



THIRD SPACE  
LEARNING

# Diagnostic Questions

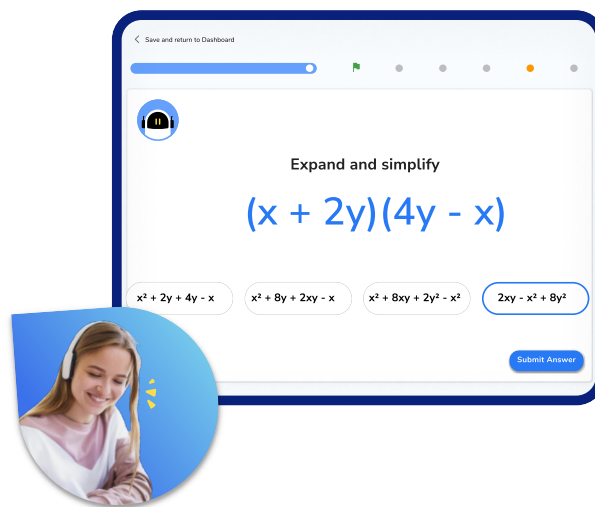
Descriptive Statistics | Statistics

## 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 **descriptive statistics** 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 18 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: **Not ordering data for the median**, **Mode is maximum**, **Incorrect average**, and **Subtracting a data value from the mean**.

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: Descriptive Statistics

1. Determine the median for this data:

1, 4, 4, 5, 8, 9, 11

A) 6	B) 5
C) 11	D) 4

2. Determine the median for this data:

2, 4, 8, 8, 11, 12, 16, 19

A) 10	B) 9.5
C) 10.5	D) 8 and 11

3. Determine the median for this data:

2.4, 9.8, 1.55, 7.32, 6.0, 4.87, 8.11

A) 4.87	B) 7.32
C) 4.125	D) 6.0

## Diagnostic Questions: Descriptive Statistics

4. Determine the mode for this data:

1, 2, 4, 4, 5, 5, 6, 6, 6, 17, 21

A) 6	B) 21
C) 3	D) 7

5. The following data is collected about the colour of each car in a car park:

red	blue	red	black	white	blue
purple	red	white	white	red	grey

Which descriptive statistic can be applied to this data?

A) Mean	B) Range
C) Mode	D) Variance

6. Determine the mean for this data:

12, 15, 16, 19, 19

A) 16	B) 15.5
C) 19	D) 16.2

## Diagnostic Questions: Descriptive Statistics

7. Determine the range for this data:

**6.4, 2.3, 1.88, 2.51, 9.2, 8.6**

A) 7.32	B) 2.2
C) 0.21	D) 11.08

8. This data set comprises a sample of test scores, all marked out of a maximum score of 50. The range of this set of data is 29. Determine the missing data point  $x$ :

**24, 13, 26,  $x$ , 28, 24**

A) 57	B) 42
C) -1	D) 16

9. The smallest value of a data set is 15.

The median of the data set is 23.

The range of the data set is 18.

Determine the largest number in the data set:

A) 41	B) 31
C) 28	D) 33

## Diagnostic Questions: Descriptive Statistics

10. Calculate the mean of this data set, giving your answer to one decimal place:

4.2, 7.9, 6, 5.3, 8, 1.9, 0.4, 2.1

A) 35.8	B) 29.0
C) 4.5	D) 4.8

11. The mean of five numbers is 8. Find the value of  $x$ , if the five numbers are:

1, 13, 9, 5,  $x$

A) 12	B) 7
C) 5.6	D) 40

12. The mean of nine numbers is 12. Find the value of  $y$ , if the nine numbers are:

6,  $y$ , 9, 21, 10,  $y$ , 15, 10, 15

A) 12.3	B) 11
C) 22	D) 12

## Diagnostic Questions: Descriptive Statistics

13. A survey of class 8A asks how many pets each class member owns.  
What is the mean number of pets owned?

Number of pets	Frequency	
0	5	
1	15	
2	8	
3	4	

A) 1.59	B) 0.74
C) 1	D) 1.34

14. The scores from a class test are recorded in a table.  
What is the median test score?

Score	Frequency
6	2
7	4
8	6
9	7
10	5

A) 8.38	B) 8
C) 8.5	D) 9

## Diagnostic Questions: Descriptive Statistics

15. The mean weight of the 15 females in class 6J is  $32.5 \text{ kg}$   
The mean weight of the 10 males in class 6J is  $36.1 \text{ kg}$   
What is the mean weight of a pupil in class 6J?

