

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

Total Marks

Mathematics
Paper 3
(Calculator)
Higher Tier

Tuesday 11 June 2019 – Morning

Time: 1 hour 30 minutes plus your additional time allowance.

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. 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 and models are NOT accurate unless otherwise indicated.

CALCULATORS MAY BE USED.

If your calculator does not have a π button, take the value of π 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.

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.

5

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

Turn over

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

It shows an incomplete Venn diagram.

$$\mathcal{E} = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$$

$$A = \{1, 5, 6, 8, 9\}$$

$$B = \{2, 6, 9\}$$

- (a) Complete the Venn diagram to represent this information.
(3 marks)

(continued on the next page)

1. continued.

A number is chosen at random from the universal set \mathcal{U}

(b) Find the probability that the number is in the set $A \cap B$
(2 marks)

(Total for Question 1 is 5 marks)

Turn over

- 2. Katy invests £200 000 in a savings account for 4 years.**

The account pays compound interest at a rate of 1.5% per annum.

Calculate the total amount of interest Katy will get at the end of 4 years.

(3 marks)

Answer space continues on the next page.

2. continued.

£ _____

(Total for Question 2 is 3 marks)

Turn over

3. The table below shows information about the heights of 80 plants.

Height (h cm)	Frequency
$10 < h \leq 20$	8
$20 < h \leq 30$	12
$30 < h \leq 40$	14
$40 < h \leq 50$	12
$50 < h \leq 60$	16
$60 < h \leq 70$	18

(continued on the next page)

Turn over

3. continued.

(a) Find the class interval that contains the median.

(1 mark)

(continued on the next page)

Turn over

3. continued.

**(b) Look at the diagram for
Question 3(b) in the Diagram Book.
On the grid, draw a frequency
polygon for the information in the
table.**

(2 marks)

(Total for Question 3 is 3 marks)

4. Look at the diagram for Question 4 in the Diagram Book.

Sean has drawn a time series graph to show the numbers, in thousands, of visitors to a fun park.

Write down two things that are wrong or could be misleading with this graph.

(2 marks)

Answer lines continue on the next page.

1 _____

4. continued.

2 _____

(Total for Question 4 is 2 marks)

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

It shows a hexagon **ABCDEF**

The hexagon has one line of symmetry.

$$FA = BC$$

$$EF = CD$$

$$\text{Angle } ABC = 117^\circ$$

$$\text{Angle } BCD = 2 \times \text{angle } CDE$$

Work out the size of angle **AFE**

You must show all your working.

(4 marks)

Answer space is on the next two pages.

Turn over

5. continued.

Turn over

5. continued.

○

(Total for Question 5 is 4 marks)

Turn over

6. Look at the diagrams for Question 6 in the Diagram Book.

Diagram 1 shows a tank.

Jeremy has to cover 3 tanks completely with paint.

Each tank is in the shape of a cylinder with both a top and a bottom as shown in Diagram 2

The tank has a diameter of 1.6 metres and a height of 1.8 metres.

Jeremy has 7 tins of paint.

Each tin of paint covers 5 m^2

(continued on the next page)

Turn over

6. continued.

**Has Jeremy got enough paint to
cover completely the 3 tanks?**

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

(5 marks)

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

6. continued.

Turn over

6. continued.

(Total for Question 6 is 5 marks)

Turn over

7. Work out

$$\sqrt{\frac{2.5 \times \sin 43^\circ}{8 \cdot 2^2 - 50 \cdot 5}}$$

Give your answer correct to

3 significant figures.

(2 marks)

Answer space continues on the next page.

Turn over

7. continued.

(Total for Question 7 is 2 marks)

Turn over

8. Look at the diagram for Question 8(a) in the Diagram Book.

ABC is a right-angled triangle.

