



H19-test Estimating from Samples (Higher): Test Pack

EDEXCEL 1ST0 · Calculator allowed · about 15 minutes

Total Marks

Name: _____ Date: ____ / ____ / ____

Answer ALL questions. Show all your working.

- 1** A mobile phone network takes a random sample of 80 customers in a city, from its 45000 customers in that city, and asks each one whether they experienced a dropped call last week. 18 of the sample said yes.
- (a) Write down the proportion of the sample who experienced a dropped call last week. (1)

- (b) Use the sample to estimate the number of the network's 45000 customers in the city who experienced a dropped call last week. (2)

(Total for Question 1 is 3 marks)

- 2** For each statement about estimating from samples, write down whether it is True or False.
- (i) Scaling up a sample statistic to estimate a population value relies on the assumption that the sample is representative of the population. (1)
- (ii) If a sample is representative, increasing its size can never improve the accuracy of an estimate. (1)
- (iii) A sample chosen so that every member of the population has an equal chance of being included is more likely to be representative than one chosen by convenience (e.g. asking whoever is nearby). (1)

(Total for Question 2 is 3 marks)

- 3** A wildlife ranger uses the capture-recapture method to estimate the number of otters living along a stretch of river. She catches 18 otters, tags each one, and releases them. Two weeks later she catches a second sample of 24 otters, of which 4 are already tagged.

Capture-recapture formula:

estimated population = (number tagged in 1st catch x total in 2nd catch) / (number tagged in 2nd catch)

Estimate the number of otters living along this stretch of river.

(Total for Question 3 is 3 marks)

- 4** A charity wants to estimate the proportion of a city's 60000 households that recycle food waste. Over one week, three different volunteer teams each survey a different sample of households.

Team	Sample size	Number recycling food waste
Team 1	40	26
Team 2	60	33
Team 3	100	61

- (a) Work out the percentage of each team's sample that recycles food waste, giving each answer to 1 decimal place. (3)
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- (b) Using the sample with the largest number of households sampled, estimate the number of the city's 60000 households that recycle food waste. (2)
- (c) The three teams' percentages range from 55.0% to 65.0%, even though every sample came from the same city. Comment on what this tells you about using a single sample to estimate a population percentage, and suggest what the charity could do to get a more precise estimate. (2)

(Total for Question 4 is 7 marks)

Mark scheme · H19-test Estimating from Samples (Higher): Test Pack

Question 1

- (a) **B1** 18/80 oe (9/40, 0.225) cao
- (a) **Answer: 18/80 (= 9/40)**
- (b) **M1** 18/80 x 45000, oe
- (b) **A1** 10125 cao
- (b) **Answer: 10125**

Question 2

- (i) **B1** True cao
- (i) **Answer: True**
- (ii) **B1** False cao
- (ii) **Answer: False**
- (iii) **B1** True cao
- (iii) **Answer: True**

Question 3

- **M1** 18 x 24 (=432), oe
- **M1** 432 / 4
- **A1** 108 cao
- **Answer: 108**

Question 4

- (a) **B1** Team 1: 65.0% cao
- (a) **B1** Team 2: 55.0% cao
- (a) **B1** Team 3: 61.0% cao
- (a) **Answer: Team 1: 65.0%, Team 2: 55.0%, Team 3: 61.0%**
- (b) **M1** 0.61 x 60000, oe (using Team 3, the largest sample)
- (b) **A1** 36600 cao
- (b) **Answer: 36600**
- (c) **B1** different samples give different estimates purely by chance (sampling error), even though the true percentage for the city's households is fixed, so a single sample estimate should be treated as approximate, not exact, oe
- (c) **B1** the charity could take a much larger sample (or pool/combine all three teams' data into one larger sample) to reduce sampling error and get a more precise estimate, oe
- (c) **Answer: The spread shows sampling error - a single sample estimate is only approximate. Taking a larger or combined sample would reduce this error and improve precision.**