An Introduction to Hypothesis Testing

Objectives
1. Learn importance of and practice taking careful and repeatable measurements.
2. Learn how to choose the proper type of graph.
3. Learn how to use two methods of statistical analyses.
4. Use "A Guide to Statistics and Graphing used in General Education Biology"

I. Introduction:

The Order Primates contains about 200 species, including lemurs, monkeys, apes, and humans.   Most of these are easily recognizable as primates: for instance, all primates have relatively flexible shoulder joints, forward facing eyes, opposable thumbs, and highly sensitive palms and fingers.   They range in size from the mouse lemur of Madagascar, at about 30 grams, to the gorilla, which can weigh up to 275 kilograms.

This week we will look at some size relationships within one species, *Homo sapiens*. In the next couple of weeks we will look at some of the morphological and molecular variation among different species within the Order Primates.

We will test two hypotheses about size in one primate, *Homo sapiens*.   We will test these two null hypotheses.

1. There is no difference in the circumference of the cranium of human males and females.

2. A person's height has no relationship to the circumference of a person's skull.

II. Methods:

Part 1: Testing Hypothesis 1. Measure the circumference of the cranium of each person in the class.   To be meaningful, measurements must be repeatable. In this case, the measurements should be taken in such a way that two people measuring the same thing should get the same result. As a class, discuss and decide on the rules for measuring the circumference of the cranium. Record your rules here.

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Use Table 1 to record the results of your measurements.

Testing Hypothesis 2.   Measure the height of each person in the class.   Again, as a class discuss and decide on the rules for measuring height. Record your rules here.

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Use Table 1 to record the results of your measurements.

III. Results: Record your data in the appropriate table.

Table 1: Measurements of human morphology

Males				Females			
Code	Circumference of cranium mm	Height mm	Ratio of cranium circumference to height	Code	Circumference of cranium mm	Height mm	Ratio of cranium circumference to height
M1				F1			
M2				F2			
M3				F3			
M4				F4			
M5				F5			
M6				F6			
M7				F7			
M8				F8			
M9				F9			
M10				F10			
M11				F11			
M12				F12			
M13				F13			
M14				F14			
M15				F15			
M16				F16			
M17				F17			
M18				F18			
M19				F19			
M20				F20			
Mean				Mean			
Standard error				Standard error			

Test each of the null hypotheses using the appropriate data from Table 1. Refer to the "Graphing and Statistics" handout to determine the kind of data you have, and test each of the hypotheses by applying the appropriate statistical test. Graph your data in the appropriate manner. Again, refer to the "Graphing and Statistics" handout to determine the proper way to graph the type of data you have collected.

To calculate means and standard errors, or correlation coefficients, computers with the appropriate templates are available in the lab. They templates are found on the web at: http://www.radford.edu/~biol-web/stats.html

IV. Conclusions: (These may be written on separate paper, or as part of a lab report.)

1.   Was the following hypothesis supported or not? Hypothesis 1: There is no difference in the circumference of the cranium of human males and females. Using the statistics you've calculated and your graph, explain how you can tell.

2. Was the following hypothesis supported or not? Hypothesis 2: A person's height has no relationship to the circumference of a person's skull. Using the statistics you've calculated and your graph, explain how you can tell.