Exercise 4. Probability distributions

1. Generate one sample of size 200 from each of the discrete Bernoulli, Binomial and Poisson distributions. Compare the distributions of each sample with suitable plots. Change the parameters in each of the models to see how they influence the distributions.

2. The Binomial distribution is a possible probability model for the number of stormy days in a season. Do you think that this is a realistic model? If there are 120 days in a winter and the probability of a stormy day in winter is 1/3, write down the parameters, n and π, of the Binomial model. Write down the expectation and variance of the number of stormy days, and compute the probability of a winter having more than 40 stormy days. Generate 100 Binomial variables to represent a sequence of 100 winters and plot the simulated data. What is the average number of stormy days simulated?

$n =$	Expectation =
$\pi =$	Variance =

Probability of more than 40 stormy days =
Average number of stormy days simulated =

3. Repeat question 1 with continuous Uniform, Normal and Gamma distributions.

4. Compare the three temperature measurements in the file `temp.txt` to Normal distributions with means and variance set equal to the sample statistics. Are there any noticeable departures from Normality?

5. Use the Normal distribution as a probabilistic model for daily mean temperatures at Reading, taking the mean and standard deviation of the model equal to the sample statistics. Find the probability that the daily mean temperature exceeds 15°C. Is this a useful estimate for the proportion of days on which mean temperature will exceed 15°C in 2004?

6. Try the demonstration 'Normal Approximation to the Binomial Distribution' in the 'Rice Virtual Lab in Statistics'.