

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

Total Marks
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Mathematics  
PAPER 3  
(Calculator)  
Higher Tier

Time: 1 hour 30 minutes plus your additional time allowance

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. 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  $3 \cdot 142$  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.**

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**Answer ALL questions.**

**Write your answers in the spaces provided.**

**You must write down all the stages in your working.**

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

It is a scatter graph which shows information about the volume of traffic and the carbon monoxide level at a point on a road each day for **22** days.

One point is an outlier.

- (a) Write down the coordinates of this point.

(1 mark)

( \_\_\_\_\_ , \_\_\_\_\_ )

(continued on the next page)

1. continued.

For another day, **370** cars pass the point on the road.

(b) Estimate the carbon monoxide level for this day.

(2 marks)

\_\_\_\_\_  $\text{mg/m}^3$

(continued on the next page)

**1. continued.**

**Alfie says,**

**“Because there is an outlier, there is no correlation.”**

**(c) Is Alfie correct?**

**You must give a reason for your answer.**

**(1 mark)**

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**(Total for Question 1 is 4 marks)**

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2. Natalie makes potato cakes in a restaurant.  
She mixes potato, cheese and onion so that

weight of potato : weight of cheese : weight of onion  
= 9 : 2 : 1

Natalie needs to make 6000 grams of potato cakes.  
Cheese costs £2.25 for 175 grams.

Work out the cost of the cheese needed to make  
6000 grams of potato cakes.

(4 marks)

Answer space continues on the next two pages.



**2. continued.**

**Turn over**

2. continued.

£ \_\_\_\_\_

(Total for Question 2 is 4 marks)

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3. (a) Write

$4.5 \times 10^5$  as an ordinary number.

(1 mark)

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(b) Write  $0.007$  in standard form.

(1 mark)

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(continued on the next page)

3. continued.

(c) Work out

$$4.2 \times 10^3 + 5.3 \times 10^2$$

Give your answer in standard form.

(2 marks)

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(Total for Question 3 is 4 marks)

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4. A water tank is empty.

Anil needs to fill the tank with **2400** litres of water.

Company **A** supplies water at a rate of **8** litres in **1** minute **40** seconds.

Company **B** supplies water at a rate of **2·2** gallons per minute.

**1** gallon = **4·54** litres

Company **A** would take more time to fill the tank than Company **B** would take to fill the tank.

How much more time?

Give your answer in minutes correct to the nearest minute.

(4 marks)

Answer space continues on the next page.

4. continued.

\_\_\_\_\_ minutes

(Total for Question 4 is 4 marks)

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Turn over

5. The first four terms of a Fibonacci sequence are

$n$        $2n$        $3n$        $5n$

The sum of the first five terms of this sequence is  
**228**

Work out the value of  $n$

(3 marks)

Answer space continues on the next page.

5. continued.

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**(Total for Question 5 is 3 marks)**

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**Turn over**



6. Look at the table for Question 6 in the Diagram Booklet.

In a bag there are only red counters, blue counters, green counters and pink counters.

A counter is going to be taken at random from the bag.

The table in the Diagram Booklet shows the probabilities of taking a red counter or a blue counter.

The probability of taking a green counter is  $0.2$  more than the probability of taking a pink counter.

- (a) Complete the table in the Diagram Booklet.  
There are two spaces to fill.  
(2 marks)

(continued on the next page)

Turn over

6. continued.

There are **18** blue counters in the bag.

(b) Work out the total number of counters in the bag.

(2 marks)

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(Total for Question 6 is 4 marks)

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

It shows a sector **OPQR** of a circle, centre **O** and radius **8 cm**

$$OP = OR = 8 \text{ cm}$$

The marked angle is a right angle.

**OPR** is a triangle.

Work out the area of the shaded segment **PQR**  
Give your answer correct to **3** significant figures.  
(4 marks)

Answer space continues on the next page.

**7. continued.**

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

**(Total for Question 7 is 4 marks)**

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**Turn over**

8. (a) Look at the diagram for Question 8(a) in the Diagram Booklet.

Using the axes in the Diagram Booklet, sketch a graph to represent the statement

**$y$  is directly proportional to  $x$**

(1 mark)

- (b) Look at the diagram for Question 8(b) in the Diagram Booklet.

Using the axes in the Diagram Booklet, sketch a graph to represent the statement

**$y$  is inversely proportional to  $x$**

(1 mark)

(Total for Question 8 is 2 marks)

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9. On Monday, 12 people took 5 hours to clean a number of cars.

On Tuesday, 15 people cleaned the same number of cars.

Assuming that all the people worked at the same rate,

- (a) work out how many hours the 15 people took to clean the cars.

(2 marks)

\_\_\_\_\_ hours

(continued on the next page)

Turn over

9. continued.

The assumption is wrong.

(b) How might this affect the time taken for the  
**15** people to clean the cars?  
(1 mark)

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(Total for Question 9 is 3 marks)

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

The diagram shows two right-angled triangles **ACB** and **DEB**

Triangle **DEB** is smaller than triangle **ACB**

Both the marked angles are right angles.

$$AD = 9 \text{ cm}$$

$$DE = 2 \text{ cm}$$

$$DB = 6 \text{ cm}$$

Calculate the length of **CB**

Give your answer correct to **2** decimal places.

