SAMPLE ENTRANCE EXAMINATION PAPER

For pupils currently in Year 9

MATHEMATICS

Time: 1 hour 30 minutes

Instructions

A calculator may be used throughout the examination.

Attempt ALL the questions. Show all your workings.
1. Match the questions to the correct answers.

The answers are written correct to two decimal places.

1. \[ \frac{2.7 - 0.46}{0.3} \]
   - Answer: 1.17 A.

2. \[ 2.7 - \frac{0.46}{0.3} \]
   - Answer: 7.47 B.

3. \[ 2.7 \div (0.46 - 0.3) \]
   - Answer: 5.57 C.

4. \[ (2.7 \div 0.46) - 0.3 \]
   - Answer: 16.88 D.

2. Use your calculator to solve problems a], b] and c], showing all necessary steps in your working.

a] Calculate the average speed in miles per hour of a journey of 36 miles which took 45 minutes.

Answer: _________________________

b] A restaurant bill is £36 + Value-Added Tax at 17.5%.
Calculate the total bill after tax.

Answer: _________________________
2. \[
\frac{10.21 + 29.75}{0.2 \times 45}
\]

Show how you would **ESTIMATE** the answer, without using a calculator. Write down your estimate. Then **CALCULATE** the answer.

Estimate  

Answer  

3. Determine the equation of each of the following lines:

(a) = 

(b) =
4. a]  

<table>
<thead>
<tr>
<th>Petrol Type</th>
<th>Price per Litre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leaded petrol</td>
<td>52.4p</td>
</tr>
<tr>
<td>Unleaded petrol</td>
<td>49.6p</td>
</tr>
</tbody>
</table>

I filled the petrol tank of my car with unleaded petrol. It cost me £18.60.

[i] How many litres did I buy?

Answer ___________________________

[ii] How much more would it have cost me if I had bought leaded petrol instead?

Answer ___________________________

b] Last year the amounts I spent on road tax, car insurance and petrol were in the ratio 1 : 3 : 7.

I spent a total of £1430 on these three items.

Calculate how much I spent on petrol.

Answer ___________________________
5. a] Solve the equation

\[ 4y - 1 = 9 - y \]

\[ y = \underline{\quad} \]

b] Solve the equation

\[ \frac{1}{2}x + 3 = 2 \]

\[ x = \underline{\quad} \]
Dawn did a survey to find out where the members of Green Hills High School spent their main holiday last summer.

Her results are shown in the table below.

<table>
<thead>
<tr>
<th>Destination</th>
<th>Boys</th>
<th>Girls</th>
<th>Staff</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Britain</td>
<td>107</td>
<td>120</td>
<td>20</td>
<td>247</td>
</tr>
<tr>
<td>France</td>
<td>48</td>
<td>40</td>
<td></td>
<td>97</td>
</tr>
<tr>
<td>Greece</td>
<td></td>
<td>36</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Rest of Europe</td>
<td>10</td>
<td>12</td>
<td>3</td>
<td>25</td>
</tr>
<tr>
<td>Other</td>
<td>10</td>
<td>6</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>200</td>
<td></td>
<td>40</td>
<td>454</td>
</tr>
</tbody>
</table>

a] Complete the table.

b] How many girls went to France and Greece?

Ans. _______________________

c] What percentage of the staff went to Greece?

Ans. _____________________%
7. a] Write each of the following numbers as a product of its prime factors:

78, 240, 420

Answers

78 = ______________________

240 = ______________________

420 = ______________________

b] Find the Highest Common Factor (HCF) of 78 and 240.

Answer

HCF = ______________________

c] Find the Lowest Common Multiple (LCM) of 240 and 420.

Answer

LCM = ______________________
8.  a] Write down the first five terms of the sequence with \( n^{\text{th}} \) term = \( \frac{1}{2} n^2 \).

Answer ........................................................................................................................................

b] Write an expression for the \( n^{\text{th}} \) term of the following sequence:

\[
3, \ 5, \ 7, \ 9, \ 11
\]

Answer \( n^{\text{th}} \) term = ........................................................................

9. Simplify the following expressions as far as possible:

a] \( 3a^2 + 5a^2 = \) ........................................................................

b] \( 5y^4 \times 8y^7 = \) ........................................................................

c] \( 4x^5 \div x^2 = \) ........................................................................

d] \( (a^2)^d = \) ........................................................................

