

GCSE Mathematics

Worksheet: Sampling · Calculator

TIME 35 min	TOTAL 31 marks	CALCULATOR Allowed	DIFFICULTY Easy, Medium
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Topics: Sampling

NAME	CLASS	DATE
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- Use black ink or ball-point pen.
- Answer all questions. Answer the questions in the spaces provided – there may be more space than you need.
- Calculators may be used. If your calculator does not have a π button, take the value of π to be 3.142 unless the question instructs otherwise.
- Diagrams are NOT accurately drawn, unless otherwise indicated.
- You must show all your working.

1

A factory makes 5000 light bulbs each day. Yusuf wants to find out how long the bulbs last before they fail.
Yusuf is going to take a sample.

(a) Give one reason why Yusuf might take a sample rather than test every light bulb.

(1)

(b) Yusuf knows that each bulb made in a day is given a number from 1 to 5000.
Which method gives a random sample of 30?

Tick (✓) **one** box.

- Using a random number generator to choose 30 different numbers from 1 to 5000 and testing those bulbs
- Choosing 30 bulbs that look faulty
- Choosing the first 30 bulbs made in the day
- Choosing 30 bulbs from the top of one box

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(1)

(Total for Question 1 is 2 marks)

2

Zara wants to find out how many hours students in a school spend on homework each week. Zara asks the 20 students who are in the library after school.

(a) Give one reason why this sample may be biased.

(1)

(b) Suggest one way in which Zara could improve the sample.

(1)

(Total for Question 2 is 2 marks)

3

There are 2000 people in a village.

Femi takes a random sample of 50 of these people. 16 of the people in the sample own a bicycle.

Work out an estimate for the total number of people who own a bicycle.

.....
(2)

(Total for Question 3 is 2 marks)

4

Bella wants to find out the opinions of the 800 members of a gym about new opening hours.

Bella is going to take a sample.

(a) Give one reason why Bella might take a sample rather than ask all 800 members.

(1)

(b) Bella has a list of all 800 members.

Which method gives a random sample of 30?

Tick (✓) **one** box.

Choosing 30 members who arrive early one morning

☐

Choosing 30 members who volunteer

☐

Numbering the members on the list from 1 to 800 and
using a random number generator to choose 30 different
numbers

☐

Choosing the first 30 members on the list

☐

(1)

(Total for Question 4 is 2 marks)

5

There are 1500 members of a library.

Fatima takes a random sample of 100 of these members. 28 of the members in the sample borrowed an e-book last month.

Work out an estimate for the total number of members who borrowed an e-book last month.

.....
(2)

(Total for Question 5 is 2 marks)

6

There are 600 trees in a forest.

Daniel takes a random sample of 60 of these trees. 34 of the trees in the sample are oak trees.

Work out an estimate for the total number of trees that are oak trees.

.....

(2)

(Total for Question 6 is 2 marks)

7

Chen wants to estimate the mean height of the Year 11 students at a school.

Chen measures the heights of the students in the school basketball team.

(a) Give one reason why this sample may be biased.

(1)

(b) Suggest one way in which Chen could improve the sample.

(1)

(Total for Question 7 is 2 marks)

8

A farm packs apples into 800 boxes.
Olivia takes a random sample of 40 of the boxes and counts the number of bruised apples in each box.
The table shows information about Olivia’s results.

Number of bruised apples	Frequency
0	12
1	15
2	8
3	3
4	2

(a) Work out an estimate for the total number of bruised apples in all 800 boxes.

.....
(3)

(b) Explain why it is important that Olivia’s sample was chosen at random.

(1)

(Total for Question 8 is 4 marks)

9

Fatima wants to find out how many hours students in a school spend on homework each week. Fatima asks the 20 students who are in the library after school.

(a) What is the population for Fatima's survey?

(1)

(b) Give one reason why this sample may be biased.

(1)

(c) Describe how Fatima could choose a random sample of 50 from the population.

(2)

(Total for Question 9 is 4 marks)

10

Liam wants to find out what the students at a school think about the school canteen. There are 1200 students at the school.

(a) Write down the population for Liam's survey.

(1)

(b) Give one advantage and one disadvantage of taking a sample rather than trying to ask all 1200 students.

(2)

(c) Describe how Liam could take a simple random sample of 40.

(2)

(Total for Question 10 is 5 marks)

11

A garden centre has 500 trays of seedlings.

Erin takes a random sample of 20 of the trays and counts the number of seedlings that have died in each tray.

The table shows information about Erin's results.

Number of seedlings that died	Frequency
0	6
1	6
2	5
3	2
4	1

(a) Work out an estimate for the total number of seedlings that have died in all 500 trays.

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(3)

(b) Explain why it is important that Erin's sample was chosen at random.

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.....

.....

