CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

STATISTICS **4040/01**

Paper 1

October/November 2003

2 hours 15 minutes

Additional Materials: Answer Booklet/Paper
                         Graph paper (3 sheets)
                         Mathematical tables
                         Pair of compasses
                         Protractor

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 on both sides of the paper.
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 in Section A and not more than **four** questions from Section B.
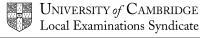Write your answers on the separate Answer Booklet/Paper provided.
All working must be clearly shown.
At the end of the examination, fasten all your work securely together.

The number of marks is given in brackets [ ] at the end of each question or part question.
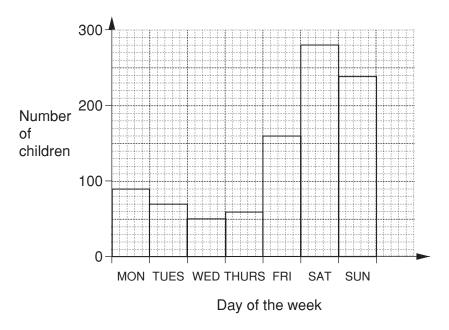The use of an electronic calculator is expected in this paper.

[Turn over

Section A [36 marks]

Answer **all** of the questions 1 to 6.

1 The bar chart below shows the number of children who visited a zoo each day during a week.

Day of the week

(i) State how many children visited the zoo on Thursday. [1]

(ii) State which day had the most children visiting the zoo. [1]

(iii) State how many more children visited the zoo on Saturday than visited the zoo on Friday. [1]

Given that no child visited the zoo on more than one day in the week,

(iv) state how many children visited the zoo, in total, during the week, [1]

(v) find the probability, as a fraction in its lowest terms, that a child chosen at random visited the zoo on Wednesday. [2]

2 **All the answers to this question should be given either as fractions in their lowest terms or as decimals correct to 3 significant figures.**

(a) A set of 10 cards is made as shown:

| S | T | A | T | I | S | T | I | C | S |

The cards are shuffled and placed face down on a desk. A boy draws one card at random from the set of cards, replaces it, shuffles the cards and then draws another card at random from the set of cards.
Calculate the probability that

(i) both cards show the letter T, [2]

(ii) exactly one of the cards shows the letter T. [2]

(b) A bag contains 6 red counters, 7 blue counters and 2 green counters. A girl picks, at the same time, two counters at random from the bag.
Calculate the probability that

(i) both counters are red, [2]

(ii) exactly one of the counters is red. [2]

3 There are 29 students in class A, 32 students in class B, 34 students in class C and 25 students in class D. The teacher wants to choose a sample of 20 students from these 4 classes.

He decides to select 5 students at random from each class.

(i) Explain why this would be a biased sampling method. [1]

He could select the students by a stratified random sampling method.

(ii) Calculate the number of students that should be selected from each class. [2]

He could select the students by the method of systematic sampling.

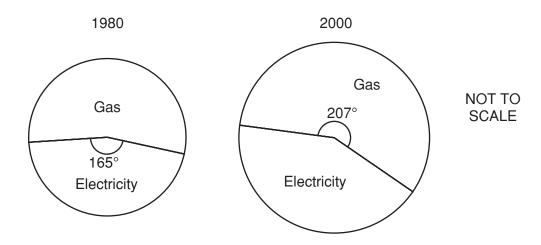**(iii)** Describe how the students could be selected using this method. [2]

[Turn over

4 The pie charts drawn below show the amounts spent by a householder on gas and electricity for the years 1980 and 2000.
The radii of the circles are 3 cm and 4 cm respectively.
In 1980 the total bill for the householder was $288.

