FW4130 – Quiz No. 2 **February 13, 2006**

You have 30 minutes. Take your time!
Note that this sheet has **two sides**.

Name: A. Student

In class we considered an example where two stands were sampled and species evenness measured at each of several sample points. We applied an unpaired test for differences using the Excel Analysis ToolPak wizard. Here's the output:

t-Test: Two-Sample Assuming Equal Variances		
	StandA	*StandB*
Mean	0.817746917	0.802806911
Variance	0.014591631	0.007385621
Observations	15	21
Pooled Variance	0.010352802	
Hypothesized Mean Difference	0	
df	34	
t Stat	0.434336006	
P(T<=t) one-tail	0.333394261	
t Critical one-tail	1.690923455	
P(T<=t) two-tail	0.666788521	
t Critical two-tail	2.032243174	

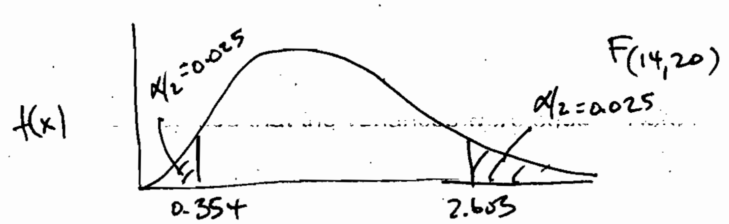
ONE: Should we have assumed that the variances were equal? Here are some statistics you might generate to test this:

F = 0.014591631/ 0.007385621 = 1.976 ← F calc
FINV(0.025,14,20) = 2.603 ← upper Fcrit
FINV(1-0.025,14,20) = 0.354 ← lower F crit

a) The "research" null hypothesis is that the variances are equal. Give the **statistical** null and alternative hypotheses for the test for equal variances.

Ho: $\sigma_A^2/\sigma_B^2 = 1$ or Ho: $\sigma_A^2 = \sigma_B^2$
Ha $\sigma_A^2/\sigma_B^2 \neq$ or Ha: $\sigma_A^2 \neq \sigma_B^2$

b) What is the rejection region? Draw and label it fully.



Note Fdist is asymmetric

c) What do you conclude for this statistical test?

Since Fcalc = 1.976 is less than Fcrit = 2.603 and greater than Fcrit = 0.354 we fail to reject Ho and assume variances are equal

1

TWO: You've radio-collared 12 wolves on Isle Royale and tracked the number of kilometres they traveled last winter. Give the general form of a confidence interval for the mean number of kilometers a wolf travels.

$$\bar{X} \pm t_{(\alpha/2, n-1)} \cdot S_{\bar{X}}$$ where $\bar{x}$ is mean km travelled

4

THREE: What is the difference between a 1-tailed and a 2-tailed statistical test? Give an example, and explain as fully as you can.

Whether a test is one- or two-tailed depends on the alternative hypothesis. If the alternative is stated as "not equal to"; e.g., $H_a: \mu \neq 27$, then we will accept our alternative if the true value is either larger than or smaller than μ. If our alternative is stated as "greater than" or "less than", e.g., $\mu > 27$, then we reject our null only if the true value is greater than or less than, respectively. In other words, we're only concerned with <u>one side</u> or <u>one tail</u> of the relevant sampling or reference distribution.

e.g., $H_o: \sigma^2_A/\sigma^2_B = 1$, $H_a: \sigma^2_A/\sigma^2_B \neq 1$ } two tailed

$H_o: \sigma^2_{TR}/\sigma^2_E = 1$, $H_a: \sigma^2_{TR}/\sigma^2_E > 1$ } one-tailed

THREE: Following is a setup for a goodness-of-fit test. The data are counts of students, by season they were born in, who took FW4130 a while back. The research hypothesis is that students are twice as likely to have been born in spring or summer as fall or winter.

2

a) Fill in as much of the table as you can.

Species	**Observed freqency**	**Expected ratio**	**Expected proportion**	**Expected frequency**
Spring	11	2	2/6 or 1/3	12
Summer	14	2	2/6 or 1/3	12
Fall	3	1	1/6	6
Winter	8	1	1/6	6
TOTAL	36	6	1	36

b) In the example Dytham (2003) uses to illustrate the Chi-square goodness-of-fit test involves the Poisson distribution. Why?

The poisson is a reference distribution we use when the null hypothesis is that a process is random