Systematic, quota and cluster sampling

Grade 5 | Worked solutions

GCSE Statistics topic practice

1 Three people each take a sample. The table describes what they do.

Person	What they do
Amir	He has a list of 800 customers. He picks one of the first 20 customers at random, then every 20th customer after that.
Beth	She picks 4 streets in a town at random and asks every household in those 4 streets.
Chen	He stands outside a cinema and asks people until he has asked 30 adults and 30 children.

Write down the name of the sampling method each person uses. (3) (3 marks)

Amir

A random start, then every 20th customer

This is systematic sampling.

Beth

Whole streets are chosen at random

and everyone in them is asked.

This is cluster sampling.

Chen

He asks whoever is there until each group is full.

This is quota sampling.

Amir systematic, Beth cluster, Chen quota

2 A sports club has 900 members. They are listed in a numbered list from 1 to 900. The club secretary takes a systematic sample of 45 members.

a. Work out the sampling interval. (1)

b. The first member chosen is number 13. Write down the numbers of the next three members chosen. (1)

c. Is member number 453 in the sample? You must show how you get your answer. (1)

d. Give one advantage of systematic sampling. (1) (4 marks)

a)

$900 \div 45 = 20$

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b)

Add 20 each time

33, 53, 73

c)

$453 - 13 = 440$

$440 \div 20 = 22$

22 is a whole number, so yes, 453 is chosen.

d)

It is quick and easy to do,

and the sample is spread evenly through the list.

a) 20 b) 33, 53, 73 c) yes d) quick and easy to do

3 A factory makes 2400 phone cases each day. The quality manager wants to check a sample of 60 of the cases made in one day.

a. Describe how the manager could take a systematic sample of 60 phone cases. (2)

b. A researcher wants to know what people think of the phone cases. She stands in a town centre and interviews the first 20 men and the first 20 women who agree to talk to her. Write down the name of this sampling method. (1)

c. Give one disadvantage of the sampling method in part (b). (1)

(4 marks)

a)

$2400 \div 60 = 40$

Pick a random number from 1 to 40 for the first case.

Then take every 40th case after that one.

b)

Quota sampling

c)

It is not random.

The researcher chooses who to ask,

so the sample may be biased.

a) random start, then every 40th b) quota c) may be biased

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4 A council wants to find out what households in a city think about its recycling service. The city is divided into 150 neighbourhoods of about the same size. The council decides to take a cluster sample.

a. Describe how the council could take a cluster sample. (2)

b. Give one advantage of using a cluster sample here. (1)

c. Give one disadvantage of using a cluster sample here. (1)

(4 marks)

a)

Number the neighbourhoods from 1 to 150.

Use random numbers to choose a few of them, such as 5.

Ask every household in the chosen neighbourhoods.

b)

The households asked are close together,

so it is cheaper and quicker to do.

c)

The chosen neighbourhoods may not be typical

of the whole city, so the sample may be biased.

a) random neighbourhoods, ask everyone b) cheap c) bias

5 A school has 600 pupils in Years 7 to 9 and 400 pupils in Years 10 and 11. Sana wants to ask a quota sample of 50 pupils about school lunches. She wants the two age groups in her sample to be in the same proportions as in the school.

a. Work out the quota for each age group. (2)

b. Sana stands in the canteen at lunchtime and asks pupils until both quotas are full. Explain why her sample may be biased. (1)

c. Describe one way that a stratified sample would be different from Sana's quota sample. (1)

d. Give one reason why Sana might choose quota sampling instead of stratified sampling. (1)

(5 marks)

a)

$600 + 400 = 1000$ pupils

$\frac{600}{1000} \times 50 = 30$

$\frac{400}{1000} \times 50 = 20$

b)

Pupils who do not eat in the canteen

have no chance of being asked.

They may have different views on school lunches.

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c)

In a stratified sample the pupils in each group are chosen at random from a list.

d)

It is quicker, and she does not need a list of all the pupils.

a) 30, 20 b) canteen only c) random d) quicker

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