Friday 25 January 2013 – Afternoon

AS GCE MATHEMATICS (MEI)

4766/01   Statistics 1

QUESTION PAPER
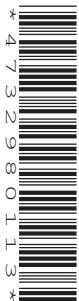
Candidates answer on the Printed Answer Book.

OCR supplied materials:
*   Printed Answer Book 4766/01
*   MEI Examination Formulae and Tables (MF2)

Other materials required:
*   Scientific or graphical calculator

Duration: 1 hour 30 minutes

INSTRUCTIONS TO CANDIDATES

These instructions are the same on the Printed Answer Book and the Question Paper.

*   The Question Paper will be found in the centre of the Printed Answer Book.
*   Write your name, centre number and candidate number in the spaces provided on the Printed Answer Book. Please write clearly and in capital letters.
*   **Write your answer to each question in the space provided in the Printed Answer Book**. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
*   Use black ink. HB pencil may be used for graphs and diagrams only.
*   Read each question carefully. Make sure you know what you have to do before starting your answer.
*   Answer **all** the questions.
*   Do **not** write in the bar codes.
*   You are permitted to use a scientific or graphical calculator in this paper.
*   Final answers should be given to a degree of accuracy appropriate to the context.

INFORMATION FOR CANDIDATES

This information is the same on the Printed Answer Book and the Question Paper.

*   The number of marks is given in brackets **[ ]** at the end of each question or part question on the Question Paper.
*   You are advised that an answer may receive **no marks** unless you show sufficient detail of the working to indicate that a correct method is being used.
*   The total number of marks for this paper is **72**.
*   The Printed Answer Book consists of **12** pages. The Question Paper consists of **4** pages. Any blank pages are indicated.

INSTRUCTION TO EXAMS OFFICER/INVIGILATOR

*   Do not send this Question Paper for marking; it should be retained in the centre or recycled. Please contact OCR Copyright should you wish to re-use this document.

This paper has been pre modified for carrier language

Turn over

2

Section A (36 marks)

1   The stem and leaf diagram illustrates the heights in metres of 25 young oak trees.

$$
\begin{array}{c|cccccc}
3 & 4 & 6 & 7 & 8 & 9 & 9 \\
4 & 0 & 2 & 2 & 3 & 4 & 6 & 8 & 9 \\
5 & 0 & 1 & 3 & 5 & 8 \\
6 & 2 & 4 & 5 \\
7 & 4 & 6 \\
8 & 1 \\
\end{array}
$$

Key: 4 │2 represents 4.2

  (i) State the type of skewness of the distribution. **[1]**

  (ii) Use your calculator to find the mean and standard deviation of these data. **[3]**

  (iii) Determine whether there are any outliers. **[4]**

2   The probability distribution of the random variable X is given by the formula

$$P(X = r) = k(r^2 - 1) \text{ for } r = 2, 3, 4, 5.$$

  (i) Show the probability distribution in a table, and find the value of k. **[3]**

  (ii) Find $E(X)$ and $Var(X)$. **[5]**

3   Each weekday Alan drives to work. On his journey, he goes over a level crossing. Sometimes he has to wait at the level crossing for a train to pass.

   • W is the event that Alan has to wait at the level crossing.

   • L is the event that Alan is late for work.

You are given that $P(L|W) = 0.4$, $P(W) = 0.07$ and $P(L \cup W) = 0.08$.

  (i) Calculate $P(L \cap W)$. **[2]**

  (ii) Draw a Venn diagram, showing the events L and W. Fill in the probability corresponding to each of the four regions of your diagram. **[3]**

  (iii) Determine whether the events L and W are independent, explaining your method clearly. **[3]**

4   At a dog show, three out of eleven dogs are to be selected for a national competition.

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

  (ii) Five of the eleven dogs are terriers. Assuming that the dogs are selected at random, find the probability that at least two of the three dogs selected for the national competition are terriers. **[5]**

5 Malik is playing a game in which he has to throw a 6 on a fair six-sided die to start the game. Find the probability that

    (i) Malik throws a 6 for the first time on his third attempt, **[3]**

    (ii) Malik needs at most ten attempts to throw a 6. **[2]**

Section B (36 marks)

