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CAMBRIDGE A LEVEL PROGRAMME

AS TRIAL EXAMINATION MARCH/APRIL 2012

(June 2011 Intake)

Friday **30 March 2012** **10.30 am –11.45 am**

MATHEMATICS 9709/63

PAPER 6 Probability & Statistics 1 (S1) 1 hour 15 minutes

Additional materials: Answer Booklet/Paper
Graph Paper
List of formulae (MF9)

READ THESE INSTRUCTIONS FIRST

If you have been given an Answer Booklet, follow the instructions on the front cover of the Booklet.
Write your name and class on all the work you hand in.
Write in dark blue or black pen on both sides of the paper.
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.
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 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.
The use of an electronic calculator is expected, where appropriate.
You are reminded of the need for clear presentation in your answers.

This document consists of **4** printed pages.

[Turn over

1 A group of students conducted an investigation on the acidity level of a river. The acidity of the water, x, was measured on 10 occasions. The results are summarized below.

$$\sum(x-a) = -107\,; \quad \bar{x} = 4.3; \quad \text{standard deviation of } x = 2.655$$

(i) Find the value of the constant a. [2]

(ii) Find $\sum(x-a)^2$. [2]

2 **(a)** The digits of the number 12355568 can be rearranged to give many different 8-digit numbers. Find how many different 8-digit numbers can be made if

(i) the digits 2, 6, 8 (in any order) are next to each other, [2]

(ii) these 8-digit numbers are even. [2]

(b) Eight students are eligible for selection to a delegation of five students from a school to attend a conference. Two of them will not attend together but each is prepared to attend in the absence of the other. In how many ways can the delegation be chosen? [2]

3 Two unbiased six-sided dice, having the numbers 1, 1, 2, 3, 5 and 6 on their faces, are thrown together. The random variable D represents the modulus of the difference between the scores.

(i) Show that $P(D > 1) = 5/9$. [2]

(ii) Tabulate the probability distribution of D. [2]

(iii) Calculate the expected value and variance of D. [3]

4 A box contains 7 balls of which 3 are red; a similar bag contains 5 balls of which 2 are red. A coin, biased so that a head is twice as likely as a tail, is tossed. If the outcome is a head, a ball is removed from the bag; otherwise a ball is removed from the box.

(a) Draw a tree diagram to illustrate this situation. [3]

(b) Find the probability that

(i) the ball will not be red. [2]

(ii) it came from the box, given that the ball is red. [2]

5 The table below shows the tensile strength of 300 specimens of sheet steel.

Tensile strength (kN m^{-2})	Number of specimens
$355 < x \leq 365$	40
$365 < x \leq 375$	30
$375 < x \leq 385$	60
$385 < x \leq 395$	100
$395 < x \leq 405$	50
$405 < x \leq 415$	20

(i) Draw a cumulative frequency graph. [4]

(ii) From the graph, estimate inter-quartile range. [2]

(iii) Estimate the number of specimens that have tensile strength above 390 kN m^{-2}. [1]

6 A motorist making a regular journey to work finds that she is delayed at a particular level crossing once in five journeys, on average. She makes 22 journeys to work in a month.

(i) Find the probability that she is delayed on fewer than 4 occasions. [3]

(ii) Find the expected number of journeys that are delayed at the level crossing in a year. [2]

(iii) Find probability that her journeys are not delayed on more than 210 occasions in a year. [4]

7 A component has a length which is normally distributed with mean of 15 cm and a standard deviation of 0.05 cm. An acceptable component is one whose length is between 14.92 cm and 15.08 cm inclusive.

(i) Find probability that a randomly selected component is accepted. [3]

(ii) Find the proportion of undersized components. [2]

The cost of production is 50p per component. An acceptable component can be sold for £1. Undersized components can be sold for scrap at 10p each, and oversized components can be corrected at an additional cost of 20p each and then sold as acceptable.

(iii) Find the expected profit per 1000 components. [5]