

Please check the examination details below before entering your candidate information

Candidate surname

Other names

Pearson Edexcel
Level 3 GCE

Centre Number

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Candidate Number

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Sample Assessment Material

(Time: 1 hour 30 minutes)

Paper Reference **9FM0/3B**

Further Mathematics
Advanced
Paper 3B: Further Statistics 1

You must have:

Mathematical Formulae and Statistical Tables, calculator

Total Marks

Candidates may use any calculator permitted by Pearson regulations. Calculators must not have the facility for algebraic manipulation, differentiation and integration, or have retrievable mathematical formulae stored in them.

Instructions

- Use **black** ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B).
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions and ensure that your answers to parts of questions are clearly labelled.
- Answer the questions in the spaces provided
– *there may be more space than you need.*
- You should show sufficient working to make your methods clear. Answers without working may not gain full credit.
- Answers should be given to three significant figures unless otherwise stated.

Information

- A booklet 'Mathematical Formulae and Statistical Tables' is provided.
- There are 7 questions in this question paper. The total mark for this paper is 75.
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

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Answer ALL questions. Write your answers in the spaces provided.

1. In a randomly selected week, a camera recorded the number of speeding drivers on a particular stretch of motorway.

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Frequency	35	30	28	24	40	51	37

Jeremy believes drivers are equally likely to be recorded speeding on any day of the week.

Carry out a hypothesis test, at the 5% level of significance, to see if the data support Jeremy's belief.

You should state your hypotheses, the degrees of freedom and the critical value used for this test.

(8)

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Question 1 continued

Lined writing area for the answer to Question 1.

(Total for Question 1 is 8 marks)



3. Tim and Sue are each typing a manuscript and they make errors at random.

On average, Tim makes 0.45 errors per page and Sue makes 0.2 errors per page.

A random sample of n pages of Tim's typing is taken. The probability that these n pages contain no errors is less than 0.05

(a) Find the smallest possible value of n . (3)

The random variable X represents the total number of errors in a random sample of 5 pages of Tim's typing and 5 pages of Sue's typing.

(b) Find $P(X = 2)$, stating a necessary assumption. (3)

Random samples, each consisting of 5 pages of Tim's typing and 5 pages of Sue's typing, are selected.

(c) Find the probability that in 10 of these samples there are at least 2 with no errors. (4)

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4. The discrete random variable $X \sim B(n, p)$ has probability generating function given by

$$G_x(t) = (0.4 + 0.6t)^2$$

(a) Write down the value of n and the value of p (2)

Using the probability generating function, find

(b) (i) $P(X = 1)$ (2)

(ii) $E(X)$ (3)

Two independent observations, X_1 and X_2 , are taken from the distribution of X
 The random variable $Y = X_1 + X_2$

(c) Use calculus to show that $E(Y^2) = 6.72$ (7)

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Question 5 continued

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Question 5 continued

Lined writing area for the answer.

(Total for Question 5 is 9 marks)

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6. The weights of bars of soap are known to be normally distributed.

The standard deviation of the weights is 3 grams.

A label on the bars of soap states that the mean weight is 120 grams.

Gizel believes that the mean weight of the bars of soap is greater than 120 grams. She takes a random sample of 10 bars of soap and finds the mean weight of her sample.

Gizel then tests, at the 5% level of significance, whether there is evidence that the bars of soap weigh more than 120 grams.

(a) Write down the probability of a Type I error. (1)

Given that the true mean weight of the bars of soap is 122 grams,

(b) show that the power of Gizel's test is 0.68 to 2 significant figures. (5)

Alex decides to carry out the same test at the 1% level of significance.

(c) Without carrying out the test, compare the power of Alex's test with the power of Gizel's test. Give a reason for your answer. (2)

Joseph decides to increase the sample size and carry out the test at the 5% level of significance.

Assuming that the true mean weight of the bars of soap is 122 grams, (d) calculate the smallest sample size that will produce a power of at least 0.9 (5)

(e) State which of Gizel's and Joseph's tests should be used. Give a reason for your answer. (2)

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Question 6 continued

Lined writing area for the answer.

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Question 6 continued

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