Here is Sarah's method to find the length of **BC**

$$\begin{aligned} BC^2 &= AB^2 + AC^2 \\ &= 6^2 + 8^2 \\ &= 100 \end{aligned}$$

$$BC = 10$$

(continued on the next page)

8. continued.

(a) What mistake has Sarah made in her method?

(1 mark)

(continued on the next page)

8. continued.

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

**It shows triangles PQR and XYZ on
a grid.**

**Roy is going to enlarge triangle PQR
with centre C and scale factor $1\frac{1}{2}$**

He draws triangle XYZ

(continued on the next page)

8. continued.

**(b) Explain why Roy's diagram is
NOT correct.**

(1 mark)

(Total for Question 8 is 2 marks)

Turn over

- 9. Look at the table for Question 9 in the Diagram Book.**

A company has to make a large number of boxes.

The company has 6 machines.

All the machines work at the same rate.

When all the machines are working, they can make all the boxes in 9 days.

The table gives the number of machines working each day.

Work out the total number of days taken to make all the boxes.

(3 marks)

Answer space is on the next page.

Turn over

9. continued.

(Total for Question 9 is 3 marks)

Turn over

10. Marie invests £8000 in an account for one year.

At the end of the year, interest is added to her account.

Marie pays tax on this interest at a rate of 20%

She pays £28·80 tax.

Work out the percentage interest rate for the account.

(3 marks)

Answer space continues on the next page.

10. continued.

_____ %

(Total for Question 10 is 3 marks)

Turn over

- 11. In May 2019, the distance between Earth and Mars was 3.9×10^7 km**

In May 2019, a signal was sent from Earth to Mars.

Assuming that the signal sent from Earth to Mars travelled at a speed of 3×10^5 km per second,

- (a) how long did the signal take to get to Mars?**

(2 marks)

Answer space continues on the next page.

11. (a) continued.

_____ seconds

(continued on the next page)

Turn over

11. continued.

The speed of the signal sent from Earth to Mars in May 2019 was actually less than 3×10^5 km per second.

**(b) How will this affect your answer to part (a)?
(1 mark)**

(Total for Question 11 is 3 marks)

Turn over

12. Patrick has to work out the exact value of $64^{\frac{1}{4}}$

Patrick says,

“ $\frac{1}{4}$ of 64 is 16 so $64^{\frac{1}{4}} = 16$ ”

Explain what is wrong with what Patrick says.

(Total for Question 12 is 1 mark)

Turn over

13. The density of ethanol is 1.09 g/cm^3
The density of propylene is
 0.97 g/cm^3

60 litres of ethanol are mixed with
128 litres of propylene to make
188 litres of antifreeze.

Work out the density of the antifreeze.
Give your answer correct to
2 decimal places.

(4 marks)

Answer space continues on the next
page.

13. continued.

_____ **g/cm³**

(Total for Question 13 is 4 marks)

Turn over

14. Look at the diagram for Question 14 in the Diagram Book.

It shows a rectangle, ABDE, and two congruent triangles,

AFE and BCD

$AF = BC = 24 \text{ cm}$

$\text{Angle FAE} = \text{Angle CBD} = 30^\circ$

area of rectangle ABDE

$= \text{area of triangle AFE} + \text{area of triangle BCD}$

$AB : AE = 1 : 3$

Work out the length of AE

(4 marks)

Answer space is on the next two pages.

Turn over

14. continued.

Turn over

14. continued.

_____ **cm**

(Total for Question 14 is 4 marks)

Turn over

15. The graph of the curve **C** with equation $y = f(x)$ is transformed to give the graph of the curve **S** with equation $y = f(-x) - 3$

The point on **C** with coordinates $(7, 2)$ is mapped to the point **Q** on **S**

Find the coordinates of **Q**
(2 marks)

Answer space continues on the next page.

15. continued.

(_____ , _____)

(Total for Question 15 is 2 marks)

Turn over

16. Here are the first six terms of a quadratic sequence.

−1 5 15 29 47 69

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

(3 marks)

Answer space continues on the next page.

