Learning outcomes: Chapter 4

1. You should understand the terms *experiment*, *outcome*, *sample space*, *event*, *independence* and *mutually exclusive*.

2. You should understand the probability scale, and be able to interpret probabilities in plain English.

3. You should be familiar with the *classical*, *frequentist* and *subjective* interpretations of probability, although we will not study *subjective* probabilities in any detail in this course.

4. You should know, and be able to use, the basic laws of probability:

- The multiplication law (for independent events)
- The addition law

5. You should be able to construct, and interpret, *tree diagrams*.

6. You should know the conditions that are necessary to assume a *binomial distribution*. You should also:

- Be familiar with the notation used: $X \sim Bin(n, p)$
- Be able to use the binomial formula for calculating probabilities (assuming independence):
$$P(X = r) = {}^{n}\mathrm{C}_{r} p^{r} (1-p)^{n-r}.$$
- Be able to find the mean and variance for a binomially distributed random variable:
$$E[X] = np, \qquad Var(X) = np(1-p).$$

7. You should know the conditions that are necessary to assume a *Poisson distribution*. You should also:

- Be familiar with the notation used: $X \sim Po(\lambda)$
- Be able to use the Poisson formula for calculating probabilities (assuming independence):
$$P(X = r) = \frac{\lambda^{r} e^{-\lambda}}{r!}.$$
- Be able to find the mean and variance for a Poisson distributed random variable:
$$E[X] = \lambda, \qquad Var(X) = \lambda.$$

8. You should know when you would use a binomial distribution rather than a Poison distribution, and vice–versa.