



THIRD SPACE
LEARNING

Diagnostic Questions

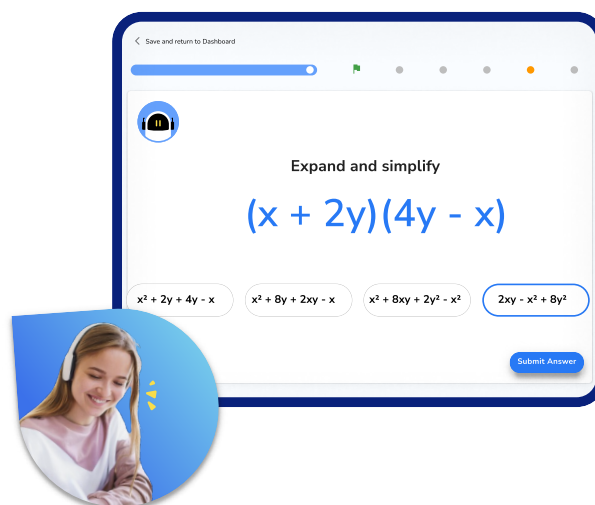
Cumulative frequency |
Statistics

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 **cumulative frequency** 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: **Adding cumulative frequencies**, **Adding the current and previous frequency only to get the cumulative frequency**, **Incorrect starting value on the cumulative frequency curves**, and **Negative gradient on a cumulative frequency curve**.

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: Cumulative frequency

1. This is a grouped frequency table for the lengths of 82 pieces of rope. Calculate the missing cumulative frequency:

Length (m)	Frequency	Cumulative frequency
$0 < l \leq 10$	13	13
$10 < l \leq 20$	24	37
$20 < l \leq 30$	28	
$30 < l \leq 40$	17	82

A) 50 m	B) 28 m
C) 65 m	D) 45 m

2. This is a grouped frequency table for the heights, in centimetres, of 90 sunflowers. Calculate the missing frequency:

Height (cm)	Frequency	Cumulative frequency
$90 < h \leq 100$	9	9
$100 < h \leq 110$	14	23
$110 < h \leq 120$	25	48
$120 < h \leq 130$		72
$130 < h \leq 140$	18	90

A) 18 cm	B) 54 cm
C) 6 cm	D) 24 cm

Diagnostic Questions: Cumulative frequency

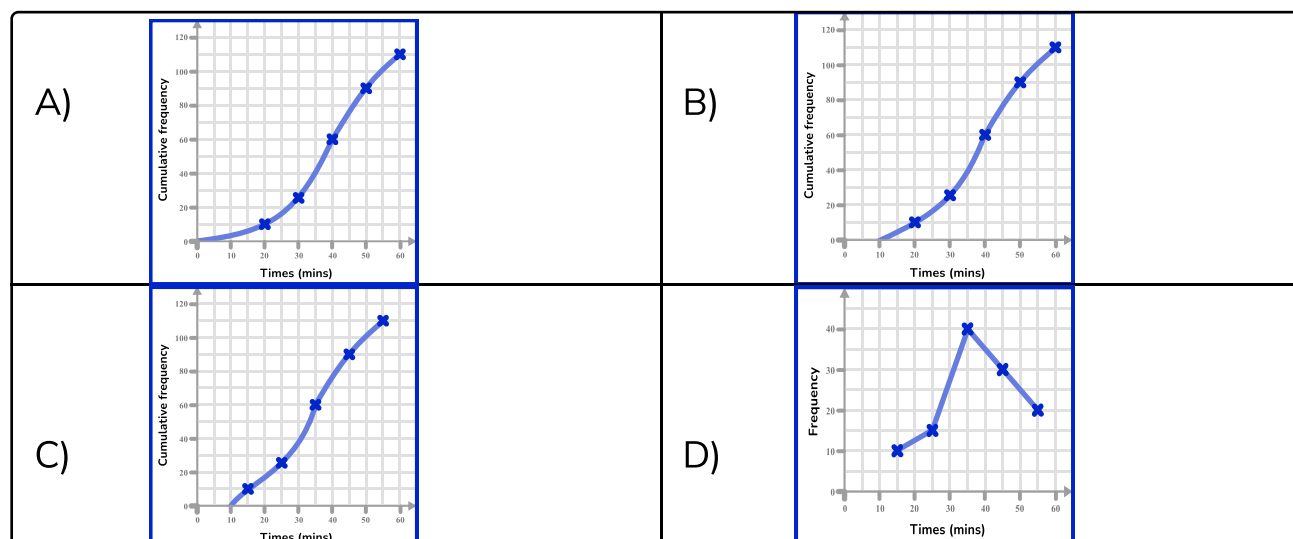
3. This is a grouped frequency table for the masses, in kilograms, of 180 children at a junior school. Determine the value of the highlighted cell:

