Day 2 In-class Assignment

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1. What is meant by the term "recycling" in R's arithmetic?

   In arithmetic operations using two vectors of different length, R will recycle the shorter vector, reusing the first elements to fill it out to the same length as the longer vector.

2. You will soon be starting the first homework. Where on your computer (or in your math dept account) will the files (an R script, plots, explanations) reside? Does your group all agree on this structure? If not decribe the differences.

   I have a folder for classes, subfolder for homework, then assn1.

3. On HW1 you should use the `ifelse` function. Read the help file. Use it and the "remainder after division" function `%%` to convert integers 2 through 13 into "odd" or "even". Show your code and results.

```
ifelse(2:13%%2 == 0, "even", "odd")

##  [1] "even" "odd"  "even" "odd"  "even" "odd"  "even" "odd"  "even" "odd"  "even" "odd"
```

   No special options needed.

4. For HW 0.5, you looked at the help on boxplot and made a plot of tooth growth relative to two predictors. Use table to find out how many animals were assigned each supplement at each dosage. Show your code and output table.

```
require(xtable)

## Loading required package:  xtable

xtable(with(ToothGrowth, table(supp, dose)))
```

	0.5	1	2
OJ	10	10	10
VC	10	10	10

5. Using the ToothGrowth data again, build a linear model to assess the effects of supplement and dosage on growth. Show your code and the summary of the model you fit. Interpret the output. How big are the effects?

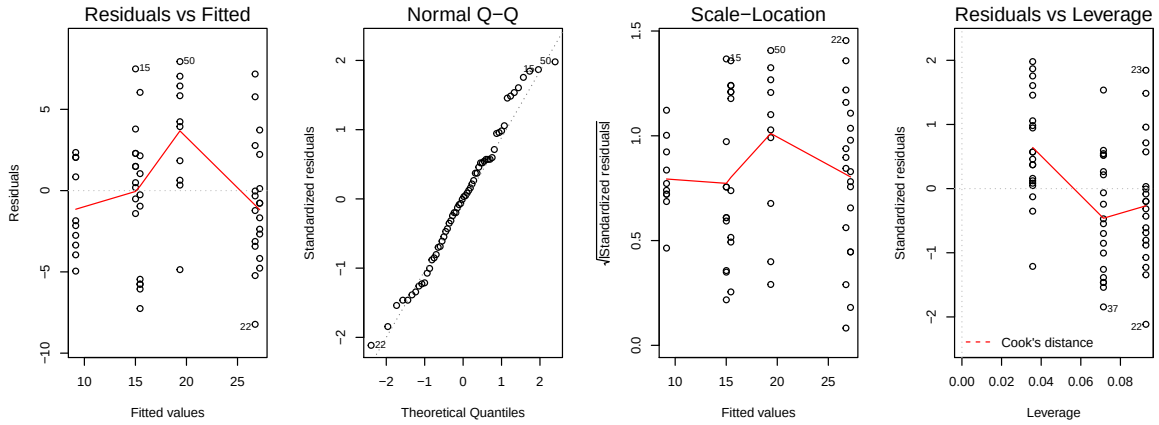
```
xtable(summary(tooth.fit <- lm(len ~ supp * I(dose - 0.5), ToothGrowth)), digits = 3)
```

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	15.456	1.091	14.163	0.000
suppVC	-6.303	1.543	-4.084	0.000
I(dose - 0.5)	7.811	1.195	6.534	0.000
suppVC:I(dose - 0.5)	3.904	1.691	2.309	0.025

As dosage increases, so does tooth growth for both ascorbic acid and orange juice (OJ) animals. I used dose as a continuous variable, some of you made it a factor. At a dose of 0.5 mg the OJ treated group had mean tooth growth of 15.5 mm which was greater by 6.3 mm than the group getting ascorbic acid (VC) ($t_{56} = -4.08$, p-value = 0.0001). A one mg increase in vitamin C dosage increased growth by 7.8 mm, and the VC group increased even faster at 7.8 + 3.9 = 11.7 mm, a steeper slope ($t_{56} = 2.3$, p-value = 0.025)

6. Show the "usual" four diagnostic plots for the above linear model. Are any problems evident? Save the plot as a png and as a pdf file in the folder from (or parallel to #2 above). What are the dimensions of each of the images?

```
par(mfrow = c(1, 4))
plot(tooth.fit)
```



These look pretty good. I see no reason to worry about non-constant variance or lack of normality.

7. The math department server is backed up regularly so that we shouldn't all lose our saved documents. When did you last back up your personal computer? Have you used outside storage like google, dropbox, github, or other? Explain with regard to how you will keep your work safe for this class. In particular, if you are using more than one computer, how will you transfer an partially completed HW back and forth?

I generally rely on the math server to do this for me and transfer things to/from it using gftp.

R Code Appendix

```
ifelse(2:13%%2 == 0, "even", "odd")
```

```
require(xtable)
xtable(with(ToothGrowth, table(supp, dose)))
```

```
xtable(summary(tooth.fit <- lm(len ~ supp * I(dose - 0.5), ToothGrowth)), digits = 3)
```

```
par(mfrow = c(1, 4))
plot(tooth.fit)
```

You may need an example of reading data into R from a file.

```
fish <- read.csv("http://www.math.montana.edu/~jimrc/classes/stat408/data/Ruby-AllFish.csv", head = T)
summary(fish[, -8])
```

```
##       trip           mark           length          weight       species         year         site
##  Min.   :1.00   Min.   :0.000   Min.   :  2.2   Min.   :   0.0   Brn:4399   Min.   :1994   3Fk  :1953
##  1st Qu.:1.00   1st Qu.:0.000   1st Qu.:198.1   1st Qu.:  77.1   RBT:7439   1st Qu.:1999   Can  :2946
##  Median :1.00   Median :0.000   Median :266.7   Median : 181.4              Median :2002   Ghorn:5484
##  Mean   :1.47   Mean   :0.142   Mean   :261.5   Mean   : 254.2              Mean   :2002   Vig  :1455
##  3rd Qu.:2.00   3rd Qu.:0.000   3rd Qu.:330.2   3rd Qu.: 362.8              3rd Qu.:2006
##  Max.   :2.00   Max.   :1.000   Max.   :746.8   Max.   :4943.1              Max.   :2007
##                                                 NA's   :1685.0
```

and you can print the value of an object in text using `\Sexpr{}`, for example, the estimated standard deviation of tooth growths is 4.083.