



THIRD SPACE
LEARNING

Diagnostic Questions

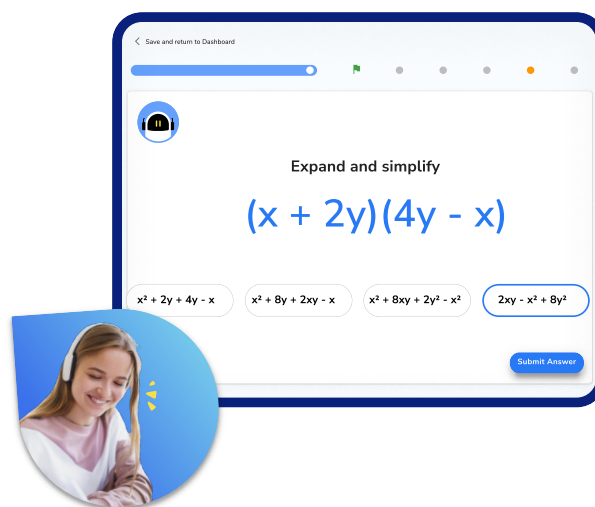
Representing data | Statistics

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 a given topic 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

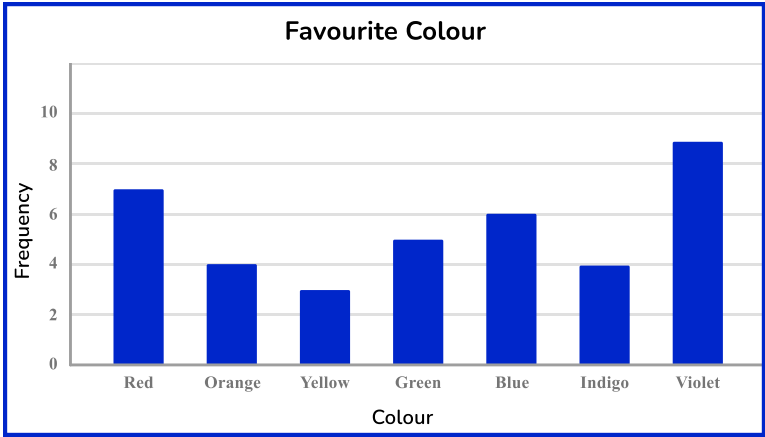
There are 24 multiple choice questions, each designed to assess each of the key skills required to master the given topic. Each question has **one correct answer** and **three carefully chosen incorrect answers** that are designed to identify and highlight fundamental misconceptions, including: **Misreading axis labels**, **Incorrect proportion of a pictogram key**, **Stating the angle and not the frequency of a pie chart**, and **Confusing statistics**.

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.

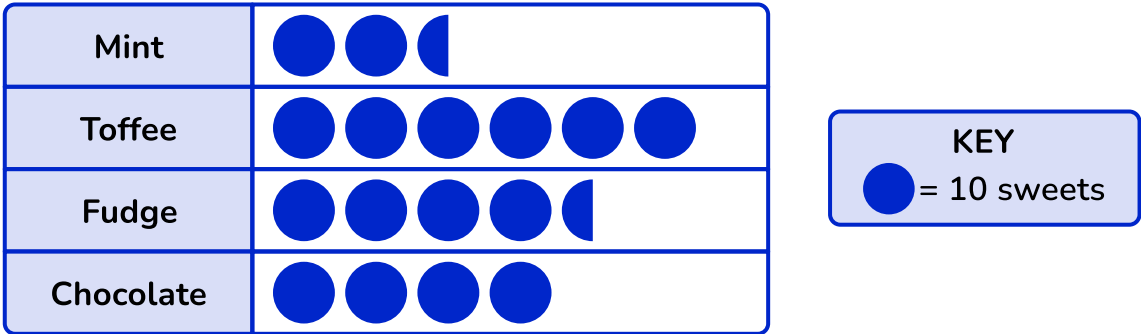
Diagnostic Questions: Representing data

1. Some primary school children were asked to name their favourite colour of the rainbow. How many children were surveyed?



A) 42	B) 9
C) 38	D) 34

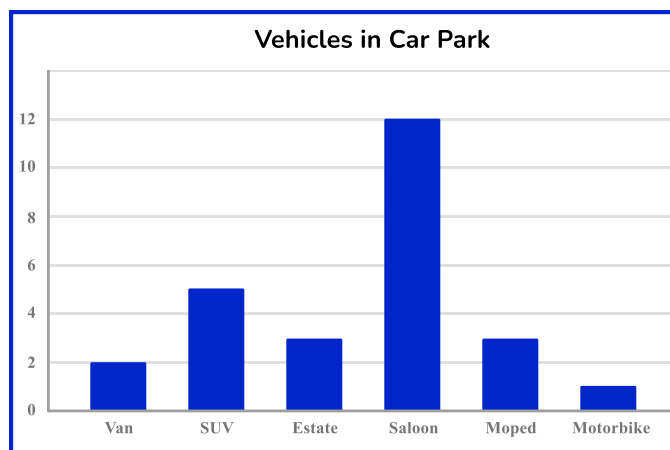
2. A pictogram is drawn to represent the types of sweets in a jar. How many toffee sweets are in the jar?



A) 17	B) 6
C) 170	D) 60



Diagnostic Questions: Representing data


3. This bar chart shows the frequencies of different vehicles in a supermarket car park. How many more saloons than SUVs were there?







A) 15	B) 7
C) 12	D) 6

4. The results from a survey on berry preference are being represented using a pictogram. Given that six people chose strawberry, which option completes the missing row in the pictogram?

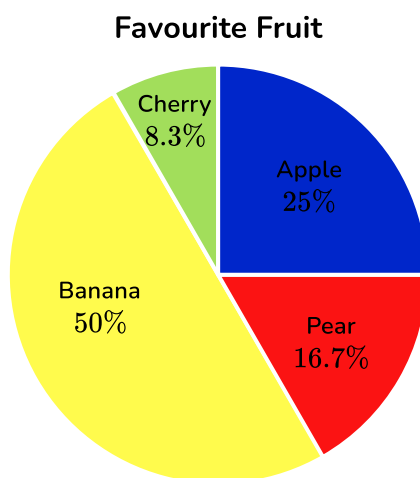
Raspberry	
Blueberry	
Strawberry	

KEY
 = 8 people

A) 	B) 
C) 	D) 

Diagnostic Questions: Representing data

5. All the children at a junior school were asked to name their favourite fruit. The results are shown in a pie chart. How many children chose apple?



