

Student Name

Mathematics Stage 5 Core

DATA ANALYSIS A

Book 2 Determine quartiles and interquartile range

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OVERVIEW

SYLLABUS CONTENT

MA5-DAT-C-01 compares and analyses datasets using summary statistics and graphical representations

Determine quartiles and interquartile range

- Determine the 5-number summary for sets of numerical data
- Determine the 5-number summary from graphical representations
- Determine the interquartile range (IQR) for datasets
- Compare and explain the relative merits of range and IQR as measures of spread

REVIEW OF PRIOR KNOWLEDGE

1 Find the median of these datasets.

a 2, 4, 5, 7, 9

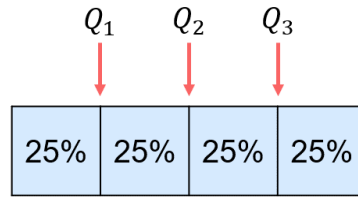
b 1, 2, 3, 5, 7, 9

c 5, 12, 7, 11, 4, 1, 7

d 12, 14, 14, 11, 10, 12, 13, 9

QUARTILES

- **Quartiles** split ordered data into four equal groups.



- Q_1 **First quartile** (lower quartile) 25% of data below this number
- Q_2 **Second quartile** (median) 50% of data below this number
- Q_3 **Third quartile** (upper quartile) 75% of data below this number

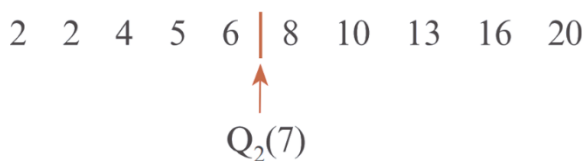
To find the quartiles:

1. Q_2 : Find the median. The median splits the dataset into two halves.
2. Q_1 : Find the median of the lower half.
3. Q_3 : Find the median of the upper half.

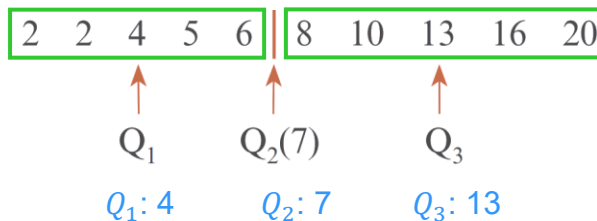
Example Determine Q_1 , Q_2 , Q_3 of a set of data.

Find Q_1 , Q_2 and Q_3 of the dataset:

1. Find median Q_2



2. Find median of lower half (Q_1) and upper half (Q_3)



What is a quartile?

A quartile splits a dataset into

What is another word for the quartile 2?

The second quartile is also the

Find Q_1 , Q_2 and Q_3 for these sets of data.

a 2 2 4 5 6 8 10 13 16 20

$$Q_1 = \boxed{} \quad Q_2 = \boxed{} \quad Q_3 = \boxed{}$$

Q1 = 4, Q2 = 7, Q3 = 13

b 1 1 2 2 3 4 4 5 6 7 18

$$Q_1 = \square \quad Q_2 = \square \quad Q_3 = \square$$

Q1 = 2, Q2 = 4, Q3 = 6

Key ideas

1. Quartiles split a dataset into equal groups.
2. The second quartile is also called the;% of data is less than this number.
3. The first quartile is also called the quartile. 25% of data is less than this number.
4. The third quartile is also called the quartile. 75% of data is less than this number.