A) $34.30 \text{ kg}$	B) $34.66 \text{ kg}$
C) $33.94 \text{ kg}$	D) $2.744 \text{ kg}$

16. 14 sacks of flour sit on the back of a truck. The mean mass of the 14 sacks is  $22.5 \text{ kg}$ . One extra sack of flour of mass  $24.2 \text{ kg}$  is loaded onto the truck. What is the mean mass (accurate to two decimal places) of the sacks on the truck?

A) $22.61 \text{ kg}$	B) $23.35 \text{ kg}$
C) $24.23 \text{ kg}$	D) $24.08 \text{ kg}$



## Diagnostic Questions: Descriptive Statistics

17. A hockey team of seven players has mean height  $183\text{ cm}$ .  
The first-choice goalkeeper, with height  $187\text{ cm}$ , is replaced.  
The mean height of the players is now  $180.5\text{ cm}$ .  
How tall is the replacement goalkeeper?

A) $165.5\text{ cm}$	B) $169.5\text{ cm}$
C) $184.5\text{ cm}$	D) $176.5\text{ cm}$

18. The heights of some chilli plants growing in a greenhouse are measured.  
Estimate the mean height of a chilli plant:

Height, $h\text{ cm}$	Frequency		
$0 < h \leq 10$	6		
$10 < h \leq 20$	7		
$20 < h \leq 25$	9		
$25 < h \leq 30$	4		

A) $21.0\text{ cm}$	B) $13.5\text{ cm}$
C) $17.2\text{ cm}$	D) $19.2\text{ cm}$

## Diagnostic Questions: Descriptive Statistics Answers

1. Determine the median for this data:

1, 4, 4, 5, 8, 9, 11

A) 6 Student determined the mean for the data

B) 5 Correct answer

C) 11 Student stated the maximum value

D) 4 Student determined the mode for the data

2. Determine the median for this data:

2, 4, 8, 8, 11, 12, 16, 19

A) 10 Student determined the mean for the data

B) 9.5 Correct answer

C) 10.5 Student divided total of minimum and maximum by two

D) 8 and 11 Student did not find the midpoint of the two middle values

3. Determine the median for this data:

2.4, 9.8, 1.55, 7.32, 6.0, 4.87, 8.11

A) 4.87 Student reordered the data incorrectly

B) 7.32 Student forgot to order the data

C) 4.125 Student found midpoint of minimum and maximum values

D) 6.0 Correct answer

## Diagnostic Questions: Descriptive Statistics Answers

4. Determine the mode for this data:

1, 2, 4, 4, 5, 5, 6, 6, 6, 17, 21

A) 6 Correct answer

B) 21 Student confused “most” (maximum) and mode

C) 3 Student stated how many times the modal value occurred

D) 7 Student confused mean and mode

5. The following data is collected about the colour of each car in a car park:

red	blue	red	black	white	blue
purple	red	white	white	red	grey

Which descriptive statistic can be applied to this data?

A) Mean Student does not understand that the mean is numeric only

B) Range Student confused “range of colours” with mathematical meaning

C) Mode Correct answer

D) Variance Student confused general meaning of variety with statistical variance

6. Determine the mean for this data:

12, 15, 16, 19, 19

A) 16 Student confused median and mean

B) 15.5 Student used only minimum and maximum in calculation

C) 19 Student confused mode and mean

D) 16.2 Correct answer

## Diagnostic Questions: Descriptive Statistics Answers

7. Determine the range for this data:

6.4, 2.3, 1.88, 2.51, 9.2, 8.6

A) 7.32 Correct answer

B) 2.2 Student used first/last data from list instead of minimum/maximum

C) 0.21 Student misunderstands place value, using 2.51 as max and 2.3 as min

D) 11.08 Student found sum instead of difference (of correct values)

8. This data set comprises a sample of test scores, all marked out of maximum score of 50. The range of this set of data is 29. Determine the missing data point  $x$ :

24, 13, 26,  $x$ , 28, 24

A) 57 Student added the range to the highest value

B) 42 Correct answer

C) -1 Student gave answer that does not fit the context

D) 16 Student subtracted the minimum data point from the range

9. The smallest value of a data set is 15.

The median of the data set is 23.

The range of the data set is 18.

