Learning outcomes: Chapter 7

1. You should know how to draw, and interpret, a scatter diagram for pairs of variables 
\((x_1, y_1), (x_2, y_2), \ldots, (x_n, y_n)\); you should be able to comment on the strength and direction 
of any relationship revealed by the plot.

2. You should be able to calculate the quantities \(S_{xx}, S_{yy}\) and \(S_{xy}\).

3. You should be able to calculate, and interpret, the correlation coefficient.

4. You should be able to test the significance of the correlation coefficient by testing the null hypothesis \(H_0: \rho = 0\), where \(\rho\) is the population correlation coefficient.

5. You should understand the simple linear regression model
\[ Y = \beta_0 + \beta_1 X + \epsilon, \]
and be able to obtain estimates of the intercept and gradient, \(\hat{\beta}_0\) and \(\hat{\beta}_1\), respectively.

6. Using output from Minitab, you should be able to test the significance of the slope term \(\beta_1\) by testing the null hypothesis \(H_0: \beta_1 = 0\); you should understand that this results in a test of the importance of the associated predictor variable \(X\).

7. You should understand the multiple linear regression model
\[ Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \ldots + \epsilon, \]
and be able to write down the estimated regression table from Minitab output.

8. You should know how to check the importance of the predictor variables \(X_1, X_2, \ldots\) by using Minitab to test the hypotheses \(H_0: \beta_j = 0, j = 1, 2, \ldots\), and you should understand the process of backwards elimination, whereby one unimportant predictor is removed from the model at a time.

9. You should understand the role, and be able to interpret, the \(R^2\) statistic.

10. You should be able to use your estimated regression model to make predictions of the response variable \((Y)\) given particular values of the predictor variables \((X_1, X_2, \ldots)\).

11. You should know the limitations of the correlation coefficient and simple/multiple linear regression models as presented in this course.