A) 25	B) Impossible to tell
C) 90	D) One quarter

6. A pie chart is being used to represent the data from a survey on favourite sport. Using the results in the table, determine the pie chart angle size for rugby:

Sport	Tennis	Rugby	Cycling	Hockey	Athletics
Frequency	41	65	24	38	32

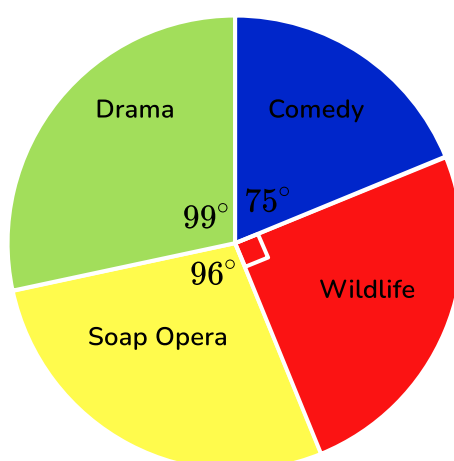
A) 173°	B) 72°
C) 65°	D) 117°

Diagnostic Questions: Representing data

7. From these options, which type of diagram would be best used to represent the relationship between two variables?

A) Scatter graph	B) Pie chart
C) Dual bar chart	D) Line graph

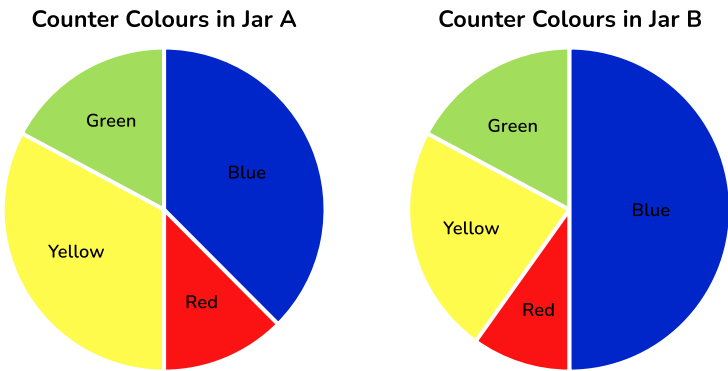
8. This pie chart shows the results of a survey in which 240 participants were asked to give their favourite type of TV show. How many chose comedy?



A) 60	B) 75
C) 180	D) 50

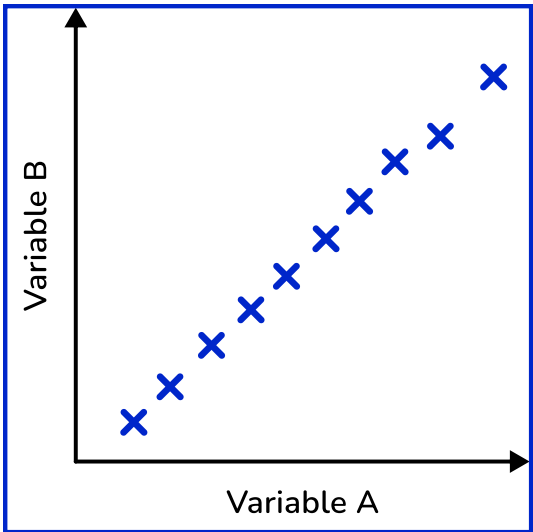
Diagnostic Questions: Representing data

9. A student counts the numbers of different coloured counters in two jars, then represents their results as pie charts. Which jar had the greatest quantity of blue counters?



A) Jar B	B) Impossible to tell
C) Jar A	D) Both contain the same quantity

10. What type of relationship is represented by this scatter graph?



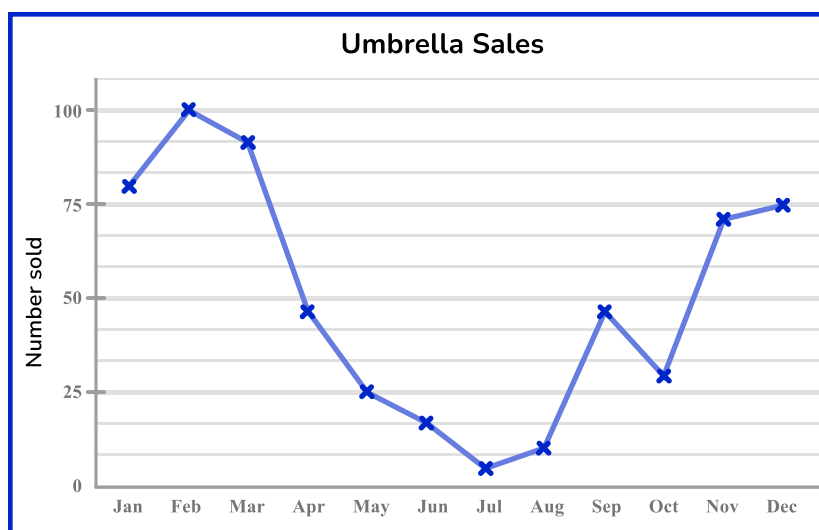
A) Impossible to determine	B) Negative correlation
C) Upward correlation	D) Strong positive correlation

Diagnostic Questions: Representing data

11. Which of the following options would be best used to represent frequencies of categorical data?

A) Bar chart	B) Pie chart
C) Scatter graph	D) Box plot

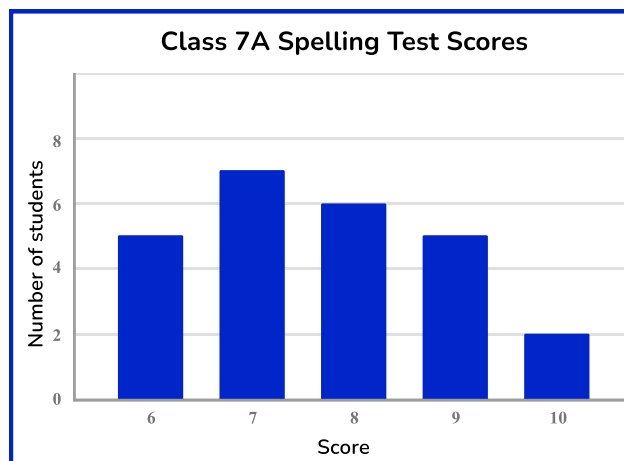
12. A shopkeeper records how many umbrellas they sell each month. Which two months had the same number of umbrella sales?



