Temperatures East to West

Finally, we will investigate possible differences in average water temperatures moving East to West across the southern United States. The data set *SWaterJulyTemp.txt* contains average water temperatures for sites in the southern Atlantic, east and west Gulf Coast, and southern Pacific.

What differences do you expect to see between these four regions? Sketch what you think a multiple comparisons output would reveal (i.e. make a prediction).

Predict warm $\overline{EG\ WG}$ $\overline{SA}$ $\overline{SP}$ cold

Open the data set, stack the variables, and make a comparative boxplot. What do you see from the boxplot? Gulf coast values are not different and not spread out @ all. AC South is cooler and PC South is <u>much</u> cooler. There is likely an issue with equal population variances.

Conduct the appropriate test to determine if there are differences in average water temperatures between these four regions and where those differences are if present.

Null: H_0: $\mu_{EG} = \mu_{WG} = \mu_{ACS} = \mu_{PCS}$

Alternative: At least one region has a different mean July temp.

You may assume the assumptions hold.

Test Stat: $87.436 = F$

p-value: 4.659×10^{-13}

Interpret your p-value.

If there really were no differences in mean July water temperatures, the probability of obtaining an F of 87.436 or larger is 4.659×10^{-13}.

Conclusion:

We have evidence @ least one region has a different mean July temp.

Multiple Comparisons summary (if appropriate):

Pacific is colder than all the rest, on avg. The others are $\overline{PCS}$ $\overline{ACS\ GCW\ GCE}$ Not signif. diff. on avg.

How accurate was your prediction?

... naives

Are Weights of Poplar Trees Affected by Different Treatments on Average?

(Data from Triola)

Random samples of poplar trees were subjected to 4 different treatments: no treatment, irrigation, fertilizer, and both irrigation and fertilizer. Each random sample consisted of 5 trees. The following partial ANOVA table was constructed. Assuming the assumptions for ANOVA are met, complete the table, perform the ANOVA and provide a conclusion to the question asked above.

	DF	SS	MS	F	p-value
Btw Treatment	3	4.68	1.56	5.73	.007
Within Residuals	16	4.357	.272	-	-
Total	19	9.037	-	-	-

Hypotheses: H_0: $\mu_1 = \mu_2 = \mu_3 = \mu_4$

H_A: At least one μ_i is different.

μ_i = avg. weight of tree under tx i

Significance level: $\alpha = .01$

i = 1 = none, 2 = irrigation, 3 = fert., 4 = both

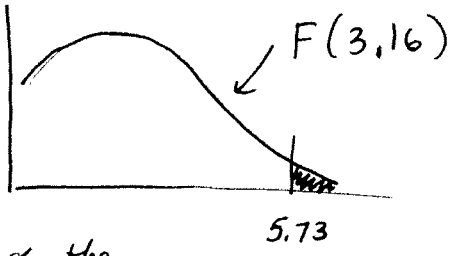
Assumptions: (Assume they hold, but list here in context.)

1. Need 4 $\perp$ groups.
2. Need randomization and $\perp$ per group.
3. Need each of the four populations to be nearly normal.
4. Need equal population variances.

Test statistic: $F = 5.73$

p-value: .007

Sketch and label the distribution used to compute the p-value.



Conclusion:

We have evidence to conclude that one of the treatments did result in a diff. avg. weight than another.

Does the ANOVA output allow you to conclude that irrigation and fertilizer combined perform better than the other three methods? Sketch an example multiple comparison summary that would allow you to make this conclusion.

No. ANOVA doesn't show where the differences are.

$\overline{IF}$ $\overline{I\ F\ N}$

High Low