

1. (a) Define a statistic.

(2)

A random sample $X_1, X_2, \dots, X_n$ is taken from a population with unknown mean μ .

- (b) For each of the following state whether or not it is a statistic.

(i) $\frac{X_1 + X_4}{2},$

(1)

(ii) $\frac{\sum X^2}{n} - \mu^2.$

(1)

Q1

(Total 4 marks)



2. The random variable J has a Poisson distribution with mean 4.

(a) Find $P(J \geq 10)$.

(2)

The random variable K has a binomial distribution with parameters $n = 25$, $p = 0.27$.

(b) Find $P(K \leq 1)$.

(3)

Q2

(Total 5 marks)



N 2 3 5 5 6 A 0 3 2 0

- Calculate the probability that this batch contains

- (b) more plants with white flowers than coloured ones. (2)

(c) Find the probability that exactly 3 of these batches contain more plants with white flowers than coloured ones. (3)

(d) Use a suitable approximation to calculate the probability that a batch of 50 plants contains more than 25 plants with white flowers.

(7)



4. (a) State the condition under which the normal distribution may be used as an approximation to the Poisson distribution. (1)

(b) Explain why a continuity correction must be incorporated when using the normal distribution as an approximation to the Poisson distribution. (1)

A company has yachts that can only be hired for a week at a time. All hiring starts on a Saturday.

During the winter the mean number of yachts hired per week is 5.

(c) Calculate the probability that fewer than 3 yachts are hired on a particular Saturday in winter. (2)

During the summer the mean number of yachts hired per week increases to 25.

The company has only 30 yachts for hire.

(d) Using a suitable approximation find the probability that the demand for yachts cannot be met on a particular Saturday in the summer. (6)

In the summer there are 16 Saturdays on which a yacht can be hired.

(e) Estimate the number of Saturdays in the summer that the company will not be able to meet the demand for yachts.

(2)



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blank**Question 4 continued****Q4****(Total 12 marks)**

- (a) Write down the probability density function of X , for all x . (2)

- (b) Given that $E(X) = 2$ and $P(X < 3) = \frac{5}{8}$ find the value of α and the value of β . (4)

$$(c) \ E(X), \tag{1}$$

- (d) the standard deviation of X ,

- (e) the probability that the shorter piece of wire is at most 30 cm long. (3)



- (c) Write down the significance level of this test. (1)

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Question 6 continued



$$F(x) = \begin{cases} 0, & x < 0, \\ 2x^2 - x^3, & 0 \leq x \leq 1, \\ 1, & x > 1. \end{cases}$$

- (a) Find $P(X > 0.3)$. (2)
- (b) Verify that the median value of X lies between $x = 0.59$ and $x = 0.60$. (3)
- (c) Find the probability density function $f(x)$. (2)
- (d) Evaluate $E(X)$. (3)
- (e) Find the mode of X . (2)
- (f) Comment on the skewness of X . Justify your answer. (2)

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