UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

6222928343O

STATISTICS **4040/11**

Paper 1 **October/November 2011**

2 hours 15 minutes

Candidates answer on the question paper.

Additional Materials: Mathematical tables
Pair of compasses
Protractor

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a soft pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions in Section A and not more than **four** questions from Section B.
If working is needed for any question it must be shown below that question.
The use of an electronic calculator is expected in this paper.

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.

This document consists of **17** printed pages and **3** blank pages.

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Section A [36 marks]

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

1 In a biological experiment, a scientist measured the heights of a large number of plants. She calculated the following statistical measures for the heights.

Median	12.3 cm
Lower quartile	7.9 cm
Upper quartile	16.5 cm
90th percentile	18.1 cm

(i) Write down the percentage of plants whose height is

(a) less than 12.3 cm,

.....[1]

(b) more than 7.9 cm,

.....[1]

(c) between 16.5 cm and 18.1 cm,

.....[1]

(d) less than 7.9 cm or more than 18.1 cm.

.....[1]

(ii) Using the above information, state whether you would expect the mean of this distribution to be about the same as the median, smaller than the median, or larger than the median. Explain briefly the reason for your answer.

.....

.....

.....[2]

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2 In a school class there are 10 boys and 20 girls. The teacher selects a sample of 6 pupils from the class.

(i) In each case, write down the **one** word which best describes the method of sampling used if she

(a) selects every 5th pupil from the class register,

.....[1]

(b) selects 2 of the boys and 4 of the girls at random from the class register,

.....[1]

(c) selects the first 3 boys and the first 3 girls who arrive for a lesson.

.....[1]

Having selected the sample, the teacher collects data from each pupil by asking three questions.

A How many brothers and sisters do you have?

B Is there a computer in your home?

C How much time did you spend doing your homework yesterday?

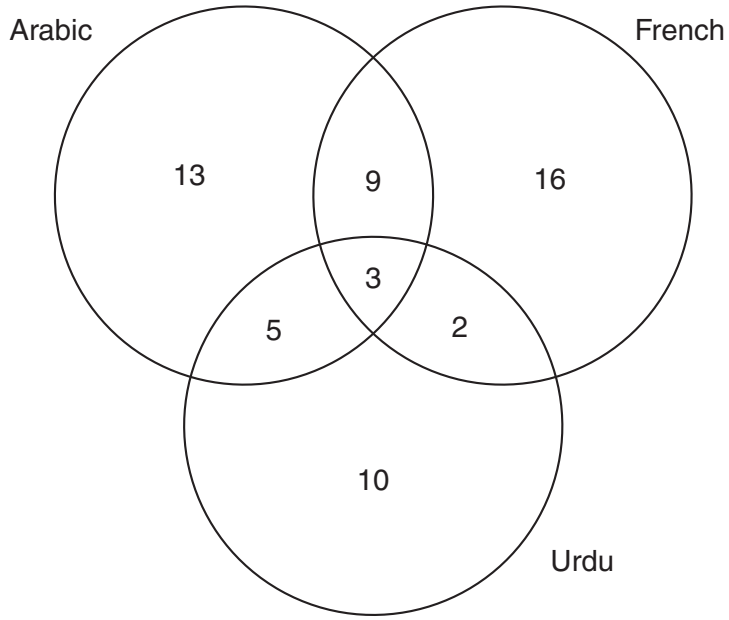
(ii) In each case, state whether the data obtained from these questions is either qualitative or quantitative, and is either discrete or continuous.

For *A*, ... and .....

For *B*, ... and .....

For *C*, ... and ..... [3]

3 The diagram below shows the number of people at an international conference who speak one or more of the languages Arabic, French and Urdu.



Use this information to find the number of people who speak

(i) Arabic,

.....[1]

(ii) Urdu and French but not Arabic,

.....[1]

(iii) French and Urdu,

.....[1]

(iv) exactly two of these languages,

.....[1]

(v) Arabic or Urdu (or both).

.....[2]

4 For a particular type of canned food, the nominal mass of food in the can (the mass written on the can) is 450 g. A sample of 8 cans was chosen, and the actual mass of food in each can was measured accurately. The following results (in grams) were obtained.

