Random and stratified sampling

Grade 4 | Worked solutions

GCSE Statistics topic practice

1 A dental surgery has 80 patients. Each patient is given a two-digit number from 01 to 80.

The receptionist wants a simple random sample of 5 patients. She uses this list of random numbers, reading from left to right.

47 93 08 47 62 85 15 00 31 26

a. Write down the numbers of the 5 patients in her sample. (2)

b. Explain what makes a sample a simple random sample. (1)

(3 marks)

a)

93, 85 and 00 are not patient numbers, so skip them.

47 comes up twice, so skip it the second time.

The first 5 that can be used are 47, 08, 62, 15, 31

b)

Every patient has the same chance of being chosen.

a) 47, 08, 62, 15, 31 b) equal chance for every patient

2 A school has 720 students in Years 7 to 11. The headteacher wants a sample of 60 students, stratified by year group.

Year group	Year 7	Year 8	Year 9	Year 10	Year 11	Total
Number of students	168	156	144	132	120	720
Number in sample	14					60

a. Complete the table. (3)

b. Write down a suitable sampling frame for this survey. (1)

(4 marks)

a)

Fraction of the students in the sample

$$\frac{60}{720} = \frac{1}{12}$$

Divide each year group by 12

$156 \div 12 = 13$

$144 \div 12 = 12$

$132 \div 12 = 11$

$120 \div 12 = 10$

Check

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$14 + 13 + 12 + 11 + 10 = 60$

b)

A list of all 720 students in the school,

such as the school registers.

a) 13, 12, 11, 10 b) List of all the students

3 A leisure centre has 600 members. The table shows the number of members in each age group.

Age group	Under 18	18 to 39	40 to 59	60 and over
Number of members	180	240	120	60

The manager wants to survey a sample of 50 members, stratified by age group.

a. Work out the number of members aged 18 to 39 that should be in the sample. (2)

b. There should be 15 members aged under 18 in the sample. Describe how the manager could choose these 15 members using simple random sampling. (2)

c. Give one reason why a stratified sample is better here than a simple random sample of all 600 members. (1)

(5 marks)

a)

$\frac{240}{600} \times 50 = 20$

b)

Number the under 18 members from 1 to 180.

Use a random number generator

to pick 15 different numbers.

Survey the members with those numbers.

c)

Every age group is represented

in proportion to its size.

a) 20 b) number, then pick 15 at random c) fair to all ages

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4 A company has 250 employees. The table shows the number of employees in each department.

Department	Factory	Office	Sales
Number of employees	143	62	45

The manager wants a sample of 40 employees, stratified by department.

a. Work out the number of employees from each department that should be in the sample. (3)

b. The manager decides instead to ask the first 40 employees who arrive at work on Monday. Give one reason why this sample may be biased. (1)

(4 marks)

a)

$\frac{143}{250} \times 40 = 22.88$

$\frac{62}{250} \times 40 = 9.92$

$\frac{45}{250} \times 40 = 7.2$

Round each one to a whole number of people

Factory 23, Office 10, Sales 7

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$23 + 10 + 7 = 40$

b)

Not everyone has an equal chance of being chosen.

The early arrivals may be mostly from one department.

a) Factory 23, Office 10, Sales 7 b) not random

5 A gym has 750 members. Each member has one type of membership: Full, Off-peak or Student.

The manager takes a sample of the members, stratified by type of membership. There are 180 Off-peak members at the gym and 12 Off-peak members in the sample.

a. Work out the total number of members in the sample. (2)

b. There are 21 Full members in the sample. Work out the number of Full members at the gym. (1)

c. Tom says, "A stratified sample must have the same number of members of each type." Is Tom correct? Give a reason for your answer. (1)

(4 marks)

a)

$180 \div 12 = 15$

So 1 member in every 15 is in the sample.

$750 \div 15 = 50$

There are 50 members in the sample.

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b)

$21 \times 15 = 315$

c)

No. The number from each type is in proportion to the number of members of that type.

a) 50 b) 315 c) no, in proportion to size

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