

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. 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.**

**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.**

**There may be spare copies of some diagrams in case  
you need to use them.**

**You may be provided with models for Question 4 and  
Question 25  
They are 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.**

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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. Make  $n$  the subject of the formula  $p = 3n - 9$

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(Total for Question 1 is 2 marks)

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2. Rob has been asked to divide 120 in the ratio 3 : 5

Here is his working.

$$120 \div 3 = 40$$

$$120 \div 5 = 24$$

Rob's working is not correct.

Describe what Rob has done wrong.

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(Total for Question 2 is 1 mark)

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3. **200** students chose one language to study.  
Each student chose one language from French or Spanish or German.

Of the **200** students,

**90** are boys and the rest of the students are girls

**70** chose Spanish

**60** of the **104** students who chose French are boys

**18** girls chose German.

Work out how many boys chose Spanish.

(3 marks)

Answer space continues on the next page.

3. continued.

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

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**Turn over**



- 4. Look at the diagram for Question 4 in the Diagram Booklet.**

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

**It is NOT accurate.**

**Karina has 4 tanks on her tractor.**

**Each tank is a cylinder with diameter 80 cm and height 160 cm**

**The 4 tanks are to be filled completely with a mixture of fertiliser and water.**

**The fertiliser has to be mixed with water in the ratio 1 : 100 by volume.**

**Karina has 32 litres of fertiliser.**

$$\mathbf{1 \text{ litre} = 1000 \text{ cm}^3}$$

**Has Karina enough fertiliser for the 4 tanks?**

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

**(4 marks)**

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

4. continued.

(Total for Question 4 is 4 marks)

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Turn over

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

Triangle **ABC** and triangle **DEF** are similar.

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

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

$$DE = 22 \text{ cm}$$

$$DF = 20 \text{ cm}$$

$$\text{Angle } ABC = \text{Angle } DEF$$

$$\text{Angle } ACB = \text{Angle } DFE$$

- (a) Work out the length of **EF**  
(2 marks)

\_\_\_\_\_cm

(continued on the next page)

Turn over

5. continued.

(b) Work out the length of **AB**  
(2 marks)

\_\_\_\_\_cm

(Total for Question 5 is 4 marks)

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Turn over

6. Look at the diagram for Question 6 in the Diagram Booklet.

One weekend the Keddie family is going to do a sports quiz and a music quiz.

The probability that the family will win the sports quiz is  $0.3$

The probability that the family will win the music quiz is  $0.35$

- (a) Complete the probability tree diagram in the Diagram Booklet.

There are three spaces to fill.

(2 marks)

(continued on the next page)

**6. continued.**

**(b) Work out the probability that the Keddie family will win both the sports quiz and the music quiz.**

**(2 marks)**

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

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**Turn over**

15

7. (a) Change  $8000 \text{ cm}^3$  to  $\text{m}^3$   
(1 mark)

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

- (b) Change a speed of  $180 \text{ km per hour}$  to  
metres per second.  
(3 marks)

\_\_\_\_\_ metres per second

(Total for Question 7 is 4 marks)

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Turn over

8. There are **30** women and **20** men at a gym.

The mean height of all **50** people is **167.6 cm**

The mean height of the **20** men is **182 cm**

Work out the mean height of the **30** women.

\_\_\_\_\_cm

(Total for Question 8 is 3 marks)

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Turn over



9. (a) Write

$6.75 \times 10^{-4}$  as an ordinary number.

(1 mark)

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(continued on the next page)

9. continued.

(b) Work out

$$\frac{2.56 \times 10^6 \times 4.12 \times 10^{-3}}{1.6 \times 10^{-2}}$$

Give your answer in standard form.

(2 marks)

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(Total for Question 9 is 3 marks)

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Turn over

10. Peter has to subtract  
 $(x^2 - 2x - 4)$  from  
 $(x^2 + 3x + 5)$

Here is his working

$$(x^2 + 3x + 5) - (x^2 - 2x - 4)$$

$$= x^2 + 3x + 5 - x^2 - 2x - 4$$

$$= x + 1$$

Explain what is wrong with Peter's working.

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(Total for Question 10 is 1 mark)

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11.  $p$  and  $q$  are integers such that

$$3 < p < 8$$

$$4 < q < 10$$

$$\text{and } p + q = 14$$

Find all the possible values of  $p$

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(Total for Question 11 is 2 marks)

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**12. Martin used his calculator to work out the value of a number  $P$**

**He wrote down the first two digits of the answer on his calculator.**

**He wrote down  $1.2$**

**Complete the error interval for  $P$**

**\_\_\_\_\_  $\leq P <$  \_\_\_\_\_**

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

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13. Look at the diagram for Question 13 in the Diagram Booklet.

Chen has the information in the table below about the time that it took an operator at a call centre to answer each of 90 calls.

Time ( $t$ seconds)	Cumulative frequency
$0 < t \leq 10$	4
$0 < t \leq 20$	25
$0 < t \leq 30$	70
$0 < t \leq 40$	88
$0 < t \leq 50$	90

Chen draws the cumulative frequency graph in the Diagram Booklet for the information in the table.

(continued on the next page)

**13. continued.**

**Write down two different things that are wrong with this graph.**

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

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

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

\_\_\_\_\_

14. (a) Simplify fully

$$(3x^5y^6)^4$$

(2 marks)

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(b) Expand and simplify

$$(y + 2)(y - 3)(y + 4)$$

(3 marks)

Answer space continues on the next page.