Mass (<i>kg</i>)	Frequency	Cumulative frequency
$30 < m \leq 35$	36	
$35 < m \leq 40$	47	
$40 < m \leq 45$	44	
$45 < m \leq 50$	36	
$50 < m \leq 55$	17	

A) 127 <i>kg</i>	B) 129 <i>kg</i>
C) 97 <i>kg</i>	D) 83 <i>kg</i>

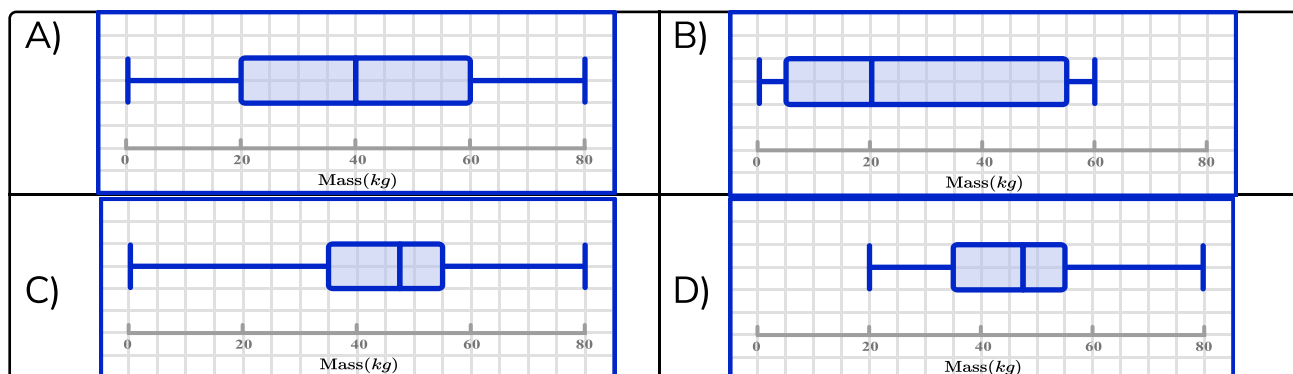
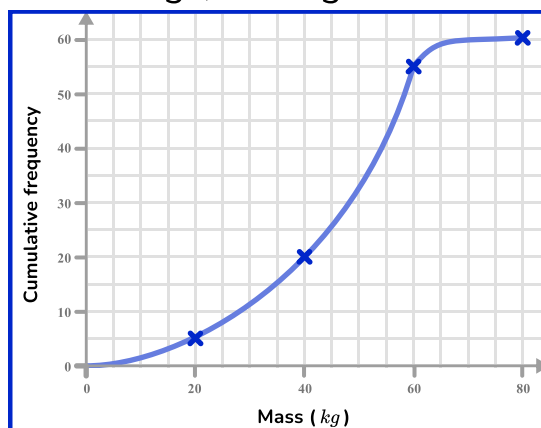
4. This grouped frequency table shows the time taken for the students in Y8 to get to school on Monday morning. Which cumulative frequency graph represents the data?

Time (mins)	Frequency
$10 < t \leq 20$	10
$20 < t \leq 30$	15
$30 < t \leq 40$	35
$40 < t \leq 50$	30
$50 < t \leq 60$	20

