

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

Total Marks
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Mathematics  
PAPER 3 (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**

**Ruler, protractor, compasses, writing and drawing equipment, calculator, Formulae Sheet (enclosed). Tracing paper may be used.**

**YOU WILL BE GIVEN**

**Diagram Booklet**

# **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.**

## **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 to use them.**

**You may be provided with a model for Question 18  
It is NOT accurate.**

**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.**

**Good luck with your examination.**

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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. Look at the diagram for Question 1 in the Diagram Booklet.

It shows a right-angled triangle,  
**ABC**

$$AB = 4 \text{ cm}$$

$$AC = 8.5 \text{ cm}$$

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

Angle **ABC** is a right angle.

Work out the value of **x**

(2 marks)

Answer space continues on the next  
two pages.

**1. continued.**

**Turn over**



**1. continued.**

**X = \_\_\_\_\_**

**(Total for Question 1 is 2 marks)**

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2.  $T = 4m^2 - 11$

(a) Work out the value of  $T$  when  
 $m = -3$

(2 marks)

Answer space continues on the  
next page.

**2. (a) continued.**

**T = \_\_\_\_\_**

**(continued on the next page)**

**2. continued.**

**(b) Make  $p$  the subject of the  
formula  $n = 3p + 4$   
(2 marks)**

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

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- 3. Look at the information for Question 3 in the Diagram Booklet. Rick, Selma and Tony are playing a game with counters.**

**Work out the value of  $p$  as shown in the ratio.**

**(5 marks)**

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

**3. continued.**

**Turn over**

**3. continued.**

**p = \_\_\_\_\_**

**(Total for Question 3 is 5 marks)**

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**Turn over**

- 4. Look at the information for Question 4 in the Diagram Booklet. Jo is going to buy 15 rolls of wallpaper.**

**The information in the Diagram Booklet shows the cost of rolls of wallpaper from each of two shops.**

**Jo wants to buy the 15 rolls of wallpaper as cheaply as possible.**

**(continued on the next page)**



**4. continued.**

**Should Jo buy the wallpaper from**

**Chic Decor or from Style Papers?**

**You must show how you get your**

**answer.**

**(4 marks)**

**Answer space continues on the next**

**two pages.**

4. continued.

**4. continued.**

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

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

**It shows a frequency polygon.**

**(continued on the next page)**

**5. continued.**

**The table below gives information about the lengths, in **cm**, of some pieces of string.**

<b>Length (<math>t</math> cm)</b>	<b>Frequency</b>
<b><math>0 &lt; t \leq 10</math></b>	<b>15</b>
<b><math>10 &lt; t \leq 20</math></b>	<b>20</b>
<b><math>20 &lt; t \leq 30</math></b>	<b>50</b>
<b><math>30 &lt; t \leq 40</math></b>	<b>25</b>
<b><math>40 &lt; t \leq 50</math></b>	<b>5</b>

**(continued on the next page)**

**Turn over**

**5. continued.**

**Amos draws the frequency polygon  
in the Diagram Booklet for the  
information in the table.**

**Write down TWO mistakes that Amos  
has made.**

**1** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**2** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

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

\_\_\_\_\_

**Turn over**

- 6. Jessica runs for 15 minutes at an average speed of 6 miles per hour. She then runs for 40 minutes at an average speed of 9 miles per hour.**

**It takes Amy 45 minutes to run the same total distance that Jessica runs.**

**Work out Amy's average speed.**

**Give your answer in miles per hour.**

**(4 marks)**

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

6. continued.

Turn over



6. continued.

\_\_\_\_\_ miles per hour

(Total for Question 6 is 4 marks)

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Turn over

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

It shows rectangle **STUV**

**TQU** and **SRV** are straight lines.

All measurements are in **cm**

$$\text{TQ} = 2y \text{ cm}$$

$$\text{TS} = 4y \text{ cm}$$

$$\text{SR} = 3y \text{ cm}$$

$$\text{RV} = 5 \text{ cm}$$

The trapezium **QUVR** is shaded.

The area of trapezium **QUVR** is

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

(continued on the next page)

Turn over

**7. continued.**

**Show that  $A = 2y^2 + 20y$**

**(3 marks)**

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

**7. continued.**

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

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**Turn over**

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

**It shows a graph.**

**An electricity company charges the same fixed amount for each unit of electricity used.**

**David uses the graph in the Diagram Booklet to work out the total cost of the electricity he has used.**

**(continued on the next page)**

**8. continued.**

**(a) Work out the gradient of the  
straight line.**

**(2 marks)**

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**(continued on the next page)**

**8. continued.**

**(b) What does the gradient of this  
line represent?  
(1 mark)**

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**(Total for Question 8 is 3 marks)**

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9. (a) Express

$$\sqrt{\frac{10^{360}}{10^{150} \times 10^{90}}} \text{ as a power of } 10$$

(3 marks)

Answer space continues on the  
next page.



