MATHEMATICS **9709/06**

Paper 6 Probability & Statistics 1 **(S1)** **October/November 2007**

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.
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.

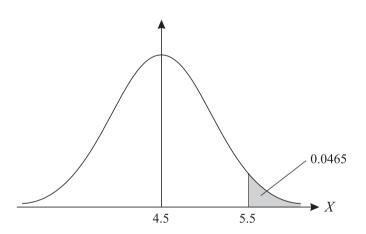This document consists of **3** printed pages and **1** blank page.

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1 A summary of 24 observations of x gave the following information:

$$\Sigma(x - a) = -73.2 \quad \text{and} \quad \Sigma(x - a)^2 = 2115.$$

The mean of these values of x is 8.95.

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

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

2 The random variable X takes the values -2, 0 and 4 only. It is given that $P(X = -2) = 2p$, $P(X = 0) = p$ and $P(X = 4) = 3p$.

    (i) Find p. [2]

    (ii) Find $E(X)$ and $Var(X)$. [4]

3 The six digits 4, 5, 6, 7, 7, 7 can be arranged to give many different 6-digit numbers.

    (i) How many different 6-digit numbers can be made? [2]

    (ii) How many of these 6-digit numbers start with an odd digit and end with an odd digit? [4]

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The random variable X has a normal distribution with mean 4.5. It is given that $P(X > 5.5) = 0.0465$ (see diagram).

    (i) Find the standard deviation of X. [3]

    (ii) Find the probability that a random observation of X lies between 3.8 and 4.8. [4]

5 The arrival times of 204 trains were noted and the number of minutes, t, that each train was late was recorded. The results are summarised in the table.

Number of minutes late (t)	$-2 \leqslant t < 0$	$0 \leqslant t < 2$	$2 \leqslant t < 4$	$4 \leqslant t < 6$	$6 \leqslant t < 10$
Number of trains	43	51	69	22	19

  (i) Explain what $-2 \leqslant t < 0$ means about the arrival times of trains. [1]

  (ii) Draw a cumulative frequency graph, and from it estimate the median and the interquartile range of the number of minutes late of these trains. [7]

6 On any occasion when a particular gymnast performs a certain routine, the probability that she will perform it correctly is 0.65, independently of all other occasions.

  (i) Find the probability that she will perform the routine correctly on exactly 5 occasions out of 7. [2]

  (ii) On one day she performs the routine 50 times. Use a suitable approximation to estimate the probability that she will perform the routine correctly on fewer than 29 occasions. [5]

  (iii) On another day she performs the routine n times. Find the smallest value of n for which the expected number of correct performances is at least 8. [2]

7 Box A contains 5 red paper clips and 1 white paper clip. Box B contains 7 red paper clips and 2 white paper clips. One paper clip is taken at random from box A and transferred to box B. One paper clip is then taken at random from box B.

  (i) Find the probability of taking both a white paper clip from box A and a red paper clip from box B. [2]

  (ii) Find the probability that the paper clip taken from box B is red. [2]

  (iii) Find the probability that the paper clip taken from box A was red, given that the paper clip taken from box B is red. [2]

  (iv) The random variable X denotes the number of times that a red paper clip is taken. Draw up a table to show the probability distribution of X. [4]

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