**OCR** RECOGNISING ACHIEVEMENT

**ADVANCED SUBSIDIARY GCE**

**MATHEMATICS** **4732**

Probability & Statistics 1

Candidates answer on the Answer Booklet

**OCR Supplied Materials:**
*   8 page Answer Booklet
*   List of Formulae (MF1)

**Other Materials Required:**
None

**Monday 15 June 2009**
**Afternoon**

**Duration:** 1 hour 30 minutes

*4 7 3 2 *

**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.

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**Turn over**

**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.
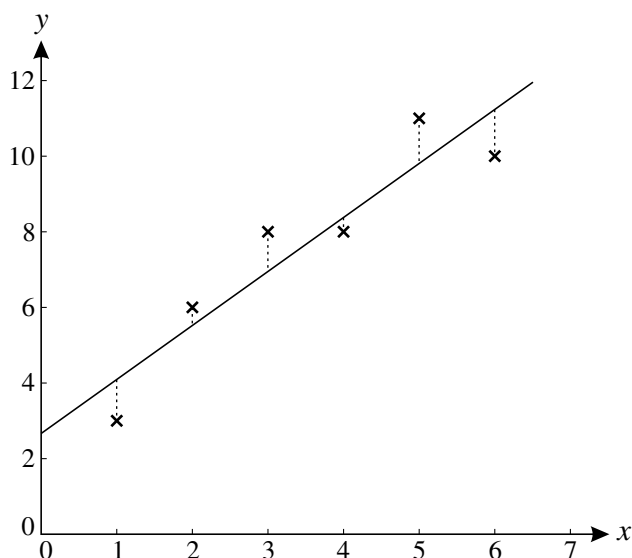


    **(i)** Give a reason why the regression line of $x$ on $y$ is not suitable in this context. **[1]**

    **(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**
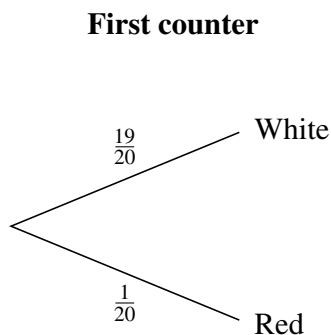


    **(b)** Find the probability that Niko will win a prize. **[3]**

    **(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]**