Please check the examination details below before entering your candidate information

| Candidate surname |  | Other names |  |
| :---: | :---: | :---: | :---: |
|  | Centre Number |  | Candidate Number |
| Pearson Edexcel |  |  |  |
| Level 1/Level 2 GCSE (9-1) |  |  |  |


| Afternoon (Time: 1 hour 30 minutes) | Paper Reference 1MA1/3H |
| :--- | :--- |

Mathematics
Paper 3 (Calculator)
Higher Tier

You must have: Ruler graduated in centimetres and millimetres,
Total Marks protractor, pair of compasses, pen, HB pencil, eraser, calculator. Tracing paper may be used.

## Instructions

- Use black ink or ball-point pen.
- Fill in the boxes at the top of this page with your name, centre number and candidate number.
- Answer all questions.
- Answer the questions in the spaces provided - 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.


## 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.


## MME.

## GCSE Maths Products



# Available in the course in a box or for purchase separately. 

> 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 $(x+5)(x-9)$

$$
x^{2}-4 x-45
$$

(2)
(b) Factorise fully $9 x^{2}+6 x$

$$
3 x(3 x+2)
$$

(2)
(Total for Question 1 is $\mathbf{4}$ marks)
2 (a) Use your calculator to work out $\frac{29^{2}-4.6}{\sqrt{35-1.9^{3}}}$
Write down all the figures on your calculator display.
157.668255
(2)
(b) Write your answer to part (a) correct to 4 significant figures.

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

Maths test mark


Jamie got a mark of 34 in the Science test.
Using the scatter graph, find an estimate for Jamie's mark in the Maths test.
(Total for Question 3 is 2 marks)

4 The table gives information about the times taken, in seconds, by 18 students to run a race.

| Time $(t$ seconds) | Frequency | mid | $8 \times m$ |
| :---: | :---: | :---: | :---: |
| $5<t \leqslant 10$ | 1 | 7.5 | 7.5 |
| $10<t \leqslant 15$ | 2 | 12.5 | 25 |
| $15<t \leqslant 20$ | 7 | 17.5 | 122.5 |
| $20<t \leqslant 25$ | 8 | 22.5 | 180 |
| Total | 18 | $>$ | 335 |

Work out an estimate for the mean time.
Give your answer correct to 3 significant figures.

$$
335 \div 18=18.6
$$

18.6 seconds

5 Write $37 \mathrm{~cm}^{3}$ in $\mathrm{mm}^{3}$

6 Nimer was driving to a hotel.
He looked at his Sat Nav at 1330

| Time | 1330 |
| :--- | :--- |
| Distance to destination | 65 miles |

Nimer arrived at the hotel at 1448
Work out the average speed of the car from 1330 to 1448
You must show all your working.

$$
\begin{aligned}
& 78 \text { mons. } \\
& \begin{aligned}
65 \div 78 & =\frac{5}{6} \text { moles } / \mathrm{mon} \\
& =\frac{5}{6} \times 60 \\
& =50 \mathrm{mph}
\end{aligned}
\end{aligned}
$$

7 (a) Write 32460000 in standard form.

$$
3.246 \times 10^{7}
$$

(1)
(b) Write $4.96 \times 10^{-3}$ as an ordinary number.

Asma was asked to compare the following two numbers.

$$
A=6.212 \times 10^{8} \quad \text { and } \quad B=4.73 \times 10^{9}
$$

She says,
" 6.212 is bigger than 4.73 so $A$ is bigger than $B$."
(c) Is Asma correct?

You must give a reason for your answer.
No. She has not accounted for powers of $10 ; 10^{9}>10^{8}$.
(1)
(Total for Question 7 is $\mathbf{3}$ marks)

8 The diagram shows a regular pentagon and a parallelogram.


Work out the size of the angle marked $x$.
You must show all your working.
76 180-117=63
Exterior angle of pentagon $=72$.
Interior angle $=180-72=108$.

$$
\begin{aligned}
& x=108-63 \\
& x=45^{\circ} .
\end{aligned}
$$

9


Enlarge triangle A by scale factor 2.5 with centre $(0,1)$
(Total for Question 9 is 2 marks)

10 (a) Solve $\frac{9+x}{7}=11-x$

$$
\begin{gathered}
\frac{a+x}{7}=11-x \\
9+x=77-7 x . \\
8 x=68 \\
x=8.5
\end{gathered}
$$

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

$$
x=8.5
$$

(3)

11 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.

$$
\begin{gathered}
0.07 \times 0.98+0.93 \times 0.11= \\
0.1709
\end{gathered}
$$

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

On the grid, draw a box plot for this information.