452.3 451.6 448.5 450.0 451.9 449.3 453.2 447.1

(i) **Using an assumed mean equal to the nominal mass**, find the mean and standard deviation of these values.

Mean = ...

Standard deviation = ...[4]

(ii) The empty cans each have a mass of 180.0 g. Write down the mean and standard deviation of the **total** mass of these cans of food.

Mean = ...

Standard deviation = ...[2]

5 In a game, a turn involves throwing an unbiased six-sided dice with faces numbered 1 to 6, and, if a 6 is thrown, a disc is chosen from a bag containing 1 black disc and 3 white discs.

Selections from the bag are made **with replacement**, and the person who chooses the black disc wins the game.

Carlo and Dean throw alternately, with Carlo throwing first.

Find the probability that

(i) Carlo does not choose a disc from the bag on his first turn,

.....[1]

(ii) Carlo does not win on his first turn,

.....[2]

(iii) Dean wins on his second turn.

.....[3]

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6 A team composed of equal numbers of men and women enters an athletics competition. In each event it is possible to win a gold, silver or bronze medal. The team wins 25 medals, of which 3 are gold, as shown in the following table.

	Medals won by men	*Medals won by women*	TOTAL
Gold			3
Silver			
Bronze			
TOTAL			25

(i) The team wins equal numbers of silver and bronze medals. Use this information to insert two numbers into the table.

[1]

(ii) The women win one more medal than the men. Use this information to insert two more numbers into the table.

[1]

(iii) The women win only one gold medal, but they win twice as many silver medals as bronze medals. Use this information to complete the table.

[2]

(iv) The head coach has a method of assessing performance overall by counting 4 points for a gold medal, 2 points for a silver medal, and 1 point for a bronze medal. Using this method, and showing all your working, find who have performed better, the men or the women.

.....[2]

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Section B [64 marks]

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

Each question in this section carries 16 marks.

7 In this question give your answers either as fractions, or as decimals correct to 3 significant figures.

In a hotel there are 25 rooms. The following table shows the number of guests staying in these rooms on one particular night.

Number of guests	0	1	2	3	4
Number of rooms	3	4	12	5	1

For example, 5 rooms each have 3 guests staying in them.

(i) Find the total number of guests staying in the hotel on this night.

.....[3]

(ii) The hotel manager chooses a room at random to check the standard of cleaning. Find the probability that

(a) it is an unoccupied room,

.....[1]

(b) it has at most 3 guests staying in it.

.....[2]

(iii) The manager chooses a guest at random to ask if they like their room. Find the probability that this guest is staying in a room

(a) with 2 other guests,

.....[3]

(b) with at least 2 other guests.

.....[3]

(iv) The manager chooses two guests at random. Find the probability that they are staying in the same room.

.....[4]

8 A travel company collected data on the ages, x years, of the people who booked holidays with the company. The results were formed into the following grouped frequency distribution.

Age, x (years)	*Number of people*			
20 – under 25	7			
25 – under 35	16			
35 – under 40	12			
40 – under 45	14			
45 – under 60	21			
60 – under 80	10			

(i) Estimate, to 3 significant figures, the mean and the standard deviation of the ages of the people who booked holidays with the company.

Mean = ...

Standard deviation = ...[8]

