

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

Total Marks
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Mathematics  
PAPER 1  
(Non-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**

**Writing and drawing equipment, ruler, protractor, compasses, Formulae Sheet. 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 NOT BE USED.**

## **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.**

**You may be provided with models for Question 7, Question 24(a) and Question 24(b)**

## **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. Write 500 as a product of powers of its prime factors.**

**(3 marks)**

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

1. continued.

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(Total for Question 1 is 3 marks)

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Turn over

2. (a) Work out

$$1\frac{3}{5} + 2\frac{1}{4}$$

Give your answer as a mixed number.

(2 marks)

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(continued on the next page)

Turn over

2. continued.

(b) Show that

$$2\frac{2}{3} \div 6 = \frac{4}{9}$$

(2 marks)

(Total for Question 2 is 4 marks)

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Turn over



**3. Simplify**

$$(2^{-5} \times 2^8)^2$$

**Give your answer as a power of 2**

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**(Total for Question 3 is 2 marks)**

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**Turn over**

**10**

**4. Work out**

$$0.004 \times 0.32$$

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**(Total for Question 4 is 2 marks)**

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**Turn over**

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

A car factory is going to make four different car models **A**, **B**, **C** and **D**

**80** people are asked which of the four models they would be most likely to buy.

The table in the Diagram Booklet shows information about the results.

The factory is going to make **40 000** cars next year.

Work out how many model **B** cars the factory should make next year.

(2 marks)

Answer space continues on the next page.

5. continued.

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(Total for Question 5 is 2 marks)

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Turn over

6. Rizwan writes down three numbers  $p$ ,  $q$  and  $r$

$$p : q = 1 : 3$$

$$q : r = 6 : 5$$

(a) (i) Find  $p : q : r$   
(2 marks)

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(continued on the next page)

6. (a) continued.

- (ii) Express  $p$  as a fraction of the total of the three numbers  $p$ ,  $q$  and  $r$   
(2 marks)

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(continued on the next page)

6. continued.

Emma writes down three numbers **W**, **X** and **y**

$$x = 2w$$

$$y = 5x$$

(b) Find **W : y**

(2 marks)

Answer space continues on the next page.

6. (b) continued.

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(Total for Question 6 is 6 marks)

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- 7. Look at Diagram 1 and Diagram 2 for Question 7 in the Diagram Booklet.**

**You may be provided with a model.**

**It is NOT accurate.**

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

**Diagram 1 and the model show a storage tank that exerts a force of 10 000 newtons on the ground.**

**The base of the tank in contact with the ground is a 4 metres by 2 metres rectangle.**

**Diagram 2 shows the base view.**

**Work out the pressure on the ground due to the tank.**

**(2 marks)**

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

7. continued.

\_\_\_\_\_ newtons / m<sup>2</sup>

(Total for Question 7 is 2 marks)

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Turn over

8. Two numbers  $m$  and  $n$  are such that  
 $m$  is a multiple of 5  
 $n$  is an even number  
the highest common factor (HCF) of  $m$  and  $n$  is 7

Write down a possible value for  $m$  and a possible value for  $n$

$m =$  \_\_\_\_\_

$n =$  \_\_\_\_\_

(Total for Question 8 is 2 marks)

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9. (a) Complete the table of values below for

$$y = 6x - x^3$$

There are four spaces to fill.

(2 marks)

x	y
-3	9
-2	
-1	
0	
1	
2	4
3	-9

(continued on the next page)

Turn over

**9. continued.**

**(b) Look at the diagram for Question 9(b) in the Diagram Booklet.**

**On the grid in the Diagram Booklet, draw the graph of**

**$y = 6x - x^3$  for values of  $x$  from  $-3$  to  $3$**   
**(2 marks)**

**(Total for Question 9 is 4 marks)**

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**10. Look at the diagram and table for Question 10 in the Diagram Booklet.**

**Lina spins the biased 5-sided spinner in the Diagram Booklet 40 times.**

**Her results are shown in the table in the Diagram Booklet.**

**Lina is now going to spin the spinner another two times.**

- (a) Work out an estimate for the probability that she gets a score of 5 both times.**  
**(2 marks)**

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**(continued on the next page)**

**Turn over**

**10. continued.**

**Derek is going to spin the spinner a large number of times.**

- (b) Work out an estimate for the percentage of times Derek can expect to get a score of 1  
(2 marks)**

\_\_\_\_\_ %

**(Total for Question 10 is 4 marks)**

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**Turn over**

**11. Look at the diagram for Question 11 in the Diagram Booklet.**

**It shows Shape P and Shape Q**

**Describe fully the single transformation that maps shape P onto shape Q in the Diagram Booklet.**

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**(Total for Question 11 is 2 marks)**

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**12. Solve the simultaneous equations**

$$5x + 2y = 11$$

$$4x + 3y = 6$$

**(4 marks)**

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

12. continued.

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

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

(Total for Question 12 is 4 marks)

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Turn over

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

**$p$  is inversely proportional to  $t$**

**Complete the table of values.**

**There are three spaces to fill.**

**(Total for Question 13 is 3 marks)**

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**Turn over**

14. Look at the diagram for Question 14 in the Diagram Booklet.

It shows a grid.

The table shows information about the weights, in grams, of some potatoes.

Weight (w grams)	Number of potatoes
$50 < w \leq 70$	20
$70 < w \leq 80$	50
$80 < w \leq 90$	60
$90 < w \leq 110$	30

On the grid in the Diagram Booklet, draw a histogram for this information.

(Total for Question 14 is 3 marks)

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

The diagram shows a sector of a circle of radius 18 cm

The length of the arc is  $4\pi$  cm

Work out the value of  $x$

(3 marks)

Answer space continues on the next page.