(Total for Question 12 is $\mathbf{3}$ marks)

13 Liquid $A$ and liquid $B$ are mixed together in the ratio $2: 13$ by volume to make liquid $C$.
Liquid A has density $1.21 \mathrm{~g} / \mathrm{cm}^{3}$
Liquid B has density $1.02 \mathrm{~g} / \mathrm{cm}^{3}$
A cylindrical container is filled completely with liquid C .
The cylinder has radius 3 cm and height 25 cm .
Work out the mass of the liquid in the container.
Give your answer correct to 3 significant figures.
You must show all your working.

$$
\begin{aligned}
& V= 25 \times \pi \times 3^{2} \\
& V= 225 \pi . \\
& 2+13=15 \\
& 225 \pi \div 15=15 \pi \\
& 15 \pi \times 2=30 \pi \\
& 1.21 \times 30 \pi+1.02 \times 195 \pi=739 \mathrm{~g} .
\end{aligned}
$$

$\qquad$
(Total for Question 13 is 4 marks)

14 A group of people went to a restaurant.
Each person chose one starter and one main course.

| starter | main course |
| :---: | :---: |
| soup | lasagne |
| prawns | curry |

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 $=5: 3$
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.

$$
2: 3 \longrightarrow 16: 24 .
$$



|  | Soup | Prawns | Total |
| :---: | :---: | :---: | :---: |
| Lasagne | 5 | 2 | 7 |
| Curry | 3 | 10 | 13 |
| Total | 8 | 12 | 20 |

$$
\frac{13}{20}
$$

15 Prove algebraically that the sum of the squares of any two consecutive even numbers is always a multiple of 4 sums are $n^{2}, n+2$

$$
\begin{aligned}
& n^{2}+(n+2)^{2}= \\
& n^{2}+n^{2}+4 n+4= \\
& 2 n^{2}+4 n+4
\end{aligned}
$$

$n$ even so $2^{2}$ divides by 4 .
$4 n+4$ divides by 4 .
$\Rightarrow$ Divisible by 4 .
$16 y$ is inversely proportional to the square of $x$.
$y=8$ when $x=2.5$
Find the negative value of $x$ when $y=\frac{8}{9}$

$$
\begin{aligned}
& y=\frac{k}{x^{2}} \\
& 8=\frac{h}{2.5^{2}} \\
& 8=\frac{k}{6.25} \\
& k=8 \times 6.25 \\
& k=50 \\
& y=\frac{50}{x^{2}} \\
& \frac{8}{9}=\frac{50}{x^{2}} \\
& x^{2}=50 \times \frac{9}{8} \\
& x^{2}=\frac{225}{4} \\
& x=-\frac{15}{2}
\end{aligned}
$$

$$
-\frac{15}{2}
$$

(Total for Question 16 is 3 marks)

17 Here is the graph of $y=x^{2}-3$


Use the graph to find estimates for the solutions to the equation $x^{2}-2 x-2=0$
You must show how you get your solutions.

$$
\begin{aligned}
& y=x^{2}-2 x-2 \\
& y=(x-1)^{2}-1-2 \\
& y=(x-1)^{2}-3 \\
& \text { So should subtract } 1 \text { from above roots } \\
& 1.7-1=0.7 \\
&-1.7-1=-2.7
\end{aligned}
$$

(Total for Question 17 is 4 marks)

18 The diagram shows triangle $A B C$.

$A B=3.4 \mathrm{~cm} \quad A C=6.2 \mathrm{~cm} \quad B C=6.1 \mathrm{~cm}$
$D$ is the point on $B C$ such that

$$
\text { size of angle } D A C=\frac{2}{5} \times \text { size of angle } B C A
$$

Calculate the length $D C$.
Give your answer correct to 3 significant figures.
You must show all your working.

$$
\begin{aligned}
& 3.4^{2}=6.1^{2}+6.2^{2}-2 \times 61 \times 6.2 \times \cos (B C A)- \\
& (1.56=37.21+38.44-75.64 \cos (B C A) \\
& 75.64 \cos (B C A)=37.21+38.44-11.56 \\
& 75.64 \cos (B C A)=64.09 \\
& \cos (B C A)=\frac{64.09}{75.64} \\
& \cos (B C A)=\frac{6409}{7564} \\
& B C A=\cos ^{-1}\left(\frac{6409}{7564}\right) \\
& D A C=\frac{2}{5} \cos ^{-1}\left(\frac{6409}{7564}\right) . \\
& \frac{\sin (D A C)}{D C}=\frac{6.2}{\sin \left(180-\frac{7}{5} B C A\right)} \\
& D C= \\
& D C=1.95
\end{aligned}
$$

19 The graph shows information about part of a cyclist's journey.

Distance travelled (metres)


Work out an estimate of the speed, in $\mathrm{m} / \mathrm{s}$, of the cyclist at time 6 seconds.

