Psychology of Perception
Psychology 4165-100
Fall 2010

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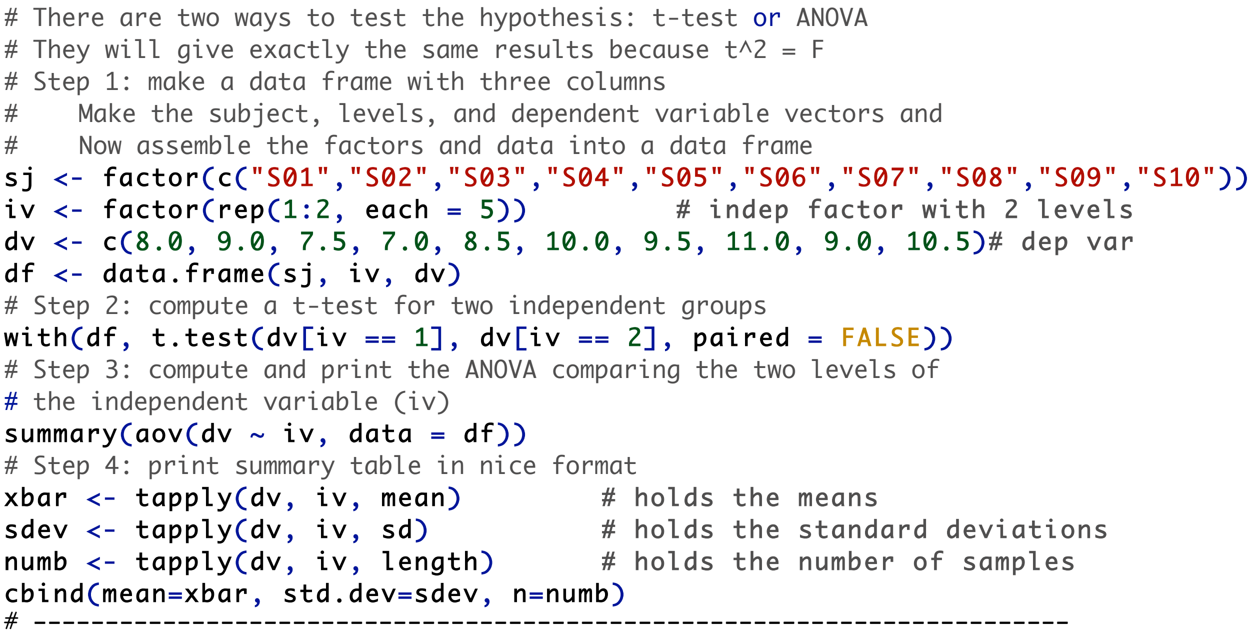
Using the R Statistical Computer Program

R is a powerful statistical computer program that is freely available under the General Public License (GPL). It runs under Unix and Linux, Microsoft Windows and Macintosh operating systems. Download your own copy here: http://www.r-project.org/. To get started, go here: http://www.statmethods.net/. Below are R commands (in **bold**) used to solve some of the math skills questions that are on the syllabus. The hash marks (#) are comments to clarify what is going on.

```
# Question 3:
x <- c(10, 9, 12, 11, 8.5, 13, 8, 10, 7, 11.5) # create data vector
mean(x)                          # compute the mean of the numbers in x
sd(x)                            # compute the standard deviation
# ------------------------------------------------------------------------
# Question 4:
obs <- c(174, 172, 104, 92, 41, 8)             # observed data
prd <- c(175.5, 167.8, 106.5, 90.4, 44.3, 6.5) # predicted data
p <- prd/sum(prd)                # predicted frequencies to probabilities
chisq.test(obs, p=p)             # do the chi-square test
# ------------------------------------------------------------------------
# Question 5:
```



```
# There are two ways to test the hypothesis: t-test or ANOVA
# They will give exactly the same results because t^2 = F
# Step 1: make a data frame with three columns
#    Make the subject, levels, and dependent variable vectors and
#    Now assemble the factors and data into a data frame
sj <- factor(c("S01","S02","S03","S04","S05","S06","S07","S08","S09","S10"))
iv <- factor(rep(1:2, each = 5))         # indep factor with 2 levels
dv <- c(8.0, 9.0, 7.5, 7.0, 8.5, 10.0, 9.5, 11.0, 9.0, 10.5)# dep var
df <- data.frame(sj, iv, dv)
# Step 2: compute a t-test for two independent groups
with(df, t.test(dv[iv == 1], dv[iv == 2], paired = FALSE))
# Step 3: compute and print the ANOVA comparing the two levels of
# the independent variable (iv)
summary(aov(dv ~ iv, data = df))
# Step 4: print summary table in nice format
xbar <- tapply(dv, iv, mean)        # holds the means
sdev <- tapply(dv, iv, sd)          # holds the standard deviations
numb <- tapply(dv, iv, length)      # holds the number of samples
cbind(mean=xbar, std.dev=sdev, n=numb)
```

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# ------------------------------------------------------------------------
# Question 6:
qnorm(0.8413447)                        # convert probability to z-score
1 - pnorm(1.959964)                     # convert z-score to probability
pnorm(1.959964, lower.tail = FALSE)     # another way to get upper tail
# ------------------------------------------------------------------------
# Questions 7 & 8:
x <- c(1.0, 3.0, 5.0, 7.0, 9.0)         # x data vector
y <- c(4.1, 9.9, 16.1, 22, 27.9)        # y data vector
df <- data.frame(x, y)                  # put x and y vectors into a data frame
reg <- lm(y ~ x, data = df)             # compute the regression
summary(reg)                            # prints summary of the regression
plot(df)                                # plots graph of data
abline(reg)                             # plots the regression line
# ------------------------------------------------------------------------
```