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| **UNIT 3: Averages and range, collecting data, representing data** |

[Return to Overview](#HOverview)

**SPECIFICATION REFERENCES**

G14 use standard units of measure and related concepts (length, area, volume/capacity, mass, time, money, etc.)

S2 interpret and construct tables, charts and diagrams, including frequency tables, bar charts, pie charts and pictograms for categorical data, vertical line charts for ungrouped discrete numerical data, tables and line graphs for time series data and know their appropriate use

S3 **construct and interpret diagrams for grouped discrete data and continuous data i.e. histograms with equal and unequal class intervals …**

S4 interpret, analyse and compare the distributions of data sets from univariate empirical distributions through:

* appropriate graphical representation involving discrete, continuous and grouped data …
* appropriate measures of central tendency (median, mode and modal class) and spread (range, including consideration of outliers) …

S5 apply statistics to describe a population

S6 use and interpret scatter graphs of bivariate data; recognise correlation and know that it does not indicate causation; draw estimated lines of best fit; make predictions; interpolate and extrapolate apparent trends whilst knowing the dangers of so doing

**PRIOR KNOWLEDGE**

Students should be able to read scales on graphs, draw circles, measure angles and plot coordinates in the first quadrant.

Students should have experience of tally charts.

Students will have used inequality notation.

Students must be able to find midpoint of two numbers.

**KEYWORDS**

Mean, median, mode, range, average, discrete, continuous, qualitative, quantitative, data, scatter graph, line of best fit, correlation, positive, negative, sample, population, stem and leaf, frequency, table, sort, pie chart, estimate

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| **3a. Averages and range**  (G14, S2, S3, S4, S5) | **Teaching time**  3-5 hours |

**OBJECTIVES**

By the end of the sub-unit, students should be able to:

* Design and use two-way tables for discrete and grouped data;
* Use information provided to complete a two-way table;
* Sort, classify and tabulate data and discrete or continuous quantitative data;
* Calculate mean and range, find median and mode from a small data set;
* Use a spreadsheet to calculate mean and range, and find median and mode;
* Recognise the advantages and disadvantages between measures of average;
* Construct and interpret stem and leaf diagrams (including back-to-back diagrams):
* find the mode, median, range, as well as the greatest and least values from stem and leaf diagrams, and compare two distributions from stem and leaf diagrams (mode, median, range);
* Calculate the mean, mode, median and range from a frequency table (discrete data);
* Construct and interpret grouped frequency tables for continuous data:
* for grouped data, find the interval which contains the median and the modal class;
* estimate the mean with grouped data;
* understand that the expression ‘estimate’ will be used where appropriate, when finding the mean of grouped data using mid-interval values.

**POSSIBLE SUCCESS CRITERIA**

Be able to state the median, mode, mean and range from a small data set.

Extract the averages from a stem and leaf diagram.

Estimate the mean from a table.

**OPPORTUNITIES FOR REASONING/PROBLEM SOLVING**

Students should be able to provide reasons for choosing to use a specific average to support a point of view.

Given the mean, median and mode of five positive whole numbers, can you find the numbers?

Students should be able to provide a correct solution as a counter-argument to statements involving the “averages”, e.g. Susan states that the median is 15, she is wrong. Explain why.

**COMMON MISCONCEPTIONS**

Students often forget the difference between continuous and discrete data.

Often the ∑(*m* × *f*) is divided by the number of classes rather than ∑*f* when estimating the mean.

**NOTES**

Encourage students to cross out the midpoints of each group once they have used these numbers to in *m* × *f*. This helps students to avoid summing *m* instead of *f*.

Remind students how to find the midpoint of two numbers.

Emphasise that continuous data is measured, i.e. length, weight, and discrete data can be counted, i.e. number of shoes.

Designing and using data collection is no longer in the specification, but may remain a useful topic as part of the overall data handling process.