16. continued.

(Total for Question 16 is 3 marks)

Turn over

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

It shows four graphs.

**The graphs represent four different
types of function f**

**Match each description of the
function in the table on the following
page to the letter of its graph.**

(2 marks)

(continued on the next page)

17. continued.

Description of function	Graph
$f(x)$ is inversely proportional to x	
$f(x)$ is a trigonometrical function	
$f(x)$ is an exponential function	
$f(x)$ is directly proportional to \sqrt{x}	

(Total for Question 17 is 2 marks)

Turn over

18. (a) Show that

$$(2x + 1)(x + 3)(3x + 7)$$

can be written in the form

$$ax^3 + bx^2 + cx + d \text{ where}$$

a, b, c and d are integers.

(3 marks)

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

18. (a) continued.

(continued on the next page)

Turn over

18. continued.

(b) Solve

$$(1 - x)^2 < \frac{9}{25}$$

(3 marks)

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

Turn over

18. (b) continued.

(Total for Question 18 is 6 marks)

Turn over

19.

$$D = \frac{u^2}{2a}$$

$u = 26.2$ correct to 3 significant figures

$a = 4.3$ correct to 2 significant figures

(a) Calculate the upper bound for the value of D

Give your answer correct to 6 significant figures.

You must show all your working.

(3 marks)

Answer space is on the next page.

Turn over

19. (a) continued.

(continued on the next page)

Turn over

19. continued.

The lower bound for the value of D is $78 \cdot 6003$ correct to 6 significant figures.

(b) By considering bounds, write down the value of D to a suitable degree of accuracy.

You must give a reason for your answer.

(2 marks)

Write your answer in the space below and on the lines on the next page.

Turn over

19. (b) continued.

(Total for Question 19 is 5 marks)

20. Solve algebraically the simultaneous equations

$$x^2 - 4y^2 = 9$$

$$3x + 4y = 7$$

(5 marks)

Answer space continues on the next two pages.

20. continued.

Turn over

20. continued.

(Total for Question 20 is 5 marks)

Turn over

21. Look at the diagram for Question 21 in the Diagram Book.

The histogram gives information about the distribution of the weights of some onions grown by a farmer.

Onions less than 60 grams in weight are used for pickling.

