

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

Total Marks

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

Turn over

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.

Turn over

6

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

Turn over

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

(3 marks)

Answer space continues on the next page.

1. continued.

(Total for Question 1 is 3 marks)

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.

(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)

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.

(Total for Question 3 is 2 marks)

Turn over

4. Work out

$$0.004 \times 0.32$$

(2 marks)

Answer space continues on the next page.

Turn over

4. continued.

(Total for Question 4 is 2 marks)

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.

Turn over

5. continued.

(Total for Question 5 is 2 marks)

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)

Answer space continues on
the next page.

6. (a) (i) continued.

(continued on the next page)

Turn over

6. (a) continued.

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

(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.

(Total for Question 6 is 6 marks)

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.**

Turn over

7. continued.

_____ newtons / m²

(Total for Question 7 is 2 marks)

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)

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.

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)

Turn over

- 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)

(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.

Turn over

10. (b) continued.

_____ %

(Total for Question 10 is 4 marks)

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.**

(Total for Question 11 is 2 marks)

Turn over

12. Solve the simultaneous equations

$$5x + 2y = 11$$

$$4x + 3y = 6$$

(4 marks)

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

Turn over

12. continued.

Turn over

12. continued.

x = _____

y = _____

(Total for Question 12 is 4 marks)

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)

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

(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)

Turn over

- 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 4π 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)

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.

Turn over

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)

(Total for Question 16 is 4 marks)

Turn over

17. Work out the value of

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

(2 marks)

Answer space continues on the
next page.

Turn over

17. continued.

(Total for Question 17 is 2 marks)

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°

(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.

Turn over

18. continued.

(Total for Question 18 is 3 marks)

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.

Turn over

19. continued.

Turn over

19. continued.

(Total for Question 19 is 5 marks)

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.

(Total for Question 20 is 3 marks)

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)

Turn over

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

It shows a triangle ABC

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

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

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

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.

Turn over

22. continued.

(Total for Question 22 is 4 marks)

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.

Turn over

23. (a) continued.

(continued on the next page)

Turn over

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.**

Turn over

23. (b) continued.

(Total for Question 23 is 5 marks)

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.

Turn over

24. (a) continued.

(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)

Turn over

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 = πrl

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.

(Total for Question 24 is 6 marks)

TOTAL FOR PAPER IS 80 MARKS

END OF PAPER
