

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.**

**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.**

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

**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.**

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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)**

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

**Turn over**

**2. (a) continued.**

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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)**

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

**Turn over**

**2. (b) continued.**

**(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**

**(2 marks)**

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

**Turn over**

**3. continued.**

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

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**Turn over**

**4. Work out**

$$0.004 \times 0.32$$

**(2 marks)**

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

**4. continued.**

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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.**

**(continued on the next page)**

**Turn over**

**5. continued.**

**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**

$$\mathbf{p : q = 1 : 3}$$

$$\mathbf{q : r = 6 : 5}$$

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

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

6. (a) (i) continued.

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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)**

**Turn over**

**6. continued.**

**Emma writes down three numbers  
w, x and y**

$$\mathbf{x = 2w}$$

$$\mathbf{y = 5x}$$

**(b) Find  $w : y$**

**(2 marks)**

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

**Turn over**

**6. (b) continued.**

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**(Total for Question 6 is 6 marks)**

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**Turn over**



- 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.**

**(continued on the next page)**

**Turn over**

**7. continued.**

**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  $n$   
(2 marks)

Answer space continues on the next page.

**8. continued.**

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

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

**(Total for Question 8 is 2 marks)**

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**Turn over**

9. (a) Complete the table of values on the following page for

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

There are four spaces to fill.

(2 marks)

9. (a) continued.

<b>x</b>	<b>y</b>
<b>−3</b>	<b>9</b>
<b>−2</b>	
<b>−1</b>	
<b>0</b>	
<b>1</b>	
<b>2</b>	<b>4</b>
<b>3</b>	<b>−9</b>

(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.**

**(continued on the next page)**

**10. continued.**

**(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)**

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

**10. (b) continued.**

\_\_\_\_\_ %

**(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  
two pages.**

**12. continued.**

**Turn over**

**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.**

**(3 marks)**

**Space for working continues on the next page.**

**13. continued.**

**(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.**

<b>Weight (<math>w</math> grams)</b>	<b>Number of potatoes</b>
<b><math>50 &lt; w \leq 70</math></b>	<b>20</b>
<b><math>70 &lt; w \leq 80</math></b>	<b>50</b>
<b><math>80 &lt; w \leq 90</math></b>	<b>60</b>
<b><math>90 &lt; w \leq 110</math></b>	<b>30</b>

**(continued on the next page)**

**Turn over**

**14. continued.**

**On the grid in the Diagram Booklet,  
draw a histogram for the information  
on the previous page.**

**(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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**Turn over**

**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**

**(continued on the next page)**

**16. continued.**

**(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**

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

**(2 marks)**

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

**17. continued.**

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**(Total for Question 17 is 2 marks)**

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**Turn over**

**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 =  $x^\circ$**

**(continued on the next page)**

**18. continued.**

**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 two pages.**



**19. continued.**

**Turn over**

**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 three pages.**

**Turn over**

**20. continued.**

**Turn over**

**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  $y = \cos x^\circ$**

**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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**Turn over**

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

**It shows a triangle ABC**

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

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

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

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

**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)**

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

**23. (a) continued.**

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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**

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

**(continued on the next page)**

**Turn over**

**23. continued.**

**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.**

**(continued on the next page)**

**24. continued.**

**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 =  $h$**

**(continued on the next page)**

**Turn over**



**24. continued.**

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

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

**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)**

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

**24. (a) continued.**

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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.**

**(continued on the next page)**

**24. continued.**

**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 =  $r$**

**(continued on the next page)**

**Turn over**

**24. continued.**

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

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

**Curved area of cone =  $\pi rl$**

**All measurements are in cm**

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

**(continued on the next page)**

**Turn over**

**24. continued.**

**(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 two pages.**

**Turn over**

**24. (b) continued.**

**Turn over**



**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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