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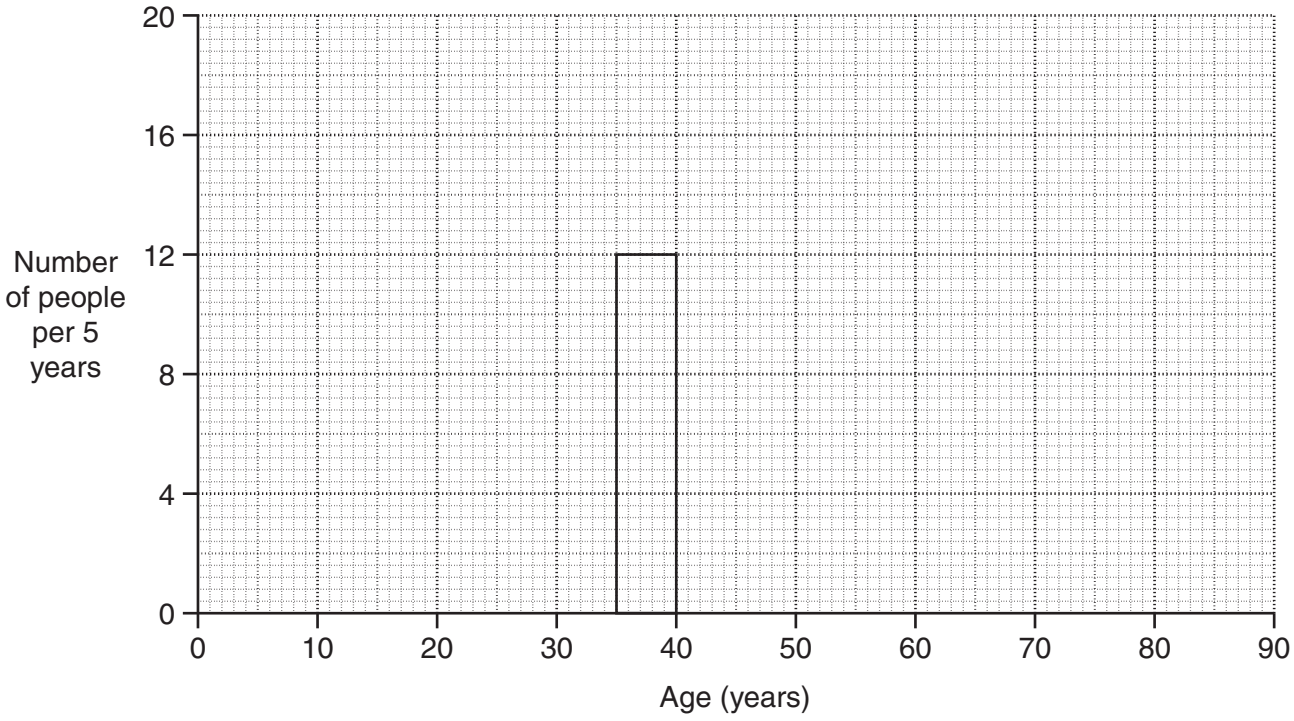
(ii) On the following grid draw a histogram to illustrate the data in the table above. The rectangle representing the 35 – under 40 class has already been drawn for you.



[5]

(iii) On the same grid, draw a frequency polygon to represent the data. [1]

(iv) One year later the company repeated the research and found that the mean and standard deviation of the ages were now 40.7 years and 16.1 years respectively. Explain briefly what these values tell you about how the ages of people booking holidays had changed.

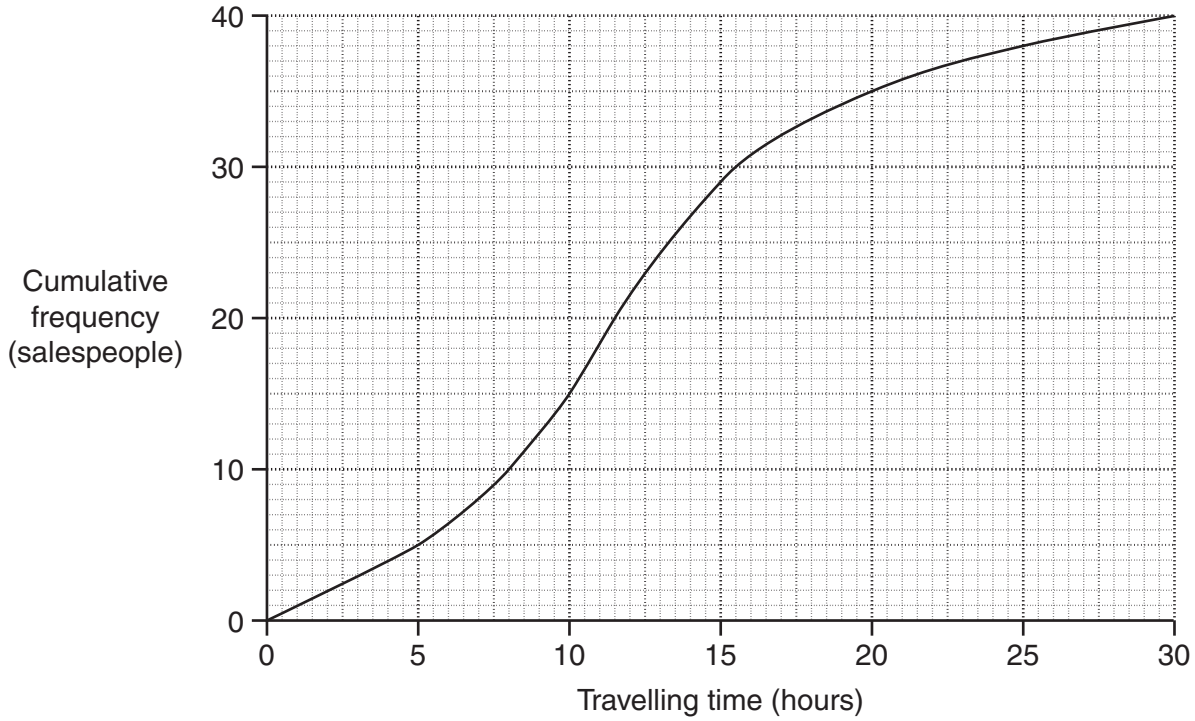
.....

