Learning outcomes: Chapters 4–5

1. You should be able to produce a barchart by hand, and know the R command for this: `barplot`. In R, you should also know how to change the colour of your plot using `col`

2. You should know how to construct histograms by hand, and in R using the `hist` command. For the exam, it might be useful to know the three bin width rules for constructing histograms in R:

   - Sturges': number of bins $= \lceil \log_2 n + 1 \rceil$
   - Scott's: bin width $= 3.49 \times s \times n^{-1/3}$
   - Freedman-Diaconis: bin width $= 2 \times IQR \times n^{-1/3}$

3. You should be able to construct box-and-whisker plots by hand, including the identification of outliers. You should know that outliers are observations outside the range:

$$W_L = \text{lower quartile} - 1.5 \times IQR \quad \text{and} \quad W_U = \text{upper quartile} + 1.5 \times IQR.$$

4. You should understand the basics of functions in R – including the use of brackets (), braces {}, arguments and `return` statements

5. You should be able to figure out the value/object returned by a basic function, and perhaps why a badly-written function doesn't work. In such cases, you might be asked to provide a "fix".

6. You should understand the terms *local variables* and *global variables*.

7. You should understand how `if` and `if else` statements work, and be able to follow code including such statements.

8. You should understand how `for` loops work. In particular, you should be able to follow code using `for` loops, and perhaps construct functions using simple `for` loops yourself.

9. You should understand how the `apply` function works, but not necessarily the `tapply` function.

10. You should know how to use R's help function; e.g. `?plot`.