

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

Mathematics  
PAPER 3 (Calculator)  
Higher Tier

Total Marks
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Monday 10 June 2024 – Morning

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, pair of compasses,  
writing and drawing equipment, calculator,  
Formulae Booklet (enclosed).  
Tracing paper may be used.**

**YOU WILL BE GIVEN**

**A separate Diagram Booklet**

**INSTRUCTIONS**

**Answer ALL questions.**

**Answer the questions in the spaces provided  
in this Question Paper or in the separate  
Diagram Booklet – 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.**

**INSTRUCTIONS continued.**

**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.**

**You may be given a model for Question 3.**

**You may be given a model for Question 7.**

**You may be given models for Question 9.**

**You may be given a cut-out shape for Question 12.**

## **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.**

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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. Find the highest common factor (HCF)  
of 63 and 105  
(2 marks)**

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

**1. continued.**

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

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2. (a) (i) Write  $5.3 \times 10^4$  as an ordinary number.  
(1 mark)
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(continued on the next page)



**2. (a) continued.**

**(ii) Write  $7.4 \times 10^{-5}$  as an  
ordinary number.  
(1 mark)**

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**(continued on the next page)**

**2. continued.**

**(b) Calculate the value of**

$$\mathbf{9.7 \times 10^6 + 2.45 \times 10^7}$$

**Give your answer in standard form.**

**(2 marks)**

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

**2. (b) continued.**

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

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- 3. Look at the diagram for Question 3 in the separate Diagram Booklet.**  
**It shows a solid triangular prism.**  
**The diagram is NOT accurately drawn.**  
**You may also be given a model.**

**(continued on the next page)**

**3. continued.**

**(a) Look at the diagram for Question 3 (a) in the separate Diagram Booklet.**

**The diagram shows a square grid.  
Each square on the grid represents a  
1 cm square.**

**Rana is trying to draw the side  
elevation of the solid prism from the  
direction of the arrow.**

**Her answer is shown on the grid.**

**Explain why Rana's side elevation is  
not correct.**

**(1 mark)**

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

**Turn over**

**3. (a) continued.**

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**(continued on the next page)**

**3. continued.**

**(b) Look at the diagram for Question 3 (b) in the separate Diagram Booklet.**

**The diagram shows shape A, shape B, shape C and shape D drawn on a square grid.**

**Each square on the grid represents a 1 cm square.**

**Which shape A, B, C or D is the plan view of the solid prism?**

**(2 marks)**

**Shape \_\_\_\_\_**

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

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4. A company has 25 000 workers.  
The number of workers increases at a rate of 6% per year for 3 years.

Calculate the total number of workers at the end of the 3 years.  
(4 marks)

Answer space continues on the next page.



**4. continued.**

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

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**5. Habib has two identical tins.**

**He puts 600 grams of flour into one of the tins.**

**The flour fills the tin completely.**

**The density of the flour is  $0.6 \text{ g/cm}^3$**

**Habib puts 600 grams of salt into the other tin.**

**The salt does NOT fill the tin completely.**

**The volume of the space in the tin that is NOT filled with salt is  $700 \text{ cm}^3$**

**Work out the density of the salt.**

**You must show all your working.**

**(4 marks)**

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

**5. continued.**

\_\_\_\_\_  $\text{g/cm}^3$

**(Total for Question 5 is 4 marks)**

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**Turn over**

**6. Look at the diagram for Question 6 (a) in the separate Diagram Booklet.**

**The diagram shows an incomplete probability tree diagram.**

**Tim has two biased coins, coin A and coin B.**

**He is going to throw both coins.**

**The probability that coin A will land on heads is 0.6**

**The probability that coin B will land on heads is 0.55**

**(a) Complete the probability tree diagram.**

**(2 marks)**

**(continued on the next page)**

**6. continued.**

**(b) Tim throws coin A once and he throws coin B once.**

**Work out the probability that both coins land on heads.**

**(2 marks)**

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

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- 7. Look at the diagram for Question 7 in the separate Diagram Booklet.**

