

Foundation GCSE: Sampling and Bias

Name: _____

Class: _____

Instructions: Answer all questions. Questions are ordered from easiest (1) to hardest (15). Working out should be shown where appropriate.

1. Define what is meant by a population in statistical terms.

2. Explain why a researcher might take a sample instead of surveying an entire population.

3. State whether surveying only members of a gym to find the average fitness level of a whole town introduces bias.

4. Define what a random sample is.

5. A school has 800 students. A sample of 40 students is chosen. Calculate the fraction representing this sample size in its simplest form:

$$\frac{40}{800}$$

6. Explain why asking people outside a chocolate shop about their favorite snack introduces sample bias.

7. A wildlife conservationist captures, tags, and releases 50 fish from a lake. Later, a sample of 120 fish is caught, of which 8 are tagged. Estimate the total fish population using:

$$\frac{50 \times 120}{8}$$

8. Identify why a survey conducted entirely via an online pop-up window might underrepresent elderly citizens.

9. A factory produces light bulbs. A quality control officer tests a sample proportion of defective items given by:

$$\frac{14}{200}$$

Convert this fraction to a percentage.

10. Describe how to select a simple random sample of 10 students from a class of 30.

11. A researcher samples 15% of a total population of 440 households. Calculate the number of households surveyed.

12. State why a sample must be representative of the entire population to draw valid conclusions.

13. A survey about school uniform receives responses from only 12 out of a form group of 30 pupils. Calculate the non-response count and express it as a fraction in simplest form:

$$\frac{18}{30}$$

14. A capture-recapture model estimates animal numbers using the formula:

$$\frac{M \times N}{n}$$

where $M = 30$, $N = 150$, and $n = 10$. Evaluate the estimated population.

15. A political poll samples 1200 voters and finds 630 support a policy. Calculate the sample support proportion as a decimal:

$$\frac{630}{1200}$$

Answers & Worked Solutions

1. The entire group of items or people being studied.
2. It saves time, cost, and effort compared to a complete census.
3. Yes, because gym members are likely fitter than the general public.
4. A sample where every member of the population has an equal chance of being selected.
5. $\left(\frac{1}{20}\right)$.
6. People outside a sweet shop are more likely to enjoy sweets.
7. $750 \left(\frac{6000}{8} = 750\right)$.
8. Many elderly people use computers less frequently or lack internet access.
9. $7\% \left(\frac{14}{200} = \frac{7}{100} = 7\%\right)$.
10. Assign numbers 1 to 30 to each student and use a random number generator to pick 10 unique numbers.
11. 66 households ($0.15 \times 440 = 66$).
12. Otherwise, the results will be skewed and will not accurately reflect the whole group.
13. 18 non-responses; $\left(\frac{3}{5}\right)$.
14. $450 \left(\frac{4500}{10} = 450\right)$.
15. (0.525).