



THIRD SPACE
LEARNING

Diagnostic Questions

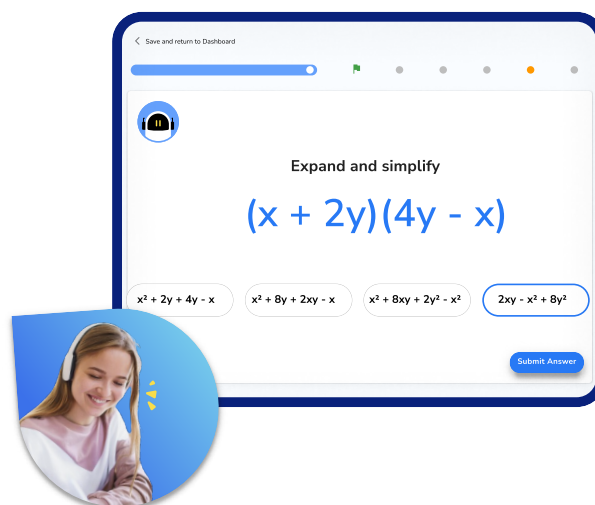
Sampling methods | Statistics

This resource in a nutshell

Diagnostic questions are a quick and easy way of assessing your students' knowledge and understanding of a particular topic.

Students may be struggling with **sampling methods** for a number of different reasons. Diagnostic questions can help to identify the particular misconception that the student has and help to determine the specific support they will need in order to improve.

They are low stakes and support students developing metacognition around how their learning is progressing and what they need to do to improve further.



At Third Space Learning, we use diagnostic questions before and after online tutoring sessions to identify gaps and track progress, an example of this is shown above.

How to use the questions in this resource

There are 10 multiple choice questions, each designed to assess each of the key skills required to master the given topic. Each question has **one correct answer** and **three carefully chosen incorrect answers** that are designed to identify and highlight fundamental misconceptions, including: **Confusing types of sampling methods**, **Using incorrect frequencies**, **Rearranging formulae (Capture-recapture)**, and **Proportion**.

When answering these questions, students should be **encouraged to explain why they have chosen a particular answer**, and why the other three answers are incorrect. This can be done verbally in small groups, or written down on the worksheet or in their books.

This resource has been designed to be as **flexible** as possible with questions that can be easily chopped up and reordered, and come with a separate answer sheet that details all of the misconceptions highlighted in the answers.

Diagnostic Questions: Sampling methods

1. The island of Tiola has a population of 165457 people. A census is being designed to gather data about the island population. How many people should be included in the census?

A) 165000	B) Approximately 10%
C) 165457	D) Anyone willing to take part

2. Phil is taking a systematic sample of 25 from a population of 200. What is the interval size for this sample?

A) 200	B) 25
C) 175	D) 8

Diagnostic Questions: Sampling methods

3. Random sampling is a method in which...

A) ...the first people meeting the criteria are selected	B) ...each member of the population has an equal chance of being selected
C) ...participants are selected based on availability	D) ...participation is based on members responding to an advert

4. How could you select a random sample of 25 pupils from a primary school of 164 pupils?

A) Write each pupil's name on a piece of paper, then draw 25 names from a bag without looking	B) Select the first 25 students to arrive at school in the morning
C) Look at the class lists and choose the class that has exactly 25 pupils	D) During assembly, ask for 25 volunteer participants to come back at lunch

Diagnostic Questions: Sampling methods

5. A survey requires 40 students using stratified sampling by year and gender. How many year 12 males should be included?

	Male	Female	Total
Year 12	66	72	138
Year 13	54	58	112
Total	120	130	250

A) 19	B) 11
C) 22	D) 10

6. Sally is researching the numbers of ferrets in a woodland. The ferrets are captured over two days and placed in a secure habitat before being marked and released. The experiment is repeated three weeks later. This is Sally's data for the initial capture and the recapture:

	Frequency
Sample size 1	37
Sample size 2	49
Ferrets marked in sample 2	31

Determine an estimate for the overall population size.

A) 43	B) 23
C) 55	D) 58

Diagnostic Questions: Sampling methods

7. A survey requires 50 boys using stratified sampling by year.
How many year 8 boys should be included?

	Girls	Boys	Total
Year 7	46	48	94
Year 8	51	45	96
Year 9	49	50	99
Total	146	143	289

A) 17	B) 8
C) 16	D) 23

8. A hiring manager receives 80 applications for a job. A random sample of 30% of the applicants is taken to find out how many have completed an apprenticeship. It is found that 5 applicants in this sample have completed an apprenticeship. Use this information to estimate how many of the 80 applicants have completed an apprenticeship:

A) 24	B) 17
C) 13	D) 19

Diagnostic Questions: Sampling methods

9. Tim is working out an estimate for the number of carp in a fishing lake. Tim captures f carp, tags them and returns them to the lake. The next day, Tim captures 60 carp, 12 of which are tagged. Given that Tim's estimate for the total number of carp in the lake is 400, work out the number, f , of carp Tim initially tagged.