1 Calculate Q1, Q2, and Q3 for these datasets.

5 data values



a 14, 20, 28, 36, 50

Q₁ = Q₂ = Q₃ =

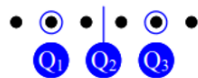
b 8, 13, 18, 23, 37

Q₁ = Q₂ = Q₃ =

c 52, 64, 115, 144, 200

Q₁ = Q₂ = Q₃ =

6 data values



a 5, 16, 25, 45, 45, 67

Q₁ = Q₂ = Q₃ =

b 38, 48, 55, 75, 82, 93

Q₁ = Q₂ = Q₃ =

c 18, 24, 86, 205, 312, 440

Q₁ = Q₂ = Q₃ =

7 data values



a 9, 14, 16, 22, 22, 22, 31

Q₁ = Q₂ = Q₃ =

b 15, 33, 49, 57, 81, 93, 102

Q₁ = Q₂ = Q₃ =

c 9, 12, 41, 57, 82, 89, 128

Q₁ = Q₂ = Q₃ =

9 data values



a 1, 7, 12, 13, 16, 16, 19, 25, 28

Q₁ = Q₂ = Q₃ =

b 19, 20, 42, 42, 57, 63, 66, 72, 77

Q₁ = Q₂ = Q₃ =

c 88, 93, 99, 106, 108, 110, 110, 113, 119

Q₁ = Q₂ = Q₃ =

10 data values



a 3, 5, 5, 8, 12, 12, 12, 14, 17, 19

Q₁ = Q₂ = Q₃ =

b 38, 46, 58, 62, 67, 73, 88, 88, 90, 94

Q₁ = Q₂ = Q₃ =

c 9, 12, 50, 73, 84, 99, 111, 118, 118, 133

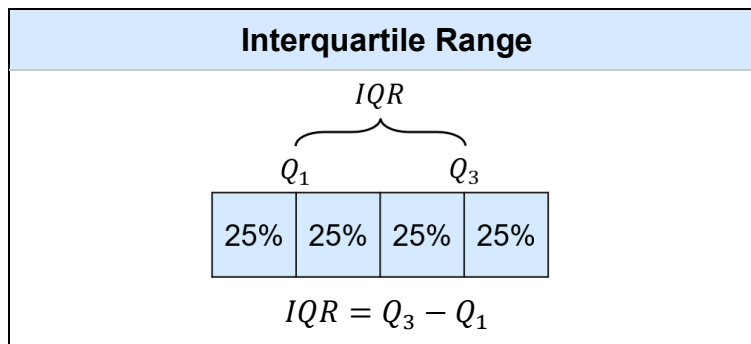
Q₁ = Q₂ = Q₃ =

FIVE-NUMBER SUMMARY AND INTERQUARTILE RANGE

- The **five-number summary** gives an overview of the data.

Five-number Summary				
Min	Q_1	Q_2	Q_3	Max

- Outliers** greatly affect range and standard deviation.
- The **interquartile range** (IQR) measures spread with less impact from outliers.



Example Determine the five-number summary for a set of data.

Determine the five-number summary and interquartile range of the dataset: 2 2 4 5 6 8 10 13 16 20 $\uparrow$ $\uparrow$ $\uparrow$ Q_1 $Q_2(7)$ Q_3 Min: 2 Q_1: 4 Q_2: 7 Q_3: 13 Max: 20 $IQR = Q_3 - Q_1$ $= 13 - 4 = 9$	What is the interquartile range? <i>The interquartile range is -</i> Why is the interquartile range useful? <i>The interquartile range is less affected by compared to the range and standard deviation.</i>
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Calculate the five-number summary and interquartile range (IQR) for these sets of data.

a 21 22 22 23 25 26 45 Min: Q_1: Q_2: Q_3: Max: $IQR = Q_3 - Q_1$ $= \dots - \dots$ $= \dots$ FNS: 21, 22, 23, 26, 45 IQR = 4	b 3 18 23 23 27 29 30 34 Min: Q_1: Q_2: Q_3: Max: $IQR = Q_3 - Q_1$ $= \dots - \dots$ $= \dots$ FNS: 3, 20.5, 25, 24.5, 34 IQR = 9
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Key ideas

- The five number summary gives an overview of the data:,,,,
- The is a measure of spread. It is less affected by when compared to the range.

Min:	Q_1 :	Q_2 :	Q_3 :	Max:	$IQR = Q_3 - Q_1$
					$= \dots - \dots$
					$= \dots$

Min:	Q_1 :	Q_2 :	Q_3 :	Max:	$IQR = Q_3 - Q_1$
					$= \dots - \dots$
					$= \dots$

Min:	Q_1 :	Q_2 :	Q_3 :	Max:	$IQR = Q_3 - Q_1$
					$= \dots - \dots$
					$= \dots$

Min:	Q_1 :	Q_2 :	Q_3 :	Max:	$IQR = Q_3 - Q_1$
					$= \dots - \dots$
					$= \dots$

- 2** This ordered data set shows the number of hours of sleep 11 people had the night before.

3 5 5 6 7 7 7 8 8 8 9

- a** Find the range
- b** Find the median
- c** Disregard the median then find the:
 - i** lower quartile
 - ii** upper quartile
- d** Find the interquartile range

- 3** This ordered data set shows the number of fish Daniel caught in the 12 weekends that he went fishing during the year.

1 2 3 3 4 4 6 7 7 9 11 13

- a** Find the range
- b** Find the median
- c** Split the data in half then find the:
 - i** lower quartile
 - ii** upper quartile
- d** Find the interquartile range

- 4** Find the 5 number summary and IQR for each of these sets of data.

a 1 3 4 7 9 10 11

b 14 14 15 16 16 18 19 19 20 20 21

c 0 1 2 3 5 5 6 7 7 8 9 9 11

d 18 21 21 26 27 29 30 30 35 36 37 38 41

5 Find the 5 number summary and IQR for each of these sets of data.

a 35 11 26 45 22 36 53 38 40 19

b 108 117 94 103 125 107 129 105 100

c 17 11 8 15 3 14 10 12 7 19 15 16

6 Consider the scores 2, 3, 4, 5, 5, 5, 6, 7, 8.

A score of 23 is added to the dataset. How will this affect the IQR?

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Hence, describe why the IQR is more useful than the range when there are outliers.

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A referee wrote down the number of goals scored in 9 different games during the season.

2, 3, 3, 3, 5, 5, 8, 9, ...

The last number has been omitted. The range of the data is 10.

What is the five-number summary for this data set?

(A) 2, 3, 5, 8.5, 12

(B) 2, 3, 5, 8.5, 10

(C) 2, 3, 5, 8, 12

(D) 2, 3, 5, 8, 10

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This set of data is arranged in order from smallest to largest.

5 6 11 x 13 18 25

The range is six less than twice the value of x

Which one of the following is true?

(A) The median is 12 and the interquartile range is 7.

(B) The median is 12 and the interquartile range is 12.

(C) The median is 13 and the interquartile range is 7.

(D) The median is 13 and the interquartile range is 12.