

CAMBRIDGE A LEVEL PROGRAMME
SEMESTER ONE EXAMINATION DECEMBER 2007
(July 2007 Intake)

Friday

7 December 2007

8.30 am – 9.45 am

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. Ten percent of the bulbs produced by a factory are defective. A sample of 5 bulbs is selected randomly and tested for defect. Find the probability that
 - (i) two bulbs are defective, [2]
 - (ii) at least 1 bulb is defective. [3]

2. (a) Eleven cards each bear a single letter, and together they can be made to spell the word "EXAMINATION". Three cards are selected from the eleven cards, and the order of selection is not relevant. Find how many possible selections can be made
 - (i) if the three cards all bear different letters, [1]
 - (ii) if two of the three cards bear the same letter. [2]
 (b) In how many ways can a committee of 2 male adults, 4 female adults and 3 boys be chosen from 6 male adults, 8 female adults and 4 boys if
 - (i) there are no restrictions, [2]
 - (ii) a particular male adult and a particular female adult must be included? [2]

3. A machine is used to produce butter whose masses are normally distributed with a mean of μ grams and a standard deviation of σ grams. It is found that 5% of the output from this machine has a mass greater than 85 g and 10% have a mass less than 25 g.

 Find the values of μ and σ , and find the ranges symmetrical about the mean, within which 75% of the masses of the butter produced by this machine lie. [8]

4. A bag contains 3 white marbles, 5 black marbles and 2 yellow marbles. A boy draws 3 marbles at random from the bag.
 Events A, B and C are defined as follows:
 A: the boy obtains 2 white marbles and a yellow marble
 B: the boy obtains 2 black marbles and a marble of another colour
 C: the boy obtains a special marble which is black

 Find
 - (i) $P(A)$ [2]
 - (ii) $P(B)$ [2]
 - (iii) $P(C)$ [2]
 - (iv) $P(C|B)$ [2]
 Are events B and C
 - (v) mutually exclusive? [1]
 - (vi) independent? [1]

5. A school entered 88 students for an examination. The results of the examination are shown in the table below.

Mark (x)	Frequency
$0 < x \leq 10$	3
$10 < x \leq 20$	6
$20 < x \leq 30$	9
$30 < x \leq 40$	10
$40 < x \leq 50$	12
$50 < x \leq 60$	18
$60 < x \leq 70$	14
$70 < x \leq 80$	11
$80 < x \leq 90$	5

- (a) Calculate, showing your working and giving your answers correct to two decimal places,
- (i) the mean mark, [2]
 - (ii) the variance, [2]
 - (iii) the standard deviation. [1]
- (b) Draw, on graph paper, a cumulative frequency polygon to illustrate the distribution of the examination marks. [2]
- (c) Use your graph to estimate
- (i) the median mark, [1]
 - (ii) the interquartile range. [1]

The lowest mark required to obtain a grade A in the examination was 75.

- (d) Estimate from your graph the number of students who were awarded a grade A for this examination. [1]
6. In a series of n independent trials, the probability of a success at each trial is p . If R is the random variable denoting the total number of successes, state the probability $R = r$. State also the mean and variance of R . [3]

A certain variety of flower seed is sold in packets containing 1000 seeds. It is claimed on the packet that 40% will bloom white and 60% will bloom red. This may be assumed to be accurate. Five seeds are planted. Find the probability that

- (a) exactly three will bloom white, [2]
- (b) at least one will bloom white. [2]

100 seeds are plated. Use the normal approximation to estimate the probability of obtaining between 30 and 45 (inclusive) white flowers. [3]