A) January and December	B) May and October
C) February and March	D) April and September

Diagnostic Questions: Representing data

13. The distribution of scores in a spelling test are represented in a bar chart. What was the mean score in the spelling test for class 7A?



A) 7	B) 7.68
C) 8	D) 7.5

14. This stem and leaf diagram represents the ages of participants in a karate session. What is the median age of a participant?

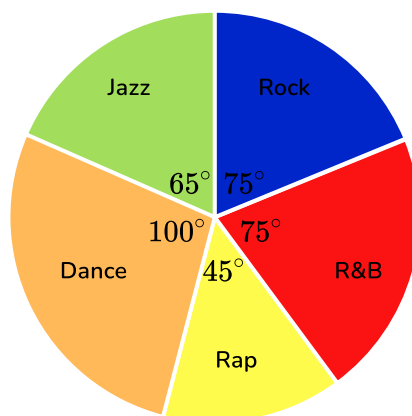
Stem	Leaf
1	6 6 9
2	3 4 6 7 7 7 9
3	0 1 2 5 6
4	4 5 9

Key: 3 | 8 means 38

A) 8	B) 27
C) 28	D) 32.5

Diagnostic Questions: Representing data

15. The results of a survey about favourite music genre are represented in a pie chart. Given that 20 people chose dance music, how many people were surveyed?



A) 100	B) 80
C) 72	D) 2000

16. This stem and leaf plot represents the heights of a squad of rugby players. What is the modal height for a rugby player in this squad?

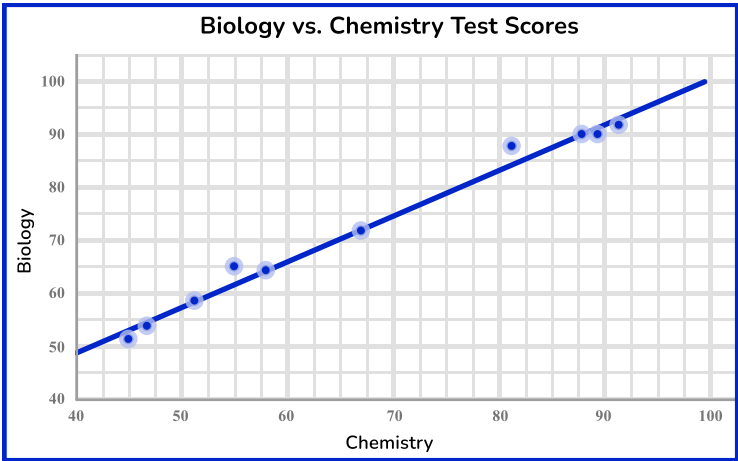
Stem	Leaf
16	5 8
17	1 3 4 4 4 8 9 9
18	0 0 2 3 5 6 7 8 8
19	1 2 7

Key: 15 | 8 means 158cm

A) 174 cm	B) 180 cm
C) 188 cm	D) 185 cm

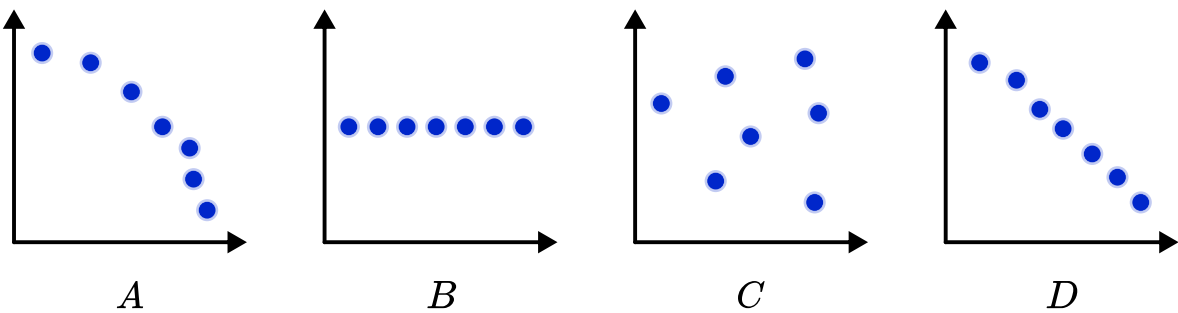
Diagnostic Questions: Representing data

17. Use this scatter graph and line of best fit to estimate the score in biology if a student scores 80 in chemistry:



A) 87	B) 76
C) 84	D) 80

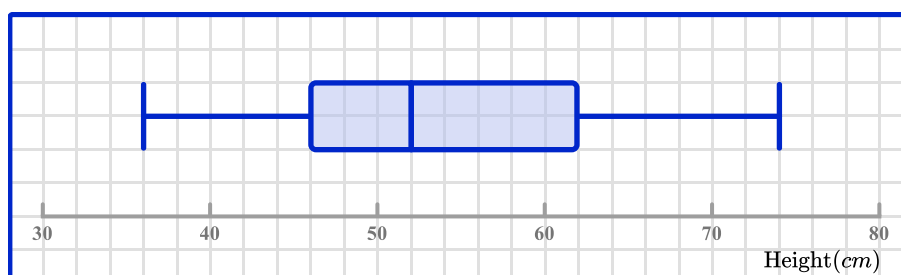
18. Which scatter graph represents negative correlation?



