

Oxford Cambridge and RSA Examinations

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

MEI STRUCTURED MATHEMATICS
STATISTICS 1 S1

4766

Specimen Paper

Additional materials: Answer booklet
Graph paper
MEI Examination Formulae and Tables (MF 2)

TIME 1 hour 30 minutes

INSTRUCTIONS TO CANDIDATES

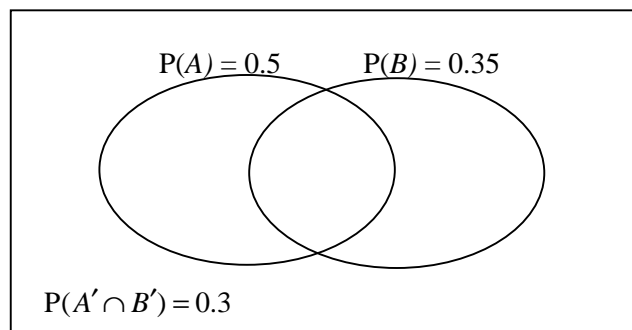
- Write your name, Centre number and candidate number in the spaces provided on the answer booklet.
- Answer **all** the questions.
- You **may** use a graphical or scientific calculator in this paper.

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**.

Section A (30 marks)

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



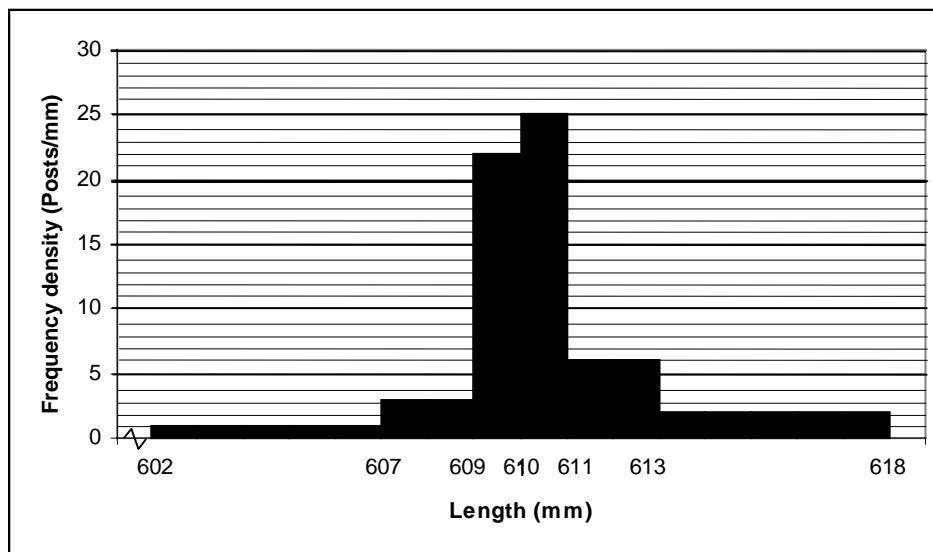
You are given these probabilities:

that A occurs	0.5,
that B occurs	0.35,
that neither A nor B occurs	0.3.

Find the probability that both A and B occur.

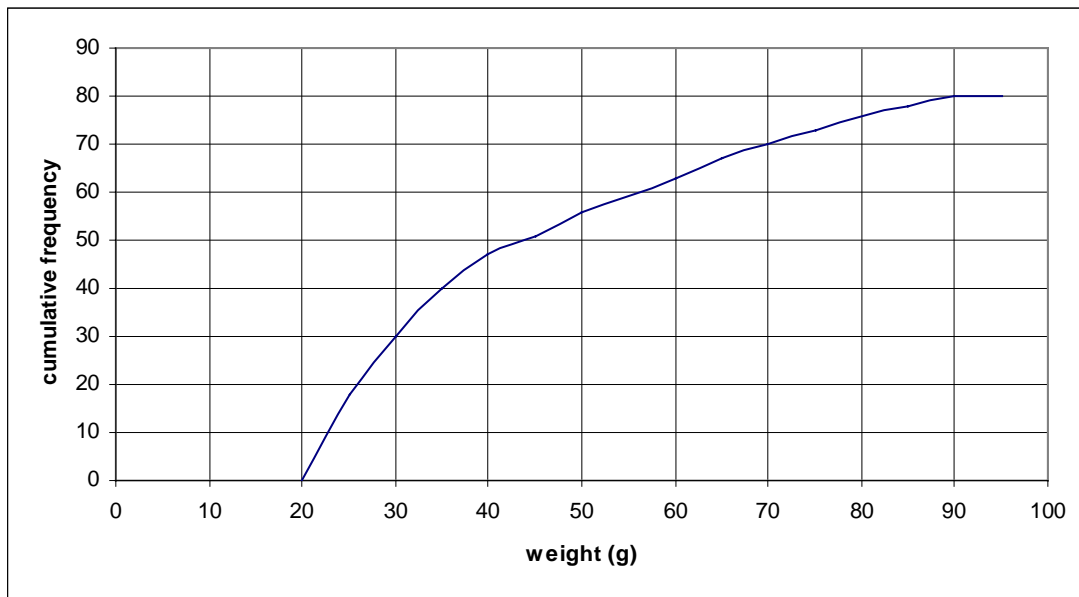
[3]