A) 80	B) 2000
C) 72	D) 48

10. In research about school canteen food, some of the canteen staff answered a 20 question survey. The findings of this survey can be generalised to...

A) ...all staff at this school	B) ...all staff and students at this school
C) ...canteen staff at all schools	D) ...all the canteen staff at this school

Diagnostic Questions: Sampling methods Answers

1. The island of Tiola has a population of 165457 people. A census is being designed to gather data about the island population. How many people should be included in the census?

- A) 165000 Student rounded to the nearest thousand
- B) Approximately 10% Student does not know the definition of a census
- C) 165457 Correct answer
- D) Anyone willing to take part Student thinks a census is voluntary

2. Phil is taking a systematic sample of 25 from a population of 200. What is the interval size for this sample?

- A) 200 Student restated the population size
- B) 25 Student restated the required sample size
- C) 175 Student found the difference between population size and sample size
- D) 8 Correct answer

Diagnostic Questions: Sampling methods Answers

3. Random sampling is a method in which...

A) ...the first people meeting the criteria are selected Student confused quota sampling and random sampling

B) ...each member of the population has an equal chance of being selected

Correct answer

C) ...participants are selected based on availability Student confused convenience sampling and random sampling

D) ...participation is based on members responding to an advert Student confused self-selected sampling and random sampling

4. How could you select a random sample of 25 pupils from a primary school of 164 pupils?

A) Write each pupil's name on a piece of paper, then draw 25 names from a bag without looking Correct answer

B) Select the first 25 students to arrive at school in the morning Student does not understand that random sampling involves equal chance of selection

C) Look at the class lists and choose the class that has exactly 25 pupils Student prioritised the sample size over the sampling method

D) During assembly, ask for 25 volunteer participants to come back at lunch Student does not understand that self-selection is not random

Diagnostic Questions: Sampling methods Answers

5. A survey requires 40 students using stratified sampling by year and gender. How many year 12 males should be included?

	Male	Female	Total
Year 12	66	72	138
Year 13	54	58	112
Total	120	130	250

A) 19 Student used the total for Year 12 instead of the total number of students

B) 11 Correct answer

C) 22 Student used the total number of males instead of the total number of students

D) 10 Student rounded their calculation incorrectly

6. Sally is researching the numbers of ferrets in a woodland. The ferrets are captured over two days and placed in a secure habitat before being marked and released. The experiment is repeated three weeks later. This is Sally's data for the initial capture and the recapture:

	Frequency
Sample size 1	37
Sample size 2	49
Ferrets marked in sample 2	31

Determine an estimate for the overall population size.

A) 43 Student found the mean of the two samples (did not apply capture-recapture)

B) 23 Student mixed up the total recaptured with the number of marked recaptured

C) 55 Student found sum of sample sizes and subtracted the number marked in second sample

D) 58 Correct answer

Diagnostic Questions: Sampling methods Answers

7. A survey requires 50 boys using stratified sampling by year.
How many year 8 boys should be included?

	Girls	Boys	Total
Year 7	46	48	94
Year 8	51	45	96
Year 9	49	50	99
Total	146	143	289

- A) 17 Student attempted to use one third of 50
 B) 8 Student used the total number of students instead of the total number of boys
 C) 16 **Correct answer**
 D) 23 Student used the total number of year 8s instead of the total number of boys

8. A hiring manager receives 80 applications for a job. A random sample of 30% of the applicants is taken to find out how many have completed an apprenticeship. It is found that 5 applicants in this sample have completed an apprenticeship. Use this information to estimate how many of the 80 applicants have completed an apprenticeship:

- A) 24 Student found the sample size
 B) 17 **Correct answer**
 C) 13 Student used the given percentage in place of the quantity represented
 D) 19 Student used the information incorrectly ($24 - 5 = 19$)

Diagnostic Questions: Sampling methods Answers

9. Tim is working out an estimate for the number of carp in a fishing lake. Tim captures carp, tags them and returns them to the lake. The next day, Tim captures 60 carp, 12 of which are tagged. Given that Tim's estimate for the total number of carp in the lake is 400, work out the number, , of carp Tim initially tagged.

A) 80 Correct answer

B) 2000 Student rearranged capture-recapture formula incorrectly

C) 72 Student found sum of carp tagged and carp recaptured

D) 48 Student found difference of carp tagged and carp recaptured

10. In research about school canteen food, some of the canteen staff answered a 20 question survey. The findings of this survey can be generalised to...

A) ...all staff at this school Student assumes canteen staff are representative of all staff

B) ...all staff and students at this school Student assumes canteen staff are representative of all school members

C) ...canteen staff at all schools Student doesn't understand the limits of sampling

D) ...all the canteen staff at this school Correct answer

Where to go next?

For more diagnostic questions, and GCSE maths revision resources and worksheets to support students in fixing any misconceptions take a look at the free Third Space Learning [GCSE maths revision](#) pages.

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