1. Explain what you understand by

(a) a population,

(1)

(b) a statistic.

(1)

A researcher took a sample of 100 voters from a certain town and asked them who they would vote for in an election. The proportion who said they would vote for Dr Smith was 35%.

(c) State the population and the statistic in this case.

(2)

(d) Explain what you understand by the sampling distribution of this statistic.

(1)

7. A bag contains a large number of coins. It contains only 1p and 2p coins in the ratio $1:3$

   (a) Find the mean μ and the variance σ^2 of the values of this population of coins.

             (3)

   A random sample of size 3 is taken from the bag.

   (b) List all the possible samples.

             (2)

   (c) Find the sampling distribution of the mean value of the samples.

             (6)

3. A random sample $X_1, X_2, \ldots X_n$ is taken from a population with unknown mean μ and unknown variance σ^2. A statistic Y is based on this sample.

(a) Explain what you understand by the statistic Y.

(2)

(b) Explain what you understand by the sampling distribution of Y.

(1)

(c) State, giving a reason which of the following is **not** a statistic based on this sample.

(i) $\sum_{i=1}^{n} \dfrac{(X_i - \bar{X})^2}{n}$ (ii) $\sum_{i=1}^{n} \left(\dfrac{X_i - \mu}{\sigma} \right)^2$ (iii) $\sum_{i=1}^{n} X_i^2$

(2)

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1. (a) Explain what you understand by a census.

    (1)

    Each cooker produced at GT Engineering is stamped with a unique serial number. GT Engineering produces cookers in batches of 2000. Before selling them, they test a random sample of 5 to see what electric current overload they will take before breaking down.

    (b) Give one reason, other than to save time and cost, why a sample is taken rather than a census.

    (1)

    (c) Suggest a suitable sampling frame from which to obtain this sample.

    (1)

    (d) Identify the sampling units.

    (1)

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4. A bag contains a large number of coins:

        75% are 10p coins,

        25% are 5p coins.

A random sample of 3 coins is drawn from the bag.
Find the sampling distribution for the median of the values of the 3 selected coins.

(7)

1. (a) Define a statistic.

   (2)

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

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

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

   (1)

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

   (1)

1. Before introducing a new rule the secretary of a golf club decided to find out how members might react to this rule.

   (a) Explain why the secretary decided to take a random sample of club members rather than ask all the members.

   (1)

   (b) Suggest a suitable sampling frame.

   (1)

   (c) Identify the sampling units.

   (1)

1. A factory produces components. Each component has a unique identity number and it is assumed that 2% of the components are faulty. On a particular day, a quality control manager wishes to take a random sample of 50 components.

   (a) Identify a sampling frame.

   (1)

   The statistic F represents the number of faulty components in the random sample of size 50.

   (b) Specify the sampling distribution of F.

   (2)

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