Exercises:

1. Evaluate the following expressions:

   1) $11 + 22 + 33 + 44 + 55 + 66 + 77$

   2) $\dfrac{11 \times 22 - 33 \times 44}{55 \times 66}$

   3) $2\sin^2(\pi/3)$

   4) $\dfrac{1}{\sqrt{2\pi}} \exp\left(-\dfrac{1}{2}\right)$

2. Evaluate the square root of all the odd numbers between 1 and 25.

3. Create a vector that repeats 10 times a sequence of integers between 1 and 5.

4. Generate:

   (a) a sequence of integers between 5 and 10,

   (b) a sequence of integers of length 5 starting at 41,

   (c) a sequence of real numbers spaced uniformly at 0.2 intervals between 0 and 2,

   (d) a sequence of even integers between 2 and 14.

5. Define an object called `a` and make it an array with four elements which are the integers 5 to 8 inclusive.

   (a) Find element 4 of `a`.

   (b) Calculate the product of elements 2 and 4 of `a`.

   (c) Assign the integers 3 and 4 to an object `b`, then use `b` to find elements 3 and 4 of object `a`.

   (d) Remove the second element of `a`.

   (e) Remove the elements 3 and 4 of `a`.

6. Define a matrix with three rows and three columns, the elements being the integers from 1 to 9 inclusive, such that the first row contains the integers 1 to 3 inclusive, the second 4 to 6 inclusive, and the third 7 to 9.

   (a) Find the value on the second row, third column.

   (b) Extract the whole second row and the whole third column.

7. Define an object which is a data frame having the same values as the matrix defined in the above question.

   (a) Extract the value of third variable of the second item.

   (b) Extract the data for the second item.

(c) Extract the third variable.

8. Create an object with four numeric values, and an object with two character values.

   (a) Use the `list` function to create an object which is a list of the two objects you have just created.

   (b) Use the `names` function to change the names of the sub-objects in the list you have just created.

9. Load the `MASS` package.

10. Install the `oz` package.

11. Simulate a vector `x.norm` of 1000 independent $N(2, 4)$ variables (recall that 4 is the *variance*). Find the sum, mean, median and variance of the sample. Plot a histogram of the simulated data using the function `hist`.
    Repeat the above (using different variable names!) for a uniform distribution bounded between 0 and 1.

12. Simulate a sample of size 100 from a Gamma distribution with parameters 3 and 1. Find the mean and standard deviation of the sample. Use the `hist` function to plot a histogram of the variable, adding a suitable title and axis labels.
    Using the `qgamma`, find the true upper and lower quartiles. Use the `abline` function to draw vertical lines on the histogram representing the quartiles.

13. - Simulate a vector `z` of 1000 $N(0, 1)$ random variables and plot a histogram of these.
    - Create a logical vector `g` indicating those values of `z` which are greater than 1.3.
    - Create a new vector `ztrunc` of all those `z` values which are greater than 1.3. Plot a histogram of these and find their average (mean).

14. Create a function called `none` which has one parameter x, and simply returns the value of x sent to it. Run this function, sending the value 3 to it.

15. Create a function called `mulp` which multiplies two numbers. Use 4 and 8 as inputs to this function.

16. Write a function called `sum.uniforms` which takes a single argument `n` and returns a 1000 numbers, each being the sum of `n` draws from the uniform(0,1) distribution.

17. Modify your function `sum.uniforms` so that it only prints a warning message if the user inputs `n < 1`. In such cases it should not not proceed to draw the samples or draw a histogram.

18. Use the `while` function to:

    (a) Generate a sequence of integers between 0 and 5.

    (b) Generate a sequence of random draws from a $N(0, 1)$ that are less than 1.5. How many of those did you get? Repeat the procedure. Do you get the same number?