

**Paper Reference 1MA1/3H**  
**Pearson Edexcel**  
**Level 1/Level 2 GCSE (9–1)**

<b>Total Marks</b>
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**Mathematics**  
**Paper 3**  
**(Calculator)**  
**Higher Tier**

**Monday 11 November 2019 – Afternoon**  
**Time: 1 hour 30 minutes 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**

# 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 BE USED.**

**If your calculator does not have a  $\pi$  button, take the value of  $\pi$  to be  $3.142$  unless the question instructs otherwise.**

**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.**

**You may be provided with a shape and a model for Question 23  
They are NOT accurate.**

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

**Turn over**

**ADVICE**

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

**Keep an eye on the time.**

**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. (a) Expand and simplify  
 $(y + 5)(y - 9)$   
(2 marks)

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(continued on the next page)

**1. continued.**

**(b) Factorise fully**

$$9x^2 + 6x$$

**(2 marks)**

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

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**Turn over**



2. (a) Use your calculator to work out

$$\frac{29^2 - 4 \cdot 6}{\sqrt{35 - 1 \cdot 9^3}}$$

Write down all the figures on  
your calculator display.

(2 marks)

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(continued on the next page)

Turn over

**2. continued.**

**(b) Write your answer to part (a)  
correct to 4 significant figures.  
(1 mark)**

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

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- 3. Look at the diagram for Question 3 in the Diagram Book.**

**The scatter graph shows information about the marks a group of students got in a Science test and in a Maths test.**

**Jamie got a mark of 35 in the Science test.**

**Using the scatter graph, find an estimate for Jamie's mark in the Maths test.**

**(2 marks)**

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

**3. continued.**

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

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**Turn over**

- 4. Look at the table for Question 4 in the Diagram Book.**

**It gives information about the times taken, in seconds, by 18 students to run a race.**

**Work out an estimate for the mean time.**

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

**(3 marks)**

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

**4. continued.**

\_\_\_\_\_ seconds

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

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**Turn over**

5. Write  $37 \text{ cm}^3$  in  $\text{mm}^3$

\_\_\_\_\_  $\text{mm}^3$

(Total for Question 5 is 1 mark)

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Turn over

**6. Look at the table for Question 6 in the Diagram Book.**

**Nimer was driving to a hotel.**

**The table shows the information on his Sat Nav at 13 30**

**Nimer arrived at the hotel at 14 48**

**Work out the average speed of the car from 13 30 to 14 48**

**You must show all your working.**

**(4 marks)**

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



**6. continued.**

**Turn over**

**6. continued.**

\_\_\_\_\_ mph

**(Total for Question 6 is 4 marks)**

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**Turn over**

**7. (a) Write**

**32 460 000 in standard form.**

**(1 mark)**

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**(continued on the next page)**

**Turn over**

**7. continued.**

**(b) Write**

**$4.96 \times 10^{-3}$  as an ordinary  
number.**

**(1 mark)**

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**(continued on the next page)**

**Turn over**

**7. continued.**

**Asma was asked to compare the following two numbers.**

$$\mathbf{A = 6 \cdot 212 \times 10^8}$$

**and**

$$\mathbf{B = 4 \cdot 73 \times 10^9}$$

**She says,**

**“6·212 is bigger than 4·73 so A is bigger than B”**

**(continued on the next page)**

**Turn over**

**7. continued.**

**(c) Is Asma correct?**

**You must give a reason for your  
answer.**

**(1 mark)**

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**(Total for Question 7 is 3 marks)**

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**Turn over**

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

**It shows a regular pentagon and a parallelogram.**

**Two angles are marked  $117^\circ$  and  $x$**

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

**You must show all your working.  
(4 marks)**

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

8. continued.

o

(Total for Question 8 is 4 marks)

Turn over



**9. Look at the diagram for Question 9 in the Diagram Book.**

**It shows triangle A and triangle B on a coordinate grid.**

**Describe fully the transformation that maps triangle A onto triangle B**

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**(Total for Question 9 is 2 marks)**

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**10. (a) Solve**

$$\frac{9 + y}{7} = 11 - y$$

**(3 marks)**

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

**Turn over**

**10. (a) continued.**

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

**(continued on the next page)**

**Turn over**

**10. continued.**

**(b) Simplify**

$$\frac{4(y + 3)^3}{(y + 3)^2}$$

**(1 mark)**

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**(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.**

**The probability tree diagram shows the probabilities that Bismah will be late for work on two days next week.**

**Calculate the probability that Bismah will be late on exactly one of the two days.**

**(3 marks)**

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

**11. continued.**

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**(Total for Question 11 is 3 marks)**

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**Turn over**

**12. Look at Diagram 1 and Diagram 2 for Question 12 in the Diagram Book.**

**Diagram 1 shows a stem and leaf diagram.**

**Diagram 2 shows a grid.**

**The stem and leaf diagram shows information about the heights, in cm, of 23 sunflowers.**

**On the grid below Diagram 1, draw a box plot for this information.**

**(Total for Question 12 is 3 marks)**

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**13. Liquid A and liquid B are mixed together in the ratio 2 : 13 by volume to make liquid C**

**Liquid A has density  $1.21 \text{ g/cm}^3$**

**Liquid B has density  $1.02 \text{ g/cm}^3$**

**A cylindrical container is filled completely with liquid C**

**The cylinder has radius 3 cm and height 25 cm**

**(continued on the next page)**



**13. continued.**

**Work out the mass of the liquid in the container.**

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

**You must show all your working.**

**(4 marks)**

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

**Turn over**

**13. continued.**

**Turn over**

**13. continued.**

\_\_\_\_\_ grams

**(Total for Question 13 is 4 marks)**

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**Turn over**

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

**A group of people went to a restaurant.  
Each person chose one starter and  
one main course shown in the table.**

**the number of people who chose  
soup : the number of people who  
chose prawns = 2 : 3**

**Of those who chose soup,  
the number of people who chose  
lasagne : the number of people who  
chose curry = 5 : 3**

**(continued on the next page)**

**Turn over**

**14. continued.**

**Of those who chose prawns,  
the number of people who chose  
lasagne : the number of people who  
chose curry = 1 : 5**

**What fraction of the people chose  
curry?**

**You must show how you get your  
answer.**

**(4 marks)**

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

14. continued.