A) A	B) B
C) C	D) D

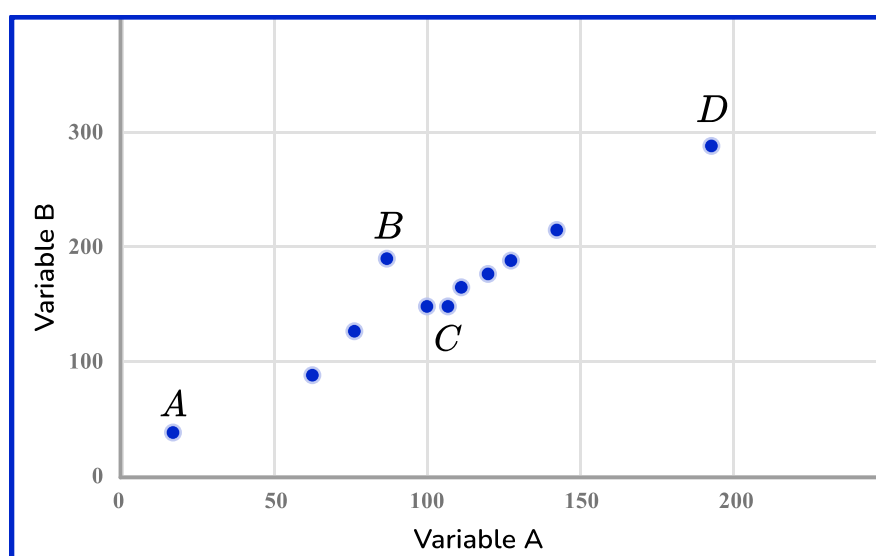
Diagnostic Questions: Representing data

19. The heights of plants in a field are recorded and the results represented using a box plot. What is the median height of these plants?



A) 46 <i>cm</i>	B) 52 <i>cm</i>
C) 54 <i>cm</i>	D) 62 <i>cm</i>

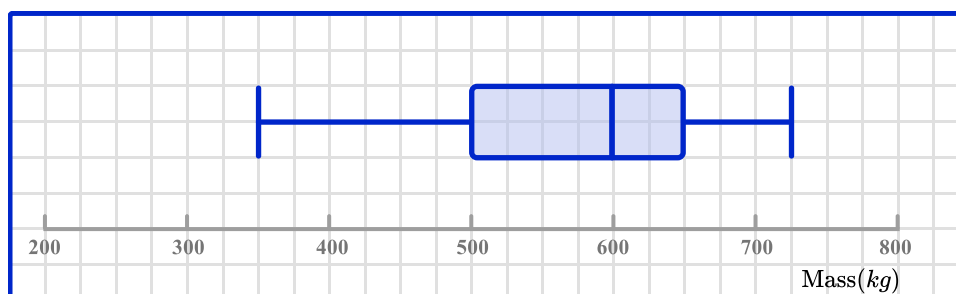
20. Which data point should be considered an outlier?



A) A	B) B
C) C	D) D

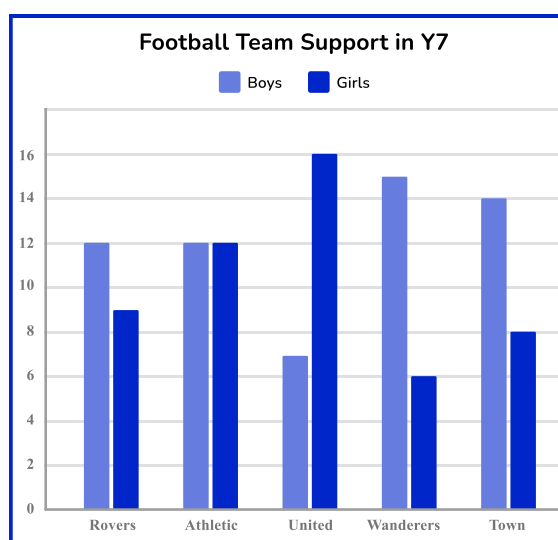
Diagnostic Questions: Representing data

21. The mass of the cargo pallets in a truck are recorded and the results represented using a box plot. What is the range of the mass?



A) 725 kg	B) 375 kg
C) 150 kg	D) 370 kg

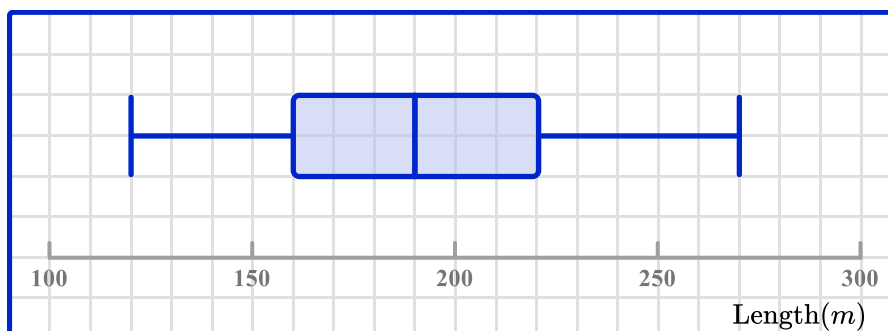
22. This bar chart shows how many pupils in Y7 support each local football team. Which team has the same number of supporters as Rovers?



A) Athletic	B) United
C) Wanderers	D) Town

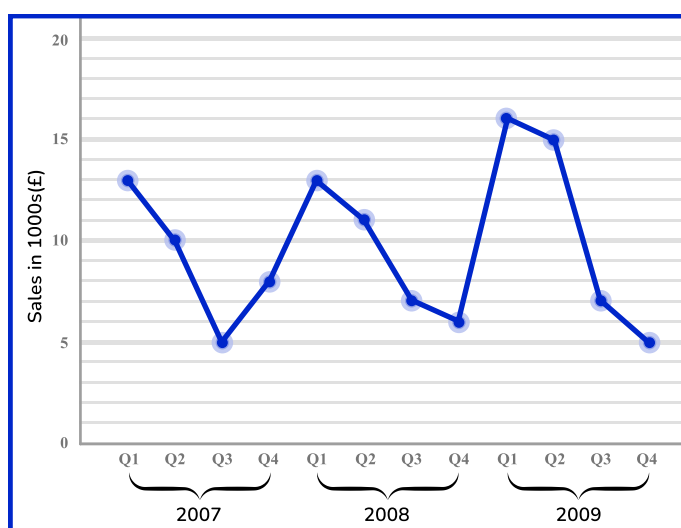
Diagnostic Questions: Representing data

23. A golf club records the length of each member's drive from the tee, and the results are represented using a box plot. What is the interquartile range of these lengths?