Turn over



14. (b) continued.

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(Total for Question 14 is 5 marks)

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Turn over

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

**It shows details about the fish in a pet shop.**

**Show that there are 555 different ways for David to choose his fish.**

**(Total for Question 15 is 2 marks)**

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**Turn over**

16. Look at the diagram for Question 16 in the Diagram Booklet.

**ABDE** is a cyclic quadrilateral.

**ABC** and **EDC** are straight lines.

Angle **DBC** =  $60^\circ$

Given that

size of angle **EAB** : size of angle **BCD** = 2 : 1

work out the size of angle **BCD**

You must show all your working.

(4 marks)

Answer space continues on the next page.

16. continued.

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(Total for Question 16 is 4 marks)

Turn over

17. There are four boxes on a shelf, **A**, **B**, **C** and **D**

The total weight of **A** and **B** is 3 times the total weight of **C** and **D**

The weight of **A** is  $\frac{2}{3}$  of the weight of **B**

The weight of **C** is 75% of the weight of **D**

Find the ratio

weight of **A** : weight of **B** : weight of **C** : weight of **D**

(4 marks)

Answer space continues on the next two pages.

17. continued.

Turn over

**17. continued.**

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

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18. Shape **A** is reflected in the line with equation  $x = 2$   
to give shape **B**  
Shape **B** is reflected in the line with equation  $x = 6$   
to give shape **C**

Describe fully the **SINGLE** transformation that maps  
shape **A** onto shape **C**

(2 marks)

Answer space and lines continue on the next page.



18. continued.

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(Total for Question 18 is 2 marks)

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19. There are only blue counters, red counters and green counters in a box.

The probability that a counter taken at random from the box will be blue is  $0.4$

The ratio of the number of red counters to the number of green counters is  $7 : 8$

Sameena takes at random a counter from the box.

She records its colour and puts the counter back in the box.

Sameena does this a total of **50** times.

Work out an estimate for the number of times she takes a green counter.

(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. Look at the diagram for Question 20 in the Diagram Booklet.

It shows a triangle **ADE**

$$AE = DE$$

$$AB : BC : CD = 1 : 2 : 1$$

Prove that triangle **ACE** is congruent to triangle **DBE**

(3 marks)

Answer space continues on the next page.

**20. continued.**

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

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**Turn over**

21. The equation of a curve is

$$y = 4x^2 - 56x$$

The curve has one turning point.

By completing the square, show that the coordinates of the turning point are  $(7, -196)$

You must show all your working.

(3 marks)

Answer space continues on the next page.

**21. continued.**

**(Total for Question 21 is 3 marks)**

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**Turn over**

22.  $\frac{2x+3}{x-5} + \frac{x-4}{x+5} - 3$

can be written in the form

$\frac{ax+b}{x^2-25}$  where **a** and **b** are integers.

Work out the value of **a** and the value of **b**

You must show all your working.

(3 marks)

Answer space continues on the next two pages.



**22. continued.**

**Turn over**

**22. continued.**

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

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

**(Total for Question 22 is 3 marks)**

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**Turn over**

**23. Look at the diagram for Question 23(a) in the Diagram Booklet.**

**It shows the graph of  $y = f(x)$**

- (a) On the grid in the Diagram Booklet, sketch the graph of  $y = f(x + 2)$**   
**(1 mark)**

**Look at the diagram for Question 23(b) in the Diagram Booklet.**

**On the grid in the Diagram Booklet, graph **A** has been reflected to give graph **B****

**The equation of graph **A** is  $y = g(x)$**

- (b) Write down an equation of graph **B****  
**(1 mark)**

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**(Total for Question 23 is 2 marks)**

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24. Look at the diagram for Question 24 in the Diagram Booklet.

It shows **CDEF** is a quadrilateral.

$$\overrightarrow{FE} = \mathbf{a}$$

$$\overrightarrow{ED} = \mathbf{b}$$

$$\overrightarrow{CD} = 2\mathbf{a}$$

The point **P** is such that **CEP** is a straight line and that **CE = EP**

Use a vector method to prove that **CF** is parallel to **DP**

(4 marks)

Answer space continues on the next page.

**24. continued.**

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

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**Turn over**

**25. Look at Diagram 1 and Diagram 2 for Question 25 in the Diagram Booklet.**

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

**It is NOT accurate.**

**The pyramid **P** is formed from two parts made of different materials.**

**The top part of **P** has a mass of  $92.8$  grams and is made from material with a density of  $2.9 \text{ g/cm}^3$**

**The bottom part of **P** has a mass of  $972.8$  grams**

**The average density of **P** is  $4.7 \text{ g/cm}^3$**

**Calculate the volume of the top part of **P** as a percentage of the total volume of **P****

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

**You must show all your working.**

**(5 marks)**

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

**25. continued.**

**Turn over**

25. continued.

\_\_\_\_\_ %

(Total for Question 25 is 5 marks)

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26. Look at the diagram for Question 26 in the Diagram Booklet.

**ABCDEFG** is a regular heptagon.

Points **G** and **B** are joined to form triangle **ABG**

The area of triangle **ABG** is  $30 \text{ cm}^2$

Calculate the length of **GB**

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

You must show all your working.

(5 marks)

Answer space continues on the next page.

26. continued.

\_\_\_\_\_ cm

(Total for Question 26 is 5 marks)

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**TOTAL FOR PAPER IS 80 MARKS**

**END OF PAPER**

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