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UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education
Advanced Subsidiary Level and Advanced Level

**MATHEMATICS** **9709/61**

Paper 6 Probability & Statistics 1 **(S1)** **October/November 2009**

**1 hour 15 minutes**

Additional Materials: Answer Booklet/Paper
Graph Paper
List of Formulae (MF9)

*0928055041*

**READ THESE INSTRUCTIONS FIRST**

If you have been given an Answer Booklet, follow the instructions on the front cover of the Booklet.
Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a soft pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer **all** the questions.
Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place in the case of angles in degrees, unless a different level of accuracy is specified in the question.
The use of an electronic calculator is expected, where appropriate.
You are reminded of the need for clear presentation in your answers.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total number of marks for this paper is 50.
Questions carrying smaller numbers of marks are printed earlier in the paper, and questions carrying larger numbers of marks later in the paper.

This document consists of **3** printed pages and **1** blank page.

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**1** The mean number of defective batteries in packs of 20 is 1.6. Use a binomial distribution to calculate the probability that a randomly chosen pack of 20 will have more than 2 defective batteries. [5]

**2** The probability distribution of the random variable $X$ is shown in the following table.

| $x$ | −2 | −1 | 0 | 1 | 2 | 3 |
|---|---|---|---|---|---|---|
| $P(X = x)$ | 0.08 | $p$ | 0.12 | 0.16 | $q$ | 0.22 |

The mean of $X$ is 1.05.

**(i)** Write down two equations involving $p$ and $q$ and hence find the values of $p$ and $q$. [4]

**(ii)** Find the variance of $X$. [2]

**3** The times for a certain car journey have a normal distribution with mean 100 minutes and standard deviation 7 minutes. Journey times are classified as follows:

'short' (the shortest 33% of times),
'long' (the longest 33% of times),
'standard' (the remaining 34% of times).

**(i)** Find the probability that a randomly chosen car journey takes between 85 and 100 minutes. [3]

**(ii)** Find the least and greatest times for 'standard' journeys. [4]

**4** A library has many identical shelves. All the shelves are full and the numbers of books on each shelf in a certain section are summarised by the following stem-and-leaf diagram.

| | | |
|---|---|---|
| 3 | 3 6 9 9 | (4) |
| 4 | 6 7 | (2) |
| 5 | 0 1 2 2 | (4) |
| 6 | 0 0 1 1 2 3 4 4 4 4 4 5 5 6 6 6 7 8 8 9 | (20) |
| 7 | 1 1 3 3 3 5 6 6 7 8 9 9 | (12) |
| 8 | 0 2 4 5 5 6 8 | (7) |
| 9 | 0 0 1 2 4 4 4 4 5 5 6 7 7 8 8 9 9 9 | (18) |

Key: 3 | 6 represents 36 books

**(i)** Find the number of shelves in this section of the library. [1]

**(ii)** Draw a box-and-whisker plot to represent the data. [5]

In another section all the shelves are full and the numbers of books on each shelf are summarised by the following stem-and-leaf diagram.

| | | |
|---|---|---|
| 2 | 1 2 2 2 3 3 4 5 6 6 6 7 9 | (13) |
| 3 | 0 1 1 2 3 4 4 5 6 6 7 7 7 8 8 | (15) |
| 4 | 2 2 3 5 7 7 8 9 | (8) |

Key: 3 | 6 represents 36 books

**(iii)** There are fewer books in this section than in the previous section. State one other difference between the books in this section and the books in the previous section. [1]

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**5** **(a)** Find how many numbers between 5000 and 6000 can be formed from the digits 1, 2, 3, 4, 5 and 6

**(i)** if no digits are repeated, [2]

**(ii)** if repeated digits are allowed. [2]

**(b)** Find the number of ways of choosing a school team of 5 pupils from 6 boys and 8 girls

**(i)** if there are more girls than boys in the team, [4]

**(ii)** if three of the boys are cousins and are either all in the team or all not in the team. [3]

**6** A box contains 4 pears and 7 oranges. Three fruits are taken out at random and eaten. Find the probability that

**(i)** 2 pears and 1 orange are eaten, in any order, [3]

**(ii)** the third fruit eaten is an orange, [3]

**(iii)** the first fruit eaten was a pear, given that the third fruit eaten is an orange. [3]

There are 121 similar boxes in a warehouse. One fruit is taken at random from each box.

**(iv)** Using a suitable approximation, find the probability that fewer than 39 are pears. [5]

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