A) 150 m	B) 60 m
C) 70 m	D) 30 m

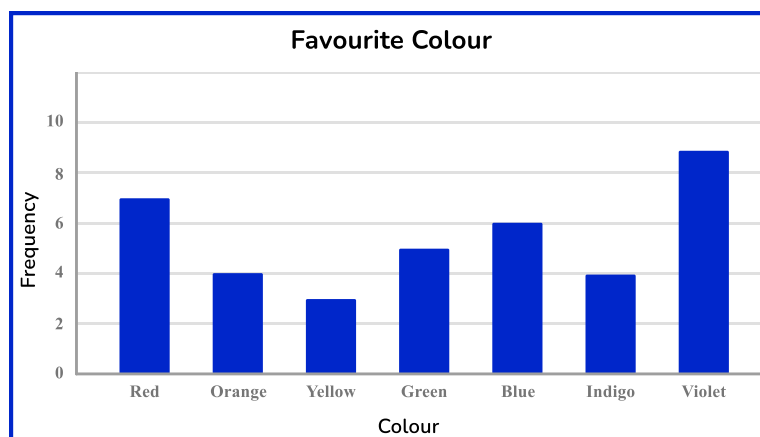
24. This line graph shows the sales for a small business over a three year period. In which quarter did sales increase year-on-year over this period?



A) Q1	B) Q2
C) Q3	D) Q4





Diagnostic Questions: Representing data Answers


1. Some primary school children were asked to name their favourite colour of the rainbow. How many children were surveyed?



- A) 42 Student misread the frequency axis, using an even number for each colour
 B) 9 Student gave the largest category frequency
 C) 38 Correct answer
 D) 34 Student discounted one occurrence of the frequency 4

2. A pictogram is drawn to represent the types of sweets in a jar. How many toffee sweets are in the jar?

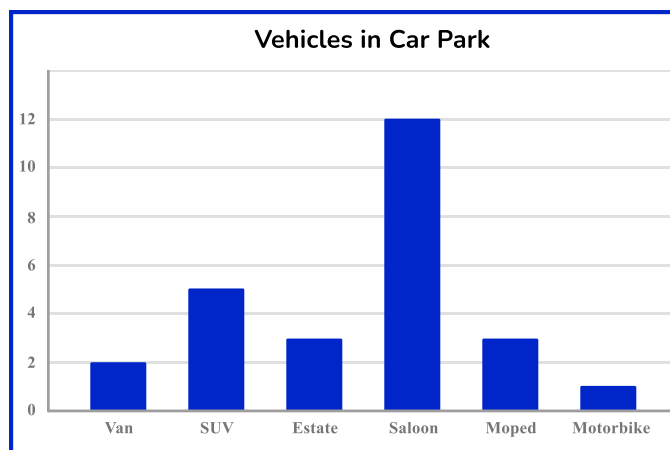
Mint	
Toffee	
Fudge	
Chocolate	

KEY
 = 10 sweets

- A) 17 Student counted the number of circles in the pictogram
 B) 6 Student counted the number of circles representing toffee
 C) 170 Student determined the number of sweets in the jar
 D) 60 Correct answer



Diagnostic Questions: Representing data Answers


3. This bar chart shows the frequencies of different vehicles in a supermarket car park. How many more saloons than SUVs were there?







- A) 15 Student found the total number of saloons and SUVs
 B) 7 **Correct answer**
 C) 12 Student stated the number of saloons
 D) 6 Student rounded the SUV bar up to the major gridline

4. The results from a survey on berry preference are being represented using a pictogram. Given that six people chose strawberry, which option completes the missing row in the pictogram?

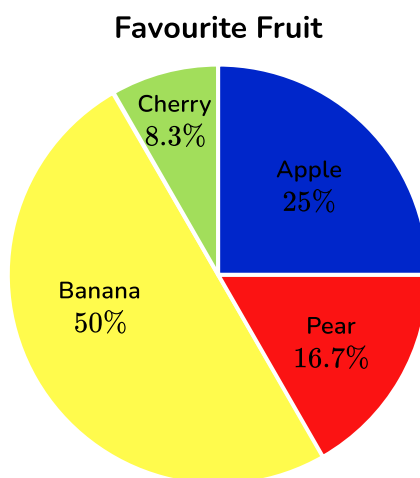
Raspberry	
Blueberry	
Strawberry	

KEY
 = 8 people

- A)  **Correct answer**
 B)  Student used six symbols (representing 48 people)
 C)  Student chose option inconsistent with current rows in pictogram
 D)  Student thought that half a square represented two people

Diagnostic Questions: Representing data Answers

5. All the children at a junior school were asked to name their favourite fruit. The results are shown in a pie chart. How many children chose apple?



- A) 25 Student gave a percentage, not a number
 B) Impossible to tell **Correct answer**
 C) 90 Student gave the size of the angle in degrees for apple
 D) One quarter Student gave the proportion of children who chose apple
6. A pie chart is being used to represent the data from a survey on favourite sport. Using the results in the table, determine the pie chart angle size for rugby:

Sport	Tennis	Rugby	Cycling	Hockey	Athletics
Frequency	41	65	24	38	32

- A) 173° Student did not include the frequency for rugby in the total surveyed
 B) 72° Student divided 360 by the number of categories
 C) 65° Student stated the frequency that chose rugby
 D) 117° **Correct answer**

Diagnostic Questions: Representing data Answers

7. From these options, which type of diagram would be best used to represent the relationship between two variables?

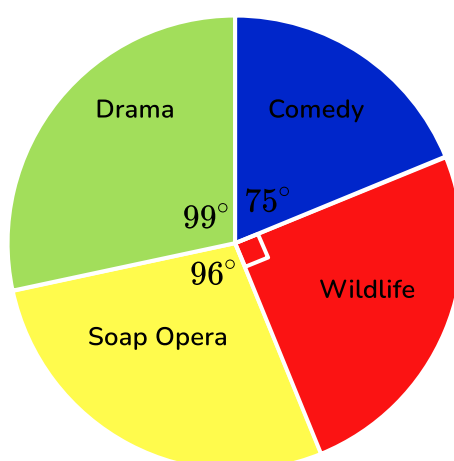
A) Scatter graph **Correct answer**

B) Pie chart, Student does not understand that a pie chart would represent the proportion of each variable

C) Dual bar chart, Student does not understand that a bar chart would represent total frequencies

D) Line graph, Student does not understand that a line graph represents how one variable changes over time

8. This pie chart shows the results of a survey in which 240 participants were asked to give their favourite type of TV show. How many chose comedy?



