

**Paper Reference 4MA1/1H**  
**Pearson Edexcel**  
**International GCSE**

<b>Total Marks</b>
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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.**

<b>Surname</b>					
<b>Other names</b>					
<b>Centre Number</b>					
<b>Candidate Number</b>					

**YOU MUST HAVE**

**Ruler, protractor, compasses, writing and drawing equipment, calculator. Tracing paper may be used.**

**YOU WILL BE GIVEN**

**Diagram Book  
Formulae Pages**

**Turn over**

# **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.**

**Turn over**

## **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.**

**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**

**(continued on the next page)**

**1. continued.**

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

**Work out how many more.**

**(4 marks)**

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

**1. continued.**

**Turn over**



**1. continued.**

\_\_\_\_\_ rand

**(Total for Question 1 is 4 marks)**

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**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)**

**Turn over**

**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)**

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

**Turn over**

**2. continued.**

\_\_\_\_\_ 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.**

**(continued on the next page)**

**Turn over**

**3. continued.**

**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)**

**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 two pages.**

**3. continued.**

**Turn over**



**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)**

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

**4. (i) continued.**

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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)**

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

**Turn over**

4. (ii) continued.

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

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5. (a) Factorise fully  
 $15y^4 + 20uy^3$   
(2 marks)
- 

(continued on the next page)

**5. continued.**

**(b) Solve**

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

**Show clear algebraic working.**

**(3 marks)**

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

**5. (b) continued.**

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

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

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**Turn over**



6. (a) Write

**2 840 000 000** in standard form.

(1 mark)

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(continued on the next page)

**6. continued.**

**(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)

Turn over

**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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**Turn over**

**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.**

**(continued on the next page)**

**8. continued.**

**Work out the perimeter of the path.**

**Give your answer correct to  
one decimal place.**

**(3 marks)**

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



8. continued.

8. continued.

\_\_\_\_\_ metres

(Total for Question 8 is 3 marks)

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9. (a) Simplify

$$(2x^3y^5)^4$$

(2 marks)

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(continued on the next page)

Turn over

**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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**Turn over**

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

**It is NOT accurately drawn.**

**It shows an isosceles triangle  $ABC$**

**$BA = BC$**

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

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

**Angle  $ADB$  is a right angle.**

**Angle  $DAB = 65^\circ$**

**Work out the perimeter of triangle  $ABC$**

**Give your answer correct to one decimal place.**

**(4 marks)**

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

**Turn over**

**10. continued.**

**Turn over**

**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)**

**Turn over**

**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.**

**(continued on the next page)**

**11. continued.**

**(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**

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

**Give your answer in its simplest form.**

**(3 marks)**

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

**12. (a) continued.**

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**(continued on the next page)**

**Turn over**

**12. continued.**

**(b) Expand and simplify**

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

**(3 marks)**

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

**12. (b) continued.**

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

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**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)**

**Turn over**

**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)**

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

**13. (b) continued.**

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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.**

**(continued on the next page)**

**14. continued.**

- (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)**

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

**14. (b) continued.**

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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 is on the next  
two pages.**

**Turn over**



**15. continued.**

**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  $120^\circ$**

**(continued on the next page)**

**16. continued.**

**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 three pages.**

**16. continued.**

**Turn over**

**16. continued.**

**Turn over**

**16. continued.**

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**(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.**

**(continued on the next page)**

**Turn over**



**17. continued.**

**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  $V$  cm<sup>3</sup> 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  
three pages.**

**17. continued.**

**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 two pages.**

**18. continued.**

**18. continued.**

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

**y =** \_\_\_\_\_

**(Total for Question 18 is 3 marks)**

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**Turn over**

**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 three pages.**



**19. continued.**

**Turn over**

**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 is on the next  
two pages.**

**20. continued.**

**20. continued.**

\_\_\_\_\_ **cm<sup>2</sup>**

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

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

**(continued on the next page)**

**Turn over**

**21. (a) continued.**

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

**(2 marks)**

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

**(continued on the next page)**



**21. continued.**

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

**It shows the graph of**

$$\mathbf{y = a \cos (x + b)^{\circ} \text{ for } 0 \leq x \leq 360}$$

**drawn on a grid.**

**Given that  $a > 0$  and that**

$$\mathbf{0 < b < 360}$$

**(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  
two pages.

**22. continued.**

**Turn over**

**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**

$$\text{ON} : \text{NB} = 2 : 1$$

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

**(continued on the next page)**

**Turn over**

**23. continued.**

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

**Show your working clearly.**

**(6 marks)**

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

**23. continued.**

**Turn over**



**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 three pages.**

**24. continued.**

**Turn over**

**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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