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

MATHEMATICS **9709/63**

Paper 6 Probability & Statistics 1 **(S1)** **May/June 2013**

1 hour 15 minutes

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

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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.

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1 Q is the event 'Nicola throws two fair dice and gets a total of 5'. S is the event 'Nicola throws two fair dice and gets one low score (1, 2 or 3) and one high score (4, 5 or 6)'. Are events Q and S independent? Justify your answer. [4]

2 The 12 houses on one side of a street are numbered with even numbers starting at 2 and going up to 24. A free newspaper is delivered on Monday to 3 different houses chosen at random from these 12. Find the probability that at least 2 of these newspapers are delivered to houses with numbers greater than 14. [4]

3 Buildings in a certain city centre are classified by height as tall, medium or short. The heights can be modelled by a normal distribution with mean 50 metres and standard deviation 16 metres. Buildings with a height of more than 70 metres are classified as tall.

(i) Find the probability that a building chosen at random is classified as tall. [2]

(ii) The rest of the buildings are classified as medium and short in such a way that there are twice as many medium buildings as there are short ones. Find the height below which buildings are classified as short. [5]

4 In a certain country, on average one student in five has blue eyes.

(i) For a random selection of n students, the probability that none of the students has blue eyes is less than 0.001. Find the least possible value of n. [3]

(ii) For a random selection of 120 students, find the probability that fewer than 33 have blue eyes. [4]

5 **(a)** John plays two games of squash. The probability that he wins his first game is 0.3. If he wins his first game, the probability that he wins his second game is 0.6. If he loses his first game, the probability that he wins his second game is 0.15. Given that he wins his second game, find the probability that he won his first game. [4]

(b) Jack has a pack of 15 cards. 10 cards have a picture of a robot on them and 5 cards have a picture of an aeroplane on them. Emma has a pack of cards. 7 cards have a picture of a robot on them and $x - 3$ cards have a picture of an aeroplane on them. One card is taken at random from Jack's pack and one card is taken at random from Emma's pack. The probability that both cards have pictures of robots on them is $\frac{7}{18}$. Write down an equation in terms of x and hence find the value of x. [4]

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6 The weights, x kilograms, of 144 people were recorded. The results are summarised in the cumulative frequency table below.

Weight (x kilograms)	$x < 40$	$x < 50$	$x < 60$	$x < 65$	$x < 70$	$x < 90$
Cumulative frequency	0	12	34	64	92	144

(i) On graph paper, draw a cumulative frequency graph to represent these results. [2]

(ii) 64 people weigh more than c kg. Use your graph to find the value of c. [2]

(iii) Calculate estimates of the mean and standard deviation of the weights. [6]

7 There are 10 spaniels, 14 retrievers and 6 poodles at a dog show. 7 dogs are selected to go through to the final.

(i) How many selections of 7 different dogs can be made if there must be at least 1 spaniel, at least 2 retrievers and at least 3 poodles? [4]

2 spaniels, 2 retrievers and 3 poodles go through to the final. They are placed in a line.

(ii) How many different arrangements of these 7 dogs are there if the spaniels stand together and the retrievers stand together? [3]

(iii) How many different arrangements of these 7 dogs are there if no poodle is next to another poodle? [3]

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