

Please check the examination details below before entering your candidate information

Candidate surname

Other names

Centre Number

Candidate Number

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Pearson Edexcel Level 3 GCE

Paper
reference

8FM0/24

Further Mathematics

Advanced Subsidiary

Further Mathematics options

24: Further Statistics 2

(Part of option G only)

You must have:

Mathematical Formulae and Statistical Tables (Green), calculator

Total Marks

Candidates may use any calculator allowed by Pearson regulations. 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.
- Values from statistical tables should be quoted in full. If a calculator is used instead of tables the value should be given to an equivalent degree of accuracy.
- Inexact 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 5 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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Q:1/1/1/



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1. Abena and Meghan are both given the same list of 10 films.

Each of them ranks the 10 films from most favourite to least favourite.

For the differences, d , between their ranks for these 10 films, $\sum d^2 = 84$

- (a) Calculate Spearman's rank correlation coefficient between Abena's ranks and Meghan's ranks. (1)

A test is carried out at the 5% level of significance to see if there is agreement between their ranks for the films.

The hypotheses for the test are

$$H_0 : \rho_s = 0 \quad H_1 : \rho_s > 0$$

- (b) (i) Find the critical region for the test.
 (ii) State the conclusion of the test. (2)

An 11th film is added to the list. Abena and Meghan both agree that this film is their least favourite.

A new test is carried out at the 5% level of significance using the same hypotheses.

- (c) Determine the conclusion of this test. You should state the test statistic and the critical value used. (4)

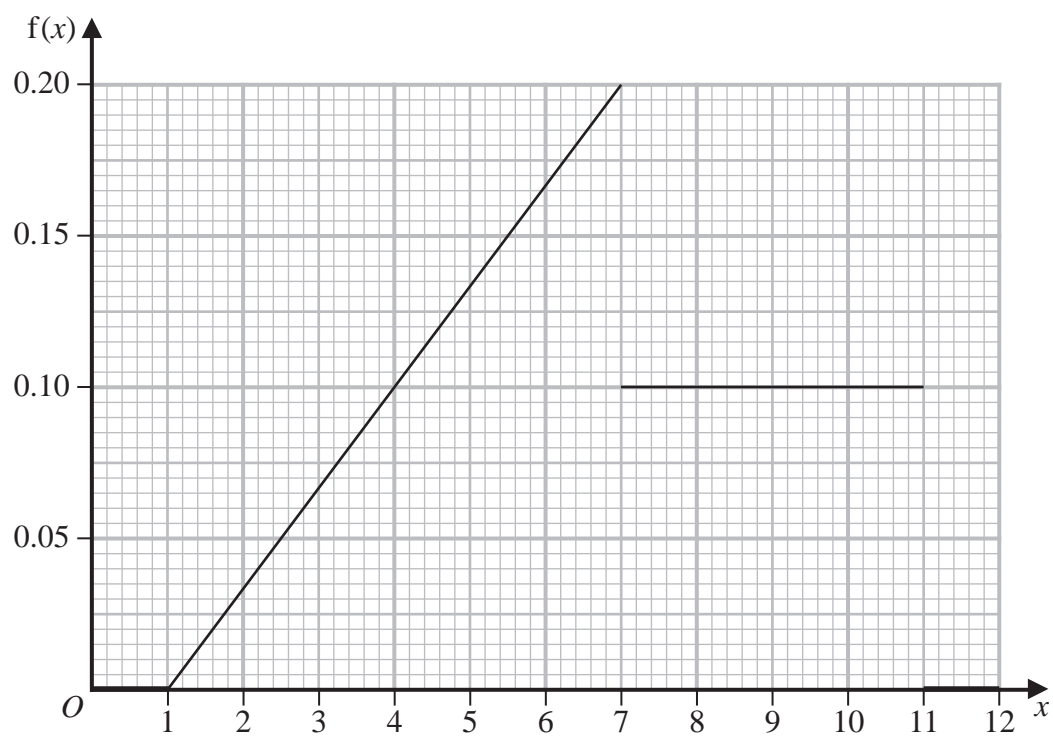
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2. The graph shows the probability density function $f(x)$ of the continuous random variable X



- (a) Find $P(X < 4)$ (2)
- (b) Specify the cumulative distribution function of X for $7 \leq x \leq 11$ (3)

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3. Gabriela is investigating a particular type of fish, called bream. She wants to create a model to predict the weight, w grams, of bream based on their length, x cm.

