Thursday 9 June 2016

Materials
For this paper you must have:
• a calculator
• mathematical instruments.

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.

Information
• The marks for questions are shown in brackets.
• The maximum mark for this paper is 105.
• The quality of your written communication is specifically assessed in Questions 2, 7, 10 and 15. These questions are indicated with an asterisk (*).
• 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.
Formulae Sheet: Higher Tier

**Area of trapezium**
\[ A = \frac{1}{2} (a + b)h \]

**Volume of prism**
\[ V = \text{area of cross section} \times \text{length} \]

**Volume of sphere**
\[ V = \frac{4}{3} \pi r^3 \]

**Surface area of sphere**
\[ A = 4 \pi r^2 \]

**Volume of cone**
\[ V = \frac{1}{3} \pi r^2 h \]

**Curved surface area of cone**
\[ A = \pi rl \]

**In any triangle** \(ABC\)

**Area of triangle**
\[ A = \frac{1}{2} ab \sin C \]

**Sine rule**
\[ \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} \]

**Cosine rule**
\[ a^2 = b^2 + c^2 - 2bc \cos A \]

**The Quadratic Equation**
The solutions of \(ax^2 + bx + c = 0\), where \(a \neq 0\), are given by
\[ x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a} \]
Answer all questions in the spaces provided.

1 Here are the ingredients to make 8 biscuits.

<table>
<thead>
<tr>
<th>75 g flour</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 g sugar</td>
</tr>
<tr>
<td>40 g butter</td>
</tr>
<tr>
<td>2 egg yolks</td>
</tr>
</tbody>
</table>

Work out the ingredients to make 20 biscuits. [3 marks]

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______________________________________________________________________________

______________________________________________________________________________

______________________ g flour

______________________ g sugar

______________________ g butter

______________________ egg yolks
2 (a) Alice wants to book a holiday for one adult and one child.

<table>
<thead>
<tr>
<th>Holiday</th>
<th>£720 per adult</th>
</tr>
</thead>
<tbody>
<tr>
<td>£430 per child</td>
<td></td>
</tr>
</tbody>
</table>

**Special Offer**
15% off

Alice has £1000

Does she have enough money to book this holiday using the special offer?
Tick a box.

Yes [ ] No [ ]

You **must** show your working.

[5 marks]
2 (b) Ben changes £800 to Euros before he goes on holiday.

£1 = 1.25 Euro

He spends 895 Euros.

He changes the Euros that he has left to Pounds (£).
The exchange rate is now £1 = 1.40 Euro

How many Pounds does he get back?

[4 marks]

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Answer £ _________________________________

Turn over for the next question
This formula converts degrees Celsius (C) to degrees Fahrenheit (F).

\[ F = \frac{9}{5} C + 32 \]

Use the formula to convert 28°C to °F
Give your answer to the nearest whole number.

Answer ____________________________ °F
4 (a) The $n$th term of a sequence is $6 - 2n$.

Work out the first three terms of the sequence.

[2 marks]

Answer __________, __________, __________

4 (b) Here is the term-to-term rule for a different sequence.

Multiply previous term by 2 and then subtract 3

The third term in this sequence is 31.

Work out the first term.

[3 marks]

Answer __________________________
The table shows information about the pay per hour of 40 people.

<table>
<thead>
<tr>
<th>Pay per hour, $x$ (£)</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>$5 &lt; x \leq 15$</td>
<td>14</td>
</tr>
<tr>
<td>$15 &lt; x \leq 25$</td>
<td>12</td>
</tr>
<tr>
<td>$25 &lt; x \leq 35$</td>
<td>11</td>
</tr>
<tr>
<td>$35 &lt; x \leq 45$</td>
<td>2</td>
</tr>
<tr>
<td>$45 &lt; x \leq 55$</td>
<td>1</td>
</tr>
<tr>
<td>Total = 40</td>
<td></td>
</tr>
</tbody>
</table>

5 (a) Which group contains the median pay per hour? Circle your answer. [1 mark]

5 (b) Work out an estimate of the mean pay per hour. [4 marks]

Answer £ ________________
A baker makes 130 loaves so that there are

6 times as many white loaves as granary loaves
half as many brown loaves as white loaves.

How many of each type does he make? [3 marks]

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

White ______________________________

Brown _____________________________

Granary ____________________________

Turn over for the next question
7 (a) The diagram shows a cylinder.

The radius of the base is 6 cm
The height is 15 cm

Work out the volume. [3 marks]

Answer: ______________ cm³
7 (b)  

1000 cm³ = 1 litre

A tank contains 45 000 cm³ of water. The tank leaks at 0.75 litres/minute.

How long does the tank take to empty? [4 marks]

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

Answer ____________________________________________________________

Turn over for the next question
8 The diagram shows a rectangle.

\[
\begin{array}{c}
5x \\
\hline
x
\end{array}
\]

Not drawn accurately

Six of these rectangles are joined to make this shape.

The area of the white rectangle in the middle is 1440 cm\(^2\).

Work out the area of one shaded rectangle. [5 marks]

______________________________________________________________________________
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______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

Answer __________________ cm\(^2\)
Work out the price of the car before it was reduced.

[3 marks]

Answer £ ____________________________

Turn over for the next question
Rob played in 15 basketball matches. The stem-and-leaf diagram shows the number of points he scored in each match.

Key: 0 5 represents 5 points

0 | 5
1 | 2 2 4 5 6 7 8
2 | 2 2 3 6 6 9
3 | 0

*10 (a) Draw a box plot to represent the data. [4 marks]
10 (b) This box plot represents the points that Jack scored in 15 basketball matches.

