OCR

Oxford Cambridge and RSA

Wednesday 20 May 2015 – Morning

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

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INSTRUCTIONS TO CANDIDATES

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

- The Question Paper will be found inside 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

Section A (36 marks)

1 The amounts of electricity, x kWh (kilowatt hours), used by 40 households in a three-month period are summarised as follows.

$$n = 40 \qquad \Sigma x = 59\,972 \qquad \Sigma x^2 = 96\,767\,028$$

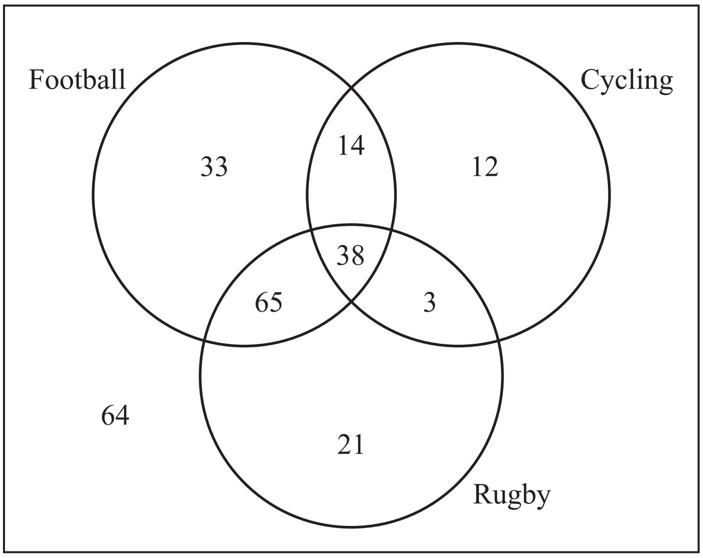
(i) Calculate the mean and standard deviation of x. **[3]**

(ii) The formula $y = 0.163x + 14.5$ gives the cost in pounds of the electricity used by each household. Use your answers to part **(i)** to deduce the mean and standard deviation of the costs of the electricity used by these 40 households. **[3]**

2 A survey is being carried out into the sports viewing habits of people in a particular area. As part of the survey, 250 people are asked which of the following sports they have watched on television in the past month.

- Football
- Cycling
- Rugby

The numbers of people who have watched these sports are shown in the Venn diagram.



One of the people is selected at random.

(i) Find the probability that this person has in the past month

(A) watched cycling but not football, **[1]**

(B) watched either one or two of the three sports. **[2]**

(ii) Given that this person has watched cycling, find the probability that this person has not watched football. **[2]**

3 A normal pack of 52 playing cards contains 4 aces. A card is drawn at random from the pack. It is then replaced and the pack is shuffled, after which another card is drawn at random.

(i) Find the probability that neither card is an ace. **[2]**

(ii) This process is repeated 10 times. Find the expected number of times for which neither card is an ace. **[1]**

4 A rugby team of 15 people is to be selected from a squad of 25 players.

(i) How many different teams are possible? **[2]**

(ii) In fact the team has to consist of 8 forwards and 7 backs. If 13 of the squad are forwards and the other 12 are backs, how many different teams are now possible? **[2]**

(iii) Find the probability that, if the team is selected at random from the squad of 25 players, it contains the correct numbers of forwards and backs. **[2]**

5 At a tourist information office the numbers of people seeking information each hour over the course of a 12-hour day are shown below.

6 25 38 39 31 18 35 31 33 15 21 28

(i) Construct a sorted stem and leaf diagram to represent these data. **[3]**

(ii) State the type of skewness suggested by your stem and leaf diagram. **[1]**

(iii) For these data find the median, the mean and the mode. Comment on the usefulness of the mode in this case. **[4]**

6 Three fair six-sided dice are thrown. The random variable X represents the highest of the three scores on the dice.

(i) Show that $\mathrm{P}(X=6)=\dfrac{91}{216}$. **[3]**

The table shows the probability distribution of X.

r	1	2	3	4	5	6
$\mathrm{P}(X=r)$	$\frac{1}{216}$	$\frac{7}{216}$	$\frac{19}{216}$	$\frac{37}{216}$	$\frac{61}{216}$	$\frac{91}{216}$

(ii) Find $\mathrm{E}(X)$ and $\mathrm{Var}(X)$. **[5]**

Section B (36 marks)

7 A drug for treating a particular minor illness cures, on average, 78% of patients. Twenty people with this minor illness are selected at random and treated with the drug.

(i) (A) Find the probability that exactly 19 patients are cured. **[3]**

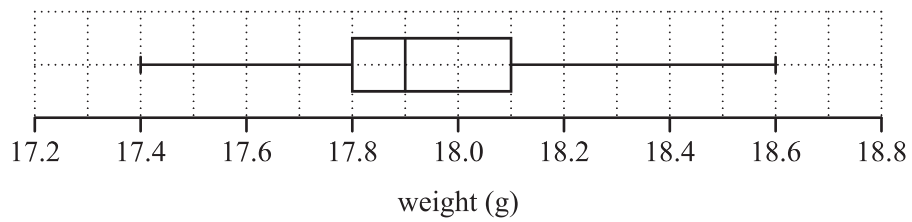
(B) Find the probability that at most 18 patients are cured. **[3]**

(C) Find the expected number of patients who are cured. **[1]**

(ii) A pharmaceutical company is trialling a new drug to treat this illness. Researchers at the company hope that a higher percentage of patients will be cured when given this new drug. Twenty patients are selected at random, and given the new drug. Of these, 19 are cured. Carry out a hypothesis test at the 1% significance level to investigate whether there is any evidence to suggest that the new drug is more effective than the old one. **[8]**

(iii) If the researchers had chosen to carry out the hypothesis test at the 5% significance level, what would the result have been? Justify your answer. **[2]**

8 The box and whisker plot below summarises the weights in grams of the 20 chocolates in a box.



(i) Find the interquartile range of the data and hence determine whether there are any outliers at either end of the distribution. **[5]**

Ben buys a box of these chocolates each weekend. The chocolates all look the same on the outside, but 7 of them have orange centres, 6 have cherry centres, 4 have coffee centres and 3 have lemon centres.

One weekend, each of Ben's 3 children eats one of the chocolates, chosen at random.

(ii) Calculate the probabilities of the following events.

A: all 3 chocolates have orange centres

B: all 3 chocolates have the same centres **[6]**

(iii) Find $\mathrm{P}(A|B)$ and $\mathrm{P}(B|A)$. **[3]**

The following weekend, Ben buys an identical box of chocolates and again each of his 3 children eats one of the chocolates, chosen at random.

(iv) Find the probability that, on both weekends, the 3 chocolates that they eat all have orange centres. **[2]**

(v) Ben likes all of the chocolates except those with cherry centres. On another weekend he is the first of his family to eat some of the chocolates. Find the probability that he has to select more than 2 chocolates before he finds one that he likes. **[3]**

END OF QUESTION PAPER