$$
v=\frac{11.5}{3.6}=3.2 \mathrm{~ms}^{-1}
$$

3.2
$\mathrm{m} / \mathrm{s}$

20 Here are the first five terms of a sequence.

$$
-1
$$

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

| 0 | -1 |  | 0 |  | 3 |  | 8 | 15 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| -1 |  | 1 |  | 3 |  | 5 |  | 7 |

- $A n^{2}+B n+C$.
Disgerence is 2 so $A=2 \div 2=1$.
Oth term is $\mathcal{O}$ so $A=0$.
$n^{2}+B n$.
$n=1: \quad 1^{2}+B(1)=-1$
$1+B=-1$

$$
B=-2 .
$$

- $n^{2}-2 n$

$$
n^{2}-2 n
$$

(Total for Question 20 is $\mathbf{2}$ marks)
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.

$$
\begin{aligned}
(P(h))^{4} & =\frac{16}{81} \\
P(h) & =\frac{2}{3} \\
P(t) & =\frac{1}{3} \\
(P(t))^{4} & =\frac{1}{81}
\end{aligned}
$$

$\qquad$

22 Show that $\frac{7 x-14}{x^{2}+4 x-12}+\frac{x-6}{x^{3}-36 x}$ simplifies to $a x$ where $a$ is an integer.
$\frac{7 x-14}{x^{2}+4 x-12} \div \frac{x-6}{x^{3}-36 x}=$


$$
\begin{aligned}
& \frac{(7 x-14)\left(x^{3}-36 x\right)}{\left(x^{2}+4 x-12\right)(x-6)}= \\
& \frac{7(x-2) x\left(x^{2}-36\right)}{(x-2)(x+6)(x-6)}= \\
& \frac{7(x-2) x(x+6)(x-6)}{(x-x)(x+6)(x-6)}=
\end{aligned}
$$

23 The diagram shows a sector $O A C B$ of a circle with centre $O$. The point $C$ is the midpoint of the arc $A B$.

The diagram also shows a hollow cone with vertex $O$. The cone is formed by joining $O A$ and $O B$.


The cone has volume $56.8 \mathrm{~cm}^{3}$ and height 3.6 cm .
Calculate the size of angle $A O B$ of sector $O A C B$. Give your answer correct to 3 significant figures. You must show all your working.

$$
\begin{aligned}
56.8 & =\frac{1}{3} \pi r^{2} \times 3.6 \\
56.8 & =1.2 \pi r^{2} \\
r^{2} & =\frac{56.8}{1.2 \pi} \\
r & =\sqrt{\frac{142}{3 \pi}}, \\
L & =\sqrt{r^{2}+h^{2}} \\
L & =\sqrt{\frac{142}{3 \pi}+3.6^{2}} \\
C & =\sqrt{\frac{142}{3 \pi}+\frac{324}{25}} \\
L & =\sqrt{\frac{15252}{350+972 \pi}} \\
L & =\frac{1}{75 \pi} \sqrt{\frac{350+972 \pi}{3 \pi}}
\end{aligned}
$$

$$
\begin{aligned}
& \pi r l=\frac{A O B}{360} \pi r^{2} \\
& r l=\frac{A O B}{360} r^{2} \\
& \sqrt{\frac{14}{5 \pi}} \times \frac{1}{5} \sqrt{\frac{350019 \pi \pi}{3 \pi}}=\frac{A O B}{360} \times \frac{142}{3 \pi} . \\
& \frac{1}{15 \pi} \sqrt{504100+138024 \pi}=\frac{71}{540} A O B \\
& A O B=\frac{36}{71} \sqrt{504100+138024 \pi} \\
& A O B=264^{\circ} .
\end{aligned}
$$

$24 O X Y Z$ is a parallelogram.


$$
\begin{aligned}
& \overrightarrow{O X}=\mathbf{a} \\
& \overrightarrow{O Y}=\mathbf{b}
\end{aligned}
$$

$P$ is the point on $O X$ such that $O P: P X=1: 2$
$R$ is the point on $O Y$ such that $O R: R Y=1: 3$
Work out, in its simplest form, the ratio $Z P: Z R$
You must show all your working.

$$
\begin{aligned}
& Z R=a-\frac{3}{4} b \\
& Z P=a-b+\frac{1}{3} a \\
& Z^{P}=\frac{4}{3} a-b . \\
& Z P=\frac{4}{3}(Z R) . \\
& Z P: Z R=4: 3 .
\end{aligned}
$$

$\qquad$
(Total for Question 24 is 5 marks)

# MME. <br> <br> GCSE Online Course 

 <br> <br> GCSE Online Course}

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$3.2 y=m x+c$
3.3 Coordinates and Midpoints
3.4 Drawing Straight Line Graphs
3.5 Parallel Lines

$$
\text { Item } \quad \text { Status }
$$

(-) Revision
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- Online Exam

Incomplete
3.6 Quadratic and Cubic Graphs
3.7 Turning Points of Quadratic Graphs

