General Certificate of Secondary Education
Higher Tier
June 2013

Mathematics 43601H

Unit 1

Monday 17 June 2013    9.00 am to 10.00 am

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

Time allowed
• 1 hour

Instructions
• Use black ink or black ball-point pen. Draw diagrams in pencil.
• Fill in the boxes at the top of this page.
• 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 54.
• The quality of your written communication is specifically assessed in Questions 2 and 8. These questions are indicated with an asterisk (*).
• You may ask for more answer paper and graph 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. A restaurant owner gives this survey to her customers.

   Question: How many take-aways did you have last month?

   Response: Tick a box

   - [ ] 5 to 10
   - [ ] 10 to 15
   - [ ] 15 to 20
   - [ ] over 20

   Write two criticisms of the response section.

   Criticism 1 ............................................................................................................................................
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   Criticism 2 ............................................................................................................................................
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   (2 marks)
On average it takes 47 lessons to pass the driving test.

Driving school A
First 5 lessons £75
then £21 per lesson

Driving school B
Normal price £23 per lesson
Special offer
15% off normal price

Which is cheaper for 47 lessons?
You must show your working.

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Answer .................................................................................................................. (5 marks)
3 (a) Here is information about animals in a rescue centre.

- Half of the dogs are male.
- 25% of the rabbits are female.
- There are 20 more males than females altogether.

Complete the two-way table.

<table>
<thead>
<tr>
<th></th>
<th>Dog</th>
<th>Cat</th>
<th>Rabbit</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>42</td>
<td>18</td>
<td>20</td>
<td>80</td>
</tr>
</tbody>
</table>

(4 marks)

3 (b) 42 of the 80 animals are dogs.

What percentage of the animals are dogs?

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Answer .............................................................. % (2 marks)
A researcher wants to compare the ages of viewers of BBC 1 and Sky 1.

(a) Write a suitable hypothesis.

(b) He writes a plan to investigate the hypothesis.

Use the Data Handling Cycle to put his plan in the correct order.

A Work out the mean age for each channel.
B Select some television viewers to ask.
C Compare the results and comment on the hypothesis.
D Collect data about the ages of the television viewers.

Answer ............, ............, ............, ............ (2 marks)

Turn over for the next question
Chen records his journey times to college.

<table>
<thead>
<tr>
<th>Time, ( t ) (minutes)</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>( 25 &lt; t \leq 30 )</td>
<td>12</td>
</tr>
<tr>
<td>( 30 &lt; t \leq 35 )</td>
<td>18</td>
</tr>
<tr>
<td>( 35 &lt; t \leq 40 )</td>
<td>24</td>
</tr>
<tr>
<td>( 40 &lt; t \leq 45 )</td>
<td>6</td>
</tr>
<tr>
<td><strong>Total = 60</strong></td>
<td></td>
</tr>
</tbody>
</table>

5 (a) Calculate an estimate of his mean journey time.

Answer ................................................ minutes \( (4 \text{ marks}) \)

5 (b) Explain why your answer to part (a) is an estimate.

................................................................. \( (1 \text{ mark}) \)
5 (c) The frequency polygon shows Lee’s journey times to college.

On the same grid, draw a frequency polygon for Chen’s journey times. (2 marks)

5 (d) An estimate of Lee’s mean journey time is 37 minutes.

Compare the journey times for Lee and Chen.

Comparison 1

Comparison 2

(2 marks)
A play area has thousands of coloured balls. They are white, pink or yellow.

Sam picks 10 balls at random. The table shows some of her results.

<table>
<thead>
<tr>
<th></th>
<th>white</th>
<th>pink</th>
<th>yellow</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Frequency</strong></td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Relative frequency</strong></td>
<td></td>
<td>0.1</td>
<td></td>
</tr>
</tbody>
</table>

6 (a) Complete the table.

(3 marks)

6 (b) Sam uses her results to estimate the proportion of white balls in the play area. How could she make her estimate more reliable?

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(1 mark)
7 (a) How many men have a waist measurement of 85 cm or less?

Answer ............................................................... (1 mark)

7 (b) What is the median waist measurement?

Answer ............................................................... cm (1 mark)

7 (c) What is the interquartile range of the waist measurements?

............................................................................................................................................
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Answer ............................................................... cm (2 marks)
8 There were 17 million families in the UK in 2006.

*8 (a) The mean number of children per family was 1.8

How many children were there in the UK?
Give your answer in standard form.

Answer ............................................................................................................................................ (2 marks)

8 (b) The total income of families in the UK was £5.6 \times 10^{11}

What was the mean income per family?
Give your answer to an appropriate degree of accuracy.

Answer £ ................................................................................................................................. (3 marks)
9 (a) Here is some information about the points scored in a quiz.

<table>
<thead>
<tr>
<th>Minimum</th>
<th>Lower quartile</th>
<th>Median</th>
<th>Upper quartile</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>20</td>
<td>50</td>
<td>80</td>
<td>90</td>
</tr>
</tbody>
</table>

Show this information on a box plot.

(2 marks)

9 (b) This box plot represents the marks gained by students in an exam.

Nobody gained exactly 45, 70 or 90 marks.
120 students gained less than 90 marks.

How many students gained more than 70 marks?

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Answer .................................................................................................................................. (3 marks)
The grouped frequency table represents the birth weights of 1000 babies.

<table>
<thead>
<tr>
<th>Birth weight, $w$ (kilograms)</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1.0 \leq w &lt; 2.5$</td>
<td>45</td>
</tr>
<tr>
<td>$2.5 \leq w &lt; 3.5$</td>
<td>490</td>
</tr>
<tr>
<td>$3.5 \leq w &lt; 4.5$</td>
<td>270</td>
</tr>
<tr>
<td>$4.5 \leq w &lt; 6.0$</td>
<td>195</td>
</tr>
</tbody>
</table>

10 (a) Show the data on a histogram.

(4 marks)
10 (b) Babies under 2.5 kg have a low birth weight.

Two of the 1000 babies are chosen at random.

Work out the probability that both babies have a low birth weight. You must show your working.

Answer ................................................................. (3 marks)

11 A home gym can take a maximum load of 145 kg of weight plates. Each weight plate is 10 kg to the nearest kilogram.

Work out the greatest number of weight plates that can be safely loaded on the gym. You must show your working.

Answer ................................................................. (4 marks)

END OF QUESTIONS
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