Jack says,

“I am better at basketball than Rob.”

Give two reasons that support his statement.

[2 marks]

Reason 1
____________________________________________________________________
____________________________________________________________________

Reason 2
____________________________________________________________________
____________________________________________________________________

Turn over for the next question
Here is a table of values for \( y = x^3 - 2 \) for \( x = -2 \) to 2:

<table>
<thead>
<tr>
<th>( x )</th>
<th>-2</th>
<th>-1</th>
<th>0</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>( y )</td>
<td>-10</td>
<td>-3</td>
<td>-2</td>
<td>-1</td>
<td>6</td>
</tr>
</tbody>
</table>

Draw the graph of \( y = x^3 - 2 \) for values of \( x \) from \(-2\) to 2.

[2 marks]
Two boats leave a port at the same time.
Boat A travels due West at an average speed of 20 km/h
Boat B travels due South at an average speed of 30 km/h

How far apart are the boats after 2.5 hours?
Give your answer to 2 significant figures.

Answer \underline{\underline{\rule{0pt}{1.5ex}}} \text{ km}
The diagram shows a trapezium.

Work out the values of $x$ and $y$.

[5 marks]

$x = \underline{\hspace{2cm}}$ degrees

$y = \underline{\hspace{2cm}}$ degrees
14 Write down the equation of the straight line that
passes through the point (0, 4)
and
is parallel to the line $y = 5x + 3$

[2 marks]

Answer ________________________________

15 Bags of nails weigh 200 grams each.
Boxes of screws weigh 140 grams each.
Both measurements are given to the nearest 10 grams.
Show that 4 bags of nails could weigh the same as 6 boxes of screws.

[3 marks]

______________________________________________________________________________

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______________________________________________________________________________

______________________________________________________________________________
A, B and C are points on a circle. PAQ is a tangent to the circle.

Work out the size of angle CAB.

Answer __________________________ degrees

[2 marks]
17 The diagram shows a sector of a circle. The radius is 7 cm

Work out the **perimeter** of the shape.

[3 marks]

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

Answer ______________ cm

Turn over for the next question
The table shows information about the masses of 400 hamsters.

<table>
<thead>
<tr>
<th>Mass, ( w ) (grams)</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>( 80 &lt; w \leq 100 )</td>
<td>100</td>
</tr>
<tr>
<td>( 100 &lt; w \leq 115 )</td>
<td>150</td>
</tr>
<tr>
<td>( 115 &lt; w \leq 125 )</td>
<td>90</td>
</tr>
<tr>
<td>( 125 &lt; w \leq 150 )</td>
<td>60</td>
</tr>
</tbody>
</table>

A sample of size 50, stratified by the groups in the table, is to be taken.

Work out the number of hamsters from each group in the sample.
Write your answers in the table below.

<table>
<thead>
<tr>
<th>Mass, ( w ) (grams)</th>
<th>Number in the sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>( 80 &lt; w \leq 100 )</td>
<td></td>
</tr>
<tr>
<td>( 100 &lt; w \leq 115 )</td>
<td></td>
</tr>
<tr>
<td>( 115 &lt; w \leq 125 )</td>
<td></td>
</tr>
<tr>
<td>( 125 &lt; w \leq 150 )</td>
<td></td>
</tr>
</tbody>
</table>
18 (b) Draw a histogram for the data. You may use the table to help you.

<table>
<thead>
<tr>
<th>Mass, ( w ) (grams)</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>( 80 &lt; w \leq 100 )</td>
<td>100</td>
</tr>
<tr>
<td>( 100 &lt; w \leq 115 )</td>
<td>150</td>
</tr>
<tr>
<td>( 115 &lt; w \leq 125 )</td>
<td>90</td>
</tr>
<tr>
<td>( 125 &lt; w \leq 150 )</td>
<td>60</td>
</tr>
</tbody>
</table>

[4 marks]
Work out the size of angle $x$.

Answer _______________________ degrees
These two solid shapes are similar.

The volume of $A$ is 1400 cm$^3$.

Work out the volume of $B$.

[3 marks]

Answer __________________________ cm$^3$

Turn over for the next question
A bag contains 10 counters.  
4 of the counters are black and 6 are white.  

Two counters are picked at random.  

Work out the probability that they are both black.  

Answer ________________________________
22 (a) Factorise $49c^2 - d^2$ [2 marks]

Answer ____________________________________________

22 (b) Simplify $\frac{x^2 - 6x}{2x^2 - 7x - 30}$ [3 marks]

Answer ____________________________________________

23 You are given that $(x + a)^2 - 7 \equiv x^2 + 10x + b$

Work out the values of $a$ and $b$. [2 marks]

$a =$ ____________________________________________

$b =$ ____________________________________________
24 Solve the equation \( \frac{6}{x + 3} + \frac{1}{2x + 5} = 3 \)

Give your answers to 2 decimal places.

[6 marks]

Answer \______________ and \______________
25 A tent is in the shape of a triangular prism.

The length of the tent is 4 metres.
The volume is $8 \text{ m}^3$

The cross-section of the tent is an equilateral triangle.

Shaun is 1.95 metres tall.

Can he stand at the highest part of the tent without having to bend over? You must show your working.

[5 marks]

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______________________________________________________________________________
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Answer __________________________________

END OF QUESTIONS
There are no questions printed on this page
There are no questions printed on this page