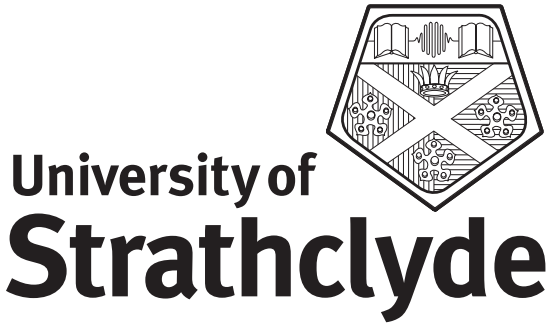

MM104/ MM106/ BM110

Topic 2: Variability, Skewness and Percentiles

Percentiles

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Quartiles and Percentiles

In order to succeed with percentiles we need to have revisit quartiles.

Recall that the median splits the data into two halves and is also called the second quartile ($Q2$).

We can expand this and say that the **median is the 50th percentile**.

> A percentile is a measure indicating the value below which a given percentage of observations in a group of observations falls.
> For example, the 20th percentile is the value below which 20 % of the observations may be found.

How to calculate percentiles

The way we calculate percentiles is very similar to how we calculate the upper and lower quartile. We calculate the k^{th} percentile, P_k using the following steps:

- Arrange the data in ascending numerical order.
- P_k is located at the $\frac{k}{100} \times (n+1)$ position in the data.
- P_k = lower value + (remainder $\times$ (upper value - lower value)).

Calculating a percentile - Example

Example 1

Calculate the 65th percentile of the following data
15, 7, 6, 11, 9, 5, 12, 4, 6, 7, 11

Firstly put the data in ascending order: $4, 5, 6, 6, 7, 7, 9, 11, 11, 12, 15$

The position of the 65th percentile is $\frac{65}{100} \times (n+1)$, here $n = 11$.

$\Rightarrow$ Position: $\frac{65}{100} \times (11+1) = \frac{65}{100} \times 12 = 7.8$

The 65th percentile quartile is located 0.8 of the way between the 7th and 8th element.

Calculating a percentile - Example

The 7th element is 9. The 8th element is 11.

P_k = lower value + (remainder $\times$ (upper value - lower value))

The remainder is 0.8

$\Rightarrow P_{65} = 9 + (0.8 \times (11 - 9))$

$\Rightarrow \underline{\underline{P_{65} = 10.60}}$