OCR
Oxford Cambridge and RSA

Higher Check In - 12.01 Sampling

1. Axel wants to give a survey to 15% of the boys in Year 10 at his school. There are 120 boys in Year 10. How many boys should be in his sample?

2. A company sent questionnaires to 310 of its 2465 customers. Work out the percentage of their customers in the sample.

Questions 3-5 are about a manager of a kennel doing a study about how common it is for dogs in her kennel to be microchipped.

3. Define the population in this study.

4. The manager took a sample of 25 dogs in the kennel. She found that 21 of the 25 dogs had been microchipped. What percentage of these dogs are microchipped?

5. On the day of the sample, there were 125 dogs in the kennel. Estimate how many of the 125 dogs are microchipped.

6. On collecting their dogs from the kennel mentioned above, each owner was asked to fill in a questionnaire. One question asked “Should dogs be allowed into the local supermarket?” Explain whether the responses to this question would be likely to be representative of the population who use the supermarket.

7. Lucy takes a 20% simple random sample of the Year 11 pupils at her school. The sample includes 33 girls. There are 151 girls in Year 11. Explain whether you think her sample is a fair reflection of the number of girls in the year group.

8. Ollie wants to conduct a simple random sample of 10 people out of the people who live in his town. To do this, he puts a map of the town on the wall, closes his eyes and throws darts at it. He continues to throw darts until he has hit 10 different buildings on his map. Ollie plans to conduct interviews one afternoon with one person at each of these buildings. Give two reasons why his sample may not be representative.

9. A company wants to send questionnaires out to its customers by post. Each questionnaire costs 70p in printing and postage costs. The company expects that only 2% of recipients will complete and return their questionnaire. Work out an estimate for how much it will cost the company to get 100 responses to its questionnaire.

10. Ayshini took a 5% sample of a population. When calculating the number of people that should be in her sample, she had to use rounding to get a whole number of people. She rounded following the rule “if the first digit after the decimal place is 5 or higher, round up; otherwise, round down”. Ayshini had 12 people in her sample. Work out the least and greatest number of people that could be in the population.

Extension

An owner wanted to find out what people thought about his café.
He surveyed his first 12 customers after 9am on a Monday morning.

(a) Explain why this may produce a biased sample.
(b) Suggest how a better sample could be selected.

Answers

1. 18

2. 12.5760…%

3. All of the dogs in the kennel

4. 84%

5. If the sample is representative, then we would expect 0.84 × 125 = 105 of the 125 dogs to be microchipped.

6. No, it would not be representative. Their responses are quite likely to be biased, since they are all dog owners. It is likely that dog owners would be more in favour of dogs being allowed into supermarkets than non-dog owners.

7. A simple representative sample would have 151 × 0.2 = 30.2 girls. Whilst the sample does not contain exactly 30 girls, the 33 girls in her sample is similar to this, so her sample is a fair reflection of the number of girls in the year group.

8. In a simple random sample, every member of the population is equally likely to be chosen. Here are some reasons why Ollie's sample is not likely to be representative:
    - People who live in big houses are more likely to be selected than people who live in smaller houses.
    - He is likely to under-represent people who live in blocks of flats, since very many people will live in the same building and he will interview only one of them.
    - He will not get many working people due to the time he is carrying out the interviews.
    - If one of the buildings selected is a hotel or a place of work then it is possible that the person interviewed will not be local.

9. Let n be the number of letters sent. We need $n \times 0.02 = 100$ so $n = 5000$. An estimate for the total cost will be $5000 \times £0.70 = £3500$.

10. Let n be the size of the population. The lower bound of $n \times 0.05$ is 11.5. Therefore the least number of people that could be in the population is $11.5 \div 0.05 = 230$. Similarly, the upper bound is $12.4\dot{9}$; if we were to use 12.5 as a bound the population would be 250. However, 250 people would have given a sample size of 13 (because she would round up), therefore there are at most 249 people in the population. There are between 230 and 249 people in the population.

Extension

(a) Ideas could include, but are not limited to:

- The sample is taken at a single time of a specific day so is not representative of all people visiting the café during week
- The sample only covered those people who use the café, the owner needs to know views of other people who do not use the café.

b) Ideas could include, but are not limited to:

- Ask his customers at random times during his opening hours
- Carry out survey away from the actual café to get views of customers and non-customers
- Target different age groups.

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AO1	2	Find percentage sample			
AO1	3	Define a population			
AO1	4	Make population inference			
AO1	5	Make population inference			
AO2	6	Understand bias			
AO2	7	Understand bias			
AO2	8	Understand bias			
AO3	9	Make population inference			
AO3	10	Find bounds of population size			

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