

# Sampling and Populations

For AQA GCSE Mathematics (8300) • Higher tier

Name \_\_\_\_\_

Total marks: **22**

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Answer **all** questions in the spaces provided. Show your working: marks are given for correct method.

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**1** A headteacher wants to find out what the 1200 students at her school think about the school lunches.

- (a) She asks 60 students who are in the lunch queue.  
Give one reason why this sample may be biased.

**[1 mark]**

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- (b) She then takes a random sample of 60 students.  
Her deputy says, “38% of the students in this sample like the school lunches.”  
Give a reason why the deputy must be wrong.

**[1 mark]**

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- (c) In fact, 24 of the 60 students in the random sample like the school lunches.  
Estimate how many of the 1200 students like the school lunches.  
Assume that the sample is representative of the whole school.

**[2 marks]**

Answer \_\_\_\_\_

- (d) Later, she finds out that 45 of the 60 students in the random sample have a school lunch every day, but only half of the 1200 students do.  
What does this suggest about how many students at the school like the lunches?  
Tick one box.

**[1 mark]**

- ☐ It is probably more than the answer to part (c)
- ☐ It is probably about the same as the answer to part (c)
- ☐ It is probably less than the answer to part (c)

- 2** Amir and Beth each want to estimate the proportion of cars in a car park that are electric.

Amir chooses 20 cars at random. 3 of them are electric.

Beth chooses 150 cars at random. 27 of them are electric.

- (a) Amir says,

“My results show that exactly 15% of the cars in the car park are electric.”

Is Amir correct? Tick a box.

Give a reason for your answer.

**[1 mark]**

☐

Yes

☐

No

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- (b) There are 900 cars in the car park.

Use Beth's results to estimate the number of electric cars in the car park.

**[2 marks]**

Answer \_\_\_\_\_

- 3** A factory makes 5000 bolts a day. A quality inspector tests the first 50 bolts made each day.

Give one reason why this sample may not be representative.

**[1 mark]**

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- 4** Maya claims that most of the flats in her 10-floor building have a view of the park. She samples 40 flats from floors 1 to 3.  
Give a reason why this sample may not be useful in testing Maya's claim.

**[1 mark]**

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- 5** Owen states a hypothesis.

“Most adults in my town spend more than £20 a week on takeaway food.”

- (a) Owen plans to ask the first 10 customers who leave a pizza takeaway on a Friday evening.  
Give **two** criticisms of Owen's sampling method.

**[2 marks]**

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- (b) Owen changes his method.  
He takes a random sample of 120 adults from the town.  
47 of them spend more than £20 a week on takeaway food.  
Does this sample support Owen's hypothesis?  
You must show your working.

**[2 marks]**

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- 6** A theatre asks a sample of the people who went to a show one week how they heard about the show.  
The table shows the results.

| How they heard | Social media | Radio | A friend | Poster |
|----------------|--------------|-------|----------|--------|
| Frequency      | 63           | 21    | 45       | 21     |

- (a) 4200 people went to the show that week.  
Estimate how many more people heard about the show from social media than from a friend.  
You may assume the sample represents everyone who went to the show.

**[3 marks]**

Answer \_\_\_\_\_

- (b) The sample was taken from people who booked their tickets online.  
Give one reason why the sample may not be representative of everyone who went to the show.

**[1 mark]**

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- 7** A factory tests batches of light bulbs for faults.  
The table shows the results.

| Batch                  | A  | B   | C   | D   |
|------------------------|----|-----|-----|-----|
| Number of bulbs tested | 80 | 150 | 250 | 120 |
| Number of faulty bulbs | 6  | 9   | 12  | 9   |

- (a) Which batch gives the most reliable estimate of the probability that a bulb is faulty?

Give a reason for your answer.

**[1 mark]**

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- (b) Use all the results to work out the best estimate of the probability that a bulb is faulty.

**[2 marks]**

Answer \_\_\_\_\_

- (c) The factory makes 15 000 bulbs a week.  
Estimate how many of these bulbs will be faulty.

**[1 mark]**

Answer \_\_\_\_\_