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):
     $$P(X = r) = \binom{n}{r}p^r(1-p)^{n-r}.$$  
   - Be able to find the mean and variance for a binomially distributed random variable:
     $$E[X] = np, \quad Var(X) = np(1-p).$$

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:
     $$E[X] = \lambda, \quad Var(X) = \lambda.$$  

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