

OXFORD CAMBRIDGE AND RSA EXAMINATIONS

**Advanced Subsidiary General Certificate of Education
Advanced General Certificate of Education**

MEI STRUCTURED MATHEMATICS

4766

Statistics 1

Tuesday 18 JANUARY 2005 Afternoon 1 hour 30 minutes

Additional materials:

- Answer booklet
- Graph paper
- MEI Examination Formulae and Tables (MF2)

TIME 1 hour 30 minutes

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the spaces provided on the answer booklet.
- Answer **all** the questions.
- 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 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.
- Final answers should be given to a degree of accuracy appropriate to the context.
- The total number of marks for this paper is 72.

This question paper consists of 6 printed pages and 2 blank pages.

Section A (36 marks)

- 1 The number of minutes of recorded music on a sample of 100 CDs is summarised below.

Time (t minutes)	$40 \leq t < 45$	$45 \leq t < 50$	$50 \leq t < 60$	$60 \leq t < 70$	$70 \leq t < 90$
Number of CDs	26	18	31	16	9

(i) Illustrate the data by means of a histogram. [5]

(ii) Identify two features of the distribution. [2]

- 2 A sprinter runs many 100-metre trials, and the time, x seconds, for each is recorded. A sample of eight of these times is taken, as follows.

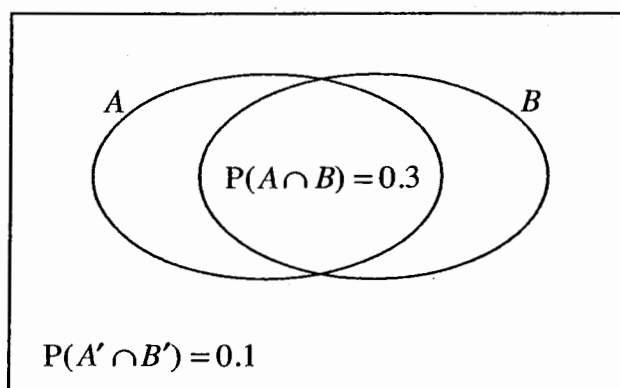
10.53 10.61 10.04 10.49 10.63 10.55 10.47 10.63

(i) Calculate the sample mean, \bar{x} , and sample standard deviation, s , of these times. [3]

(ii) Show that the time of 10.04 seconds may be regarded as an outlier. [2]

(iii) Discuss briefly whether or not the time of 10.04 seconds should be discarded. [2]

- 3 The Venn diagram illustrates the occurrence of two events A and B .



You are given that $P(A \cap B) = 0.3$ and that the probability that neither A nor B occurs is 0.1. You are also given that $P(A) = 2P(B)$.

Find $P(B)$.

[3]

- 4 The number, X , of children per family in a certain city is modelled by the probability distribution $P(X = r) = k(6 - r)(1 + r)$ for $r = 0, 1, 2, 3, 4$.

(i) Copy and complete the following table and hence show that the value of k is $\frac{1}{50}$. [3]

r	0	1	2	3	4
$P(X = r)$	$6k$	$10k$			

(ii) Calculate $E(X)$. [2]

(iii) Hence write down the probability that a randomly selected family in this city has more than the mean number of children. [1]

- 5 A rugby union team consists of 15 players made up of 8 forwards and 7 backs. A manager has to select his team from a squad of 12 forwards and 11 backs.

(i) In how many ways can the manager select the forwards? [2]

(ii) In how many ways can the manager select the team? [3]

- 6 An amateur weather forecaster describes each day as either sunny, cloudy or wet. He keeps a record each day of his forecast and of the actual weather. His results for one particular year are given in the table.

		Weather Forecast			Total
		Sunny	Cloudy	Wet	
Actual Weather	Sunny	55	12	7	74
	Cloudy	17	128	29	174
	Wet	3	33	81	117
Total		75	173	117	365

A day is selected at random from that year.

(i) Show that the probability that the forecast is correct is $\frac{264}{365}$. [2]