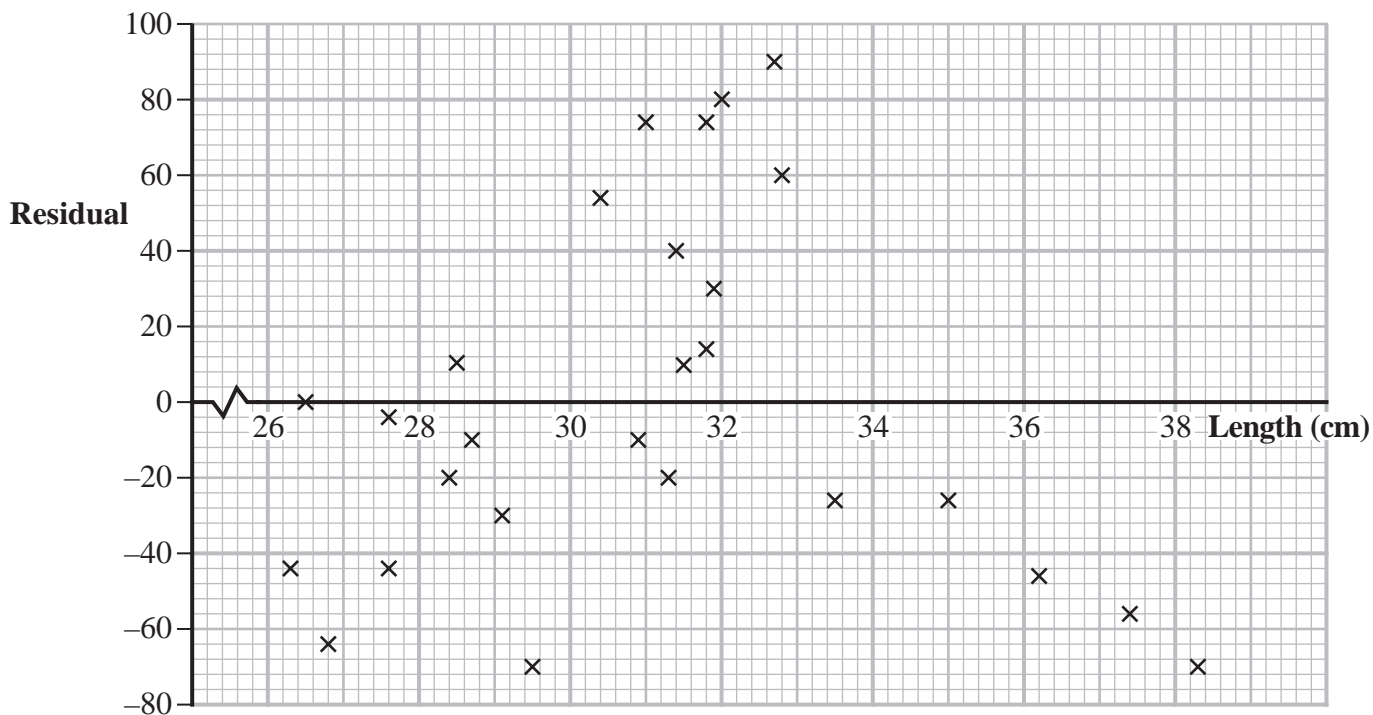
For a sample of 27 bream, some summary statistics are given below.

$$\bar{x} = 31.07 \quad \bar{w} = 628.59 \quad \sum w^2 = 11\,386\,134$$

$$S_{xw} = 13\,082.3 \quad S_{xx} = 260.8$$

- (a) Find the value of the product moment correlation coefficient between x and w (3)
- (b) Explain whether the answer to part (a) is consistent with a linear model for these data. (1)
- (c) Find the equation of the regression line of w on x in the form $w = a + bx$ (3)

A residual plot for these data is shown below.



One of the bream in the sample has a length of 32 cm.

- (d) Find its weight. (2)
- (e) With reference to the residual plot, comment on the model for bream with lengths above 33 cm. (1)

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Question 3 continued

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(Total for Question 3 is 10 marks)



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4. A random variable X has probability density function given by

$$f(x) = \begin{cases} 0.8 - 6.4x^{-3} & 2 \leq x \leq 4 \\ 0 & \text{otherwise} \end{cases}$$

The median of X is m

(a) Show that $m^3 - 3.625m^2 + 4 = 0$ (3)

(b) (i) Find $f'(x)$

(ii) Explain why the mode of X is 4 (2)

Given that $E(X^2) = 10.5$ to 3 significant figures,

(c) find $\text{Var}(X)$, showing your working clearly. (4)

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Question 4 continued

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Lined writing area for the answer.



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Question 4 continued

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(Total for Question 4 is 9 marks)



5. The random variable X has the continuous uniform distribution over the interval $[0.5, 2.5]$

Talia selects a number, T , at random from the distribution of X

(a) Find $P(T < 1)$ (1)

Malik takes Talia's number, T , and calculates his number, M , where $M = \frac{1}{T^2}$

(b) Find the probability that both T and M are less than 2.25 (3)

Raja and Greta play a game many times.
Each time they play they use a number, R , randomly selected from the distribution of X

Raja's score is R

Greta's score is G , where $G = \frac{2}{R^2}$

(c) Determine, giving a reason, who you would expect to have the higher **total score**. (5)

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Question 5 continued

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(Total for Question 5 is 9 marks)**TOTAL FOR FURTHER STATISTICS 2 IS 40 MARKS**