Please write clearly in block capitals.

Centre number ___________________________  Candidate number ___________________________

Surname ________________________________________________________________________________

Forename(s) ____________________________________________________________________________

Candidate signature ________________________________________________________________________

**GCSE**

**MATHEMATICS**

Higher Tier  Paper 1  Non-Calculator

Thursday 2 November 2017  Morning  Time allowed: 1 hour 30 minutes

**Materials**

For this paper you must have:

• mathematical instruments

You must **not** use a calculator.

**Instructions**

• Use black ink or black ball-point pen. Draw diagrams in pencil.

• Answer **all** questions.

• You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.

• Do all rough work in this book. Cross through any work you do not want to be marked.

**Information**

• The marks for questions are shown in brackets.

• The maximum mark for this paper is 80.

• You may ask for more answer paper, graph paper and tracing paper. These must be tagged securely to this answer book.

**Advice**

• In all calculations, show clearly how you work out your answer.
Answer all questions in the spaces provided

1. Work out \( \sqrt{2^6 + 6^2} \)
   Circle your answer. [1 mark]
   
<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>14</td>
<td>50</td>
<td>100</td>
</tr>
</tbody>
</table>

2. What is 800 million in standard form?
   Circle your answer. [1 mark]
   
<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>800 \times 10^6</td>
<td>8 \times 10^8</td>
<td>8 \times 10^9</td>
<td>0.8 \times 10^{10}</td>
</tr>
</tbody>
</table>

3. Circle the expression that is equivalent to \( \left( 4a^5 \right)^2 \) [1 mark]
   
<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>16a^{10}</td>
<td>16a^7</td>
<td>8a^{10}</td>
<td>8a^7</td>
</tr>
</tbody>
</table>
4 \[ y = \frac{10}{x} \]
If the value of \( x \) doubles, what happens to the value of \( y \)?
Circle your answer.

[1 mark]

\( \div 2 \times 2 \div 5 \times 5 \)

5 (a) Factorise \( x^2 - 100 \)

Answer ____________________________

[1 mark]

5 (b) Solve \( 7x + 6 > 1 + 2x \)

Answer ____________________________

[2 marks]
6 Work out the value of \((\sqrt{3})^2 \times (\sqrt{2})^2\) [2 marks]

Answer


7 Here is a quarter circle of radius 6 cm

Not drawn accurately

Work out the area of the quarter circle.
Give your answer in terms of \(\pi\). [2 marks]

Answer \(\text{cm}^2\)
8. Three whole numbers are each rounded to the nearest 10
The sum of the rounded numbers is 70
Work out the maximum possible sum for the original three numbers. [2 marks]

Answer

9. Circle the expression for the range of $n$ consecutive integers. [1 mark]

\[
\frac{n + 1}{2} \quad n - 1 \quad n \quad n + 1
\]
Three identical isosceles triangles are joined to make this trapezium. Each triangle has base $b$ cm and perpendicular height $h$ cm

10 (a) Work out an expression, in terms of $b$ and $h$, for the area of the trapezium. Give your answer in its simplest form.

[2 marks]

Answer __________________________ $\text{cm}^2$
10 (b) This diagram shows the same trapezium.

\[ b : s = 2 : 3 \]

Work out an expression, in terms of \( b \), for the perimeter of the trapezium. [2 marks]

Answer \( \text{cm} \)
The four candidates in an election were A, B, C and D. The pie chart shows the proportion of votes for each candidate.

Work out the probability that a person who voted, chosen at random, voted for C.

[4 marks]

Answer


12 Use approximations to 1 significant figure to estimate the value of

\[
\frac{0.526 \times 39.6^2}{\sqrt{97.65}}
\]

You **must** show your working.

[3 marks]

Answer ____________________________

Turn over for the next question
13 \[ x : y = 7 : 4 \]
\[ x + y = 88 \]

Work out the value of \( x - y \) \[ \text{[3 marks]} \]

Answer \______________________________\
14 Two congruent regular polygons are joined together.

Work out the number of sides on each polygon.

[3 marks]

Answer

Turn over for the next question
There are
7 different sandwiches
5 different drinks
and
3 different snacks.

15 (a) How many different Meal Deal combinations are there?

[2 marks]

Answer ____________________________

15 (b) Two of the sandwiches have cheese in them.
Three of the drinks are fizzy.
Eva picks a Meal Deal at random.

Work out the probability that the sandwich has cheese in it and the drink is fizzy.
Give your answer as a fraction.

[2 marks]

Answer ____________________________
16. Water is poured into a tank.  
The graph shows the number of litres of water in the tank.