Find the probability that

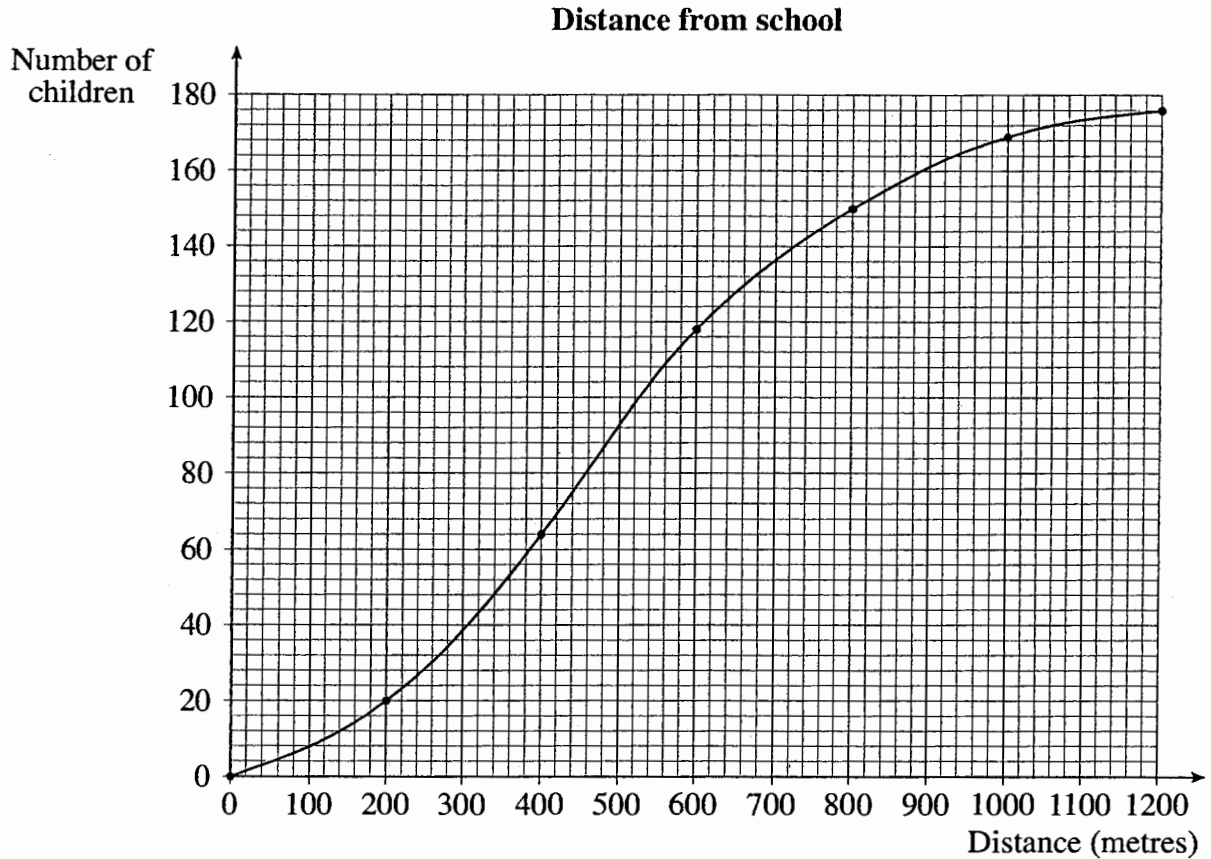
(ii) the forecast is correct, given that the forecast is sunny, [2]

(iii) the forecast is correct, given that the weather is wet, [2]

(iv) the weather is cloudy, given that the forecast is correct. [2]

Section B (36 marks)

- 7 The cumulative frequency graph below illustrates the distances that 176 children live from their primary school.



- (i) Use the graph to estimate, to the nearest 10 metres,
- (A) the median distance from school, [2]
- (B) the lower quartile, upper quartile and interquartile range. [3]
- (ii) Draw a box and whisker plot to illustrate the data. [3]

[Question 7 continues on the next page.]

The graph on page 4 used the following grouped data.

Distance (metres)	200	400	600	800	1000	1200
Cumulative frequency	20	64	118	150	169	176

(iii) Copy and complete the grouped frequency table below describing the same data. [2]

Distance (d metres)	Frequency
$0 < d \leq 200$	20
$200 < d \leq 400$	

(iv) Hence estimate the mean distance these children live from school. [3]

It is subsequently found that none of the 176 children lives within 100 metres of the school.

(v) Calculate the revised estimate of the mean distance. [2]

(vi) Describe what change needs to be made to the cumulative frequency graph. [2]

[Question 8 is printed overleaf.]

- 8** At a doctor's surgery, records show that 20% of patients who make an appointment fail to turn up. During afternoon surgery the doctor has time to see 16 patients.

There are 16 appointments to see the doctor one afternoon.

(i) Find the probability that all 16 patients turn up. [2]

(ii) Find the probability that more than 3 patients do not turn up. [3]

To improve efficiency, the doctor decides to make more than 16 appointments for afternoon surgery, although there will still only be enough time to see 16 patients. There must be a probability of at least 0.9 that the doctor will have enough time to see all the patients who turn up.

(iii) The doctor makes 17 appointments for afternoon surgery. Find the probability that at least one patient does not turn up. Hence show that making 17 appointments is satisfactory. [3]

(iv) Now find the greatest number of appointments the doctor can make for afternoon surgery and still have a probability of at least 0.9 of having time to see all patients who turn up. [4]

A computerised appointment system is introduced at the surgery. It is decided to test, at the 5% level, whether the proportion of patients failing to turn up for their appointments has changed. There are always 20 appointments to see the doctor at morning surgery. On a randomly chosen morning, 1 patient does not turn up.

(v) Write down suitable hypotheses and carry out the test. [7]