9. (a) continued.

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**(continued on the next page)**

**Turn over**

**9. continued.**

**Liam was asked to express  $(12^{50})^2$   
as a power of 12**

**Liam wrote**

$$(12^{50})^2 = 12^{50^2} = 12^{2500}$$

**(continued on the next page)**

**9. continued.**

**Liam's method is wrong.**

**(b) Explain why.**

**(1 mark)**

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**(Total for Question 9 is 4 marks)**

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**10. Jane bought a new car three years ago.**

**At the end of the first year the value of the car had decreased by  $12.5\%$**

**The value of the car then decreased by  $10\%$  each year for the next two years.**

**At the end of the three years, the value of the car was £17 010**

**(continued on the next page)**

**10. continued.**

**Work out the value of the car when  
Jane bought it three years ago.**

**(3 marks)**

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

**10. continued.**

**Turn over**

**10. continued.**

£ \_\_\_\_\_

**(Total for Question 10 is 3 marks)**

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**Turn over**

- 11. Rayheem has**  
**16 shirts**  
**5 pairs of jeans**  
**3 jackets**

**Rayheem chooses an outfit to wear.**

**An outfit is 1 shirt, 1 pair of jeans  
and 1 jacket.**

**Work out how many different outfits**

**Rayheem can choose.**

**(2 marks)**

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



**11. continued.**

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**(Total for Question 11 is 2 marks)**

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**Turn over**

**12. Look at the diagram for Question 12 in the Diagram Booklet.**

**$ABC$  and  $ACD$  are right-angled triangles with a common side  $AC$**

**$DC = 8 \text{ cm}$**

**Angle  $ADC = 45^\circ$**

**Angle  $ABC = 20^\circ$**

**Angle  $ACD$  and angle  $ACB$  are right angles.**

**Work out the length of  $AB$**

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

**(3 marks)**

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

**12. continued.**

**Turn over**

**12. continued.**

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

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

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**Turn over**

13. **a** and **b** are vectors such that

$$\mathbf{a} = \begin{pmatrix} 2 \\ -3 \end{pmatrix} \quad \text{and} \quad 3\mathbf{a} - 2\mathbf{b} = \begin{pmatrix} 8 \\ -17 \end{pmatrix}$$

Find **b** as a column vector.

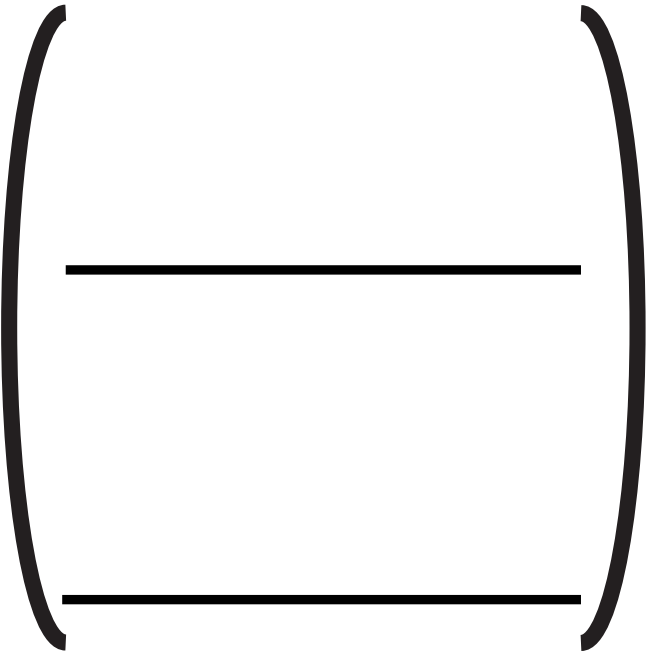
(3 marks)

Answer space continues on the next two pages.

**13. continued.**

**Turn over**

**13. continued.**



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

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**Turn over**

14. (a) Factorise fully

$$4p^2 - 36$$

(2 marks)

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(continued on the next page)



**14. continued.**

**(b) Show that**

$$(m + 4)(2m - 5)(3m + 1)$$

**can be written in the form**

$$am^3 + bm^2 + cm + d$$

**where  $a$ ,  $b$ ,  $c$  and  $d$  are  
integers.**

**(3 marks)**

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

14. (b) continued.

Turn over

**14. (b) continued.**

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

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**Turn over**

**15. Look at the diagram for Question 15 in the Diagram Booklet.**

**P, Q, R and S are four points on a circle.**

**PXR and SXQ are straight lines.**

**Prove that triangle PQX and triangle SRX are similar.**

**(3 marks)**

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

15. continued.