1980　　　　　　　　　　2000

Gas

165°
Electricity

Gas
207°

Electricity

NOT TO SCALE

Calculate, giving your answers to the nearest $,

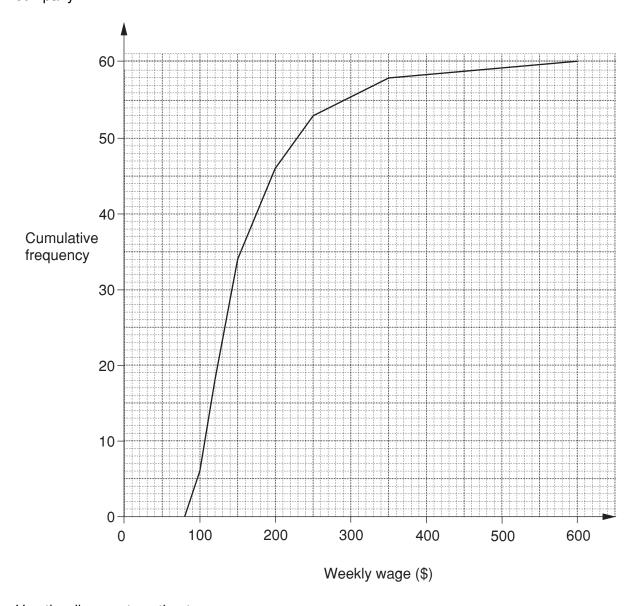**(i)** the amount spent on electricity in 1980, [2]

(ii) the total amount spent on gas and electricity in 2000, [2]

(iii) the amount spent on electricity in 2000. [2]

5 In a class test the marks of 10 pupils were

5　　4　　10　　3　　3　　4　　7　　4　　6　　5.

Find, for this distribution of marks,

(i) the mean, [1]

(ii) the mode, [1]

(iii) the median, [1]

(iv) the range. [1]

6 The cumulative frequency polygon below shows the weekly wage of 60 women working for a company.

Weekly wage ($)

Use the diagram to estimate

(i) the proportion of women earning a weekly wage of more than $320,   [2]

(ii) the median weekly wage,   [1]

(iii) the range between the 10th and the 90th percentile of the weekly wage.   [3]

The range between the 10th and the 90th percentile of the weekly wage for the men working for the same company was $240.

(iv) Using this information, describe briefly how the wages are different for the men and women working for this company.   [1]

Section B [64 marks]

Answer not more than **four** of the questions 7 to 11.

Each question in this section carries 16 marks.

7   The number of hours worked by 800 employees in a large factory during one week is shown in the table below.

Number of hours (t)	Number of employees
$25 \leqslant t < 35$	120
$35 \leqslant t < 40$	140
$40 \leqslant t < 45$	320
$45 \leqslant t < 50$	130
$50 \leqslant t < 60$	90

(i)   Copy and complete the following cumulative frequency table.

Number of hours	Cumulative frequency
$t < 35$	
$t < 40$	
$t < 45$	
$t < 50$	
$t < 60$	

[1]

(ii)   Using 2 cm to represent 5 hours on the horizontal axis, starting at 25 hours, and 2 cm to represent 100 employees on the vertical axis, draw on graph paper a cumulative frequency **polygon** to illustrate the distribution of the number of hours worked by the employees.   [4]

(iii)   Use your graph to estimate, for the number of hours worked by the employees,

   (a)   the lower quartile,   [1]

   (b)   the median,   [1]

   (c)   the upper quartile,   [1]

   (d)   the interquartile range.   [1]

(iv)   Estimate the number of employees who worked more than 54 hours.   [2]

Exactly 35% of the employees worked less than T hours.

(v)   Using your graph, find the value of T.   [2]

An employee is selected at random from the 800 employees.

(vi)   Calculate, correct to 2 decimal places, the probability that this employee worked between 37.5 hours and 47.5 hours that week.   [3]

8 The maximum daily temperature, in °C, was recorded throughout the month of April. The results are shown in the table below.

Temperature (T°C)	Number of days
$4 < T \leqslant 10$	6
$10 < T \leqslant 12$	6
$12 < T \leqslant 14$	8
$14 < T \leqslant 17$	6
$17 < T \leqslant 21$	4

(i) Calculate, showing your working and giving your answers correct to 1 decimal place, an estimate of

   (a) the mean temperature, [2]

   (b) the standard deviation. [4]

(ii) Using 2 cm to represent 2 °C on the horizontal axis, starting at 4 °C, and a column of height 8 cm to represent the $12 < T \leqslant 14$ temperature group, draw on graph paper a histogram to illustrate the distribution of the daily temperature for April. [5]

(iii) Write down the modal class of the distribution. [1]

(iv) Estimate, correct to 1 decimal place, the percentage of days having a temperature greater than 15 °C. [2]

For the month of June, the mean maximum daily temperature was 14.9 °C and the standard deviation was 2.7 °C.

