

ISA R Workshop- Practice

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1. Describe in your own words the following data objects:
 - (a) matrix
 - (b) data frame
 - (c) vector
 - (d) list
2. Describe in your own words the following vector types (“modes”):
 - (a) integer
 - (b) numeric
 - (c) character
 - (d) factor
 - (e) logical
3. Which data objects would you need to hold the following information?
(More than one option is possible)
 - (a) The heights in your sample.
 - (b) The heights and weights in your sample.
 - (c) The names, heights and weights in your sample.
4. Create the following data vectors:
 - (a) (1, 5, 4, 6, 8). See `c()`
 - (b) (11, 11, 11, 11, 11, 11, 11). See `rep()`
 - (c) (1, 3, 5, 7, 9, 11, 13, 15). See `seq()`
5. Download the data located at <http://www-stat.stanford.edu/~tibs/ElemStatLearn/datasets/bone.data>.
 - (a) How are the columns separated? Which is the appropriate value for the `sep=` argument of the `read.table` command?

- (b) How many observations are in the data?
See the `dim()` command.
 - (c) How many variables are in the data? What is the class of each?
See the `class()` command.
 - (d) What is the age of the youngest male? How about the youngest female? What is their respective bone density (`spnbmd`)?
See `subset()`, `min()` and `which()` commands.
 - (e) Would you say the ages of males and females are similarly distributed in the sample?
Are the means similar?
Are the distributions similar?
See `mean()`, `tapply()`, `plot(dist())`, `rug()`, `hist()`, `boxplot()`
 - (f) Test the hypothesis of equal location of the ages distribution for different genders.
 - i. Perform a t-test. Can Normality be assumed? Can Equal variances be assumed?
See `t.test()` and `var.test()`
 - ii. Perform a Wilcoxon test.
See `wilcox.test()`
 - (g) Transform the age from years to days and save the transformed data in .csv format.
See `getwd()`, `setwd()`, `write.csv`
 - (h) Visualize the relation between age and bone density. Try three different ways to visualize the gender on this plot. Don't forget to add a title and axis labels.
See `plot()` and it's `pch`, `cex`, `col` parameters.
If you want a legend, have a peek at `legend()` and `locator()`.
 - (i) Fit a simple linear regression to *bone density* using the *age* and gender as predictors (no interaction).
See `lm()`, `summary()`, `coef()`, `confint()`, `plot()`
 - i. What are the estimated coefficients?
 - ii. Construct confidence intervals to coefficient estimates.
 - iii. Diagnose the fit: Is the variance constant? Do the residuals seem correlated?
6. Simulate the distribution of the correlation coefficient:
See `runif()`, `?Control`, `rpois()`, `cor()`, `hist()`
- (a) Generate 100 observations from a uniform distribution [0,1]. Store these as `x`.
 - (b) Multiply each observation by 3, add 2 and add some Poisson disturbance with `rate=1`. Store these as `Y`.

- (c) Calculate the correlation between X and Y .
 - (d) Repeat the process 1000 times and visualize the distribution. Is it bell shaped?
7. Think of one more good practice question and post it to our forum at <http://groups.google.com/group/israel-r-user-group> for other to enjoy.