**The diagram is NOT accurately drawn.**

**The diagram shows a paddling pool in the shape of a cylinder.**

**You may also be given a model.**

**The pool has radius 100 cm**

**The pool has depth 30 cm**

**The pool is empty.**

**It is then filled with water at a rate of  $250 \text{ cm}^3$  per second.**

**Work out the number of minutes it takes to fill the pool completely.**

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

**You must show all your working.**

**(4 marks)**

**Answer space continues on the next 2 pages.**

**Turn over**

**7. continued.**

**7. continued.**

\_\_\_\_\_ minutes

**(Total for Question 7 is 4 marks)**

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

The diagram is a grid.

On the grid, draw and label the vector  $2\mathbf{a} + \mathbf{b}$

$$\text{when } \mathbf{a} = \begin{pmatrix} 3 \\ 2 \end{pmatrix} \quad \mathbf{b} = \begin{pmatrix} -1 \\ 4 \end{pmatrix}$$

(Total for Question 8 is 3 marks)

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9. Look at the diagram for Question 9 in the separate Diagram Booklet.

The diagram is NOT accurately drawn.

The diagram shows a cube with sides 6 cm and a square-based pyramid with an 8 cm square base and perpendicular height  $h$  cm.

You may also be given two models.

The volume of the cube is equal to the volume of the pyramid.

Work out the perpendicular height,  $h$  cm, of the pyramid.

(3 marks)

Answer space continues on the next page.

9. continued.

\_\_\_\_\_ cm

**(Total for Question 9 is 3 marks)**

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**Turn over**

**10. There are only red counters and yellow counters in bag A.**

**number of red counters : number of yellow counters = 3 : 5**

**There are only green counters and blue counters in bag B.**

**The number of counters in bag B is half the number of counters in bag A.**

**Given that there are  $x$  red counters in bag A,**

**use algebra to show that the total number of counters in bag A and bag B is  $4x$**

**(3 marks)**

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

**10. continued.**

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

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**Turn over**

**11. Mina records the speeds, in mph, of some cars on a road on Friday.**

**She uses her results to work out the information in the table below.**

	<b>Speed (mph)</b>
<b>Lowest speed</b>	<b>25</b>
<b>Lower quartile</b>	<b>35</b>
<b>Median</b>	<b>40</b>
<b>Interquartile range</b>	<b>10</b>
<b>Range</b>	<b>35</b>

**(a) On the grid provided for Question 11 (a) in the separate Diagram Booklet, draw a box plot to show the information in the table.**

**(3 marks)**

**(continued on the next page)**

**11. continued.**

**(b) Look at the diagram for Question 11 (b) in the separate Diagram Booklet.**

**The diagram shows a box plot.**

**Mina also records the speeds of some cars on the same road on Sunday.**

**She uses her results to draw the box plot.**

**Compare the distribution of the speeds on Friday with the distribution of the speeds on Sunday.  
(2 marks)**

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

**11. (b) continued.**

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**(Total for Question 11 is 5 marks)**

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

**The diagram shows triangle T and triangle S on a coordinate grid.**

**Describe fully the single transformation that maps triangle T onto triangle S.**

**You may be given a cut-out shape for this question.**

**(2 marks)**

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

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**12. continued.**

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**(Total for Question 12 is 2 marks)**

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**13. There are 30 students in a class.**

**A teacher is going to choose at random  
2 of the students.**

**Work out the number of different pairs  
of students that the teacher can choose.**

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**(Total for Question 13 is 2 marks)**

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- 14. At the start of 2022 Kim invested some money in a savings account. The account paid 3.5% compound interest each year.**

**At the end of 2022 interest was added to the account then Kim took £750 from the account.**

**At the end of 2023 interest was added to the account then Kim took £1000 from the account.**

**There was then £2937.14 in the account.**

**Work out how much money Kim invested at the start of 2022**

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

**Answer space continues on the next 2 pages.**

**14. continued.**

**14. continued.**

£ \_\_\_\_\_

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

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15. (a) Simplify fully  $\frac{(p - 3)^2}{5(p - 3)}$   
(1 mark)

