GCSE Maths: Sampling and population estimates (Higher): answers

GCSE Maths - Statistics - Higher - Lesson 24.2

Answers. Final answers to the worksheet questions. Full step-by-step solutions for every question are free at **websink.site/gcse/maths/ch24-statistics/higher/sampling-and-population-estimates/**

Exercise 24B Sampling and population estimates Non-calculator

1 **For each situation, say what the population is and what the sample is.**

(a)

A teacher asks 20 students in Year 10 whether they like the canteen food. There are 180 students in Year 10.

Answer: Population: all 180 students in Year 10. Sample: the 20 students asked.

(b) A factory tests 50 light bulbs from a batch of 2000 bulbs.

Answer: Population: all 2000 bulbs. Sample: the 50 bulbs tested.

2 **Give two reasons why a sample is used instead of asking the whole population.**

Answer: It is quicker and cheaper; sometimes testing destroys the item.

3 **Mia wants to find out how often people in her town use the bus. She asks the first 20 people she meets at the bus station. Explain why this sample may be biased.**

Answer: The people at the bus station are more likely to use the bus than people in the town as a whole.

4 **Which of these is a random sample of 10 students from a school? A: the first 10 students to arrive on Monday. B: 10 students chosen by a computer from the full school list. C: the 10 students in the school football team.**

Answer: B

5 **In each case a random sample is taken. Estimate the number in the population who have the property.**

(a)

A random sample of 40 pupils from a school of 800: 10 are left-handed. How many left-handed pupils are there likely to be in the school?

Answer: 200

(b)

A random sample of 60 batteries from a batch of 3000: 3 are faulty. How many faulty batteries are there likely to be in the batch?

Answer: 150

(c) A random sample of 25 customers from 400 customers: 9 prefer tea. How many prefer tea?

Answer: 144

6 **A wildlife officer marks animals, releases them, and later catches a second sample. Estimate the population each time.**

(a) Marked first: 30. Second sample: 40. Marked in the second sample: 6.

Answer: 200

(b) Marked first: 50. Second sample: 60. Marked in the second sample: 10.

Answer: 300

(c) Marked first: 24. Second sample: 50. Marked in the second sample: 8.

Answer: 150

7 **In a lake, 120 fish are caught, tagged and returned. A week later, 150 fish are caught and 25 of them have tags. (a) Estimate the number of fish in the lake. (b) Give one assumption you made.**

(a) Estimate the number of fish

Answer: 720

(b) One assumption

Answer: For example: the tagged fish mixed evenly with the others (or no fish were born, died or moved).

8 **A school has the numbers of students shown. Work out how many students from each group should be in each stratified sample.**

(a) Year 7: 90, Year 8: 60, Year 9: 150. Sample of 20.

Answer: Year 7 6, Year 8 4, Year 9 10

(b) Boys: 240, Girls: 160. Sample of 50.

Answer: Boys 30, Girls 20

(c) Year 10: 125, Year 11: 100, Sixth form: 75. Sample of 60.

Answer: Year 10 25, Year 11 20, Sixth form 15

9 **A club has 124 juniors, 96 seniors and 80 veterans. A stratified sample of 30 members is taken. How many members of each group are in the sample? Round to the nearest whole number.**

Answer: Juniors 12, Seniors 10, Veterans 8

10 **Ben says: "In a stratified sample, you must take the same number from every group." Explain why Ben is wrong.**

Answer: The number taken from each group should be in proportion to its size.

11 **A scientist says: "My population estimate from capture–recapture may be too high because some of the marked animals died before the second sample was taken." Explain whether she is right.**

Answer: She is right: fewer marked animals are in the second sample, so the fraction marked is too small and the estimate N is too big.

12 **A population of 450 is estimated using capture–recapture. 60 animals were marked in the first catch and the second sample was 45. How many marked animals were in the second sample?**

Answer: 6

13 **In a sample of 80 pupils from a school, 18 are in the school band. The school has 1050 pupils, and the headteacher says that about 236 pupils are in the band. Is the headteacher right to say "exactly 236"? Give your reasoning, and work out the estimate.**

Answer: The estimate is about 236, but it is only an estimate, not exact.

14 **Zoe marks 40 deer and later catches 30, of which 5 are marked, giving an estimate of 240. Her friend takes a bigger second sample of 90 and finds 14 marked. Work out the second estimate, then say which estimate you would trust more and why.**

> **Answer:** 240 and 257; the second, because the sample is larger.

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