

QUEEN MARY, UNIVERSITY OF LONDON

MTH 4106

Introduction to Statistics

Assignment 3

For handing in on 31 January 2012

You should attempt all of these questions, as they are designed to help you to learn and understand the material in the course.

The ‘Feedback’ question is the one for handing in. Write your name, student number and group number at the top of your answer before handing it in. Staple all the pages together. Hand it to your allocated tutor when (s)he asks for it during your allocated Minitab laboratory session on Tuesday 31 January 2012.

If you want help on any of the other questions, or want to check that you have done them correctly, you may ask any tutor during your laboratory session or ask me in any of my office hours.

1 Consider the data on poplar trees used in Practical 1. For $i = 1, \dots, 20$, let x_i denote the value of the variable D2H for the i -th tree, and let y_i denote the weight in kilograms of the wood from the i -th tree. Then $\sum x_i = 881.841$, $\sum y_i = 7.0800$, $\sum x_i^2 = 65232.98$, $\sum y_i^2 = 4.3250$ and $\sum x_i y_i = 512.011$.

- (a) Calculate the sample correlation coefficient between x and y , showing your working. Give your answer to three decimal places.
- (b) Identify the tree which looks different from the others on the scatterplot of weight against D2H that you created in Practical 1. Remove that tree from the data, and recalculate the sample correlation coefficient.
- (c) Comment on how the sample correlation coefficient changes when this one tree is removed.

Use the *New Cambridge Statistical Tables* for Questions 2–4.

2 Let $X \sim \text{Bin}(19, 0.4)$.

- (a) Find $\mathbb{P}(X \leq 14)$.
- (b) Find $\mathbb{P}(X > 5)$.
- (c) Find $\mathbb{P}(6 \leq X \leq 14)$.

3 Let $X \sim \text{Bin}(16, 0.7)$.

- (a) Let $Y = 16 - X$. What is the distribution of Y ?
- (b) Find $\mathbb{P}(X \leq 10)$.
- (c) Find $\mathbb{P}(X = 9)$.

4 Let $X \sim \text{Poisson}(4.5)$.

- (a) Find $\mathbb{P}(X < 6)$.
- (b) Find $\mathbb{P}(X \geq 10)$.
- (c) Find $\mathbb{P}(3 \leq X \leq 7)$.

5 (Feedback) Let $X \sim \text{Poisson}(\mu)$.

- (a) Find the probability generating function of X .
- (b) Use the probability generating function to find $\mathbb{E}(X)$ and $\text{Var}(X)$.
- (c) Now suppose that $Y \sim \text{Poisson}(\lambda)$ and that X and Y are independent of each other. Find the distribution of the random variable $X + Y$, stating your result as a theorem and giving a proof.