NCETM
NATIONAL CENTRE FOR EXCELLENCE IN THE TEACHING OF MATHEMATICS

Core concept 5.2: Statistical analysis

This document is part of a set that forms the subject knowledge content audit for Key Stage 3 maths. The audit is based on the NCETM Secondary Professional Development materials and there is one document for each of the 17 core concepts. Each document contains audit questions with check boxes you can select to show how confident you are (1 = not at all confident, 2 = not very confident, 3 = fairly confident, 4 = very confident), exemplifications and explanations, and further support links. At the end of each document there is space to type reflections, targets and notes. The document can then be saved for your records.

5.2.1 Interpret reasonably statistical measures and representations

How confident are you that you understand and can explain how to interpret appropriate statistical representations to compare and interpret data sets?

1 ☐ 2 ☐ 3 ☐ 4 ☐

How confident are you that you understand and can explain how statistical measures may change as a result of changes in the data?

1 ☐ 2 ☐ 3 ☐ 4 ☐

How confident are you that you understand range as a measure of spread and how to consider outliers?

1 ☐ 2 ☐ 3 ☐ 4 ☐

How confident are you that you understand and can explain the relationships between bivariate data represented on a scatter graph?

1 ☐ 2 ☐ 3 ☐ 4 ☐

The measures of central tendency and spread will each be most appropriate and meaningful in different situations. By experiencing data sets arising in varying contexts, and comparing and contrasting ways of analysing and representing them, students can be encouraged to explain, justify and be critical of their choice of measure. Students need to be able to make an informed choice about what statistical tools to use, and understand the effect that these choices have on the interpretation, and misinterpretation, of data, including the potential impact of outliers.

Students should appreciate the differences between a frequency-based chart (such as a bar chart or pictogram) and a proportional chart (such as a pie chart) and how different aspects of the data can, and cannot, be inferred from each. They should understand the importance of having both a measure of central tendency (mean, median and mode) and a measure of spread (range, including a consideration of outliers) in order to appreciate the distribution of a set of data. Students should be presented with summary data to interrogate, so they can appreciate the limitations of such information when the raw data is no longer available. Dealing with inaccuracies, outliers and other contextual issues gives a greater appreciation of the realistic nature of statistical analysis.

For example:

a) The daily temperatures across March last year for two cities are summarised in this table
Which city should you choose to visit if you want to enjoy high temperatures?
Justify your answer.

City	Mean maximum daily temperature	Range of maximum daily temperatures
A	22 °C	6 °C
B	22 °C	13 °C

b) The daily temperatures last week for two other cities are summarised in this table.
How would you argue that city **C** enjoyed warmer days last week?
How could you argue that city **D** did?

City	Mean maximum daily temperature	Modal maximum daily temperatures
C	24 °C	18 °C
D	20 °C	23 °C

Further support links

- NCETM Secondary Professional Development materials: 5.2 Statistical analysis, pages 11–17

5.2.2 Choose appropriately statistical measures and representations

How confident are you that you understand and can explain how to choose and use statistical measures and representations to solve problems?

1 ☐ 2 ☐ 3 ☐ 4 ☐

How confident are you that you understand and can explain how to choose and use statistical measures and representations to summarise and communicate conclusions?

1 ☐ 2 ☐ 3 ☐ 4 ☐

Situations that require statistical techniques to be employed will probably begin with an issue, a question or a problem. For example, *'Which was the wettest month this year?'* or *'What different flavours of crisps (and how many packets) should we order for the school tuck shop each month?'*. These situations require a number of decisions to be made:

- Which data do I need to collect?
- How will I organise this data?
- How will I analyse this data in order to address the original question/problem?
- Which representation should I choose in order to address the original question/problem and communicate clearly my findings?

Students should have the opportunity to consider all of these aspects at different stages of their work on statistics. The use of real-life contexts and issues are important to give statistics meaning.

Students should be given opportunities to solve problems that do not necessarily have a correct answer, where they are required to justify decisions made and are prepared to be challenged. As statistical problems often involve prediction of trends and forecasting, probability could be linked with this element of problem-solving so students begin to gain an understanding of confidence and statistical significance.

Further support links

- NCETM Secondary Professional Development materials: 5.2 Statistical analysis, pages 18–20

Notes