Turn over

**15. continued.**

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

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16.  $p = \sqrt{\frac{2t}{u}}$

**$t = 6.8$  correct to 1 decimal place.**

**$u = 0.05$  correct to 1 significant figure.**

**Work out the upper bound for the value of  $p$**

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

**You must show all your working.**

**(3 marks)**

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

16. continued.



**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(a) in the  
Diagram Booklet.  
It shows a grid.**

**(continued on the next page)**

**17. continued.**

**The table below gives information about the distances, in miles, that some Year 10 students live from school.**

<b>Distance (d miles)</b>	<b>Frequency</b>
<b><math>0 &lt; d \leq 1.0</math></b>	<b>90</b>
<b><math>1.0 &lt; d \leq 1.5</math></b>	<b>50</b>
<b><math>1.5 &lt; d \leq 2.0</math></b>	<b>30</b>
<b><math>2.0 &lt; d \leq 3.0</math></b>	<b>20</b>
<b><math>3.0 &lt; d \leq 5.0</math></b>	<b>20</b>

**(continued on the next page)**

**Turn over**

**17. continued.**

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

**(continued on the next page)**

**17. continued.**

**Look at the diagram for Question 17(b) in the Diagram Booklet.**

**It is a histogram which shows information about the distances, in miles, that some Year 11 students live from school.**

**The number of Year 11 students who live between 1 and 2 miles from school is  $n$**

**(continued on the next page)**

**17. continued.**

**(b) Find an expression, in terms of  $n$ , for the number of Year 11 students who live between 3 and 5 miles from school.**

**(2 marks)**

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

**17. (b) continued.**

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**(Total for Question 17 is 5 marks)**

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**18. Look at Diagram 1 and Diagram 2 for Question 18 in the Diagram Booklet.**

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

**Diagram 1 and the model show a prism  $ABCDSPQR$**

**The base  $ABCD$  of the prism is a square of side  $14\text{ cm}$**

**$T$  is the point on  $BC$  such that  $BT:TC = 4:3$**

**(continued on the next page)**



**18. continued.**

**The cross section of the prism  
is in the shape of a trapezium of  
area  $147 \text{ cm}^2$  as shown in Diagram 2**

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

$$\text{CD} = 14 \text{ cm}$$

**Find the size of the angle between the  
line **ST** and the base **ABCD****

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

**(5 marks)**

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

**18. continued.**

**Turn over**

**18. continued.**

○

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

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**Turn over**

19. Show that

$$\frac{3x}{x+2} - \frac{2x+1}{x-2} - 1$$

can be written in the form

$$\frac{ax+b}{x^2-4}$$

where **a** and **b** are integers.

(4 marks)

Answer space continues on the next  
three pages.

**19. continued.**

**Turn over**

**19. continued.**

**Turn over**

**19. continued.**

**(Total for Question 19 is 4 marks)**

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**20. Look at the table for Question 20 in the Diagram Booklet.**

**The profit made by a shop increases each year.**

**The profit made by the shop in year  $n$  is  $\text{£}P_n$**

**Given that the profit made by the shop in the next year is  $\text{£}P_{n+1}$  then**

**$P_{n+1} = aP_n + 800$  where  $a$  is a constant.**

**(continued on the next page)**



**20. continued.**

**The table in the Diagram Booklet  
shows the profit made by the shop in  
2018 and in 2019**

**Work out the profit predicted to be  
made by the shop in 2021**

**(4 marks)**

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

**20. continued.**

**Turn over**

**20. continued.**

£ \_\_\_\_\_

**(Total for Question 20 is 4 marks)**

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**Turn over**

**21. Look at the diagram for Question 21  
in the Diagram Booklet.**

**It shows Ray's nine cards numbered  
1 to 9**

**Ray takes at random three of these  
cards.**

**He works out the sum of the numbers  
on the three cards and records the  
result.**

**(continued on the next page)**

**21. continued.**

**Work out the probability that the result is an even number.**

**(4 marks)**

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

**21. continued.**

**Turn over**

**21. continued.**

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

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**Turn over**

**22. L is the straight line with equation**  
 **$y = 2x - 5$**

**C is a graph with equation**  
 **$y^2 = 6x^2 - 25x - 8$**

**Using algebra, find the coordinates of  
the points of intersection of L and C  
You must show all your working.**

**(5 marks)**

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



**22. continued.**

**Turn over**

**22. continued.**

**Turn over**

**22. continued.**

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

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

**(Total for Question 22 is 5 marks)**

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**TOTAL FOR PAPER IS 80 MARKS**

**END OF PAPER**

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