

Paper Reference 4MA1/2H
Pearson Edexcel
International GCSE

Total Marks

Mathematics A
PAPER 2H
Higher Tier
(Calculator)

Time: 2 hours 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
Formulae Pages**

INSTRUCTIONS

Answer ALL questions.

Without sufficient working, correct answers may be awarded no marks.

Answer the questions in the spaces provided in this Question Paper or on the separate diagrams – there may be more space than you need.

CALCULATORS MAY BE USED.

You must NOT write anything on the Formulae Pages. Anything you write on the Formulae Pages will gain NO credit.

INFORMATION

The total mark for this paper is **100**

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.

You may be provided with a model for Question 22

ADVICE

Read each question carefully before you start to answer it.

Check your answers if you have time at the end.

Answer ALL TWENTY TWO questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1. (a) Write down the value of m , given that

$$3^4 \times 3^5 = 3^m$$

(1 mark)

$$m = \underline{\hspace{4cm}}$$

- (b) Write down the value of n , given that

$$(5^3)^7 = 5^n$$

(1 mark)

$$n = \underline{\hspace{4cm}}$$

(continued on the next page)

1. continued.

(c) Find the value of p , given that

$$\frac{7^8 \times 7^2}{7^p} = 7^6$$

(2 marks)

$p =$ _____

(Total for Question 1 is 4 marks)

2. Look at the diagram for Question 2 in the Diagram Booklet.

It is NOT accurately drawn.

It shows two rectangles, rectangle **A** and rectangle **B**

Rectangle **A** has length **4 cm** and width **$(5 - x)$ cm**

Rectangle **B** has length **5 cm** and width **$(2x - 1)$ cm**

The area of rectangle **B** is twice the area of rectangle **A**

Work out the value of **x**

Show your working clearly.

(4 marks)

Answer space continues on the next page.

2. continued.

x = _____

(Total for Question 2 is 4 marks)

Turn over

3. Look at the table for Question 3 in the Diagram Booklet.

It gives information about the amounts of money, in euros, that **70** of Anjali's friends spent last Saturday.

One of Anjali's **70** friends is going to be chosen at random.

- (a) Find the probability that this friend spent more than **24** euros last Saturday.

(1 mark)

(continued on the next page)

3. continued.

- (b) Work out an estimate for the mean amount of money spent by Anjali's friends last Saturday. Give your answer correct to 2 decimal places. (4 marks)

_____ euros

(Total for Question 3 is 5 marks)

Turn over

4. Look at the diagram for Question 4 in the Diagram Booklet.

It is NOT accurately drawn.

It shows two similar triangles **ABC** and **DEF**

In triangle **ABC**, **AC = 45 cm**

In triangle **DEF**, **DE = 36 cm** and **DF = 20 cm**

Angle **BAC** = angle **EDF**

Angle **BCA** = angle **EFD**

- (a) Work out the length of **AB**

(2 marks)

_____ cm

(continued on the next page)

Turn over

4. continued.

Given that $BC = 54 \text{ cm}$

(b) work out the length of EF
(2 marks)

_____ cm

(Total for Question 4 is 4 marks)

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

It is NOT accurately drawn.

It shows a regular octagon **ABCDHIJK** and a pentagon **DEFGH**

Angle **GHD** = angle **FGH**

Angle **EDH** = 112°

Angle **DEF** = 102°

Angle **EFG** = 96°

The exterior angle **GHI** is marked **x**

Work out the size of the angle marked **x**

Show your working clearly.

(5 marks)

Answer space continues on the next page.

5. continued.

_____ ○

(Total for Question 5 is 5 marks)

6. Victor buys 12 bottles of apple juice for a total cost of \$21

Victor sells all 12 bottles at \$2.45 each bottle.

Work out Victor's percentage profit.

(3 marks)

Answer space continues on the next page.

6. continued.

_____ %

(Total for Question 6 is 3 marks)

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

It provides information about two banks.

Ali and Badia each have **25 000** dollars to invest.

Ali invests in the Cyclone Bank for **3** years.

Badia invests in the Tornado Bank for **3** years.

By the end of the **3** years, Ali will have received more interest than Badia.

How much more?

Show your working clearly.

Give your answer correct to the nearest dollar.

(4 marks)

Answer space continues on the next two pages.

