Y10 Maths Knowledge Organiser Foundation Tier: Charts, Tables and Averages

What must I be able to do?	Key vocabulary	
New content: ☐ Solve problems which involve averages ➢ Mathswatch 62 (GCSE) ☐ Calculate averages from frequency tables ➢ Mathswatch 130a (GCSE) ☐ Estimate the mean from a grouped frequency table ➢ Mathswatch 130b (GCSE)	**Modal group**	The group with the highest frequency in a grouped frequency table

Types of averages

e.g. Given this list of numbers 3, 7, 5, 4, 7

Mean: 3 + 7 + 5 + 4 + 7 = 26

26 ÷ 5 = 5.2

The mean value is 5.2

Median: First, write in ascending order

3, 4, 5, 7, 7 ← Only 5 in the middle

The median value is 5.

Mode: The number which appears the most is 7. (7 appears twice)

The modal value is 7.

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e.g. Given this list of numbers 7, 9, 3, 5

Mean: 7 + 9 + 3 + 5 = 24

24 ÷ 4 = 6

The mean value is 6

Median: First write in ascending order

3, 5, 7, 9 ← 5 and 7 in the middle. 5 + 7 = 12, 12 ÷ 2 = 6

The median value is 6

Mode: Each number appears an equal number of times (only once)

There is no mode.

Range

e.g. Given the list of numbers 3, 6, 10, 3, 5, 8 the range is the largest (10) subtract the smallest (3). 10 – 3 = 7. The range is 7.

The range is not an average but instead is a measure of spread. In general, a lower range is better as it implies the data is more consistent.

Comparing data

When comparing data you should write two statements, one comparing an average (mean, median or mode) and another comparing the spread (range).

E.g. Joe and Emma are testing frisbees. They each throw their frisbee 3 times and measure how far it travels in metres.

Joe's results are: 13.2, 17.6 and 11.5

Emma's results are: 14.5, 13.9 and 14.8.

Compare the results.

Joe's mean average: 13.2 + 17.6 + 11.5 = 42.3

42.3 ÷ 3 = 14.1m

Joe's range is 17.6 – 11.5 = 6.1m

Emma's mean average: 14.5 + 13.9 + 14.8 = 43.2

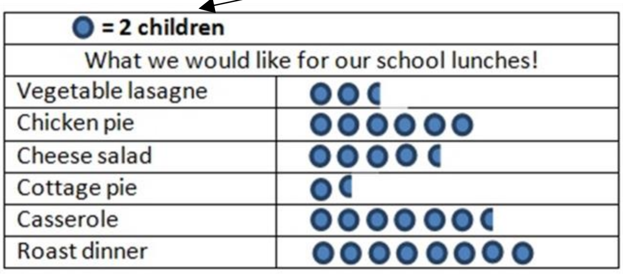
43.2 ÷ 3 = 14.4m

Emma's range is 14.8 – 13.9 = 0.9.

So, on average Emma's frisbee went further as 14.4 > 14.1. Emma's frisbee was also more consistent as her range was only 0.9 while Joe's range was 6.1m.

Pictograms

Don't forget a key!



Averages from tables

e.g.

# of people	Frequency
1	8
2	6
3	3
4	4
	Total = 21 cars

The **mode** will be the group with the largest frequency. The highest frequency is 8 so the mode is 1 person in a car.

The **median** is the middle value. There are 21 values in total (the sum of the frequency) so the middle value will be the 11th. The first 8 values are all 1s, the next 6 values are all 2s which is 14 values in total. So the 11th value was a 2. The median is 2 people in a car.

The **mean** is the average number of people **per car**:

# of people	Frequency	Total
1	8	8 x 1 = 8
2	6	6 x 2 = 12
3	3	3 x 3 = 9
4	4	4 x 4 = 16
	21 cars	45 people

8 cars have 1 person. 8 x 1 = 8.

6 cars have 2 people. 6 x 2 = 12.

3 cars have 3 people. 3 x 3 = 9.

4 cars have 4 people. 4 x 4 = 16.

So the total is 8 + 12 + 9 + 16 = 45 people.

The mean is: 45 ÷ 21 = 2.14 people per car (2d.p.)

Estimating the mean from a grouped frequency table

e.g.