Determine the largest number in the data set:

A) 41 Student added the range to the median instead of the smallest value

B) 31 Student assumed the median was the midpoint of smallest and largest values

C) 28 Student added the difference between median and range to the median

D) 33 Correct answer

## Diagnostic Questions: Descriptive Statistics Answers

10. Calculate the mean of this data set, giving your answer to one decimal place:

**4.2, 7.9, 6, 5.3, 8, 1.9, 0.4, 2.1**

- A) 35.8 Student forgot to divide by the number of data values
- B) 29.0 Student did not type the decimal points on their calculator
- C) 4.5 Correct answer
- D) 4.8 Student determined the median of the data set

11. The mean of five numbers is 8. Find the value of  $x$ , if the five numbers are:

**1, 13, 9, 5,  $x$**

- A) 12 Correct answer
- B) 7 Student found the mean of the four known numbers
- C) 5.6 Student divided the sum of the four known numbers by five
- D) 40 Student found the total of the five numbers

12. The mean of nine numbers is 12. Find the value of  $y$ , if the nine numbers are:

**6,  $y$ , 9, 21, 10,  $y$ , 15, 10, 15**

- A) 12.3 Student found the mean of the seven known numbers
- B) 11 Correct answer
- C) 22 Student attempted to solve an equation, but found the value of  $2y$
- D) 12 Student restated the given mean

## Diagnostic Questions: Descriptive Statistics Answers

13. A survey of class 8A asks how many pets each class member owns.  
What is the mean number of pets owned?

Number of pets	Frequency	
0	5	
1	15	
2	8	
3	4	

- A) 1.59 Student did not include the frequency for owners of zero pets  
 B) 0.74 Student mixed up dividend and divisor  
 C) 1 Student stated the modal number of pets  
 D) 1.34 Correct answer

14. The scores from a class test are recorded in a table.  
What is the median test score?

Score	Frequency
6	2
7	4
8	6
9	7
10	5

- A) 8.38 Student calculated the mean  
 B) 8 Student used only the score column, not the frequencies  
 C) 8.5 Correct answer  
 D) 9 Student stated the modal score

## Diagnostic Questions: Descriptive Statistics Answers

15. The mean weight of the 15 females in class 6J is  $32.5 \text{ kg}$   
 The mean weight of the 10 males in class 6J is  $36.1 \text{ kg}$   
 What is the mean weight of a pupil in class 6J?

- A)  $34.30 \text{ kg}$  Student found the sum of the two means then divided by two  
 B)  $34.66 \text{ kg}$  Student multiplied each mean by the wrong frequency  
 C)  $33.94 \text{ kg}$  Correct answer  
 D)  $2.744 \text{ kg}$  Student misused information (total of means divided by number of pupils)

16. 14 sacks of flour sit on the back of a truck. The mean mass of the 14 sacks is  $22.5 \text{ kg}$ . One extra sack of flour of mass  $24.2 \text{ kg}$  is loaded onto the truck.  
 What is the mean mass (accurate to two decimal places) of the sacks on the truck

- A)  $22.61 \text{ kg}$  Correct answer  
 B)  $23.35 \text{ kg}$  Student found the midpoint of 22.5 and 24.2  
 C)  $24.23 \text{ kg}$  Student found the new total, but divided by 14 instead of 15  
 D)  $24.08 \text{ kg}$  Student mixed up the order of operations to be carried out

## Diagnostic Questions: Descriptive Statistics Answers

17. A hockey team of seven players has mean height  $183\text{ cm}$ .  
The first choice goalkeeper, with height  $187\text{ cm}$ , is replaced.  
The mean height of the players is now  $180.5\text{ cm}$ .  
How tall is the replacement goalkeeper?
- A)  $165.5\text{ cm}$  Student subtracted the 1st mean height from total instead of goalkeeper's height
- B)  $169.5\text{ cm}$  Correct answer
- C)  $184.5\text{ cm}$  Student found the difference in means and subtracted from 1st goalkeeper's height
- D)  $176.5\text{ cm}$  Student found the difference in 1st mean/goalkeeper's height and subtracted from 2nd mean

18. The heights of some chilli plants growing in a greenhouse are measured.  
Estimate the mean height of a chilli plant:

Height, $h\text{ cm}$	Frequency		
$0 < h \leq 10$	6		
$10 < h \leq 20$	7		
$20 < h \leq 25$	9		
$25 < h \leq 30$	4		

- A)  $21.0\text{ cm}$  Student used the upper bound of each interval (not midpoint)
- B)  $19.2\text{ cm}$  Student used the lower bound of each interval (not midpoint)
- C)  $17.2\text{ cm}$  Correct answer
- D)  $13.5\text{ cm}$  Student was not accurate finding midpoints (used 25, 35 by continuing pattern)



# 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.

Scan the QR code to discover our library of FREE GCSE maths revision resources

## Do you have KS4 students who need additional support in maths?



Our specialist tutors will help students to develop the skills they need to succeed at GCSE in weekly one to one online revision lessons. Trusted by secondary schools across the UK.

Visit [thirdspacelearning.com](https://thirdspacelearning.com) to find out more.