A) 60 Student used 300° as the numbers of degrees about a point

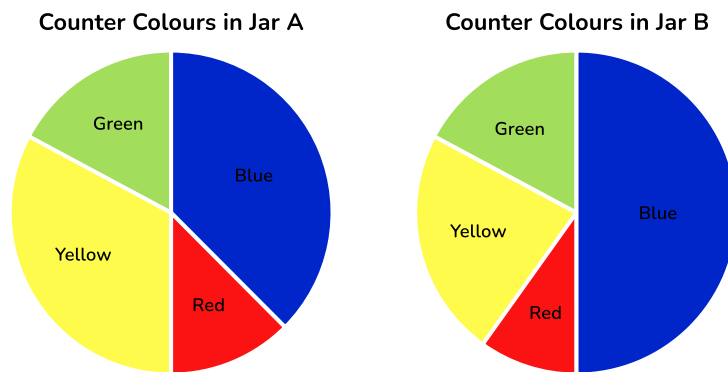
B) 75 Student gave the angle size, not the category frequency

C) 180 Student calculated 75% of 240

D) 50 **Correct answer**

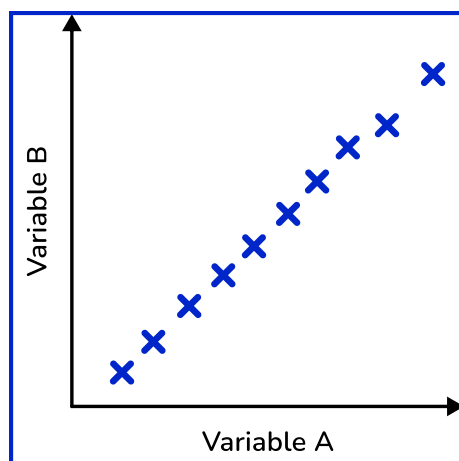
Diagnostic Questions: Representing data Answers

9. A student counts the numbers of different coloured counters in two jars, then represents their results as pie charts. Which jar had the greatest quantity of blue counters?



- A) Jar B Student assumed that a larger proportion means a greater quantity
 B) Impossible to tell Correct answer
 C) Jar A Student lacks understanding of pie charts
 D) Both contain the same quantity Student guessed without justification

10. What type of relationship is represented by this scatter graph?



- A) Impossible to determine Student assumed not knowing the variables means a relationship cannot be determined
 B) Negative correlation Student does not understand correlation
 C) Upward correlation Student lacks knowledge of statistical language
 D) Strong positive correlation Correct answer

Diagnostic Questions: Representing data Answers

11. Which of the following options would be best used to represent frequencies of categorical data?

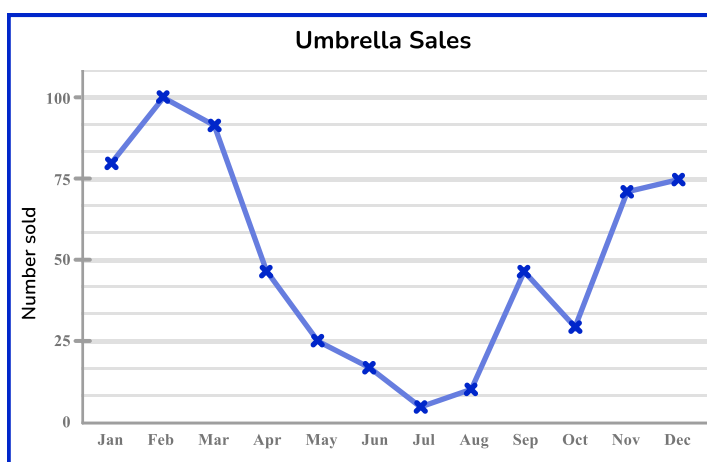
A) Bar chart Correct answer

B) Pie chart Student does not understand that a pie chart represents proportions, not the frequencies

C) Scatter graph Student does not understand that a scatter graph is used to represent continuous, bivariate data

D) Box plot Student does not understand that a box plot is used to represent the key descriptive statistics of a continuous variable

12. A shopkeeper records how many umbrellas they sell each month. Which two months had the same number of umbrella sales?



A) January and December Student did not compare first and last data points correctly

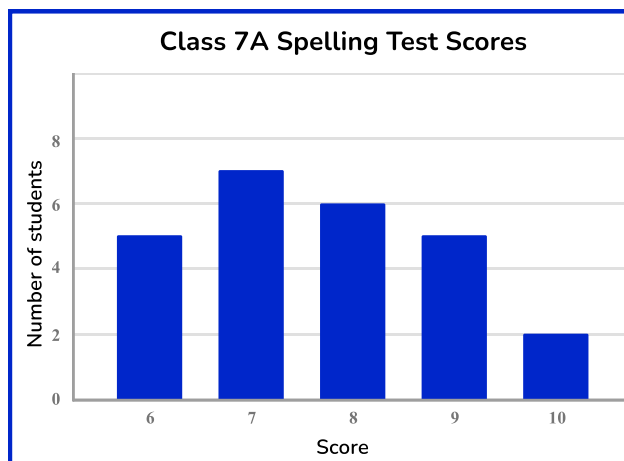
B) May and October Student did not use chart scale accurately

C) February and March Student chose the months with the highest sales

D) April and September Correct answer

Diagnostic Questions: Representing data Answers

13. The distribution of scores in a spelling test are represented in a bar chart. What was the mean score in the spelling test for class 7A?



- A) 7 Student gave the modal score
 B) 7.68 Correct answer
 C) 8 Student found the midpoint of 6 and 10
 D) 7.5 Student made a guess based on the shape of the distribution

14. This stem and leaf diagram represents the ages of participants in a karate session. What is the median age of a participant?