7. continued.

7. continued.

_____ dollars

(Total for Question 7 is 4 marks)

8. (a) Simplify

$$(3x^2y)^0$$

(1 mark)

(b) (i) Factorise

$$y^2 - 5y - 36$$

(2 marks)

(continued on the next page)

8. (b) continued.

(ii) Hence solve

$$y^2 - 5y - 36 = 0$$

(1 mark)

(Total for Question 8 is 4 marks)

9. A rainwater tank contains 2.4×10^7 raindrops.
The rainwater tank also contains
 1.75×10^6 bacteria.

(a) Work out the number of bacteria per raindrop in the tank.

Give your answer in standard form correct to 2 significant figures.

(3 marks)

Answer space continues on the next page.

9. (a) continued.



(continued on the next page)

9. continued.

A drop of rainwater contains 5.01×10^{21} atoms.

In a drop of rainwater the number of atoms is
3 times the number of molecules.

(b) Work out the number of molecules in the
rainwater tank.

Give your answer in standard form correct to
one significant figure.

(2 marks)

_____ molecules

(Total for Question 9 is 5 marks)

Turn over

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

It is NOT accurately drawn.

ABC is an isosceles triangle with **BA = BC**

Angle **BAN** = 38°

N is the point on **AC** such that **AN = 9.3 cm** and **BN** is perpendicular to **AC**

Work out the perimeter of triangle **ABC**

Give your answer correct to **3** significant figures.

(4 marks)

Answer space continues on the next page.

10. continued.

_____ cm

(Total for Question 10 is 4 marks)

Turn over

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

It is NOT accurately drawn.

B, D, E and F are points on a circle, centre **O**

ABC is a tangent to the circle.

ODC is a straight line.

BOE is a diameter of the circle.

Angle **BCD** = 48°

Find the size of angle **DFE**

(3 marks)

Answer space continues on the next page.

11. continued.

○

(Total for Question 11 is 3 marks)

Turn over

12. (a) Simplify

$$(64p^9q^{12})^{\frac{2}{3}}$$

(2 marks)

(continued on the next page)

12. continued.

(b) Write as a single fraction $\frac{2}{3x} + \frac{4}{5x} - \frac{9}{10x}$

Give your answer in its simplest form.

(2 marks)

Answer space continues on the next page.

12. (b) continued.

(c) Expand and simplify

$$4y(y - 5)(2y + 3)$$

Show your working clearly.

(3 marks)

Answer space continues on the next page.

12. (c) continued.

(Total for Question 12 is 7 marks)

Turn over

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

The region **R**, shown shaded in the diagram, is bounded by three straight lines.

One of the straight lines is labelled $y = 2x + 2$

Write down the three inequalities that define **R**

(Total for Question 13 is 3 marks)

14. Manuel collected information about the flights that arrived late at an airport last month.

The table below gives information about the number of minutes that these flights were late.

Minutes late (L minutes)	Frequency
$0 < L \leq 10$	10
$10 < L \leq 15$	15
$15 < L \leq 25$	25
$25 < L \leq 40$	30
$40 < L \leq 60$	10

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

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

(3 marks)

(continued on the next page)

14. continued.

Manuel selected at random a flight that was late by **25** minutes or less from his results.

(b) Work out an estimate for the probability that this flight was late by **5** minutes or less.

(2 marks)

(Total for Question 14 is 5 marks)

15. The functions **f** and **g** are such that

$$f(x) = 2x - 3$$

$$g(x) = \frac{x}{3x + 1}$$

(a) State the value of **x** that cannot be included in any domain of **g**

(1 mark)

(b) Find **gf(x)**

Simplify your answer.

(2 marks)

Answer space continues on the next page.

15. (b) continued.

$$gf(x) = \underline{\hspace{10em}}$$

Remember:

$$f(x) = 2x - 3$$

$$g(x) = \frac{x}{3x + 1}$$

(c) Express the inverse function g^{-1} in the form $g^{-1}(x) = \dots$

(3 marks)

Answer space continues on the next page.

15. (c) continued.

$$g^{-1}(x) = \underline{\hspace{10em}}$$

(Total for Question 15 is 6 marks)

16. A box contains 15 counters.

There are 4 red counters, 5 green counters and the rest are yellow counters.

