MATHEMATICS   **9709/06**

STATISTICS   **0390/06**

Paper 6 Probability & Statistics 1 **(S1)**

May/June 2005

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 Centre number, candidate number and name 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 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.
The use of an electronic calculator is expected, where appropriate.
You are reminded of the need for clear presentation in your answers.

1   It is known that, on average, 2 people in 5 in a certain country are overweight. A random sample of 400 people is chosen. Using a suitable approximation, find the probability that fewer than 165 people in the sample are overweight. [5]

2   The following table shows the results of a survey to find the average daily time, in minutes, that a group of schoolchildren spent in internet chat rooms.

Time per day (t minutes)	Frequency
$0 \leqslant t < 10$	2
$10 \leqslant t < 20$	f
$20 \leqslant t < 40$	11
$40 \leqslant t < 80$	4

The mean time was calculated to be 27.5 minutes.

   (i) Form an equation involving f and hence show that the total number of children in the survey was 26. [4]

   (ii) Find the standard deviation of these times. [2]

3   A fair dice has four faces. One face is coloured pink, one is coloured orange, one is coloured green and one is coloured black. Five such dice are thrown and the number that fall on a green face are counted. The random variable X is the number of dice that fall on a green face.

   (i) Show that the probability of 4 dice landing on a green face is 0.0146, correct to 4 decimal places. [2]

   (ii) Draw up a table for the probability distribution of X, giving your answers correct to 4 decimal places. [5]

4 The following back-to-back stem-and-leaf diagram shows the cholesterol count for a group of 45 people who exercise daily and for another group of 63 who do not exercise. The figures in brackets show the number of people corresponding to each set of leaves.

	People who exercise			People who do not exercise	
(9)	9 8 7 6 4 3 2 2 1	3	1 5 7 7		(4)
(12)	9 8 8 8 7 6 6 5 3 3 2 2	4	2 3 4 4 5 8		(6)
(9)	8 7 7 7 6 5 3 3 1	5	1 2 2 2 3 4 4 5 6 7 8 8 9		(13)
(7)	6 6 6 6 4 3 2	6	1 2 3 3 3 4 5 5 5 7 7 8 9 9		(14)
(3)	8 4 1	7	2 4 5 5 6 6 7 8 8		(9)
(4)	9 5 5 2	8	1 3 3 4 6 7 9 9 9		(9)
(1)	4	9	1 4 5 5 8		(5)
(0)		10	3 3 6		(3)

Key: 2 | 8 | 1 represents a cholesterol count of 8.2 in the group
who exercise and 8.1 in the group who do not exercise.

  (i) Give one useful feature of a stem-and-leaf diagram. [1]

  (ii) Find the median and the quartiles of the cholesterol count for the group who do not exercise. [3]

You are given that the lower quartile, median and upper quartile of the cholesterol count for the group who exercise are 4.25, 5.3 and 6.6 respectively.

  (iii) On a single diagram on graph paper, draw two box-and-whisker plots to illustrate the data. [4]

5 Data about employment for males and females in a small rural area are shown in the table.

	Unemployed	Employed
Male	206	412
Female	358	305

A person from this area is chosen at random. Let M be the event that the person is male and let E be the event that the person is employed.

  (i) Find P(M). [2]

  (ii) Find P(M and E). [1]

  (iii) Are M and E independent events? Justify your answer. [3]

  (iv) Given that the person chosen is unemployed, find the probability that the person is female. [2]

6 Tyre pressures on a certain type of car independently follow a normal distribution with mean 1.9 bars and standard deviation 0.15 bars.

  (i) Find the probability that all four tyres on a car of this type have pressures between 1.82 bars and 1.92 bars. [5]

  (ii) Safety regulations state that the pressures must be between $1.9 - b$ bars and $1.9 + b$ bars. It is known that 80% of tyres are within these safety limits. Find the safety limits. [3]

7 **(a)** A football team consists of 3 players who play in a defence position, 3 players who play in a midfield position and 5 players who play in a forward position. Three players are chosen to collect a gold medal for the team. Find in how many ways this can be done

   (i) if the captain, who is a midfield player, must be included, together with one defence and one forward player, [2]

   (ii) if exactly one forward player must be included, together with any two others. [2]

(b) Find how many different arrangements there are of the nine letters in the words GOLD MEDAL

   (i) if there are no restrictions on the order of the letters, [2]

   (ii) if the two letters D come first and the two letters L come last. [2]