

Paper Reference 4MA1/1H  
Pearson Edexcel  
International GCSE

Total Marks
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Mathematics A  
Paper 1H  
(Calculator)  
Higher Tier

Thursday 7 January 2021 – Morning

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 Book  
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.**

**You may be provided with a model for Question 3,  
Question 17 and two models for Question 20**

**There may be spare copies of some diagrams.**

**ADVICE**

**Read each question carefully before you start to  
answer it.**

**Check your answers if you have time at the end.**

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**Answer ALL TWENTY FOUR questions.**

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

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

1. Pieter owns a currency conversion shop.

Last Monday, Pieter changed a total of **20 160** rand into a number of different currencies.

He changed  $\frac{3}{10}$  of the **20 160** rand into euros.

He changed the rest of the rands into dollars, rupees and francs in the ratios **9 : 5 : 2**

Pieter changed more rands into dollars than he changed into francs.

Work out how many more.

(4 marks)

Answer space continues on the next page.

1. continued.

\_\_\_\_\_ rand

(Total for Question 1 is 4 marks)

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Turn over

- 2. Look at the table for Question 2 in the Diagram Book.**

**It gives information about the speeds, in kilometres per hour, of 80 motorbikes as each pass under a bridge.**

- (a) Write down the modal class.**  
**(1 mark)**

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**(continued on the next page)**

**2. continued.**

**(b) Work out an estimate for the mean speed of the motorbikes as they pass under the bridge.**

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

**(4 marks)**

\_\_\_\_\_ kilometres per hour

**(Total for Question 2 is 5 marks)**

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**Turn over**



- 3. Look at Diagram 1 and Diagram 2 for Question 3 in the Diagram Book.**

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

**They are NOT accurate.**

**Diagram 1 and the model show a container for water in the shape of a prism.**

**Diagram 2 shows the front view of the prism.**

**The dimensions of the container are shown on the model and the diagrams.**

**All the corners of the prism are right angles.**

**The rectangular base of the prism, shown shaded in Diagram 1, is horizontal and has width 85 cm and length 125 cm**

**The container is completely full of water.**

**Tuah is going to use a pump to empty the water from the container so that the volume of water in the container decreases at a constant rate.**

**(continued on the next page)**

**Turn over**

**3. continued.**

**The pump starts to empty water from the container at 10 30 and at 12 00 the water level in the container has dropped by 20 cm**

**Find the time at which all the water has been pumped out of the container.**

**(4 marks)**

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

**3. continued.**

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**(Total for Question 3 is 4 marks)**

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**Turn over**

4.  $\mathcal{E} = \{20, 21, 22, 23, 24, 25, 26, 27, 28, 29\}$

$A = \{\text{odd numbers}\}$

$B = \{\text{multiples of } 3\}$

List the members of the set

(i)  $A \cap B$

(1 mark)

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(continued on the next page)

4. continued.

Remember:

$$\mathcal{E} = \{20, 21, 22, 23, 24, 25, 26, 27, 28, 29\}$$

$$A = \{\text{odd numbers}\}$$

$$B = \{\text{multiples of 3}\}$$

List the members of the set

(ii)  $A \cup B$

(1 mark)

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(Total for Question 4 is 2 marks)

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Turn over

5. (a) Factorise fully

$$15y^4 + 20uy^3$$

(2 marks)

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(continued on the next page)

5. continued.

(b) Solve

$$4 - 3x = \frac{5 - 8x}{4}$$

Show clear algebraic working.

(3 marks)

**x =** \_\_\_\_\_

(Total for Question 5 is 5 marks)

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Turn over

6. (a) Write

**2840 000 000** in standard form.

(1 mark)

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(b) Write

**$2.5 \times 10^{-4}$**  as an ordinary number.

(1 mark)

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**(Total for Question 6 is 2 marks)**

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**Turn over**



7. Chen invests **40 000** yuan in a fixed-term bond for **3** years.

The fixed-term bond pays compound interest at a rate of **3.5%** each year.

- (a) Work out the value of Chen's investment at the end of **3** years.

Give your answer to the nearest yuan.

(3 marks)

Answer space continues on the next page.

7. (a) continued.

