Edexcel Maths S2

Topic Questions from Papers

Population & Samples

| Е | explain what you understand by | |
|-----|--------------------------------|-----|
| (8 | a) a sampling unit, | |
| (- | | (1) |
| (ł | o) a sampling frame, | |
| (- | | (1) |
| (0 | e) a sampling distribution. | |
| | | (2) |
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| Bef mer | ore introducing a new rule the secretary of a golf club decided to find out how nbers 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) |
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| | (Total 3 marks) |



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1. (a) Define a statistic.

(2)

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

(1)

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

(1)

Q1

(Total 4 marks)

| | | |] I |
|---|--|---|-----|
| 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. | 4. A bag contains a large number of coin | ns: | |
| 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. | 75% are 10p 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. | | | |
| Find the sampling distribution for the median of the values of the 3 selected 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) |
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| (a) Explain what you understand by a census. | 245 |
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| | (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, a random sample of 5 to see what electric current overload they will take before down. | they test a |
| (b) Give one reason, other than to save time and cost, why a sample is taken a census. | rather than |
| | (1) |
| (c) Suggest a suitable sampling frame from which to obtain this sample. | (1) |
| (d) Identify the sampling units. | (1) |
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- **3.** A random sample $X_1, X_2, ... X_n$ 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)
$$\sum_{i=1}^{n} \frac{(X_i - \overline{X})^2}{n}$$

| (ii) | $\sum_{i=1}^{n}$ | $\left(\underline{X_i - \mu}\right)$ |
|------|------------------|--------------------------------------|
| (11) | | $(\overline{\sigma})$ |

| (iii) | $\sum_{i=1}^{n} X_i^2$ |
|-------|------------------------|
| | i-1 |

(2)

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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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Leave blank Explain what you understand by 1. (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)**



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| | 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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| 6. | A bag contains a large number of balls. | |
| | 65% are numbered 1 | |
| | 35% are numbered 2 | |
| | | |
| | A random sample of 3 balls is taken from the bag. | |
| | Find the sampling distribution for the range of the numbers on the 3 selected balls. (6) | |
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| 1. | A bag contains a large number of counters. A third of the counters have a number 5 on them and the remainder have a number 1. | blank |
| | A random sample of 3 counters is selected. | |
| | (a) List all possible samples. | |
| | (2) | |
| | (b) Find the sampling distribution for the range. (3) | |
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| 1. | A bag contains a large number of 1p, 2p and 5p coins. | | |
| | 50% are 1p coins 20% are 2p coins | | |
| | 30% are 5p coins | | |
| | A random sample of 3 coins is chosen from the bag. | | |
| | (a) List all the possible samples of size 3 with median 5p. | (2) | |
| | (b) Find the probability that the median value of the sample is 5p. | (4) | |
| | (c) Find the sampling distribution of the median of samples of size 3 | (5) | |
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