(1)

(Total for Question 11 is 4 marks)

END OF QUESTIONS

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Mark scheme

GCSE Mathematics · Worksheet: Sampling · 31 marks

Question 1 (2 marks)

(a) [1 mark]

Answer: Testing how long a bulb lasts destroys it, so testing every bulb would leave none to sell.

- c1 for a correct reason, e.g. testing destroys the bulbs / it would take too long / it is cheaper
-

(b) [1 mark]

Correct: Using a random number generator to choose 30 different numbers from 1 to 5000 and testing those bulbs

Question 2 (2 marks)

(a) [1 mark]

Answer: Students in the library after school may spend more time on homework than other students.

- c1 for a correct reason, e.g. students in the library after school may spend more time on homework than other students
-

(b) [1 mark]

Answer: Take a random sample of students from the whole school.

- c1 for a sensible improvement, e.g. take a random sample of students from the whole school
-

Question 3 (2 marks)

[2 marks]

Answer: 640

- M1 for $\frac{16}{50} \times 2000$ oe
- A1 for 640

Worked solution: $\frac{16}{50} \times 2000 = 640$

Question 4 (2 marks)

(a) [1 mark]

Answer: A sample is quicker and cheaper than asking everyone.

- c1 for a correct reason, e.g. it is quicker / cheaper / easier than asking everyone

(b) [1 mark]

Correct: Numbering the members on the list from 1 to 800 and using a random number generator to choose 30 different numbers

Question 5 (2 marks)

[2 marks]

Answer: 420

- M1 for $\frac{28}{100} \times 1500$ oe
- A1 for 420

Worked solution: $\frac{28}{100} \times 1500 = 420$

Question 6 (2 marks)

[2 marks]

Answer: 340

- M1 for $\frac{34}{60} \times 600$ oe
- A1 for 340

Worked solution: $\frac{34}{60} \times 600 = 340$

Question 7 (2 marks)

(a) [1 mark]

Answer: Basketball players are likely to be taller than average.

- c1 for a correct reason, e.g. basketball players are likely to be taller than average

(b) [1 mark]

Answer: Choose Year 11 students at random, e.g. by numbering a list of all Year 11 students and using random numbers.

- c1 for a sensible improvement, e.g. choose Year 11 students at random, e.g. by numbering a list of all Year 11 students and using random numbers
-

Question 8 (4 marks)

(a) [3 marks]

Answer: 960

- **M1** for $\Sigma fx = 48$ (at least three correct products, e.g. 1×15)
- **M1** for $\frac{48}{40} \times 800$ oe
- **A1** for 960

Worked solution: $\Sigma fx = 0 \times 12 + 1 \times 15 + 2 \times 8 + 3 \times 3 + 4 \times 2 = 48$. The 40 boxes in the sample contain 48 bruised apples altogether.

Estimate = $\frac{48}{40} \times 800 = 960$.

(b) [1 mark]

Answer: So that the sample is not biased and is likely to be representative of all 800 boxes.

- **C1** for a correct explanation, e.g. so that the sample is representative / not biased / every box has the same chance of being chosen

Question 9 (4 marks)

(a) [1 mark]

Answer: All the students at the school.

- **B1** for all the students at the school

(b) [1 mark]

Answer: Students in the library after school may spend more time on homework than other students.

- **C1** for a correct reason, e.g. students in the library after school may spend more time on homework than other students

(c) [2 marks]

Answer: Make a numbered list of everyone in the population, then use a random number generator to choose 50 different numbers.

- **C1** for a list of the population with each member given a number
 - **C1** for using random numbers (e.g. a calculator or computer) to select 50 different members
-

Question 10 (5 marks)

(a) [1 mark]

Answer: The 1200 students at the school.

- **B1** for the 1200 students at the school

(b) [2 marks]

Answer: Advantage: quicker / cheaper. Disadvantage: the results may not represent the whole population exactly.

- **C1** for a correct advantage, e.g. quicker / cheaper / less data to process
- **C1** for a correct disadvantage, e.g. the sample may be biased / not representative / less accurate

(c) [2 marks]

Answer: Number every member of the population, then use a random number generator to pick 40 different numbers.

- **C1** for a numbered list of the whole population
- **C1** for selecting 40 using random numbers (ignoring repeats)

Question 11 (4 marks)

(a) [3 marks]

Answer: 650

- **M1** for $\Sigma fx = 26$ (at least three correct products, e.g. 1×6)
- **M1** for $\frac{26}{20} \times 500$ oe
- **A1** for 650

Worked solution: $\Sigma fx = 0 \times 6 + 1 \times 6 + 2 \times 5 + 3 \times 2 + 4 \times 1 = 26$. In the 20 trays in the sample, 26 seedlings have died altogether.

Estimate = $\frac{26}{20} \times 500 = 650$.

(b) [1 mark]

Answer: So that the sample is not biased and is likely to be representative of all 500 trays.

- **C1** for a correct explanation, e.g. so that the sample is representative / not biased / every tray has the same chance of being chosen
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