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 2011**

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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[Turn over

1 When a butternut squash seed is sown the probability that it will germinate is 0.86, independently of any other seeds. A market gardener sows 250 of these seeds. Use a suitable approximation to find the probability that more than 210 germinate. [5]

2 The values, x, in a particular set of data are summarised by

$$\Sigma(x - 25) = 133, \qquad \Sigma(x - 25)^2 = 3762.$$

The mean, $\bar{x}$, is 28.325.

(i) Find the standard deviation of x. [4]

(ii) Find Σx^2. [2]

3 A team of 4 is to be randomly chosen from 3 boys and 5 girls. The random variable X is the number of girls in the team.

(i) Draw up a probability distribution table for X. [4]

(ii) Given that $\mathrm{E}(X) = \frac{5}{2}$, calculate $\mathrm{Var}(X)$. [2]

4 The marks of the pupils in a certain class in a History examination are as follows.

28 33 55 38 42 39 27 48 51 37 57 49 33

The marks of the pupils in a Physics examination are summarised as follows.

Lower quartile: 28, Median: 39, Upper quartile: 67.
The lowest mark was 17 and the highest mark was 74.

(i) Draw box-and-whisker plots in a single diagram on graph paper to illustrate the marks for History and Physics. [5]

(ii) State one difference, which can be seen from the diagram, between the marks for History and Physics. [1]

5 The weights of letters posted by a certain business are normally distributed with mean 20 g. It is found that the weights of 94% of the letters are within 12 g of the mean.

(i) Find the standard deviation of the weights of the letters. [3]

(ii) Find the probability that a randomly chosen letter weighs more than 13 g. [3]

(iii) Find the probability that at least 2 of a random sample of 7 letters have weights which are more than 12 g above the mean. [3]

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6 **(a)** Find the number of different ways in which the 12 letters of the word STRAWBERRIES can be arranged

(i) if there are no restrictions, [2]

(ii) if the 4 vowels A, E, E, I must all be together. [3]

(b) **(i)** 4 astronauts are chosen from a certain number of candidates. If order of choosing is not taken into account, the number of ways the astronauts can be chosen is 3876. How many ways are there if order of choosing is taken into account? [2]

(ii) 4 astronauts are chosen to go on a mission. Each of these astronauts can take 3 personal possessions with him. How many different ways can these 12 possessions be arranged in a row if each astronaut's possessions are kept together? [2]

7 Bag A contains 4 balls numbered 2, 4, 5, 8. Bag B contains 5 balls numbered 1, 3, 6, 8, 8. Bag C contains 7 balls numbered 2, 7, 8, 8, 8, 8, 9. One ball is selected at random from each bag.

(i) Find the probability that exactly two of the selected balls have the same number. [5]

(ii) Given that exactly two of the selected balls have the same number, find the probability that they are both numbered 2. [2]

(iii) Event X is 'exactly two of the selected balls have the same number'. Event Y is 'the ball selected from bag A has number 2'. Showing your working, determine whether events X and Y are independent or not. [2]

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