(v) Make two comments on the differences between the figures for June and the corresponding figures for April. [2]

[Turn over

9 Mrs Brown often travels by taxi to visit her friends. The details of her journeys for 10 visits are shown below, the distances being given correct to 1 decimal place.

Distance travelled (x km)	2	3.5	4.5	5	6.5	7	8	8.5	9	10
Cost (y cents)	380	440	550	580	650	680	750	780	810	880

(i) Using 2 cm to represent 1 km on the horizontal axis and 2 cm to represent 100 cents on the vertical axis, plot on graph paper a scatter diagram of cost, y, against distance travelled, x.

[5]

(ii) By calculating and plotting $(\bar{x}, \bar{y})$ and the two semi-averages, draw the line of best fit. [6]

(iii) Use your line of best fit to estimate, to the nearest 10 cents, the cost of travelling 6 km. [1]

(iv) Obtain the equation of your line of best fit in the form $y = mx + c$, giving your values of m and c to the nearest integer (whole number). [3]

(v) Give an interpretation for the value of c in your equation. [1]

10 **(a)** The information in the table below, which is incomplete, relates to town *R* in the year 1995.

Age group	Population	Number of deaths	Death rate
0 – 20	25 000	275	
21 – 40	20 000		8 per 1000
41 and over		525	15 per 1000

Calculate

(i) the death rate for the 0 – 20 age group, [1]

(ii) the number of deaths in the 21 – 40 age group, [1]

(iii) the population in the 41 and over age group, [1]

(iv) the crude death rate of town *R*. [3]

The standard population for the region of which town *R* is a part is shown below.

      0 – 20   40%

      21 – 40   35%

   41 and over   25%

(v) Calculate the standardised death rate for town *R*. [3]

Town *S* has a crude death rate of 10.8 per thousand and a standardised death rate of 12.5 per thousand.

(vi) State, with a reason, which town offers the better chance of a longer life. [1]

(b) Jomo played four games in a competition. In three of the games he scored 7 points, 9 points and 12 points respectively. In the other game he scored no points.

(i) Calculate his mean score over the four games. [1]

Sandra only played two games. Her mean score was 8 points and the range of her scores was 6 points.

(ii) Calculate the points Sandra scored in each of her two games. [2]

Kevin played three games. His mean score was 8 points and the range of his scores was 5 points.

(iii) Calculate the points Kevin could have scored in each of his three games. [3]

[Turn over

11 (a) The 32 pupils in group 11J are classified by gender, hair colour and eye colour. The diagram below shows, for example, that 5 boys have fair hair and blue eyes, and 3 girls do not have fair hair and do not have blue eyes.

```
                    Blue eyes                 Not blue eyes
        ┌──────────────────────────┬──────────────────────────┐
        │ 1                        │                        4 │
        │          ┌ ─ ─ ─ Fair ─ ─┼ hair ─ ─ ─ ─ ─ ─ ─┐     │
        │          │ 5            │              7     │     │
 Boys   │          │              │                    │     │
        │          │              │                    │     │
        ├──────────┼──────────────┼────────────────────┼─────┤
        │          │              │                    │     │
        │          │ 8            │              4     │     │
        │          └ ─ ─ ─ ─ ─ ─ ─┼ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┘     │
 Girls  │                        │                        │
        │ 0                      │                        3 │
        └──────────────────────────┴──────────────────────────┘
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(i) Calculate the probability that a pupil chosen at random has fair hair. [1]

A girl is chosen at random.

(ii) Calculate the probability that she does not have blue eyes. [2]

A pupil with fair hair is chosen at random.

(iii) Calculate the probability that the pupil has blue eyes. [2]

(b) Mr Singh drives to work. On his way to work he has to cross two sets of traffic lights. The probability of having to stop at the first set of traffic lights is 0.4 and the probability of having to stop at the second set of traffic lights is 0.8.

Calculate

(i) the probability that he will have to stop at both sets of traffic lights, [2]

(ii) the probability that he will have to stop at only one set of traffic lights. [3]

(c) Bag X contains 8 blue counters and 5 red counters.
Bag Y contains 9 blue counters and 6 red counters.

A counter is selected at random from Bag X and placed in Bag Y. A second counter is **then** selected at random from Bag Y and then placed in Bag X.

Calculate the probability that the number of blue counters and red counters in Bag X and in Bag Y remains unchanged after the two selections. [6]

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