

QUEEN MARY, UNIVERSITY OF LONDON

MTH 4106

Introduction to Statistics

Assignment 1

For handing in on 17 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 17 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 each of the following variables. For each one, state whether it is quantitative or qualitative. State whether the quantitative ones are continuous or discrete. State what type of scale the continuous ones are measured on. State whether the qualitative ones are categorical (nominal) or ordinal.

- (a) Answers to the question “*What country were you born in?*”.
- (b) Answers to the question “*How many buses have you travelled on in the last seven days?*”
- (c) Answers to the question “*How often do you visit the gym and exercise for at least thirty minutes? Tick one of the following. (i) At least once a week. (ii) Less than once a week but at least once a month. (iii) Less than once a month but more than once a year. (iv) Less than twice a year.*”
- (d) The height of flood waters at various places in Queensland, given in metres.
- (e) For each day of the year, the difference between the maximum outside temperature recorded at Queen Mary and the minimum outside temperature recorded at Queen Mary, given in degrees Celsius.
- (f) For each country in the EU, male mortality (for those aged under 65) from liver disease in 2007, expressed as number of deaths per 100,000 people.

2 Fifteen patients with high blood pressure were each given 25mg of the drug captopril. Their systolic blood pressure was measured before taking the drug, and was measured again two hours later. Measured in mm of mercury, their blood pressure was reduced by the following amounts.

9, 4, 21, 3, 20, 31, 17, 26, 26, 10, 23, 33, 19, 19, 23

Calculate the five-number summary and draw the corresponding box-plot.

3 (Feedback) The VW petrol consumption data used in lectures were given in miles per gallon. (They are also available on the web page.)

- Convert these to litres per 100 kilometres, using the rule that x miles per gallon is the same as $f(x)$ litres per 100 kilometres, where $f(x) = 282.5/x$. Give your results correct to one decimal place.
- Plot the new data on a dot diagram.
- Calculate the five-number summary for the new data.
- Draw the box-plot for the new data.
- Calculate the mean and standard deviation for the new data.
- Which of the seven summary numbers for the new data can be obtained by applying the function f to one of the summary numbers for the old data? Justify your answers.

4 Let x_1, \dots, x_n be real numbers. Put

$$\bar{x} = \frac{1}{n} \sum_{i=1}^n x_i.$$

Prove that

$$\sum_{i=1}^n (x_i - \bar{x})^2 = \sum_{i=1}^n x_i^2 - n\bar{x}^2.$$

5 Let x_1, \dots, x_n be data, with interquartile range equal to u . For $i = 1, \dots, n$, put $y_i = ax_i + b$, where a and b are constants and $a \neq 0$. Let the interquartile range of y_1, \dots, y_n be equal to v . Find v in terms of u , giving a proper proof of your result.