



F09-test Estimating from Samples (Foundation): Test Pack

EDEXCEL 1ST0 · Calculator allowed · about 25 minutes

Total Marks

Name: _____ Date: ____ / ____ / ____

Answer ALL questions. Show all your working.

- 1** A gym manager surveyed a sample of 40 gym members and asked which activity they use most. The results are shown in the table.

Activity	Cardio	Weights	Swimming	Classes
Frequency	14	10	6	10

The gym has 600 members in total.

- (a) Write down the fraction of the sample who said Swimming was the activity they use most. (1)
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- (b) Estimate the number of the gym's 600 members who use Swimming as their most-used activity. (2)

(Total for Question 1 is 3 marks)

- 2** A sample of 25 magazines in a shop found that 5 were sports magazines. Write down the proportion of the sample that were sports magazines, giving your answer as a fraction in its simplest form.

(Total for Question 2 is 1 mark)

- 3** In a sample of 90 commuters, 63 travel to work by car. Work out the proportion of the sample who travel by car, giving your answer as a fraction in its simplest form.

(Total for Question 3 is 2 marks)

- 4** A sample of 8 fish caught from a lake had the following masses, in grams: 340, 355, 350, 345, 360, 348, 352, 350. The lake is estimated to contain 2500 fish of this species.

Work out the mean mass of a fish in the sample, then use your answer to estimate the total mass, in grams, of all 2500 fish in the lake.

(Total for Question 4 is 3 marks)

- 5** A sample of 15 households recorded the weight of recycling, in kg, they put out in one week. The results, in order, were:

3, 4, 4, 5, 5, 6, 6, 7, 8, 9, 9, 10, 11, 12, 14

There are 3000 households in the area.

- (a)** Find the median weekly recycling weight, in kg, for this sample. **(1)**

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- (b)** Use the median to estimate how many of the 3000 households in the area recycle less than 7 kg of waste per week. **(2)**

(Total for Question 5 is 3 marks)

- 6** Three ecology students each estimate the total number of daisies growing on a school field by counting daisies in a number of 1 square metre quadrats, then scaling up.

Sample size (number of quadrats)	2	10	40
Estimate of total daisies on the field	3400	2650	2500

- (a) State which of the three estimates is likely to be the most reliable. (1)
- (b) Explain why using a larger number of quadrats makes the estimate of the total number of daisies more reliable. (2)

(Total for Question 6 is 3 marks)

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- 7** A student is estimating the number of left-handed pupils in a school of 900 pupils, using a sample of 40 pupils in which 6 are left-handed. Here is the student's working:

Proportion of left-handed pupils in the sample = $6/40 = 0.15$

Estimated number of left-handed pupils in the school = $0.15 \times 900 = 135$

- (a) Identify the error in the student's working. (1)
- (b) Work out the correct estimate for the number of left-handed pupils in the school. (2)

(Total for Question 7 is 3 marks)

8 A conservation volunteer wants to estimate the number of bats roosting in a barn, using the capture-recapture method.

- (a)** Give one reason why it would not be practical for the volunteer to count every bat in the barn directly. **(1)**
- (b)** The volunteer catches and tags 18 bats one night, then releases them. Give one thing she should do before catching the second sample, to make sure the estimate is reliable. **(1)**
- (c)** A week later, she catches a second sample of 24 bats, of which 6 are already tagged. Use the capture-recapture method to estimate the number of bats roosting in the barn. **(2)**
- (d)** Give one assumption that must be true for this estimate of 72 to be reliable. **(1)**

(Total for Question 8 is 5 marks)

Mark scheme • F09-test Estimating from Samples (Foundation): Test Pack

Question 1

- (a) **B1** $6/40$ oe (e.g. $3/20$, 0.15) cao
- (a) **Answer: $6/40$ ($= 3/20$)**
- (b) **M1** $6/40 \times 600$, oe
- (b) **A1** 90 cao
- (b) **Answer: 90**

Question 2

- **B1** $1/5$ oe cao
- **Answer: $1/5$**

Question 3

- **M1** $63/90$, oe
- **A1** $7/10$ cao
- **Answer: $7/10$**

Question 4

- **M1** correct sum of the 8 masses ($=2800$), or equivalent
- **M1** $2800/8$ ($=350$), then multiplying their mean by 2500, oe
- **A1** 875000 cao
- **Answer: 875,000 g (mean 350 g per fish)**

Question 5

- (a) **B1** 7 cao
- (a) **Answer: 7 kg**
- (b) **M1** 0.5×3000 , oe
- (b) **A1** 1500 cao
- (b) **Answer: 1500**

Question 6

- (a) **B1** 2500 (from the sample of 40 quadrats) cao
- (a) **Answer: 2500 (the 40-quadrat estimate)**
- (b) **B1** a larger sample is less affected by chance, e.g. by one or two unusually crowded or unusually empty quadrats, oe
- (b) **B1** a larger sample gives a more representative picture of how the daisies are spread across the whole field, reducing sampling error, oe
- (b) **Answer: A larger sample is less affected by chance and better represents how daisies are spread across the field.**

Question 7

- (a) **B1** the student added the proportion and 900 instead of multiplying them (should be 0.15×900 , not $0.15 + 900$), oe
- (a) **Answer: The student added instead of multiplied.**
- (b) **M1** 0.15×900 , oe
- (b) **A1** 135 cao
- (b) **Answer: 135**

Question 8

- (a) **B1** bats move around and roost in hard-to-reach places, so counting every one directly would disturb them or be very difficult and unreliable, oe
- (a) **Answer: Bats are mobile and roost in hard-to-reach places, so a full direct count would be impractical.**
- (b) **B1** wait long enough for the tagged bats to mix back thoroughly (and randomly) with the rest of the colony before the second catch, oe
- (b) **Answer: Allow enough time for the tagged bats to mix back randomly with the rest of the colony.**
- (c) **M1** $18 \times 24 (=432)$, oe
- (c) **A1** 72 cao
- (c) **Answer: 72**
- (d) **B1** the bat population stayed the same between the two catches (no bats born, died, or moved in/out), or the tagged bats mixed back randomly with the rest of the colony, oe
- (d) **Answer: The bat population must stay unchanged between catches, and tagged bats must mix back in randomly.**