UNIVERSITY OF STRATHCLYDE
DEPARTMENT OF MATHEMATICS & STATISTICS

MM104: Statistics and Data Presentation Semester 2
MM107: Statistics and Data Presentation

SPC AND CORRELATION AND LINEAR REGRESSION
TUTORIAL QUESTIONS

Question 1

A call centre wants to investigate the average waiting time of customers, as a means of quality assuring their time management approaches, and in order to find out whether or not the average waiting times are getting longer. The target is the average time to answer should be less than 1 min 15 sec.

The waiting times (in seconds) of 30 callers per day, over a 7 day period are recorded and the mean of each sampled day is record below.

The company do not have historical data, but they are happy to use the sample mean and sample standard deviation as estimates for the historical parameters, the sample standard deviation was found to be 7.30.

Day	1	2	3	4	5	6	7
Sample Mean (seconds)	67	53	56	72.5	55.5	67	61.5

a. Using Statistical Process Control analysis, determine if the call centre waiting times in control.

b. Is the call centre meeting their target waiting time ?

c. What considerations need to be taken into account when carrying out this statistical analysis.

Question 2

There is currently some media attention surrounding the issue of whether or not welfare benefits paid to those who are unemployed encourages people not to work. A recent study investigated how provision of community services e.g. food banks, community initiatives e.g. access to mental health cafes), x, and people's employment commitment, y, varied across 18 Scottish councils.

The researchers have calculated the correlation coefficient and have confirmed that it is appropriate to carry out a simple linear regression. The summary calculated statistics are given below:

$$\sum x = 888.03, \qquad \sum y = 1225.59, \qquad \sum xy = 60671.32$$
$$\sum x^2 = 44266.71, \qquad \sum y^2 = 83777.98,$$

a. Calculate the equation of simple regression line from these revised statistics.

b. By considering the reported diagnostic/residual plots as part of the Minitab output below state whether or not the following assumptions are satisfied, along with an appropriate justification:

   (i) Homoscedasticity of residuals.

   (ii) Independence of residuals.