Niklas takes at random a counter from the box and writes down the colour of his counter.

He then puts the counter back into the box.

Sasha then takes at random a counter from the box and writes down the colour of her counter.

Work out the probability that the counters taken by Niklas and Sasha both have the same colour.

(3 marks)

Answer space continues on the next two pages.

16. continued.

16. continued.

(Total for Question 16 is 3 marks)

17. Express

$\frac{8}{\sqrt{5}-1}$ in the form $\sqrt{a} + b$ where a and b are integers.

Show each stage of your working clearly.

(3 marks)

Answer space continues on the next page.

17. continued.

(Total for Question 17 is 3 marks)

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

It is NOT accurately drawn.

It shows a quadrilateral **ABCD**

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

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

$$CD = 7 \text{ cm}$$

$$\text{Angle } ABC = 60^\circ$$

$$\text{Angle } ACD = 84^\circ$$

Calculate the area of quadrilateral **ABCD**

Give your answer correct to **3** significant figures.

Show your working clearly.

(5 marks)

Answer space continues on the next two pages.

18. continued.

18. continued.

_____ cm^2

(Total for Question 18 is 5 marks)

19. The straight line **L** has equation $x - y = 3$
The curve **C** has equation $3x^2 - y^2 + xy = 9$

L and **C** intersect at the points **P** and **Q**

Find the coordinates of the midpoint of **PQ**

Show clear algebraic working.

(6 marks)

Answer space continues on the next two pages.

19. continued.

19. continued.

(_____ , _____)

(Total for Question 19 is 6 marks)

20. Here are the first four terms of an arithmetic series.

$$m \quad \frac{3m}{4} \quad \frac{m}{2} \quad \frac{m}{4}$$

Given that the 15th term of the series is $(90 + 2m)$,

calculate the sum of the first 30 terms of the series.

(5 marks)

Answer space continues on the next two pages.

20. continued.

20. continued.

(Total for Question 20 is 5 marks)

21. The curve **C** has equation $y = f(x)$ where
 $f(x) = 9 - 3(x + 2)^2$

The point **A** is the maximum point on **C**

(a) Write down the coordinates of **A**
(1 mark)

(_____ , _____)

(continued on the next page)

21. continued.

Remember:

The curve **C** has equation $y = f(x)$ where

$$f(x) = 9 - 3(x + 2)^2$$

The curve **C** is transformed to the curve **S** by a translation of $\begin{pmatrix} 4 \\ 0 \end{pmatrix}$

(b) Find an equation for the curve **S**

(1 mark)

(continued on the next page)

Turn over

21. continued.

Remember:

The curve **C** has equation $y = f(x)$ where
 $f(x) = 9 - 3(x + 2)^2$

The curve **C** is transformed to the curve **T**

The curve **T** has equation $y = 3(x + 2)^2 - 9$

- (c) Describe fully the transformation that maps
curve **C** onto curve **T**
(1 mark)

(continued on the next page)

Turn over

21. continued.

Look at the diagram for Question 21(d) in the Diagram Booklet.

It shows the graph of

$y = a \cos (x - b)^\circ + c$ for $-180 \leq x \leq 360$ drawn on a grid.

- (d) Find the value of **a**, the value of **b** and the value of **c**
(3 marks)

a = _____

b = _____

c = _____

(Total for Question 21 is 6 marks)

Turn over

22. Look at Diagram 1 and Diagram 2 for Question 22 in the Diagram Booklet.

You may be provided with a model.

They are NOT accurate.

Diagram 1 shows a 2D view of a sphere with diameter x cm

Diagram 2 and the model show a pyramid **ABCDE** with a horizontal rectangular base **BCDE**

The vertex **A** of the pyramid is vertically above the centre **O** of the base so that

$$AB = AC = AD = AE$$

$$BC = x \text{ cm}, CD = 2x \text{ cm and } AO = 5x \text{ cm}$$

The volume of the sphere is $288\pi \text{ cm}^3$

Calculate the total surface area of the pyramid.

Give your answer correct to the nearest cm^2

(6 marks)

Answer space is on the next three pages.

22. continued.

22. continued.

22. continued.

_____ cm^2

(Total for Question 22 is 6 marks)

TOTAL FOR PAPER IS 100 MARKS

END OF PAPER
