Mathematical Background for the Postgraduate Certificate

Some participants in the course will not have encountered mathematics for a very long time or they will only have limited experience of the use of mathematical formulae. This should not be a problem. The important thing is not to panic! For those people, I would like to suggest that they ensure that they can read and understand the simple expressions that will be encountered during the course. This is important, not so much for the purpose of doing calculations (computers take care of that nowadays) but to be sure they understand what is being done to the data.

Some Revision!

1. The formula for a sample standard deviation is:

\[
s = \sqrt{\frac{\sum_{i=1}^{n} (X_i - \bar{X})^2}{n-1}}
\]

Take three consecutive integers, say 6, 7, 8, and compute s (by hand); the answer is 1. If this is in any difficult for you, get a friend to explain the steps involved and the meaning of the symbols. This is very important as sums of squared deviations are widely used in the course. Do not worry about why s is defined in this way, just make sure you can ‘read’ the symbols.

2. Logarithms may be used in some modules. Do you know that \( \log_{10}(100) = 2 \)? If not, either get a friend to explain it to you or find an elementary mathematics book and study it. Then move on to \( \log_{e}(x) = y \). Revise \( \log(mn) = \log(m) + \log(n) \) and \( \log(m^n) = n \log(m) \).
3. Regression analysis involves fitting lines to data (in the simplest case). Consider the following formula and picture.

\[ Y = a + b X \]

Can you explain the relationship between the picture and the equation? If not, find out.

On a rough graph of y against x, plot the points (3,4), (0,3), (9,6). Substitute the three x values 3, 0 and 9 in the equation \( y = 3 + \frac{1}{3} x \). On your graph, plot the line with equation \( y = 3 + \frac{1}{3} x \).