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

MATHEMATICS **9709/63**

Paper 6 Probability & Statistics 1 **(S1)** **October/November 2011**

1 hour 15 minutes

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

* 3 4 2 8 2 8 8 1 5 6 *

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 random variable X is normally distributed and is such that the mean μ is three times the standard deviation σ. It is given that $P(X < 25) = 0.648$.

(i) Find the values of μ and σ. [4]

(ii) Find the probability that, from 6 random values of X, exactly 4 are greater than 25. [2]

2 In a group of 30 teenagers, 13 of the 18 males watch 'Kops are Kids' on television and 3 of the 12 females watch 'Kops are Kids'.

(i) Find the probability that a person chosen at random from the group is either female or watches 'Kops are Kids' or both. [4]

(ii) Showing your working, determine whether the events 'the person chosen is male' and 'the person chosen watches Kops are Kids' are independent or not. [2]

3 A factory makes a large number of ropes with lengths either 3 m or 5 m. There are four times as many ropes of length 3 m as there are ropes of length 5 m.

(i) One rope is chosen at random. Find the expectation and variance of its length. [4]

(ii) Two ropes are chosen at random. Find the probability that they have different lengths. [2]

(iii) Three ropes are chosen at random. Find the probability that their total length is 11 m. [3]

4 Mary saves her digital images on her computer in three separate folders named 'Family', 'Holiday' and 'Friends'. Her family folder contains 3 images, her holiday folder contains 4 images and her friends folder contains 8 images. All the images are different.

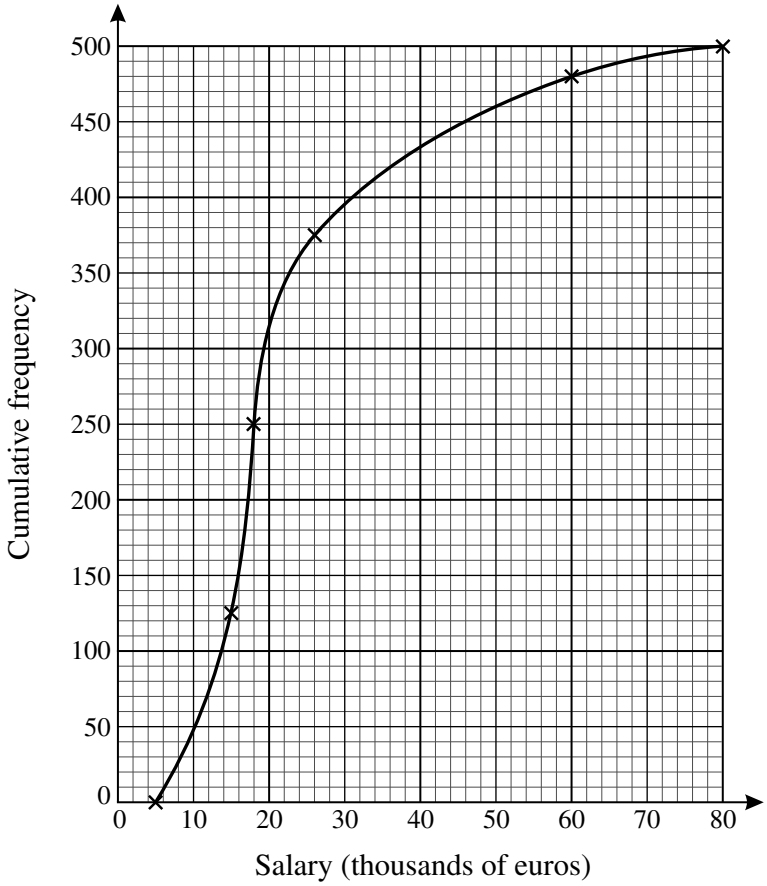
(i) Find in how many ways she can arrange these 15 images in a row across her computer screen if she keeps the images from each folder together. [3]

(ii) Find the number of different ways in which Mary can choose 6 of these images if there are 2 from each folder. [2]

(iii) Find the number of different ways in which Mary can choose 6 of these images if there are at least 3 images from the friends folder and at least 1 image from each of the other two folders. [4]

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The cumulative frequency graph shows the annual salaries, in thousands of euros, of a random sample of 500 adults with jobs, in France. It has been plotted using grouped data. You may assume that the lowest salary is 5000 euros and the highest salary is 80 000 euros.

(i) On graph paper, draw a box-and-whisker plot to illustrate these salaries. [4]

(ii) Comment on the salaries of the people in this sample. [1]

(iii) An 'outlier' is defined as any data value which is more than 1.5 times the interquartile range above the upper quartile, or more than 1.5 times the interquartile range below the lower quartile.

(a) How high must a salary be in order to be classified as an outlier? [3]

(b) Show that none of the salaries is low enough to be classified as an outlier. [1]

6 Human blood groups are identified by two parts. The first part is A, B, AB or O and the second part (the Rhesus part) is + or −. In the UK, 35% of the population are group A+, 8% are B+, 3% are AB+, 37% are O+, 7% are A−, 2% are B−, 1% are AB− and 7% are O−.

(i) A random sample of 9 people in the UK who are Rhesus + is taken. Find the probability that fewer than 3 are group O+. [6]

(ii) A random sample of 150 people in the UK is taken. Find the probability that more than 60 people are group A+. [5]

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