15. continued.

**X** = \_\_\_\_\_

(Total for Question 15 is 3 marks)

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16. (a) Prove that

$$(2m + 1)^2 - (2n - 1)^2 = 4(m + n)(m - n + 1)$$

(3 marks)

Answer space continues on the next page.

**16. (a) continued.**

**(continued on the next page)**

**Turn over**



**16. continued.**

**Sophia says that the result in part (a) shows that the difference of the squares of any two odd numbers must be a multiple of 4**

**(b) Is Sophia correct?**

**You must give reasons for your answer.**

**(1 mark)**

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

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17. Work out the value of

$$\left(\frac{8}{27}\right)^{\frac{4}{3}}$$

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(Total for Question 17 is 2 marks)

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

It shows a circle with a centre **O**

**A** and **B** are points on the circle.

The lines **AB**, **OB** and **OA** form the triangle **AOB**

**DBC** is the tangent to the circle at point **B**

Angle **AOB** =  $x^\circ$

Show that angle **ABC** =  $\frac{1}{2}x^\circ$

You must give a reason for each stage of your working.

(3 marks)

Answer space continues on the next page.

18. continued.

(Total for Question 18 is 3 marks)

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Turn over

19. Solve

$$\frac{1}{x} - \frac{1}{x+1} = 4$$

Give your answer in the form

$a \pm b\sqrt{2}$  where  $a$  and  $b$  are fractions.

(5 marks)

Answer space continues on the next page.

19. continued.

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(Total for Question 19 is 5 marks)

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Turn over

**20. Alfie has 11 cards.**

**He has**

**3 blue cards**

**7 green cards**

**and 1 white card.**

**Alfie takes at random 2 of these cards.**

**Work out the probability that he takes cards of  
different colours.**

**(3 marks)**

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

20. continued.

Turn over



**20. continued.**

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**(Total for Question 20 is 3 marks)**

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**Turn over**

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

**It shows a sketch of part of the curve with equation**

$$\mathbf{y = \cos x^\circ}$$

**P is a minimum point on the curve.**

**Write down the coordinates of P**

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

**(Total for Question 21 is 2 marks)**

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

It shows a triangle **ABC**

$$AC = 6.5 \text{ cm}$$

$$BC = 10.7 \text{ cm}$$

$$\text{Angle } BAC = 30^\circ$$

Work out the value of  **$\sin ABC$**

Give your answer in the form  $\frac{m}{n}$  where **m** and **n** are integers.

(4 marks)

Answer space continues on the next page.

**22. continued.**

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**(Total for Question 22 is 4 marks)**

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**Turn over**

23. Here are the first five terms of a geometric sequence.

$$\sqrt{5} \quad 10 \quad 20\sqrt{5} \quad 200 \quad 400\sqrt{5}$$

(a) Work out the next term of the sequence.  
(2 marks)

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(continued on the next page)

23. continued.

The 4th term of a different geometric sequence is

$$\frac{5\sqrt{2}}{4}$$

The 6th term of this sequence is

$$\frac{5\sqrt{2}}{8}$$

Given that the terms of this sequence are all positive,

(b) work out the first term of this sequence.

You must show all your working.

(3 marks)

Answer space continues on the next page.

**23. (b) continued.**

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**(Total for Question 23 is 5 marks)**

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**Turn over**

**24. Look at Diagram 1, Diagram 2, Diagram 3, Diagram 4 and Diagram 5 for Question 24(a) in the Diagram Booklet.**

**You may be provided with models.**

**They are NOT accurate.**

**Diagram 1 and Model 1 show a solid sphere.**

**Diagram 2 shows a 2D representation of the sphere.**

**Diagram 3 and Model 2 show a solid cone.**

**Diagram 4 shows a 2D representation of the cone.**

**Diagram 5 shows the base of the cone.**

**radius of the sphere = radius of the base of the cone =  $r$   
vertical height of the cone =  $h$**

$$\text{Volume of sphere} = \frac{4}{3}\pi r^3$$

$$\text{Volume of cone} = \frac{1}{3}\pi r^2 h$$

**All measurements are in cm**

**The volume of the sphere is equal to the volume of the cone.**

**(continued on the next page)**

**Turn over**



24. continued.

(a) Find  $r:h$

Give your answer in its simplest form.

(2 marks)

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(continued on the next page)

Turn over

**24. continued.**

**Look at Diagram 1, Diagram 2, Diagram 3, Diagram 4 and Diagram 5 for Question 24(b) in the Diagram Booklet.**

**You may be provided with models.**

**They are NOT accurate.**

**They show a different solid sphere and solid cone.**

**Diagram 1 and Model 1 show a solid sphere.**

**Diagram 2 shows a 2D representation of the sphere.**

**Diagram 3 and Model 2 show a solid cone.**

**Diagram 4 shows a 2D representation of the cone.**

**Diagram 5 shows the base of the cone.**

**radius of the sphere = radius of the base of the cone =  $r$**

**slant height of the cone =  $l$**

**Surface area of sphere =  $4\pi r^2$**

**Curved area of cone =  $\pi r l$**

**(continued on the next page)**

**Turn over**

**24. continued.**

**All measurements are in cm**

**The surface area of the sphere is equal to the  
TOTAL surface area of the cone.**

**(b) Find  $r:h$**

**Give your answer in the form  $1:\sqrt{n}$  where  
 $n$  is an integer.**

**(4 marks)**

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

24. (b) continued.

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(Total for Question 24 is 6 marks)

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**TOTAL FOR PAPER IS 80 MARKS**

**END OF PAPER**

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