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1. (a) Define a statistic.

(2)

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

(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)

Lined area for student response.

(Total 4 marks)

Q1

Grade box





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3. For a particular type of plant 45% have white flowers and the remainder have coloured flowers. Gardenmania sells plants in batches of 12. A batch is selected at random.

Calculate the probability that this batch contains

- (a) exactly 5 plants with white flowers, (3)
- (b) more plants with white flowers than coloured ones. (2)

Gardenmania takes a random sample of 10 batches of plants.

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

Due to an increasing demand for these plants by large companies, Gardenmania decides to sell them in batches of 50.

(d) Use a suitable approximation to calculate the probability that a batch of 50 plants contains more than 25 plants with white flowers. (7)

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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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