mathbf{a} - 2\mathbf{b} = \begin{pmatrix} 8 \\ -17 \end{pmatrix}$$

Find **b** as a column vector.

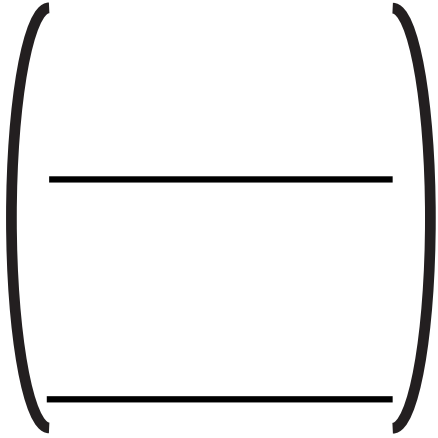
(3 marks)

Answer space continues on the next two pages.

13. continued.

Turn over

13. continued.



(Total for Question 13 is 3 marks)

Turn over

14. (a) Factorise fully

$$4p^2 - 36$$

(2 marks)

(continued on the next page)

Turn over

14. continued.

(b) Show that

$$(m + 4)(2m - 5)(3m + 1)$$

can be written in the form

$$am^3 + bm^2 + cm + d$$

**where a , b , c and d are
integers.**

(3 marks)

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

14. (b) continued.

14. (b) continued.

(Total for Question 14 is 5 marks)

Turn over

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

P, Q, R and S are four points on a circle.

PXR and **SXQ** are straight lines.

Prove that triangle **PQX** and triangle **SRX** are similar.

(3 marks)

Answer space continues on the next two pages.

15. continued.

Turn over

15. continued.

(Total for Question 15 is 3 marks)

Turn over

16. $p = \sqrt{\frac{2t}{u}}$

$t = 6.8$ correct to 1 decimal place.

$u = 0.05$ correct to 1 significant figure.

Work out the upper bound for the value of p

Give your answer correct to 3 significant figures.

You must show all your working.

(3 marks)

Answer space continues on the next two pages.

Turn over

16. continued.

Turn over

16. continued.

(Total for Question 16 is 3 marks)

Turn over

- 17. Look at the diagram for
Question 17(a) in the
Diagram Booklet.
It shows a grid.**

(continued on the next page)

17. continued.

The table below gives information about the distances, in miles, that some Year 10 students live from school.

Distance (d miles)	Frequency
$0 < d \leq 1.0$	90
$1.0 < d \leq 1.5$	50
$1.5 < d \leq 2.0$	30
$2.0 < d \leq 3.0$	20
$3.0 < d \leq 5.0$	20

(continued on the next page)

Turn over

17. continued.

- (a) On the grid in the
Diagram Booklet, draw a
histogram for this information.
(3 marks)**

(continued on the next page)

17. continued.

Look at the diagram for Question 17(b) in the Diagram Booklet.

It is a histogram which shows information about the distances, in miles, that some Year 11 students live from school.

The number of Year 11 students who live between 1 and 2 miles from school is n

(continued on the next page)

Turn over

17. continued.

(b) Find an expression, in terms of n , for the number of Year 11 students who live between 3 and 5 miles from school.

(2 marks)

Answer space continues on the next page.

17. (b) continued.

(Total for Question 17 is 5 marks)

Turn over

18. Look at Diagram 1 and Diagram 2 for Question 18 in the Diagram Booklet. You may be provided with a model. Diagram 1 and the model show a prism **ABCDSPQR**

The base **ABCD** of the prism is a square of side **14 cm**

T is the point on **BC** such that **$BT:TC = 4:3$**

(continued on the next page)

18. continued.

**The cross section of the prism
is in the shape of a trapezium of
area 147 cm^2 as shown in Diagram 2**

$$\text{CR} = 12 \text{ cm}$$

$$\text{CD} = 14 \text{ cm}$$

**Find the size of the angle between the
line **ST** and the base **ABCD****

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

(5 marks)

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

Turn over

18. continued.

Turn over

18. continued.

○

(Total for Question 18 is 5 marks)

Turn over

19. Show that

$$\frac{3x}{x+2} - \frac{2x+1}{x-2} - 1$$

can be written in the form

$$\frac{ax+b}{x^2-4}$$

where **a** and **b** are integers.

(4 marks)

Answer space continues on the next three pages.

19. continued.

Turn over

19. continued.

Turn over

19. continued.

(Total for Question 19 is 4 marks)

Turn over

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

The profit made by a shop increases each year.

The profit made by the shop in year n is $\text{£}P_n$

Given that the profit made by the shop in the next year is $\text{£}P_{n+1}$ then

$P_{n+1} = aP_n + 800$ where a is a constant.

(continued on the next page)

20. continued.

**The table in the Diagram Booklet
shows the profit made by the shop in
2018 and in 2019**

**Work out the profit predicted to be
made by the shop in 2021**

(4 marks)

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

20. continued.

Turn over

20. continued.

£ _____

(Total for Question 20 is 4 marks)

Turn over

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

It shows Ray's nine cards numbered 1 to 9

Ray takes at random three of these cards.

He works out the sum of the numbers on the three cards and records the result.

(continued on the next page)

21. continued.

**Work out the probability that the
result is an even number.**

(4 marks)

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

21. continued.

Turn over

21. continued.

(Total for Question 21 is 4 marks)

Turn over

22. L is the straight line with equation
 $y = 2x - 5$

C is a graph with equation
 $y^2 = 6x^2 - 25x - 8$

Using algebra, find the coordinates of
the points of intersection of **L** and **C**
You must show all your working.

(5 marks)

Answer space continues on the next
three pages.

22. continued.

Turn over

22. continued.

Turn over

22. continued.

(_____ , _____)

(_____ , _____)

(Total for Question 22 is 5 marks)

TOTAL FOR PAPER IS 80 MARKS

END OF PAPER