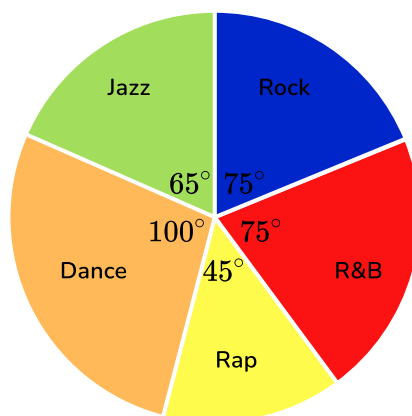
Stem	Leaf
1	6 6 9
2	3 4 6 7 7 7 9
3	0 1 2 5 6
4	4 5 9

Key: 3 | 8 means 38

- A) 8 Student found the correct leaf position, but did not include the stem
 B) 27 Student found the modal age
 C) 28 Correct answer
 D) 32.5 Student found the midpoint of minimum and maximum ages

Diagnostic Questions: Representing data Answers

15. The results of a survey about favourite music genre are represented in a pie chart. Given that 20 people chose dance music, how many people were surveyed?



- A) 100 Student gave the angle size for dance music
 B) 80 Student used 400° for degrees in a full turn
 C) 72 Correct answer
 D) 2000 Student multiplied the angle size by frequency represented

16. This stem and leaf plot represents the heights of a squad of rugby players. What is the modal height for a rugby player in this squad?

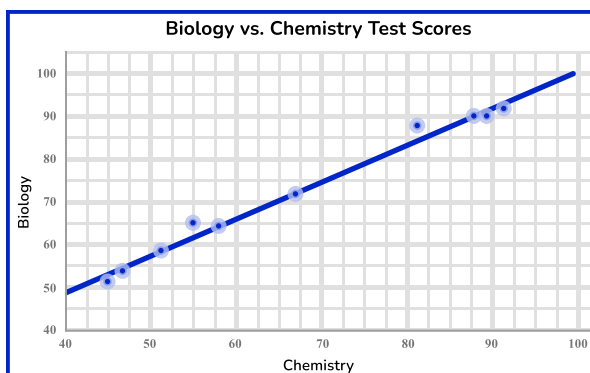
Stem	Leaf
16	5 8
17	1 3 4 4 4 8 9 9
18	0 0 2 3 5 6 7 8 8
19	1 2 7

Key: 15 | 8 means 158cm

- A) 174 cm Correct answer
 B) 180 cm Student gave the median height
 C) 188 cm Student gave the height corresponding to the largest value in the row with most leaves
 D) 185 cm Student gave the height corresponding to the middle value in the row with most leaves

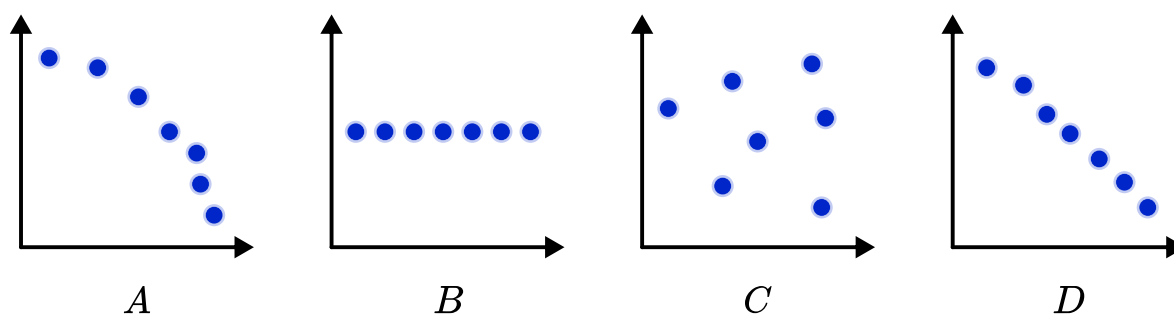
Diagnostic Questions: Representing data Answers

17. Use this scatter graph and line of best fit to estimate the score in biology if a student scores 80 in chemistry:



- A) 87 Student used the nearest data point to 80 for chemistry
 B) 76 Student used the axes in wrong order
 C) 84 Correct answer
 D) 80 Student ignored the line of best fit and stated the same score as chemistry

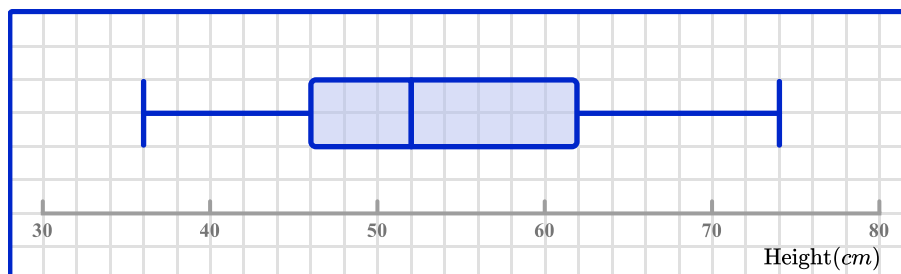
18. Which scatter graph represents negative correlation?



- A) A Student chose a nonlinear relationship
 B) B Student thinks a lack of vertical change means negative correlation
 C) C Student confused no correlation with negative correlation
 D) D Correct answer

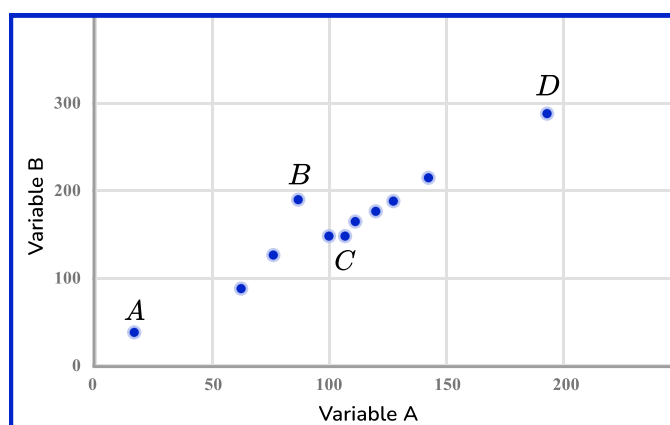
Diagnostic Questions: Representing data Answers

19. The heights of plants in a field are recorded and the results represented using a box plot. What is the median height of these plants?