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(continued on the next page)

**15. continued.**

**(b) Factorise  $3k^2 + 11k - 4$   
(2 marks)**

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**(continued on the next page)**

**Turn over**



**15. continued.**

**(c) Simplify fully**  $\frac{4 - y^2}{y^2 + 3y} \div \frac{y + 2}{y + 3}$   
**(3 marks)**

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

**15. (c) continued.**

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**(Total for Question 15 is 6 marks)**

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16. The functions  $f$  and  $g$  are given by

$$f(x) = \frac{12}{x+1} \quad \text{and} \quad g(x) = 5 - 3x$$

(a) Find  $f(-3)$

(1 mark)

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(continued on the next page)

**16. continued.**

**(b) Find  $fg(1)$   
(2 marks)**

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**(continued on the next page)**

**Turn over**

**16. continued.**

**(c) Find  $g^{-1}(4)$   
(2 marks)**

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**(Total for Question 16 is 5 marks)**

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**Turn over**

**17. A ball is thrown upwards and reaches a maximum height.**

**The ball then falls and bounces repeatedly.**

**After the  $n$ th bounce, the ball reaches a height of  $h_n$**

**After the next bounce, the ball reaches a height given by  $h_{n+1} = 0.55h_n$**

**After the 1st bounce, the ball reaches a height of 8 metres.**

**What height does the ball reach after the 4th bounce?**

**(3 marks)**

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

**17. continued.**

\_\_\_\_\_ metres

**(Total for Question 17 is 3 marks)**

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**Turn over**

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

**The diagram is NOT accurately drawn.  
The diagram shows a quadrilateral labelled ABCD.**

**In the diagram:**

$$\text{AD} = 17 \text{ cm}$$

$$\text{Angle ABC} = 57^\circ$$

$$\text{Angle ACB} = 48^\circ$$

$$\text{Angle CAD} = 35^\circ$$

**The area of triangle ACD is  $54 \text{ cm}^2$**

**Calculate the area of triangle ABC.**

**Give your answer correct to**

**3 significant figures.**

**(5 marks)**

**Answer space continues on the next 2 pages.**

**Turn over**



**18. continued.**

**18. continued.**

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

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

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19. When  $R = \frac{P}{Q}$

and  $P = 5.88 \times 10^8$  correct to  
3 significant figures  
and  $Q = 3.6 \times 10^5$  correct to  
2 significant figures.

Work out the lower bound for  $R$ .  
Give your answer as an ordinary  
number correct to the nearest integer.  
You must show all your working.  
(3 marks)

Answer space continues on the next page.

**19. continued.**

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

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**Turn over**

20. (a)  $x - 4$ ,  $x + 2$  and  $3x + 1$   
are three consecutive terms of an  
arithmetic sequence.

Find the value of  $x$ .

(2 marks)

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

**20. continued.**

**(b)  $y - 4$ ,  $y + 2$  and  $3y + 1$   
are three consecutive terms of a  
geometric sequence.**

**Find the possible values of  $y$ .  
(5 marks)**

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

**20. (b) continued.**

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**(Total for Question 20 is 7 marks)**

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**Turn over**

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

**The diagram is NOT accurately drawn.**

**The diagram shows a circle, radius  $r$  cm and two regular hexagons.**

**Each side of the larger hexagon**

**ABCDEF is a tangent to the circle.**

**Each side of the smaller hexagon**

**PQRSTU is a chord of the circle.**

**By considering perimeters, show that**

$$3 < \pi < 2\sqrt{3}$$

**(4 marks)**

**Answer space continues on the next 2 pages.**



**21. continued.**

**21. continued.**

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

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**TOTAL FOR PAPER IS 80 MARKS**  
**END OF PAPER**

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