.....

.....

.....[2]

9 A large company recorded the time spent travelling in one particular week by the 40 people in its sales team. These times are illustrated in the cumulative frequency curve below.



(i) Use the graph to estimate

(a) the median of the travelling times,

..... hours [1]

(b) the interquartile range of the travelling times,

..... hours [4]

(c) the 80th percentile of the travelling times.

..... hours [2]

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(ii) Use the graph to estimate the number of salespeople who spent more than 12.5 hours travelling.

.....[3]

Because of the expense, the company wanted to reduce the time spent by its salespeople in travelling. The sales team were given a training course on using the internet to improve sales techniques. The table below shows the distribution of the team's travelling times in a subsequent week after the training.

Travelling time (hours)	*Number of salespeople*	*Cumulative frequency*
under 5	7	
5 – under 10	13	
10 – under 15	13	
15 – under 20	5	
20 – under 25	2	
25 – under 30	0	

(iii) Enter the cumulative frequencies for this distribution in the table. [1]

(iv) Draw the cumulative frequency curve for this distribution on the same grid as the given cumulative frequency curve. [2]

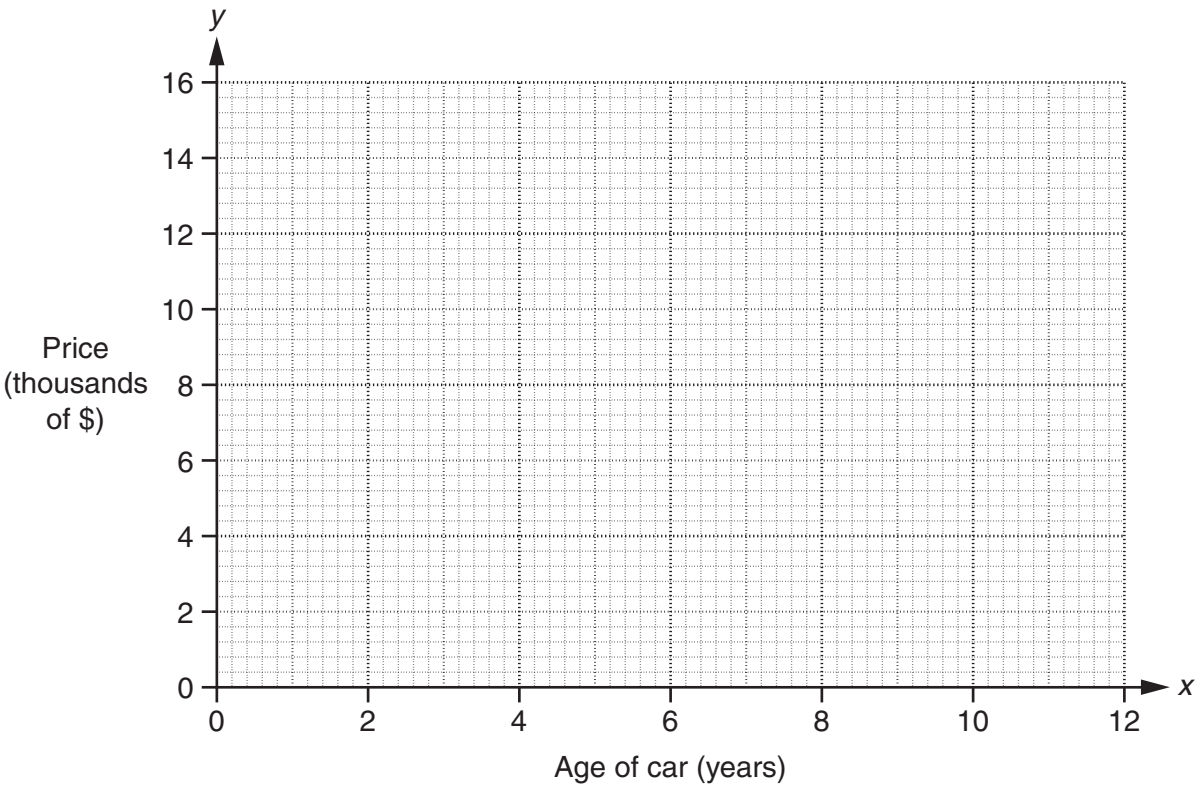
(v) Use your graph to estimate the percentage reduction in the number of salespeople who spent more than 12.5 hours travelling after the training. Give your answer to 2 significant figures.

.....[3]

10 Abdul is considering buying a particular model of new car. To see how well the car will keep its value, he collects information on the price of old cars of this model. The information is given in the following table.

Age of car (years), *x*	1.5	3.0	3.5	4.5	6.25	7.0	8.75	10.0
Price (thousands of $), *y*	13.2	11.8	10.5	9.4	7.0	6.8	4.4	2.6

(i) Draw a scatter diagram of these data on the grid below.



[3]

(ii) Calculate the overall mean and the two semi-averages of the data, and plot them on your graph.

[5]