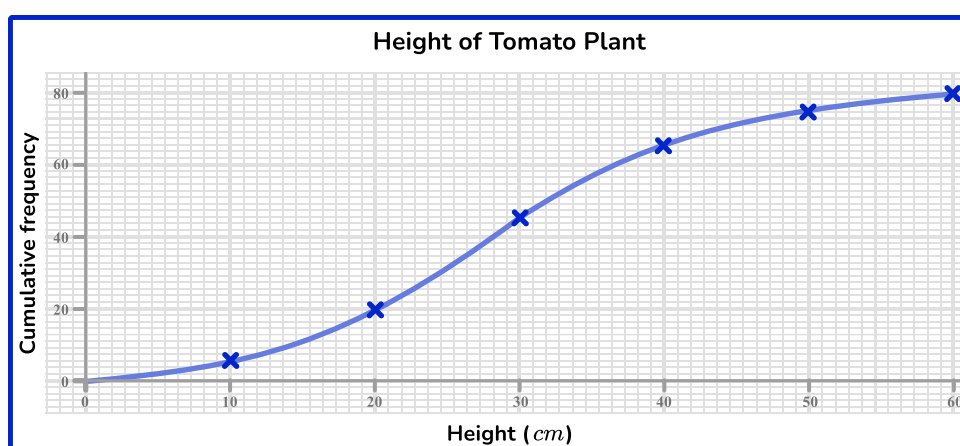


Diagnostic Questions: Cumulative frequency

5. This graph shows the mass of 60 sandbags, in kilograms. Which box plot correctly represents the data?



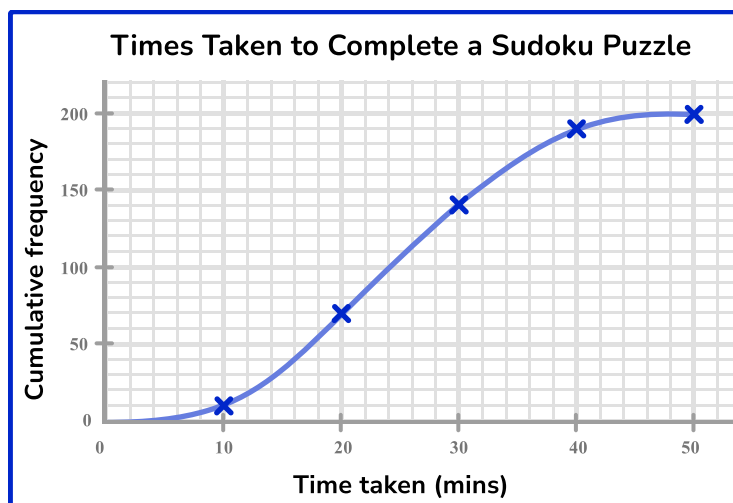
6. This graph shows the heights of 80 tomato plants. Use the graph to estimate the median height of the plants:



A) 28 cm	B) 45 cm
C) 30 cm	D) 40 cm

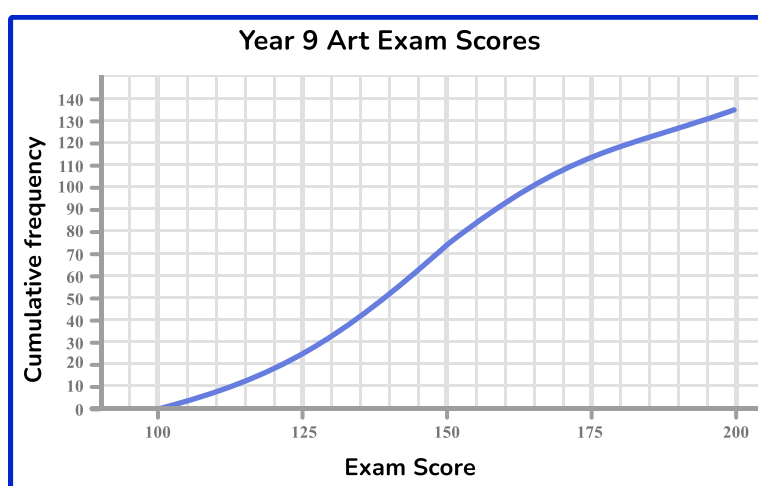
Diagnostic Questions: Cumulative frequency

7. This graph shows the time taken for 200 people to complete a sudoku puzzle. Use the graph to estimate the interquartile range for the data set:



A) 50 mins	B) 100 mins
C) 15 mins	D) 24 mins

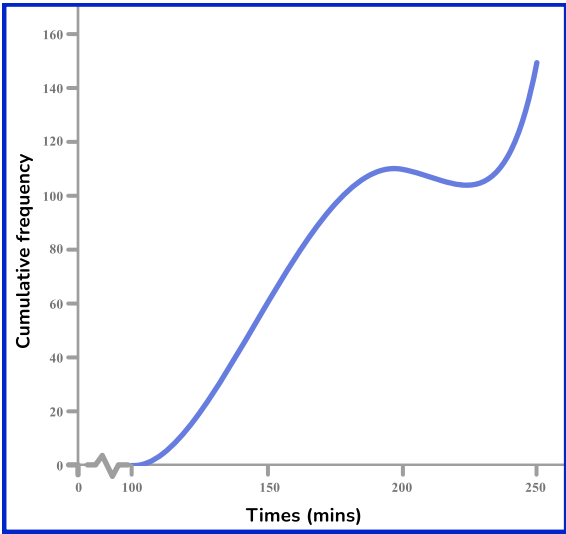
8. This graph shows the scores for 135 year 9 students in their art exam. Estimate how many students scored at least 165 marks:



A) 140	B) 100
C) 45	D) 35

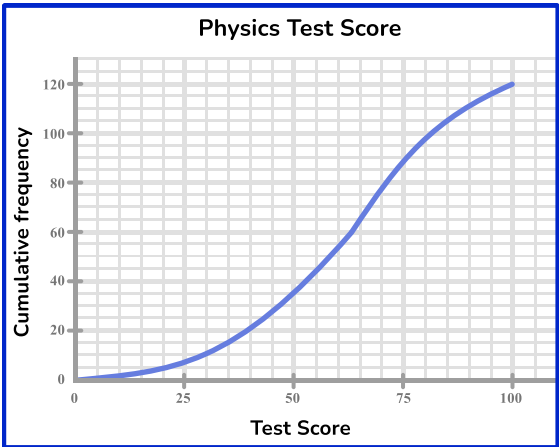
Diagnostic Questions: Cumulative frequency

9. What tells us that this cumulative frequency curve is incorrect?



A) Curve does not start at zero	B) Curve has a section with negative gradient
C) Scales on axes are different	D) No data points plotted

10. This graph shows the scores in a physics test for all 120 students in Y9. Given that 75% of the students passed the exam, determine the pass mark:



A) 76	B) 89
C) 48	D) 8

Diagnostic Questions: Cumulative frequency Answers

1. This is a grouped frequency table for the lengths of 82 pieces of rope. Calculate the missing cumulative frequency:

Length (m)	Frequency	Cumulative frequency
$0 < l \leq 10$	13	13
$10 < l \leq 20$	24	37
$20 < l \leq 30$	28	
$30 < l \leq 40$	17	82

- A) 50 m Student added the previous two cumulative frequencies together
 B) 28 m Student restated the frequency in the row of the missing value
 C) 65 m Correct answer
 D) 45 m Student found the sum of the last two frequencies ($28 + 17$)

2. This is a grouped frequency table for the heights, in centimetres, of 90 sunflowers. Calculate the missing frequency:

Height (cm)	Frequency	Cumulative frequency
$90 < h \leq 100$	9	9
$100 < h \leq 110$	14	23
$110 < h \leq 120$	25	48
$120 < h \leq 130$		72
$130 < h \leq 140$	18	90

- A) 18 cm Student found difference between incorrect cumulative frequencies
 B) 54 cm Student subtracted the last frequency (18) from 72
 C) 6 cm Student subtracted the sum of the given frequencies from 72
 D) 24 cm Correct answer

Diagnostic Questions: Cumulative frequency Answers

3. This is a grouped frequency table for the masses, in kilograms, of 180 children at a junior school. Determine the value of the highlighted cell:

Mass (<i>kg</i>)	Frequency	Cumulative frequency
$30 < m \leq 35$	36	
$35 < m \leq 40$	47	
$40 < m \leq 45$	44	
$45 < m \leq 50$	36	
$50 < m \leq 55$	17	

A) 127 *kg* Correct answer

B) 129 *kg* Student added the three visible numbers in the row ($40 + 45 + 44$)

C) 97 *kg* Student determined the cumulative frequency in the wrong direction

D) 83 *kg* Student determined the value for the cell above the one highlighted

4. This grouped frequency table shows the time taken for the students in Y8 to get to school on Monday morning. Which cumulative frequency graph represents the data?