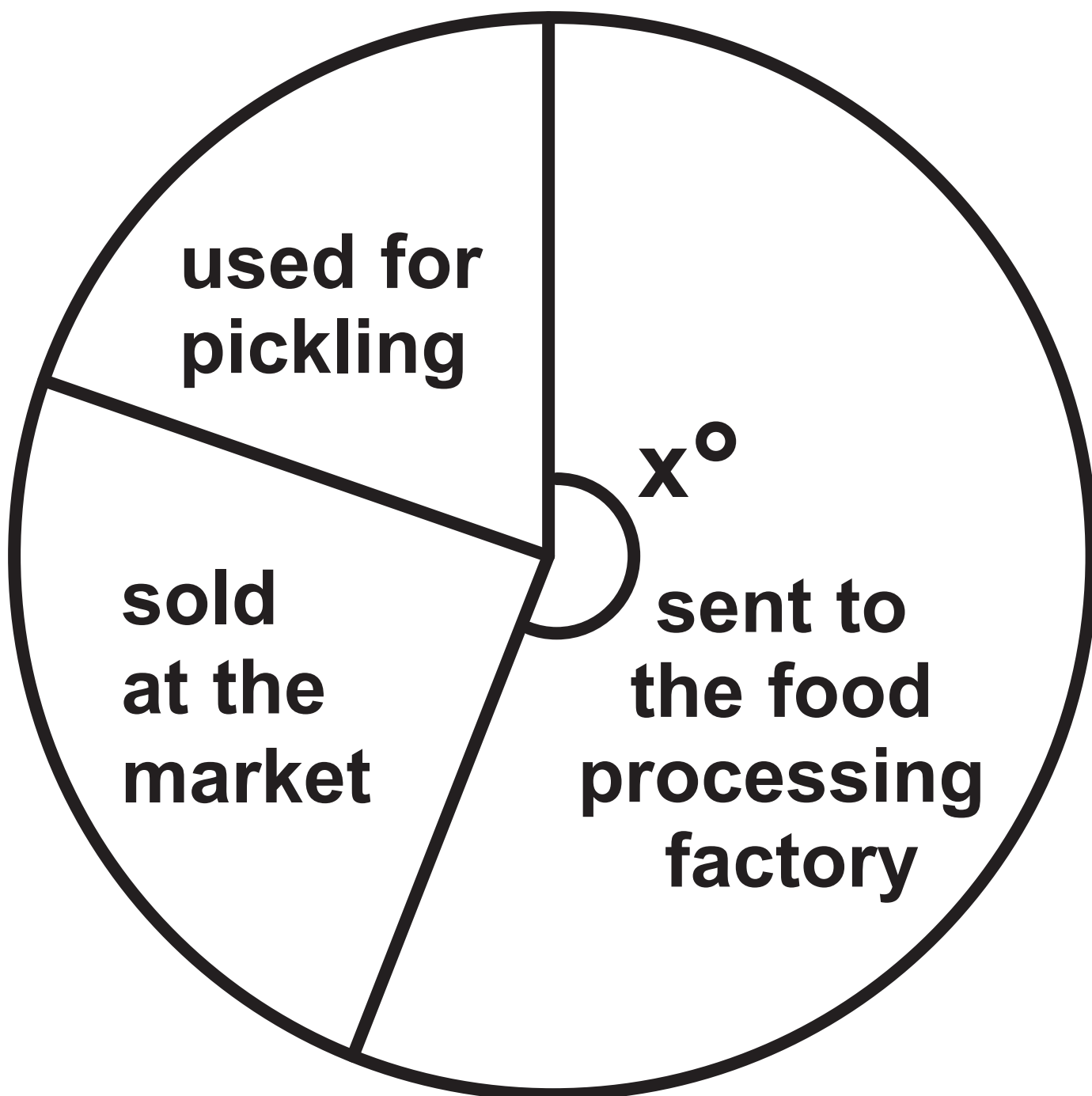
Onions greater than 120 grams in weight are sold at the market.

The rest of the onions are sent to a food processing factory.

(continued on the next page)

21. continued.

The pie chart below is drawn using the information in the histogram to show what the farmer does with the onions he grows.



The angle of the sector for the onions sent to the food processing factory is x°

(continued on the next page)

Turn over

21. continued.

**Work out the value of the angle
marked x°**

(4 marks)

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

Turn over

21. continued.

x = _____

(Total for Question 21 is 4 marks)

Turn over

22. Look at the diagram for Question 22 in the Diagram Book.

It shows a circle, centre O

AB is the tangent to the circle at the point A

OA is shown on the diagram.

Angle OBA = 30°

Point B has coordinates (16, 0)

Point P has coordinates (3p, p)

(continued on the next page)

22. continued.

Find the value of p

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

You must show all your working.

(4 marks)

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

22. continued.

p = _____

(Total for Question 22 is 4 marks)

Turn over

23. Look at the diagram for Question 23 in the Diagram Book.

It shows the positions of three towns, Acton (A), Barston (B) and Chorlton (C)

Barston is 8 km from Acton on a bearing of 037°

Chorlton is 9 km from Barston on a bearing of 150°

Find the bearing of Chorlton from Acton.

Give your answer correct to 1 decimal place.

You must show all your working.

(5 marks)

Answer space is on the next two pages.

Turn over

23. continued.

Turn over

23. continued.

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(Total for Question 23 is 5 marks)

TOTAL FOR PAPER IS 80 MARKS

END OF PAPER