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

MATHEMATICS **9709/61**

Paper 6 Probability & Statistics 1 **(S1)** **May/June 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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1 Biscuits are sold in packets of 18. There is a constant probability that any biscuit is broken, independently of other biscuits. The mean number of broken biscuits in a packet has been found to be 2.7. Find the probability that a packet contains between 2 and 4 (inclusive) broken biscuits. [4]

2 When Ted is looking for his pen, the probability that it is in his pencil case is 0.7. If his pen is in his pencil case he always finds it. If his pen is somewhere else, the probability that he finds it is 0.2. Given that Ted finds his pen when he is looking for it, find the probability that it was in his pencil case. [4]

3 The possible values of the random variable X are the 8 integers in the set $\{-2, -1, 0, 1, 2, 3, 4, 5\}$. The probability of X being 0 is $\frac{1}{10}$. The probabilities for all the other values of X are equal. Calculate

(i) $\mathrm{P}(X < 2)$, [2]

(ii) the variance of X, [3]

(iii) the value of a for which $\mathrm{P}(-a \leqslant X \leqslant 2a) = \frac{17}{35}$. [1]

4 A cricket team of 11 players is to be chosen from 21 players consisting of 10 batsmen, 9 bowlers and 2 wicketkeepers. The team must include at least 5 batsmen, at least 4 bowlers and at least 1 wicketkeeper.

(i) Find the number of different ways in which the team can be chosen. [4]

Each player in the team is given a present. The presents consist of 5 identical pens, 4 identical diaries and 2 identical notebooks.

(ii) Find the number of different arrangements of the presents if they are all displayed in a row. [1]

(iii) 10 of these 11 presents are chosen and arranged in a row. Find the number of different arrangements that are possible. [3]

5 **(a)** The random variable X is normally distributed with mean μ and standard deviation σ. It is given that $3\mu = 7\sigma^2$ and that $\mathrm{P}(X > 2\mu) = 0.1016$. Find μ and σ. [4]

(b) It is given that $Y \sim \mathrm{N}(33, 21)$. Find the value of a given that $\mathrm{P}(33 - a < Y < 33 + a) = 0.5$. [4]

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6 There are 5000 schools in a certain country. The cumulative frequency table shows the number of pupils in a school and the corresponding number of schools.

Number of pupils in a school	$\leqslant 100$	$\leqslant 150$	$\leqslant 200$	$\leqslant 250$	$\leqslant 350$	$\leqslant 450$	$\leqslant 600$
Cumulative frequency	200	800	1600	2100	4100	4700	5000

(i) Draw a cumulative frequency graph with a scale of 2 cm to 100 pupils on the horizontal axis and a scale of 2 cm to 1000 schools on the vertical axis. Use your graph to estimate the median number of pupils in a school. [3]

(ii) 80% of the schools have more than n pupils. Estimate the value of n correct to the nearest ten. [2]

(iii) Find how many schools have between 201 and 250 (inclusive) pupils. [1]

(iv) Calculate an estimate of the mean number of pupils per school. [4]

7 **(a)** **(i)** Find the probability of getting at least one 3 when 9 fair dice are thrown. [2]

(ii) When n fair dice are thrown, the probability of getting at least one 3 is greater than 0.9. Find the smallest possible value of n. [4]

(b) A bag contains 5 green balls and 3 yellow balls. Ronnie and Julie play a game in which they take turns to draw a ball from the bag at random without replacement. The winner of the game is the first person to draw a yellow ball. Julie draws the first ball. Find the probability that Ronnie wins the game. [4]

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