How much water is poured into the tank each minute?  
Circle your answer.  

[1 mark]  
1.5 litres  15 litres  30 litres  120 litres  

Turn over for the next question
A and B are similar solids.

<table>
<thead>
<tr>
<th>Solid</th>
<th>length (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>l</td>
</tr>
<tr>
<td>B</td>
<td>2l</td>
</tr>
</tbody>
</table>

Alex says,

“The volume of B is double the volume of A
because the length of B is double the length of A.”

Is he correct?

Tick a box.

Yes  No

Give a reason for your answer.  [1 mark]

Circle the two roots of \((2x + 3)(5x - 2) = 0\)  [1 mark]

\[
\begin{array}{c}
\frac{-3}{2} \\
\frac{-2}{5} \\
\frac{2}{5} \\
\frac{3}{2}
\end{array}
\]
The diagram shows a triangle and a trapezium.

Prove that \( a = b \)  

[3 marks]
In one month, the number of hours of exercise taken by 10 people are

4  7  2  8  6  5  1  82  3  9

Which is the appropriate average to use in this situation?

Tick a box.

Mean  Median  Mode

Give one reason for each of the other two averages as to why they are not appropriate.

[2 marks]

Reason 1

Reason 2
21 A, B and C are points on the axes as shown.

The area of triangle ABC is 28 square units.

Work out possible coordinates for A, B and C.

[2 marks]

A (_____, _____)  B (_____, _____)  C (_____, _____)

Turn over for the next question
Here is some information about the miles per gallon of 60 cars.

<table>
<thead>
<tr>
<th>Miles per gallon, $x$</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>$40 &lt; x \leq 50$</td>
<td>6</td>
</tr>
<tr>
<td>$50 &lt; x \leq 60$</td>
<td>16</td>
</tr>
<tr>
<td>$60 &lt; x \leq 70$</td>
<td>28</td>
</tr>
<tr>
<td>$70 &lt; x \leq 80$</td>
<td>10</td>
</tr>
</tbody>
</table>

22 (a) Draw a cumulative frequency graph.

[3 marks]
22 (b) Use the graph to work out the interquartile range. [2 marks]

Answer ____________________________ miles per gallon

23 The equation of a curve is \( y = (x + 3)^2 + 5 \)

Circle the coordinates of the turning point. [1 mark]

(5, 3) (5, –3) (3, 5) (–3, 5)
Here is a cyclic quadrilateral.

$x : y = 5 : 7$

Work out the size of angle $w$.

[4 marks]

Answer ______________________ degrees
25 15 machines work at the same rate.
Together, the 15 machines can complete an order in 8 hours.

3 of the machines break down after working for 6 hours.
The other machines carry on working until the order is complete.

In total, how many hours does each of the other machines work? [3 marks]

Answer _________________________________ hours

Turn over for the next question
26 (a) \[ 0.\dot{7} = \frac{7}{9} \]

Use this fact to show that \[ 0.0\dot{7} = \frac{7}{90} \]

[1 mark]

26 (b) Using part (a) or otherwise, convert \( 0.2\dot{7} \) to a fraction.

Give your answer in its simplest form.

[3 marks]

Answer: _______________________________
There are 11 pens in a box. 
8 are black and 3 are red. 

Two pens are taken out at random **without** replacement. 

Work out the probability that the two pens are the **same** colour. 

**Answer** 

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[4 marks]
28. A, B and C are points on the circle $x^2 + y^2 = 36$ as shown.

- A is on the $y$-axis.
- B is on the $x$-axis.
- M is the midpoint of AB.
- COM is a straight line.

28 (a) Show that the coordinates of A are (0, 6)  

[1 mark]

28 (b) Work out the coordinates of B.  

[1 mark]

Answer (________, ________)
28 (c) Show that the equation of the straight line passing through \( C, O \) and \( M \) is \( y = x \) [2 marks]


28 (d) Work out the coordinates of \( C \).
Give your answers in surd form.

[3 marks]

Answer (_________, __________)

Turn over for the next question
29 Here is a sketch of \( y = \sin x^\circ \) for \(-360 \leq x \leq 360\)

29 (a) Write down the coordinates of \( P \).

Answer \( (\text{_______}, \text{_______})\)  

29 (b) Write down the coordinates of \( Q \).

Answer \( (\text{_______}, \text{_______})\)
30 (a) Work out the value of $81^{-\frac{1}{4}}$ [2 marks]

____________________
____________________
____________________

Answer ____________________

30 (b) Write $16 \times 8^{2x}$ as a power of 2 in terms of $x$. [3 marks]

____________________
____________________
____________________

Answer ____________________

END OF QUESTIONS