(4 marks)

Answer space continues on the next page.



10. continued.

\_\_\_\_\_ cm

(Total for Question 10 is 4 marks)

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Turn over

11. Freya writes down the value of  $X$ , correct to 1 decimal place.

She writes  $X = 6.4$

Complete the error interval for  $X$

\_\_\_\_\_  $\leq x <$  \_\_\_\_\_

(Total for Question 11 is 2 marks)

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Turn over

12.  $(mx^6)^{\frac{1}{n}} = 7x^3$

Work out the value of **m** and the value of **n**

**m** = \_\_\_\_\_

**n** = \_\_\_\_\_

(Total for Question 12 is 2 marks)

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

**It shows a pattern made from four identical rectangles within a set of axes.**

**The sides of the rectangles are parallel to the axes.**

**Point A has coordinates (3, 4)**

**Point B has coordinates (11, 20)**

**Point C is marked on the diagram in the Diagram Booklet.**

**Work out the coordinates of C**

**You must show all your working.**

**(5 marks)**

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

13. continued.

( \_\_\_\_\_ , \_\_\_\_\_ )

(Total for Question 13 is 5 marks)

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Turn over

14. Olivia and Jessica have in total half as many sweets as Fran and Gary have in total.

Fran and Gary share their sweets in the ratio **2:3**

Olivia and Jessica share their sweets in the ratio **9:1**

Fran got **W** sweets.

Gary got **X** sweets.

Olivia got **y** sweets.

Jessica got **Z** sweets.

Find, in its simplest form, **W:X:y:Z**

(4 marks)

Answer space continues on the next page.

14. continued.

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(Total for Question 14 is 4 marks)

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Turn over

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

It shows a graph which gives the volume of water, in litres, in a container at time  $t$  seconds after the water started to flow out of the container.

Using the graph, work out an estimate for the rate at which the water is flowing out of the container when  $t = 12$

You must show your working.

\_\_\_\_\_ litres per second

(Total for Question 15 is 3 marks)

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Turn over



16. The curve **C** has equation  $y = x^2 + 3x - 3$

The line **L** has equation  $y - 5x + 4 = 0$

Show, algebraically, that **C** and **L** have exactly one point in common.

(4 marks)

Answer space continues on the next two pages.

16. continued.

**16. continued.**

**(Total for Question 16 is 4 marks)**

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17. **X** is directly proportional to the square of **y**  
**y** is directly proportional to the cube of **z**

**z = 2** when **x = 32**

Find a formula for **X** in terms of **z**

(4 marks)

Answer space continues on the next two pages.

17. continued.

17. continued.

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(Total for Question 17 is 4 marks)

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18. Look at the diagram for Question 18 in the Diagram Booklet.

It shows a trapezium **OABC**

A straight line inside the trapezium joins point **O** and point **B**

$$\vec{OA} = a$$

$$\vec{AB} = b$$

$$\vec{OC} = 3b$$

**D** is the point on **OB** such that **OD:DB = 2:3**

**E** is the point on **BC** such that **BE:EC = 1:4**

Work out the vector  $\vec{DE}$  in terms of **a** and **b**

Give your answer in its simplest form.

(4 marks)

Answer space continues on the next page.

18. continued.

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(Total for Question 18 is 4 marks)

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Turn over



19. At the start of year  $n$ , the number of animals in a population is  $P_n$

At the start of the following year, the number of animals in the population is  $P_{n+1}$  where

$$P_{n+1} = kP_n$$

At the start of **2017** the number of animals in the population was **4000**

At the start of **2019** the number of animals in the population was **3610**

Find the value of the constant  $k$

(3 marks)

Answer space continues on the next page.

**19. continued.**

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**(Total for Question 19 is 3 marks)**

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**Turn over**

**20. Pat throws a fair coin  $n$  times.**

**Find an expression, in terms of  $n$ , for the probability that Pat gets at least 1 head and at least 1 tail.**

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**(Total for Question 20 is 2 marks)**

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

**It is a speed–time graph showing the speed, in metres per second, of an object  $t$  seconds after it started to move from rest.**

- (a) Using 3 trapeziums of equal width, work out an estimate for the area under the graph between  $t = 1$  and  $t = 4$**   
**(3 marks)**

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**(continued on the next page)**

**Turn over**

**21. continued.**

**(b) What does this area represent?**

**(1 mark)**

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**(Total for Question 21 is 4 marks)**

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22. Show that

$$\frac{6y^3}{(9y^2 - 144)} \div \frac{2y^4}{3(y - 4)}$$

can be written in the form

$$\frac{1}{y(y + r)} \text{ where } r \text{ is an integer.}$$

(3 marks)

Answer space continues on the next page.

**22. continued.**

**(Total for Question 22 is 3 marks)**

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**Turn over**

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

It shows triangle **ABC**

**D** is the point on **BC** such that  
angle **BAD** = angle **DAC** =  $x^\circ$

Prove that  $\frac{AB}{BD} = \frac{AC}{DC}$   
(4 marks)

Answer space continues on the next page.



**23. continued.**

**(Total for Question 23 is 4 marks)**

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**TOTAL FOR PAPER IS 80 MARKS**

**END OF PAPER**

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