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CAMBRIDGE A LEVEL PROGRAMME

SEMESTER ONE EXAMINATION DECEMBER 2010

(June 2010 Intake)

Monday **6 December 2010** **3.00-4.15pm**

MATHEMATICS 9709/6

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

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

READ THESE INSTRUCTIONS FIRST

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 **3** printed pages.

1. Cement is packed in bags which the manufacturer claims contain 50 kg each. Eighty bags are examined and the mass x kg of each is found. The results are $\sum(x-50)=40$ and $\sum(x-50)^2=100$. Find the mean and the standard deviation of the masses. [4]

2. In country A 70% of the students who drink coffee have milk in it. In country B 60% of students who drink coffee have milk in it. There are 5 million students in country A who drink coffee and 20 million students in country B who drink coffee. A student is chosen at random from these 25 million students.

   (a) Find the probability that the student chosen is from country A. [1]

   (b) Find the probability that the student chosen does not have milk in their coffee. [2]

   Given that the student chosen does not have milk in their coffee, find the probability that the student is from country B. [2]

3. A player is about to toss two fair cubical dice. Dependent upon the total score, T, obtained, there will be an increase, X, in the number of tokens that the player holds. If $T=6,7$ or 8 then $X=-9$, if $T=9$ then $X=25$ and if $T=12$ then $X=50$. If T takes any other value, then $X=0$.

   (a) Tabulate the probability distribution of X. [4]

   (b) Show that $E(X)=\frac{1}{6}$. [2]

4. (a) Find how many four digit number can be made by using 1, 2, 3,4 and 5 where any digit can be used more than once. [1]

   (b) Find how many different four digit odd number greater than 3000 can be made using 1, 2, 3, 4 and 5 with no digit being repeated. [2]

   (c) Five cards numbered 1, 2, 3, 4 and 5 are arranged randomly in a line. Find the number of arrangement where the cards numbered 4 and 5 are not next to each other. [3]

5. The following data shows the time, in seconds, taken by a group of 40 technicians to complete a particular task.

11	21	21	27	27	13	26	24	16	15
42	53	52	27	22	12	12	41	34	37
45	56	20	29	30	22	22	17	23	15
47	21	50	28	29	15	31	32	35	41

(a) Draw a stem-and-leaf diagram to represent the data. [3]

(b) Find the median and quartiles. [3]

(c) Represent the data by means of a box-and-whisker plot. [3]

6. (a) X is a normal variable with mean μ and standard deviation σ. It is given that $P(X > 128) = 0.13$ and that $P(X > 97) = 0.8770$. Calculate μ and σ. [5]

(b) The quality of essays written by students from a certain class is classified as 'poor', 'fair' or 'good' on the basis of a measured quantity G may be assumed to have a normal distribution with mean 60 units and standard deviation 5 units. Essays are 'poor' if $G < 55$, and the proportions of 'fair' and 'good' are equal. Calculate the boundary value of G separating 'fair' from 'good'. [5]

7. The probability that a certain type of missile will arrive and function properly in an assigned target zone is $\frac{1}{5}$. If it does arrive and function properly in the target zone, the target is destroyed.

(a) If five missiles are launched against one target, find

(i) the probability that at most one missile will arrive and function properly in the target zone. [3]

(ii) The probability that the target will be destroyed. [2]

(b) If 50 missiles are launched against one target, using a suitable approximation, find the probability that at least $\frac{3}{10}$ of them will arrive and function properly in the target zone. [5]