- A) 46 *cm* Student gave the value for the lower quartile
 B) 52 *cm* **Correct answer**
 C) 54 *cm* Student found the midpoint of the data set
 D) 62 *cm* Student gave the value for the upper quartile

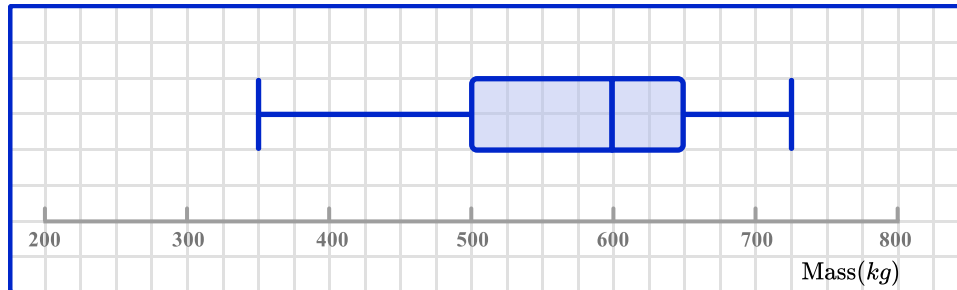
20. Which data point should be considered an outlier?



- A) A Minimum for both variables. This point is consistent with the trend, so not an outlier
 B) B **Correct answer**
 C) C This point exhibits variation from the trend, but is not an outlier
 D) D Maximum for both variables. This point is consistent with the trend, so not an outlier

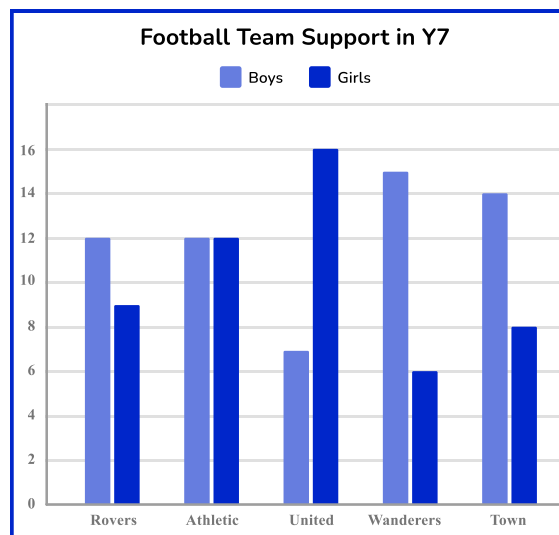
Diagnostic Questions: Representing data Answers

21. The mass of the cargo pallets in a truck are recorded and the results represented using a box plot. What is the range of the mass?



- A) 725 *kg* Student gave the maximum mass
 B) 375 *kg* Correct answer
 C) 150 *kg* Student confused range and interquartile range
 D) 370 *kg* Student read scale incorrectly, taking max value as 720kg

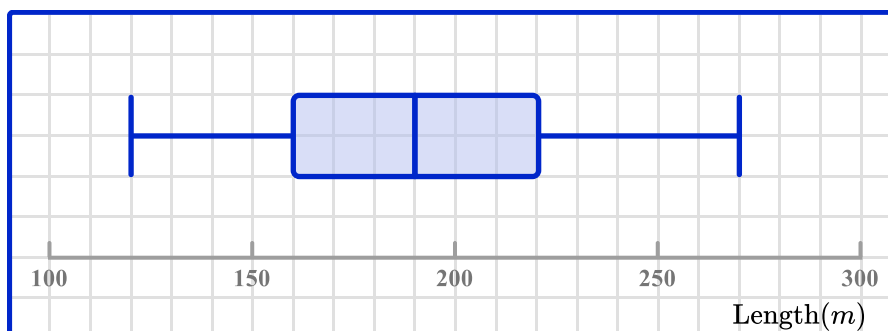
22. This bar chart shows how many pupils in Y7 support each local football team. Which team has the same number of supporters as Rovers?



- A) Athletic Student only considered the bar for boys
 B) United Student made an arithmetic error
 C) Wanderers Correct answer
 D) Town Student made an arithmetic error

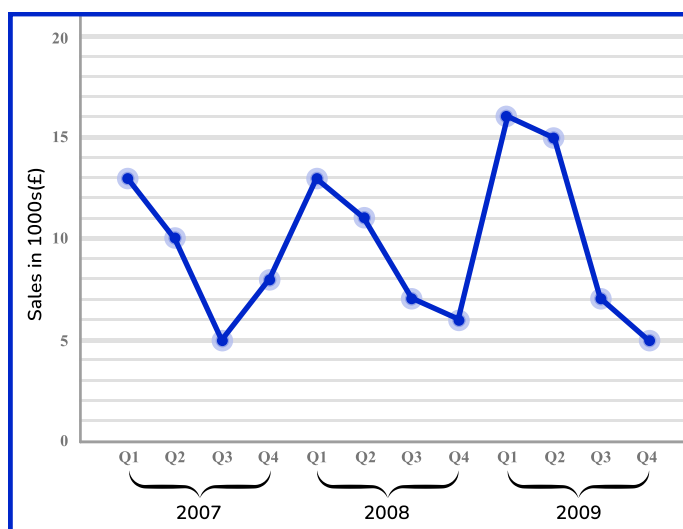
Diagnostic Questions: Representing data Answers

23. A golf club records the length of each member's drive from the tee, and the results are represented using a box plot. What is the interquartile range of these lengths?



- A) 150m Student confused range and interquartile range
 B) 60m **Correct answer**
 C) 70m Student used median and minimum, rather than upper/lower quartiles
 D) 30m Student calculated the difference between median and quartiles

24. This line graph shows the sales for a small business over a three year period. In which quarter did sales increase year-on-year over this period?



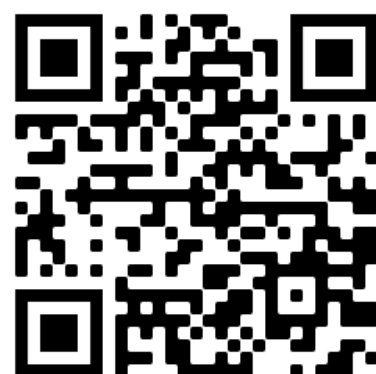
- A) Q1 Sales are equal in 2007 and 2008, then increase in 2009
 B) Q2 **Correct answer**
 C) Q3 Sales increase from 2007 to 2008, but are equal in 2008 and 2009
 D) Q4 Sales decrease year-on-year during this period

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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