\_\_\_\_\_ yuan

(continued on the next page)

**7. continued.**

**Wang invested  $P$  yuan.**

**The value of his investment decreased by  $6.5\%$  each year.**

**At the end of the first year, the value of Wang's investment was  $30\,481$  yuan.**

**(b) Work out the value of  $P$**   
**(3 marks)**

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

7. (b) continued.

**P =** \_\_\_\_\_

**(Total for Question 7 is 6 marks)**

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8. Look at the diagram for Question 8 in the Diagram Book.

It is NOT accurately drawn.

The diagram shows a curved path.

The boundary of the path is formed by two semicircles, with the same centre **O**, and two straight lines.

The inner semicircle has a radius of **7** metres.

The path has a width of **2** metres.

Work out the perimeter of the path.

Give your answer correct to one decimal place.

(3 marks)

Answer space continues on the next page.

8. continued.

\_\_\_\_\_ metres

(Total for Question 8 is 3 marks)

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Turn over

9. (a) Simplify  
 $(2x^3y^5)^4$   
(2 marks)

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(continued on the next page)

9. continued.

(b) (i) Factorise

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

(2 marks)

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(continued on the next page)

Turn over



9. (b) continued.

(ii) Hence, solve

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

(1 mark)

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**(Total for Question 9 is 5 marks)**

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

It is NOT accurately drawn.

It shows an isosceles triangle **ABC**

$$\mathbf{BA = BC}$$

**D** is the midpoint of **AC**

$$\mathbf{DB = 16\text{ cm}}$$

Angle **ADB** is a right angle.

$$\text{Angle } \mathbf{DAB = 65^\circ}$$

Work out the perimeter of triangle **ABC**

Give your answer correct to one decimal place.

(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. Look at the diagram for Question 11 in the Diagram Book.**

**It shows a cumulative frequency graph which gives information about the weights, in grams, of 90 bags of sweets.**

**(a) Find an estimate for the median of the weights of these bags of sweets.**

**(2 marks)**

\_\_\_\_\_ grams

**(continued on the next page)**

**11. continued.**

**Roberto sells the bags of sweets to raise money for charity.**

**Bags with a weight greater than  $p$  grams are labelled large bags and sold for  $3.75$  euros each bag.**

**The total amount of money he receives by selling all the large bags is  $93.75$  euros.**

**(b) Find the value of  $p$   
(3 marks)**

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

11. (b) continued.

$p =$  \_\_\_\_\_

(Total for Question 11 is 5 marks)

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Turn over

12. (a) Express

$$\frac{4}{y-2} - \frac{3}{y+1} \text{ as a single fraction.}$$

Give your answer in its simplest form.

(3 marks)

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(continued on the next page)

Turn over

**12. continued.**

**(b) Expand and simplify**

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

**(3 marks)**

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**(Total for Question 12 is 6 marks)**

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**Turn over**



13. Point **A** has coordinates  $(5, 8)$   
Point **B** has coordinates  $(9, -4)$

(a) Work out the gradient of **AB**  
(2 marks)

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(continued on the next page)

**13. continued.**

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

**(b) Write down the gradient of a straight line that is perpendicular to  $L$**

**(1 mark)**

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

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**14. Look at the diagram for Question 14 in the Diagram Book.**

**It shows a probability tree diagram.**

**Ding is going to play one game of snooker against each of two of his friends, Marco and Judd.**

**The probability tree diagram gives information about the probabilities that Ding will win or lose each of these two games.**

- (a) Work out the probability that Ding will win both games.**  
**(2 marks)**

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**(continued on the next page)**

**Turn over**

**14. continued.**

**(b) Work out the probability that Ding will win exactly one of the games.**

**(3 marks)**

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**(Total for Question 14 is 5 marks)**

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15. Given that

$$a = \frac{v - u}{t}$$

and

$v = 9.6$  correct to 1 decimal place

$u = 3.8$  correct to 1 decimal place

$t = 1.84$  correct to 2 decimal places

calculate the upper bound for the value of  $a$

Give your answer as a decimal correct to 2 decimal places.

Show your working clearly.

(3 marks)

Answer space continues on the next page.

15. continued.

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(Total for Question 15 is 3 marks)

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Turn over

**16. Look at the diagram for Question 16 in the Diagram Book.**

**It is NOT accurately drawn.**

**It shows the positions of three ships, A, B and C**

**Ship B is due north of ship A**

**The bearing of ship C from ship A is  $120^\circ$**

**Calculate the bearing of ship C from ship B**

**Give your answer correct to the nearest degree.**

**(5 marks)**

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

16. continued.

