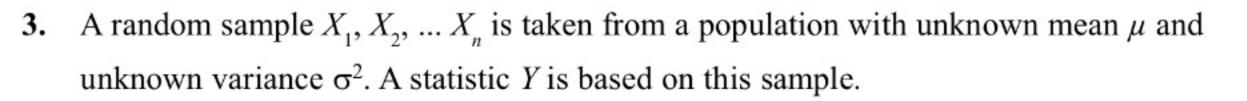
| 1. | Explain what you understand by |
|----|---|
| | (a) a population, (1) |
| | (b) a statistic. |
| | A researcher took a sample of 100 voters from a certain town and asked them who they would vote for in an election. The proportion who said they would vote for Dr Smith was 35%. |
| | (c) State the population and the statistic in this case. (2) |
| | (d) Explain what you understand by the sampling distribution of this statistic. (1) |
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| 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) |
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- (a) Explain what you understand by the statistic Y.
- (b) Explain what you understand by the sampling distribution of Y.
- (c) State, giving a reason which of the following is not a statistic based on this sample.

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

(2)

(1)

| 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 tes 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 that a census. | har |
| | | (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) |
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1. (a) Define a statistic.

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

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

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

∑ --- ²

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

n (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. | | |
| | (b) | Suggest a suitable sampling frame. (1) | | |
| | (c) | Identify the sampling units. (1) | | |
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| 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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