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 2012**

**1 hour 15 minutes**

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

* 9 4 6 7 0 3 9 4 4 1 *

**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.




© UCLES 2012

**1** In a normal distribution with mean 9.3, the probability of a randomly chosen value being greater than 5.6 is 0.85. Find the standard deviation. [3]

**2** The discrete random variable $X$ has the following probability distribution.

| $x$ | −3 | 0 | 2 | 4 |
|---|---|---|---|---|
| $P(X = x)$ | $p$ | $q$ | $r$ | 0.4 |

Given that $E(X) = 2.3$ and $Var(X) = 3.01$, find the values of $p$, $q$ and $r$. [6]

**3** Ronnie obtained data about the gross domestic product (GDP) and the birth rate for 170 countries. He classified each GDP and each birth rate as either 'low', 'medium' or 'high'. The table shows the number of countries in each category.

| | | Birth rate | | |
|---|---|---|---|---|
| | | Low | Medium | High |
| GDP | Low | 3 | 5 | 45 |
| | Medium | 20 | 42 | 12 |
| | High | 35 | 8 | 0 |

One of these countries is chosen at random.

**(i)** Find the probability that the country chosen has a medium GDP. [1]

**(ii)** Find the probability that the country chosen has a low birth rate, given that it does not have a medium GDP. [2]

**(iii)** State with a reason whether or not the events 'the country chosen has a high GDP' and 'the country chosen has a high birth rate' are exclusive. [2]

One country is chosen at random from those countries which have a medium GDP and then a different country is chosen at random from those which have a medium birth rate.

**(iv)** Find the probability that both countries chosen have a medium GDP and a medium birth rate. [3]

**4** In a survey, the percentage of meat in a certain type of take-away meal was found. The results, to the nearest integer, for 193 take-away meals are summarised in the table.

| Percentage of meat | 1 – 5 | 6 – 10 | 11 – 20 | 21 – 30 | 31 – 50 |
|---|---|---|---|---|---|
| Frequency | 59 | 67 | 38 | 18 | 11 |

**(i)** Calculate estimates of the mean and standard deviation of the percentage of meat in these take-away meals. [4]

**(ii)** Draw, on graph paper, a histogram to illustrate the information in the table. [5]

© UCLES 2012

**5** The random variable $X$ is such that $X \sim \mathrm{N}(82, 126)$.

**(i)** A value of $X$ is chosen at random and rounded to the nearest whole number. Find the probability that this whole number is 84. [3]

**(ii)** Five independent observations of $X$ are taken. Find the probability that at most one of them is greater than 87. [4]

**(iii)** Find the value of $k$ such that $\mathrm{P}(87 < X < k) = 0.3$. [5]

**6** **(a)** A chess team of 2 girls and 2 boys is to be chosen from the 7 girls and 6 boys in the chess club. Find the number of ways this can be done if 2 of the girls are twins and are either both in the team or both not in the team. [3]

**(b)** **(i)** The digits of the number 1 244 687 can be rearranged to give many different 7-digit numbers. How many of these 7-digit numbers are even? [4]

**(ii)** How many different numbers between 20 000 and 30 000 can be formed using 5 different digits from the digits 1, 2, 4, 6, 7, 8? [2]

**(c)** Helen has some black tiles, some white tiles and some grey tiles. She places a single row of 8 tiles above her washbasin. Each tile she places is equally likely to be black, white or grey. Find the probability that there are no tiles of the same colour next to each other. [3]

© UCLES 2012

**BLANK PAGE**

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

University of Cambridge International Examinations is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.