- 2 A sawmill cuts wooden posts which should be 610 mm long. They measure the lengths of a sample of 80 posts. Their lengths are illustrated in the histogram below.



- (i) State the number of posts in each of the classes used in the histogram. [3]
- (ii) What can you say about the range of the lengths of the posts in the sample? [1]
- (iii) Without doing any further calculations, explain why an estimate of the mean will be greater than 610 mm. [2]
- 3 In a group of 36 blood donors, 16 are male and 20 are female. Four of these people are chosen at random for an interview.
- (i) In how many ways can they be chosen? [2]
- (ii) Find the probability that they are all of the same sex. [3]

- 4 As part of a survey of fish stocks in a river, 80 specimens of a particular type of fish are trapped and weighed.
The results are shown on the cumulative frequency graph below.



- (i) Find the median and quartiles of the distribution. [2]
- (ii) Draw a box and whisker plot to illustrate the distribution. [2]
- (iii) Comment on the shape of the distribution and draw a rough sketch of it. [3]

- 5 A train operating company does a survey of the time-keeping of a particular train over the working days in two weeks.
The results for this sample are shown in Table 5.1 below.

	Monday	Tuesday	Wednesday	Thursday	Friday
Week 1	0	2	3	0	5
Week 2	6	1 early	32	0	3

Table 5.1: Minutes late

- (i) Calculate:
- (A) the mean; [1]
- (B) the root mean square deviation; [2]
- (C) the standard deviation. [1]

of these data.

- (ii) Use your results from part (i) to justify classifying the figure for Week 2 Wednesday as an outlier. [2]

- (iii) The delay on Week 2 Wednesday was caused by a security alert.
The train operating company says this was not their fault and so removes the outlier from the data set.
What effect does this have on the mean and standard deviation? [2]

- 6 The number, X , of occupants of cars coming into a city centre is modelled by the probability distribution $P(X = r) = \frac{k}{r}$ for $r = 1, 2, 3, 4$.

- (i) Tabulate the probability distribution and determine the value of k . [3]
- (ii) Calculate $E(X)$ and $\text{Var}(X)$. [4]

Section B (36 marks)

- 7 Wendy is an amateur weather forecaster.
She classifies the weather on a day as either wet or fine.
From past records she suggests that:
- if a day is wet then the probability that the next day is wet is 0.5,
 - if a day is fine then the probability that the next day is fine is 0.8.
- In a particular week, it is wet on Monday.
- (i) Draw a probability tree diagram for wet or fine days on Tuesday, Wednesday and Thursday. [4]
- (ii) Find the probability that Tuesday, Wednesday and Thursday all have the same weather. [3]
- (iii) Find the probability that the weather is wet on Thursday. [4]
- (iv) Find the probability that it is fine on Tuesday and wet on Thursday. [3]
- (v) Given that it is wet on Thursday, find the conditional probability that it was fine on Tuesday. [3]

8 A police road-safety team examines the tyres of a large number of commercial vehicles. They find that 17% of lorries and 20% of vans have defective tyres.

(i) Six lorries are stopped at random by the road-safety team. Find the probability that:

- (A)** none of the lorries has defective tyres, [2]
- (B)** exactly two lorries have defective tyres, [3]
- (C)** more than two lorries have defective tyres. [3]

Following a road-safety campaign to reduce the proportion of vehicles with defective tyres, 18 vans are stopped at random and their tyres are inspected.

Just one of the vans has defective tyres.

You are to carry out a suitable hypothesis test to examine whether the campaign appears to have been successful.

- (ii)** State your hypotheses clearly, justifying the form of the alternative hypothesis. [3]
- (iii)** Carry out the test at the 5% significance level, stating your conclusions clearly. [4]
- (iv)** State, with a reason, the critical value for the test. [2]
- (v)** Give a level of significance such that you would come to the opposite conclusion for your test. Explain your reasoning. [2]