10. If \( n \) can only take whole number values, find the set of values of \( n \) which satisfy the inequality

\[-3 < n \leq 3\]

Answer \( n = \) ........................................................................
11. Using a method of trial and improvement, find a solution to the following equation correct to 2 decimal places:

\[ x^2 - x = 10 \]  
(Use \( x = 3 \) as your first guess and show all your working)

Answer: ______________________________

12. Solve the following pair of simultaneous equations:

\[ a + 2b = 9 \]
\[ 3a + b = 7 \]

Answers:  
\[ a = \_________________________ \]
\[ b = \_________________________ \]
13. a) Draw a straight line graph on the grid below to convert temperatures between degrees Fahrenheit and degrees Celsius, given that:

\[ 0^\circ C = 32^\circ F \text{ and } 100^\circ C = 212^\circ F \]

b) Use your graph to complete the following conversions:

\[ 60^\circ C = \underline{\quad}^\circ F ; \quad 170^\circ F = \underline{\quad}^\circ C \]
Shade on the diagram the area where they could stand to fly their kite.
15. Calculate the length of the side marked with a letter in each triangle, showing all your working.

a)

\[ x = \quad \text{cm} \]

b)

\[ y = \quad \text{cm} \]

Answers

a]  \( x = \) ________________  
b]  \( y = \) ________________

16. The diagram shows a running track.

BA and DE are parallel and straight.

They are each of length 90 metres.

BCD and EFA are semi-circular.

They each have a diameter of length 70 metres.

a] Calculate the perimeter of the track.

Answer  ______________________

b] Calculate the total area inside the track.

Answer  ______________________
Josie designs a possible box for a kite.

The box is a closed regular hexagonal prism.

Use the dimensions given to calculate the volume of this box.

Answer
17. On the grid, enlarge the trapezium PQRS using a scale factor of \( \frac{1}{2} \).
Use the point O as the centre of the enlargement.

18. The examination marks of 250 pupils are recorded below. What was the mean mark?

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency f</td>
<td>0</td>
<td>2</td>
<td>6</td>
<td>24</td>
<td>36</td>
<td>47</td>
<td>55</td>
<td>40</td>
<td>27</td>
<td>13</td>
</tr>
<tr>
<td>Mid Point ( x )</td>
<td>( x )</td>
<td>( x )</td>
<td>( x )</td>
<td>( x )</td>
<td>( x )</td>
<td>( x )</td>
<td>( x )</td>
<td>( x )</td>
<td>( x )</td>
<td>( x )</td>
</tr>
<tr>
<td>( f \times x )</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Answer  
Mean mark = ____________________________
The table below shows Mathematics and Science marks for ten pupils:

<table>
<thead>
<tr>
<th>Pupil</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maths</td>
<td>20</td>
<td>22</td>
<td>26</td>
<td>27</td>
<td>37</td>
<td>42</td>
<td>43</td>
<td>52</td>
<td>56</td>
<td>60</td>
</tr>
<tr>
<td>Science</td>
<td>25</td>
<td>26</td>
<td>22</td>
<td>30</td>
<td>40</td>
<td>45</td>
<td>48</td>
<td>58</td>
<td>52</td>
<td>48</td>
</tr>
</tbody>
</table>

a] Plot a scatter graph of the maths scores against the science scores for each pupil on the grid below:

b] Draw the line of best fit on your graph.

c] Use your graph to predict marks for Pupil A and Pupil B if:

Pupil A scores 10 for maths

Answer Predicted science mark for Pupil A = ________________

and Pupil B scores 50 for science

Answer Predicted maths mark for Pupil B = ________________
20. a] How many times would you expect to get a six if you rolled a fair dice 18 times?

Answer __________________________________

b] What is the probability of getting either a 1 or a 2 on one roll of a fair die?

Answer __________________________________

c] If a pair of dice are rolled together, what is the probability of a total score of 8?

Answer __________________________________

21. a] Find the length of AD

Answer AD = _______________________

b] Find the length of DC.

Answer DC = _______________________

c] Hence find the area of Δ ABC.

Area of Δ ABC = _______________________