**6** The heights x cm of 100 boys in Year 7 at a school are summarised in the table below.

Height	$125 \leqslant x \leqslant 140$	$140 < x \leqslant 145$	$145 < x \leqslant 150$	$150 < x \leqslant 160$	$160 < x \leqslant 170$
Frequency	25	29	24	18	4

    (i) Estimate the number of boys who have heights of at least 155 cm. **[2]**

    (ii) Calculate an estimate of the median height of the 100 boys. **[3]**

    (iii) Draw a histogram to illustrate the data. **[5]**

The histogram below shows the heights of 100 girls in Year 7 at the same school.
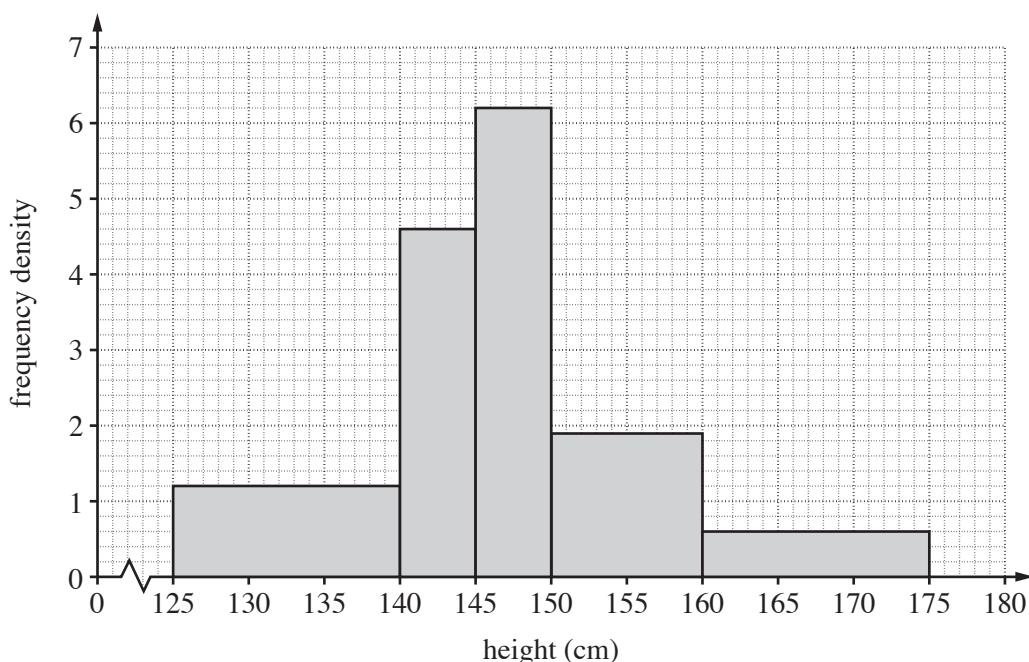
    (iv) How many more girls than boys had heights exceeding 160 cm? **[3]**

    (v) Calculate an estimate of the mean height of the 100 girls. **[5]**

Turn over

7   A coffee shop provides free internet access for its customers. It is known that the probability that a randomly selected customer is accessing the internet is 0.35, independently of all other customers.

   (i) 10 customers are selected at random.

   (*A*) Find the probability that exactly 5 of them are accessing the internet.   **[3]**

   (*B*) Find the probability that at least 5 of them are accessing the internet.   **[2]**

   (*C*) Find the expected number of these customers who are accessing the internet.   **[2]**

Another coffee shop also provides free internet access. It is suspected that the probability that a randomly selected customer at this coffee shop is accessing the internet may be different from 0.35. A random sample of 20 customers at this coffee shop is selected. Of these, 10 are accessing the internet.

   (ii) Carry out a hypothesis test at the 5% significance level to investigate whether the probability for this coffee shop is different from 0.35. Give a reason for your choice of alternative hypothesis.   **[9]**

   (iii) To get a more reliable result, a much larger random sample of 200 customers is selected over a period of time, and another hypothesis test is carried out. You are given that 90 of the 200 customers were accessing the internet. You are also given that, if X has the binomial distribution with parameters $n = 200$ and $p = 0.35$, then $P(X \geqslant 90) = 0.0022$. Using the same hypotheses and significance level which you used in part **(ii)**, complete this test.   **[2]**