Introduction to Lisp-Stat and its applications.

Exercises 2.

1. Write a function which takes a list of data, assumed to be a random sample from a Normal(μ, σ^2) population, and returns the log-likelihood function for the data.

2. Write a function which takes a list of lists of numbers, viewed as a list of samples and returns a list of the within groups and between groups sums of squares.
(**Hint:** the `mapcar` function may be useful.)

3. The code for the datasets example is available in the file
`/usr/people59/canty/teach/epfl/lispstat/datasets.lsp`
Copy this file to your directory and load it into `Xlispstat`.

   (a) Write a `:t-test` method for `one-sample-proto` which assumes that the data comes from a normal distribution and does a Student's t test of the null hypothesis $\mu = \mu_0$. The value μ_0 should be an optional argument to the method and should default to 0.

   (b) Add a menu item to the dataset menu for the t-test. When this item is selected a dialog should appear asking for a dataset name. If this dataset is not a univariate dataset an error dialog should appear, otherwise a dialog asking for the value of μ_0 should appear and the `:t-test` method be called.

   (c) Define a new prototype for paired data which inherits from `data-set-proto` and write its `:isnew` method. Adapt the function `make-dataset` to include this new data type.

   (d) Write appropriate messages for the new prototype.

4. The code for adding a new menu item to a plot can be found in the file `/usr/people59/canty/teach/epfl/lispstat/plotmenu.lsp`
Copy this file to your directory.

   (a) The new menu item `change-sym-item` and associated method change the plotting symbols for all data points. Change the code so that the plotting symbols for the items not currently selected are changed only. The method should test if there are indeed any unselected points. If there are none then it should say this in a dialog and not attempt to change the symbols.

   (b) Add a menu item which allows the user to change which of the four variables are plotted. Dialogs should appear to ask which variable will be the new x variable and which the new y variable. Don't forget to send the `:adjust-to-data` so that the plot actually changes.