Test Score	Frequency	Midpoint (of test score)	Estimated Total
0-10	5	(10 + 0) ÷ 2 = 5	5 x 5 = 25
11-20	4	(20 + 11) ÷ 2 = 10.5	4 x 10.5 = 42
21-30	8	(21 + 30) ÷ 2 = 25.5	8 x 25.5 = 204
31-40	12	(40 + 31) ÷ 2 = 35.5	12 x 35.5 = 426
	Total = 29 people		697

Estimated mean is:

Estimated total ÷ total frequency

= 697 ÷ 29 = 24.03 (2dp)

In a grouped frequency table you do not know the actual values, e.g. we know 5 people scored between 0 and 10 but not their actual scores. So we cannot add up their scores to find an accurate total. The way around this is to estimate their scores and we use the **midpoint** of the values for this estimation. The rest of the question follows the same pattern as a normal frequency table.

Note: For this estimation to be accurate we assume that the groups are **evenly distributed** (this means that there are approximately the same amount of values above the midpoint as there are below the midpoint in each group).

Reverse mean questions (find a new mean after a change)

e.g. The mean height of 4 basketball players is 1.88m. A 5th player joins who is 1.96m tall. What is the new mean height of all 5 players?

First, find the total height of the original 4.

4 x 1.88 = 7.52m

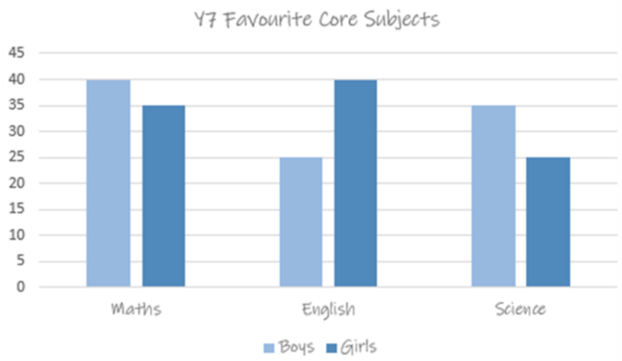
New total height is therefore 7.52 + 1.96 = 9.48m

New mean height is 9.48 ÷ 5 = 1.896m

Pros and Cons of each type of average

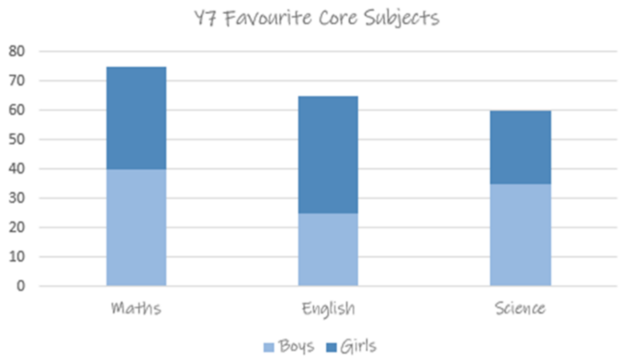
	Pros	Cons
Mean	Uses all the values in a data set.	Can be misleading if the data has an outlier (a particularly large or small value compared to the others.
Median	Ignores outliers	Only uses the middle value so does not use all of the data.
Mode	Can be used with non-numerical values e.g. colours	There may not be a mode. Does not use all of the data.

Types of bar charts



Comparative bar chart

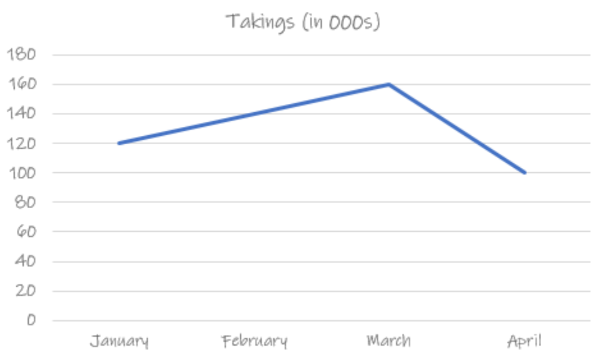
Bars are side by side – good for comparing differences



Composite bar chart

Bars are on top of each other – good for comparing totals

Line graphs



Usually used to represent changes over a period of time

GLUE

HERE