

Write your name here

Surname

Other names

Pearson Edexcel
Level 3 GCE

Centre Number

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Candidate Number

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Further Mathematics

Advanced Subsidiary
Further Mathematics options
23: Further Statistics 1
(Part of options B, E, F and G)

Thursday 17 May 2018 – Afternoon

Paper Reference

8FM0-23

You must have:

Mathematical Formulae and Statistical Tables, calculator

Total Marks

Candidates may use any calculator allowed by the regulations of the Joint Council for Qualifications. Calculators must not have the facility for symbolic algebra 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.
- The total mark for this part of the examination is 40. There are 4 questions.
- 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. A researcher is investigating the distribution of orchids in a field. He believes that the Poisson distribution with a mean of 1.75 may be a good model for the number of orchids in each square metre. He randomly selects 150 non-overlapping areas, each of one square metre, and counts the number of orchids present in each square.

The results are recorded in the table below.

| | | | | | | | |
|---|----|----|----|----|----|---|---|
| Number of orchids in each square metre | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| Number of squares | 30 | 42 | 35 | 26 | 11 | 6 | 0 |

He calculates the **expected** frequencies as follows

| | | | | | | | |
|---|-------|-------|-------|-------|-------|------|-------------|
| Number of orchids in each square metre | 0 | 1 | 2 | 3 | 4 | 5 | More than 5 |
| Number of squares | 26.07 | 45.62 | 39.91 | 23.28 | 10.19 | 3.57 | r |

- (a) Find the value of r giving your answer to 2 decimal places. (1)

The researcher will test, at the 5% level of significance, whether or not the data can be modelled by a Poisson distribution with mean 1.75

- (b) State clearly the hypotheses required to test whether or not this Poisson distribution is a suitable model for these data. (1)

The test statistic for this test is 2.0 and the number of degrees of freedom to be used is 4

- (c) Explain fully why there are 4 degrees of freedom. (2)
- (d) Stating your critical value clearly, determine whether or not these data support the researcher's belief. (2)

The researcher works in another field where the number of orchids in each square metre is known to have a Poisson distribution with mean 1.5

He randomly selects 200 non-overlapping areas, each of one square metre, in this second field, and counts the number of orchids present in each square.

- (e) Using a Poisson approximation, show that the probability that he finds at least one square with exactly 6 orchids in it is 0.506 to 3 decimal places. (4)