Turn over

**14. continued.**

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**(Total for Question 14 is 4 marks)**

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**Turn over**

- 15. Prove algebraically that the sum of the squares of any two consecutive even numbers is always a multiple of 4**  
**(3 marks)**

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



**15. continued.**

**(Total for Question 15 is 3 marks)**

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**Turn over**

**16.  $y$  is inversely proportional to the square of  $x$**

$$y = 8 \text{ when } x = 2.5$$

**Find the negative value of  $x$  when**

$$y = \frac{8}{9}$$

**(3 marks)**

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

**16. continued.**

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**(Total for Question 16 is 3 marks)**

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**Turn over**

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

**It shows the graph of  $y = x^2 - 4$**

**Use the graph to find estimates for the solutions to the equation**

$$\mathbf{x^2 - 2x - 3 = 0}$$

**You must show how you get your solutions.**

**(4 marks)**

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

**17. continued.**

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**(Total for Question 17 is 4 marks)**

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**Turn over**

**18. Look at the diagram for Question 18  
in the Diagram Book.**

**It shows triangle ABC**

$$\mathbf{AB = 3.4 \text{ cm}}$$

$$\mathbf{AC = 6.2 \text{ cm}}$$

$$\mathbf{BC = 6.1 \text{ cm}}$$

**D is the point on BC such that**

**size of angle DAC =  $\frac{2}{5}$  × size of  
angle BCA**

**(continued on the next page)**

**Turn over**

**18. continued.**

**Calculate the length DC**

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

**You must show all your working.**

**(5 marks)**

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

**18. continued.**

**Turn over**



**18. continued.**

\_\_\_\_\_ **cm**

**(Total for Question 18 is 5 marks)**

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**Turn over**

**19. Look at the diagram for Question 19 in the Diagram Book.**

**It shows information about part of a cyclist's journey.**

**Work out an estimate of the speed, in m/s, of the cyclist at time 6 seconds.**

**\_\_\_\_\_ m/s**

**(Total for Question 19 is 3 marks)**

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**Turn over**

**20. Here are the first five terms of a sequence.**

**−1      0      3      8      15**

**Find an expression, in terms of  $n$ , for the  $n$ th term of this sequence.**

**(2 marks)**

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

**20. continued.**

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**(Total for Question 20 is 2 marks)**

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**Turn over**

**21. When a biased coin is thrown  
4 times, the probability of getting  
4 heads is  $\frac{16}{81}$**

**Work out the probability of getting  
4 tails when the coin is thrown  
4 times.**

**(2 marks)**

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

**21. continued.**

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**(Total for Question 21 is 2 marks)**

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**Turn over**

**22. Show that**

$$\frac{7x - 14}{x^2 + 4x - 12} \div \frac{x - 6}{x^3 - 36x}$$

**simplifies to  $ax$  where  $a$  is an integer.**

**(4 marks)**

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

**22. continued.**

**Turn over**



**22. continued.**

**(Total for Question 22 is 4 marks)**

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**Turn over**

**23. Look at the diagrams and the formulae for Question 23 in the Diagram Book.**

**You may be provided with a model cone and a cut out shape of sector  $OACB$**

**Diagram 1 shows a sector  $OACB$  of a circle with centre  $O$**

**The point  $C$  is the midpoint of the arc  $AB$**

**Diagram 2 shows a hollow cone with vertex  $O$**

**The cone is formed by joining  $OA$  and  $OB$**

**(continued on the next page)**

**Turn over**

**23. continued.**

**The cone has volume  $56.8 \text{ cm}^3$  and height  $3.6 \text{ cm}$**

**The formulae are shown above  
Diagram 1 and Diagram 2 in the  
Diagram Book.**

**Calculate the size of angle AOB of  
sector OACB**

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

**You must show all your working.  
(5 marks)**

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

**Turn over**

**23. continued.**

**Turn over**

**23. continued.**

**Turn over**

**23. continued.**

**Turn over**

**23. continued.**

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**(Total for Question 23 is 5 marks)**

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**Turn over**

**24. Look at the diagram for Question 24 in the Diagram Book.**

**$OXYZ$  is a parallelogram.**

$$\overrightarrow{OX} = a$$

$$\overrightarrow{OY} = b$$

**$P$  is the point on  $OX$  such that**

$$\mathbf{OP:PX = 1:2}$$

**$R$  is the point on  $OY$  such that**

$$\mathbf{OR:RY = 1:3}$$

**(continued on the next page)**



**24. continued.**

**Work out, in its simplest form, the  
ratio  $ZP : ZR$**

**You must show all your working.**

**(5 marks)**

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

**24. continued.**

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**(Total for Question 24 is 5 marks)**

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**Turn over**

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**TOTAL FOR PAPER IS 80 MARKS**

**END OF PAPER**

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