Instructions: In this lab, we will practice more programming with Scilab. The first two exercises require simple calculations using the 'for' loop in Scilab. You will also be expected to make some histograms. In this lab, you will be required to save and upload any plots or figures that you generate from Scilab. Remember to include proper labels of axis, legends and plot titles in each figure.
This lab also includes two exercises devoted to calculating some costs etc. from data available in a production environment.

You are required to work on your own and submit a report on paper before you leave. All questions marked with '[**R**]' should be answered in the report. Upload all your Scilab files other image files (png or eps or pdf) on Moodle.

Exercise 1 Simple exercises with a vector/matrix

(a) Write a function in Scilab `ex1fun(a)` which takes as input a column vector `a` and displays the following output. (Assume that the vector `a` contains integers only)

1. The number of elements in `a`. You may use the `size` function available in Scilab to find the size of the matrix (Remember to use Scilab-help whenever you need help).
2. The minimum value amongst all elements of the matrix `a`.
3. The maximum value amongst all elements of the matrix `a`.
4. The number of times each element (between the maximum and the minimum values) occurs in the matrix `a`.
5. The average value of elements of `a`.
6. The standard deviation of elements of `a`.

Your program should not use in-built functions of Scilab for any of these calculations (except for finding size). You should write code to evaluate these values yourself.

(b) [**R**] Explain in detail the logic you used in part-4 above.

(c) [**R**] Use this function to report the answers of the above questions for three matrices available on Moodle. You may read these matrices by first downloading these files to the current folder and then typing

```
exec('ex1a.sce', -1)
```

Similarly, take the same steps for 'ex1b.sce' and 'ex1c.sce'. Some of these files may be quite big, and copy-paste using mouse will not work as expected.

(d) [**R**] Which of the three matrices is like to have uniformly distributed entries? Explain why you think so?

(e) [**R**] What are the likely distributions for 'ex1b.sce' and 'ex1c.sce'?

Exercise 2: More exercises with a matrix

(a) Write a function in Scilab `ex2fun(a,m)` which takes as input a column vector `a` and a positive integer `m`. This function should create a vector `b` such that the first element of `b` is the average value of the first `m` values of `a`, the second element is the average of the next `m` values of `a` and so forth. If less than `m` values remain at the end, they may be discarded. The function should display the following.

1. The number of elements in `b`.
2. The minimum value amongst all elements of the matrix `b`.
3. The maximum value amongst all elements of the matrix `b`.
4. The average value of elements of `b`.
5. The standard deviation of elements of `b`.

(b) **[R]** Use this function to report the above five values for 'ex2a.sce' available on Moodle, and `m=4`.

(c) **[R]** What is the likely distribution of the elements of array `b`? You may use the `histplot` function is Scilab to look at its histogram.

(d) **[R]** By appropriately choosing different values of `m` and running the above function, comment how do each of the above five values change with `m`.

Exercise 3: Vending Milk

Bindu operates a milk shop in Powai. Every morning, before opening her shop, she receives milk supply from the supplier. The supply varies day-to-day depending upon the availability with the supplier. She pays Rs 30 per litre to the supplier. During the day, she sells milk at Rs 35 per litre. The demand varies every day. If the demand is more than the supply, customers return empty handed, and the sale is lost. If the supply is more than the demand, there is excess milk left with Bindu at the end of the day. She sells it off at Rs 23 per litre to a local confectioner. Thus there is no milk left with Bindu at the end of any given day.

Suppose the data for demand and supply are available for last two years (730 days) in two files 'demand.sce' and 'supply.sce'. The first input file creates an array '`dem`' and the second an array '`supp`'.

1. Compute the daily profit Bindu made in the last two years. It must be an array of size 730.
2. [**R**] Compute some statistical measures of this data which you think may be important in analysing the operations of Bindu's shop. Report your observations.
3. Due to improvements in packaging milk, suppose we can store milk for two days (instead of one). Milk which can not be sold in two days is sold off at Rs 23 per litre to the confectioner. Compute the daily profit Bindu made in the last two years. It must be an array of size 730.
4. [**R**] Compare the statistics under the new assumption with those of part-2 above.