OCR RECOGNISING ACHIEVEMENT

ADVANCED SUBSIDIARY GCE

MATHEMATICS **4732**

Probability & Statistics 1

Monday 15 June 2009
Afternoon

Duration: 1 hour 30 minutes

4732

INSTRUCTIONS TO CANDIDATES

*   Write your name clearly in capital letters, your Centre Number and Candidate Number in the spaces provided on the Answer Booklet.
*   Use black ink. Pencil may be used for graphs and diagrams only.
*   Read each question carefully and make sure that you know what you have to do before starting your answer.
*   Answer **all** the questions.
*   Do **not** write in the bar codes.
*   Give non-exact numerical answers correct to 3 significant figures unless a different degree of accuracy is specified in the question or is clearly appropriate.
*   You are permitted to use a graphical calculator in this paper.

INFORMATION FOR CANDIDATES

*   The number of marks is given in brackets **[ ]** at the end of each question or part question.
*   **You are reminded of the need for clear presentation in your answers.**
*   The total number of marks for this paper is **72**.
*   This document consists of **4** pages. Any blank pages are indicated.

1   20% of packets of a certain kind of cereal contain a free gift. Jane buys one packet a week for 8 weeks. The number of free gifts that Jane receives is denoted by X. Assuming that Jane's 8 packets can be regarded as a random sample, find

    (i) P($X = 3$), **[3]**

    (ii) P($X \geqslant 3$), **[2]**

   (iii) E(X). **[2]**

2   Two judges placed 7 dancers in rank order. Both judges placed dancers A and B in the first two places, but in opposite orders. The judges agreed about the ranks for all the other 5 dancers. Calculate the value of Spearman's rank correlation coefficient. **[4]**

3   In an agricultural experiment, the relationship between the amount of water supplied, x units, and the yield, y units, was investigated. Six values of x were chosen and for each value of x the corresponding value of y was measured. The results are shown in the table.

x	1	2	3	4	5	6
y	3	6	8	8	11	10

These results, together with the regression line of y on x, are plotted on the graph.
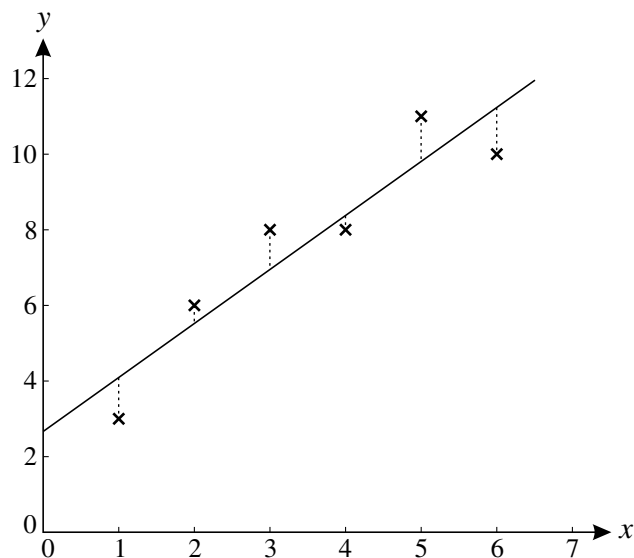
    (i) Give a reason why the regression line of x on y is not suitable in this context. **[1]**

    (ii) Explain the significance, for the regression line of y on x, of the distances shown by the vertical dotted lines in the diagram. **[2]**

   (iii) Calculate the value of the product moment correlation coefficient, r. **[3]**

   (iv) Comment on your value of r in relation to the diagram. **[2]**

4 30% of people own a Talk-2 phone. People are selected at random, one at a time, and asked whether they own a Talk-2 phone. The number of people questioned, up to and including the first person who owns a Talk-2 phone, is denoted by X. Find

   (i) $P(X = 4)$, **[3]**

   (ii) $P(X > 4)$, **[2]**

   (iii) $P(X < 6)$. **[3]**

5 The diameters of 100 pebbles were measured. The measurements rounded to the nearest millimetre, x, are summarised in the table.

x	$10 \leqslant x \leqslant 19$	$20 \leqslant x \leqslant 24$	$25 \leqslant x \leqslant 29$	$30 \leqslant x \leqslant 49$
Number of stones	25	22	29	24

These data are to be presented on a statistical diagram.

   (i) For a histogram, find the frequency density of the $10 \leqslant x \leqslant 19$ class. **[2]**

   (ii) For a cumulative frequency graph, state the coordinates of the first two points that should be plotted. **[2]**

   (iii) Why is it not possible to draw an exact box-and-whisker plot to illustrate the data? **[1]**

6 Last year Eleanor played 11 rounds of golf. Her scores were as follows:

$$79, \quad 71, \quad 80, \quad 67, \quad 67, \quad 74, \quad 66, \quad 65, \quad 71, \quad 66, \quad 64.$$

   (i) Calculate the mean of these scores and show that the standard deviation is 5.31, correct to 3 significant figures. **[4]**

   (ii) Find the median and interquartile range of the scores. **[4]**

This year, Eleanor also played 11 rounds of golf. The standard deviation of her scores was 4.23, correct to 3 significant figures, and the interquartile range was the same as last year.

   (iii) Give a possible reason why the standard deviation of her scores was lower than last year although her interquartile range was unchanged. **[1]**

In golf, smaller scores mean a better standard of play than larger scores. Ken suggests that since the standard deviation was smaller this year, Eleanor's overall standard has improved.

   (iv) Explain why Ken is wrong. **[1]**

   (v) State what the smaller standard deviation does show about Eleanor's play. **[1]**

[Questions 7, 8 and 9 are printed overleaf.]

7 Three letters are selected at random from the 8 letters of the word COMPUTER, without regard to order.

    (i) Find the number of possible selections of 3 letters. **[2]**

    (ii) Find the probability that the letter P is included in the selection. **[3]**

Three letters are now selected at random, one at a time, from the 8 letters of the word COMPUTER, and are placed in order in a line.

    (iii) Find the probability that the 3 letters form the word TOP. **[3]**

8 A game at a charity event uses a bag containing 19 white counters and 1 red counter. To play the game once a player takes counters at random from the bag, one at a time, without replacement. If the red counter is taken, the player wins a prize and the game ends. If not, the game ends when 3 white counters have been taken. Niko plays the game once.

    (i) (a) Copy and complete the tree diagram showing the probabilities for Niko. **[4]**

First counter
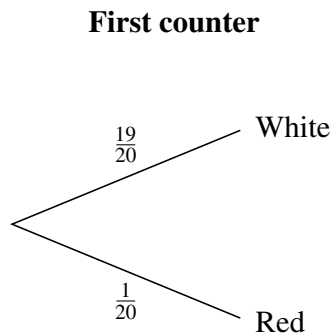
      (b) Find the probability that Niko will win a prize. **[3]**

    (ii) The number of counters that Niko takes is denoted by X.

      (a) Find $P(X = 3)$. **[2]**

      (b) Find $E(X)$. **[4]**

9 Repeated independent trials of a certain experiment are carried out. On each trial the probability of success is 0.12.

    (i) Find the smallest value of n such that the probability of at least one success in n trials is more than 0.95. **[3]**

    (ii) Find the probability that the 3rd success occurs on the 7th trial. **[5]**