Turn over



16. continued.

o

(Total for Question 16 is 5 marks)

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Turn over

17. Look at the diagram for Question 17 in the Diagram Book.

You may be provided with a model.

They are NOT accurate.

A solid, **S**, is made from a hemisphere and a cylinder as shown by the model.

The diagram shows the **2D** view of the solid.

The centre of the circular face of the hemisphere and the centre of the top face of the cylinder are at the same point.

The radius of the cylinder and the radius of the hemisphere are both **x cm**

The height of the cylinder is **(20 – 4x) cm**

The volume of **S** is  **$V \text{ cm}^3$**  where  **$V = \frac{1}{3}\pi y$**

Find the maximum value of **y**

Show clear algebraic working.

(5 marks)

Answer space is on the next two pages.

Turn over

17. continued.

Turn over

17. continued.

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(Total for Question 17 is 5 marks)

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Turn over

18. Given that  $(8 - \sqrt{x})(5 + \sqrt{x}) = y\sqrt{x} + 21$  where  $x$  is a prime number and  $y$  is an integer,

find the value of  $x$  and the value of  $y$

Show each stage of your working clearly.

(3 marks)

Answer space continues on the next page.

18. continued.

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

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

(Total for Question 18 is 3 marks)

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**19. Solve the simultaneous equations**

$$x^2 - 9y - x = 2y^2 - 12$$

$$x + 2y - 1 = 0$$

**Show clear algebraic working.**

**(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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**20. Look at the models for Question 20**

**The models are NOT accurate.**

**They show two similar solids, A and B**

**A has a volume of  $1836 \text{ cm}^3$**

**B has a volume of  $4352 \text{ cm}^3$**

**B has a total surface area of  $1120 \text{ cm}^2$**

**Work out the total surface area of A**

**(3 marks)**

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

**20. continued.**

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

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

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**Turn over**

21. A curve has equation  $y = f(x)$

The coordinates of the minimum point on this curve are  $(-9, 15)$

(a) Write down the coordinates of the minimum point on the curve with equation

(i)  $y = f(x + 3)$

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

(ii)  $y = \frac{1}{3}f(x)$

(2 marks)

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

(continued on the next page)

Turn over

**21. continued.**

**Look at the diagram for Question 21(b) in the Diagram Book.**

**It shows the graph of  $y = a \cos (x + b)^\circ$  for  $0 \leq x \leq 360$  drawn on a grid.**

**Given that  $a > 0$  and that  $0 < b < 360$**

**(b) find the value of  $a$  and the value of  $b$   
(2 marks)**

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

**21. (b) continued.**

**a =** \_\_\_\_\_

**b =** \_\_\_\_\_

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

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**Turn over**

22. The function  $f$  is such that  
 $f(x) = x^2 - 8x + 5$  where  $x \leq 4$

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

(3 marks)

Answer space continues on the next page.

22. continued.

$$f^{-1}(x) = \underline{\hspace{10cm}}$$

(Total for Question 22 is 3 marks)

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Turn over



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

It is NOT accurately drawn.

It shows triangle **OAB**

In the triangle

$$\overrightarrow{OA} = 2\underline{a} \quad \text{and} \quad \overrightarrow{OB} = 2\underline{b}$$

**M** is the midpoint of **AB**

**N** is the point on **OB** such that **ON : NB = 2 : 1**

**P** is the point on **AN** such that **OPM** is a straight line.

Use a vector method to find **OP : PM**

Show your working clearly.

(6 marks)

Answer space continues on the next three pages.

23. continued.

Turn over

**23. continued.**

**Turn over**

**23. continued.**

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**(Total for Question 23 is 6 marks)**

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**Turn over**

24. An arithmetic series has first term  $a$  and common difference  $d$

The sum of the first  $2n$  terms of the series is four times the sum of the first  $n$  terms of the series.

Find an expression for  $a$  in terms of  $d$

Show your working clearly.

(4 marks)

Answer space continues on the next two pages.

24. continued.

Turn over

24. continued.

**a =** \_\_\_\_\_

**(Total for Question 24 is 4 marks)**

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**TOTAL FOR PAPER IS 100 MARKS**

**END OF PAPER**

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