(iii) Use your plotted averages to draw a line of best fit, and find its equation in the form $y = mx + c$.

.....[4]

(iv) Use your equation to estimate the price of a car of this model which is 5 years old.

$ .....[2]

(v) Interpret the point at which the line of best fit meets the y-axis.

.....

.....

.....[1]

Abdul's friend Bruno also wants to buy a new car, but of a different model. Bruno does a similar investigation on his chosen model of car, and obtains a line of best fit with equation $y = 0.93x + 16.2$.

(vi) Explain briefly why Bruno has probably made a mistake in his calculation.

.....

.....

.....[1]

11 In this question calculate all death rates per thousand. Where values do not work out exactly give your answers to two decimal places.

The table below gives information on the population and deaths in the town of Bosco for the year 2010, together with the standard population of the area in which Bosco is situated.

Age group	*Deaths*	*Population*	*Age group death rate*	*Standard population* (%)
0 – 20	9	3600		18
21 – 50	33	7500		40
51 – 70	45	4000		30
Over 70	63	1750		12

(i) Calculate the crude death rate for Bosco.

.....[4]

(ii) Calculate the death rate for each age group, and insert the values in the table above.

[2]

(iii) Use your results from part **(ii)** to calculate the standardised death rate for Bosco.

.....[4]

Riva and Techno are two other towns in the same area. The table below gives data for these towns, also for 2010.

Town	*Population*	*Crude Death Rate* (per thousand)	*Standardised Death Rate* (per thousand)
Riva	18200	8.79	8.21
Techno	15000	9.60	9.65

(iv) Showing all your working, find which of the three towns experienced the largest number of total deaths in 2010.

.....[3]

(v) State, giving a reason, which of the three towns appears to have the healthiest environment.

.....

.....

.....[2]

(vi) Considering your answers to parts **(iv)** and **(v)** together, explain briefly what has caused this situation to occur.

.....

.....

.....[1]

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