Time (mins)	Frequency
$10 < t \leq 20$	10
$20 < t \leq 30$	15
$30 < t \leq 40$	35
$40 < t \leq 50$	30
$50 < t \leq 60$	20

A) Curve starts at zero minutes (data starts at ten minutes)

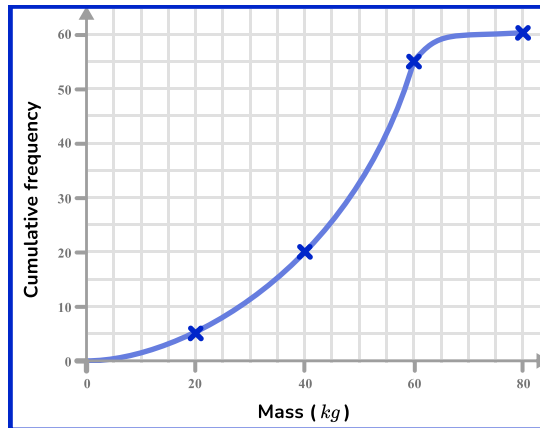
B) Correct answer

C) Curve plotted at group midpoints, not upper bounds

D) Student confused cumulative frequency with frequency polygon

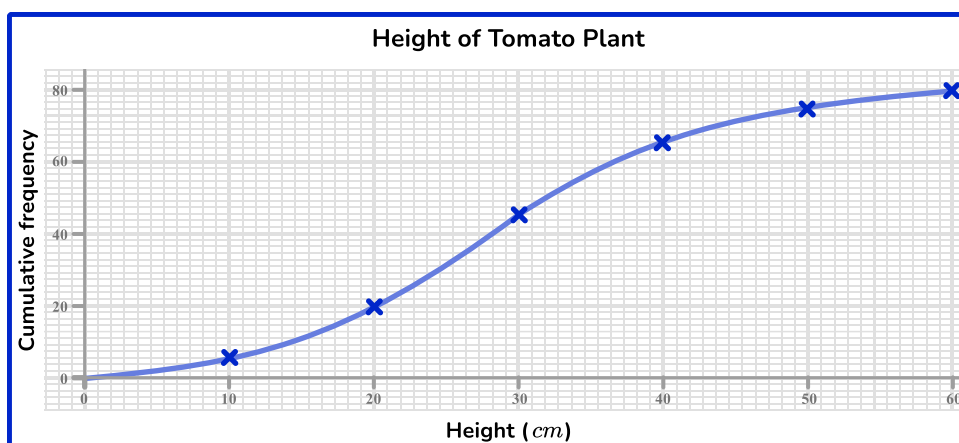
Diagnostic Questions: Cumulative frequency Answers

5. This graph shows the mass of 60 sandbags, in kilograms. Which box plot correctly represents the data?



- A) Student did not use the curve, placing quartiles evenly spaced
- B) Student used axes in wrong orientation
- C) Correct answer
- D) Student did not take minimum as being the lower bound of the first group

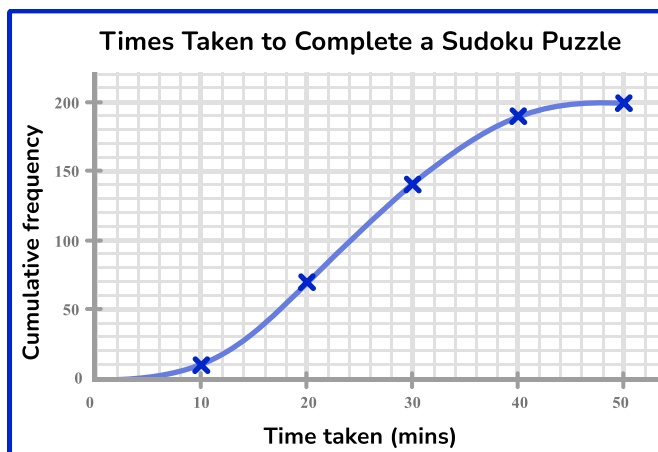
6. This graph shows the heights of 80 tomato plants. Use the graph to estimate the median height of the plants:



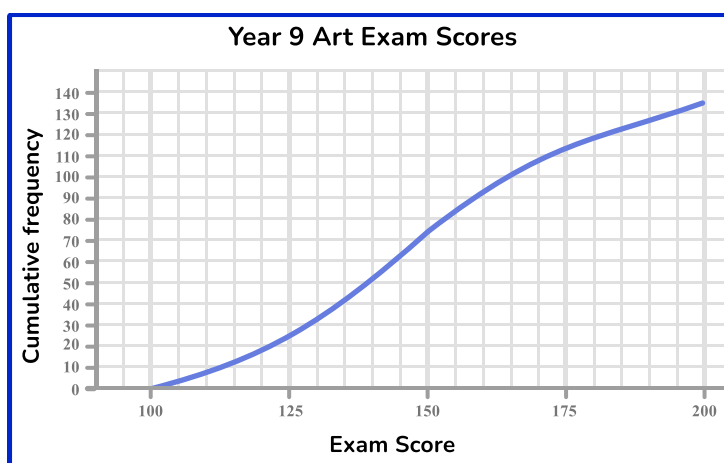
- A) 28 cm Correct answer
- B) 45 cm Student used axes in wrong orientation
- C) 30 cm Student gave the midpoint of horizontal axis
- D) 40 cm Student gave the midpoint of the vertical axis

Diagnostic Questions: Cumulative frequency Answers

7. This graph shows the time taken for 200 people to complete a sudoku puzzle. Use the graph to estimate the interquartile range for the data set:



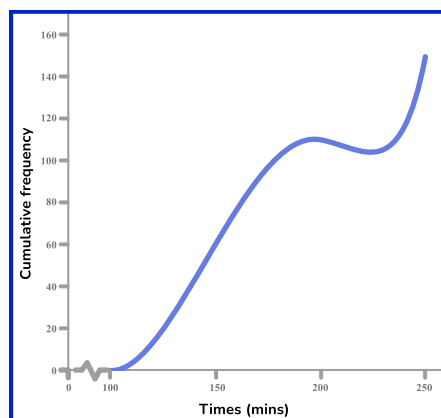
- A) 50 mins Student gave the range
 B) 100 mins Student used axes incorrectly
 C) 15 mins Correct answer
 D) 24 mins Student gave the median
8. This graph shows the scores for 135 year 9 students in their art exam. Estimate how many students scored at least 165 marks:



- A) 140 Student used maximum of scale instead of total number of students
 B) 100 Student found the cumulative frequency for a score of 165
 C) 45 Student used the horizontal axis to calculate the difference
 D) 35 Correct answer

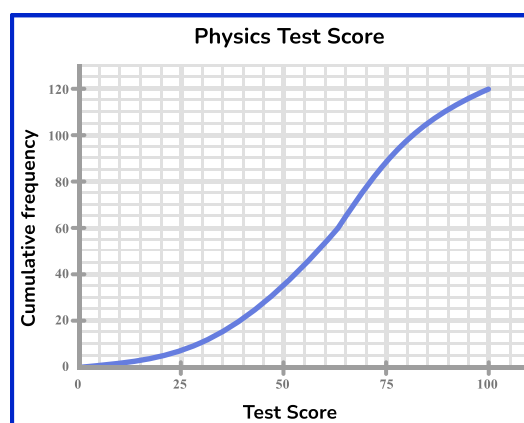
Diagnostic Questions: Cumulative frequency Answers

9. What tells us that this cumulative frequency curve is incorrect?



- A) Curve does not start at zero The curve can start at the lowest data point, which may not be zero
- B) Curve has a section with negative gradient Correct answer
- C) Scales on axes are different It is often necessary to have different scales for x- and y- axes
- D) No data points plotted Although data points are helpful, they are not necessary

10. This graph shows the scores in a physics test for all 120 students in Y9.
Given that 75% of the students passed the exam, determine the pass mark:



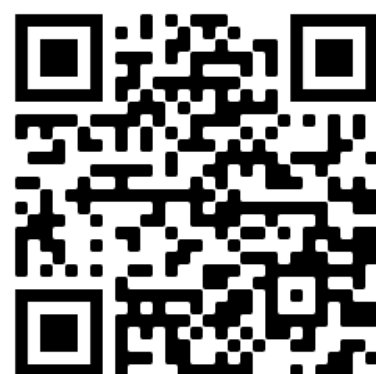
- A) 76 Student used the vertical axis in the wrong direction
- B) 89 Student found the cumulative frequency for a test score of 75
- C) 48 Correct answer
- D) 8 Student used the wrong axis variable

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?



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