Biometry	Quiz #2	Winter, 2013

1. Use the background information and the analytical results from ***Results #1*** on the R Handout to answer the following questions. Make sure to answer each question as thoroughly as possible and by citing supporting evidence where appropriate (you may want to label output on the handout).

    a) **[6 pts]** Assess all assumptions (with the exception of independence) on the original scale. State whether you will interpret results on the original or transformed scale (you should examine, but you do not need to describe, the tests of assumptions on the transformed scale).

    b) **[4 pts]** What type(s) of effects are **and** are not evident in these results?

    c) **[6 pts]** For the effect(s) that you identified in (b), which group means are **and** are not statistically different? Specifically state which group means are larger or smaller.

    d) **[4 pts]** Construct a graphic that illustrates your results from question (c) (*make sure to explicitly identify which graph(s) you marked*).

    e) **[4 pts]** For the largest difference in group means, specifically describe how the two group means compare (on the original scale, if possible).

2. Use the background information and the analytical results from ***Results #2*** on the R handout to answer the following questions. Make sure to answer each question as thoroughly as possible and by citing supporting evidence where appropriate (you may want to label output on the handout).

    a) **[8 pts]** Assess all assumptions (with the exception of independence) on the original scale. State whether you will interpret results on the original or transformed scale (you should examine, but you do not need to describe, the tests of assumptions on the transformed scale).

    b) **[6 pts]** Is there a statistically significant relationship? If so, specifically describe that relationship.

    c) **[4 pts]** Make the prediction that corresponds to what the authors wanted to predict (in background).

3. **[6 pts]** Thoroughly explain why one experiment where two factors are simultaneously manipulated is "better" than two separate experiments where one factor at a time is manipulated. If you decided to demonstrate your points with an illustrative example, assume that there are 36 individuals available for experimentation and that one factor has two levels and the other factor has three levels.

4. **[6 pts]** H.C. Watson demonstrated the species-area relationship for Britain's vascular flora in 1859 (which has since been accepted for many other fauna from many other locations). Watson's relationship describes how the number of species (N) relates to area (A), using the formula $N=aA^b$ where *a* and *b* are constants. From Watson's formula, it is possible to estimate the amount of species that may become extinct or threatened when the area available to them is reduced by habitat destruction (due, for instance, to global warming). However, these calculations cannot be made unless the a and b parameters are established from empirical data on N and A. Explain how one would estimate the original parameters (a and b) by applying a linearized model to data on N and A. In your explanation, you should demonstrate (*algebraically show each step of your work*) how you linearized this function, explicitly identify the response and explanatory variables of your linearized function, and explain how the original parameters (a and b) can be determined from the results of applying your linearized function to data on N and A (*i.e., how do these parameters relate to the intercept and slope of the linearized function*).

5. Hood (2002) examined characteristics of tidal channels to improve understanding for restoration projects. In one part of this study, the variability in slough area (m^2) was attempted to be explained by slough length (m). Sloughs from three watersheds were examined – North River, South Fork Willapa River, Willapa River – as there was concern that the relationship between slough area and length might differ among sloughs from these watersheds. Use this information to answer the following questions.

    a. **[3 pts]** Construct all necessary indicator variables assuming that the North River is to be the reference.
    b. **[3 pts]** Construct the ultimate full model for these data.
    c. **[3 pts]** Construct all submodels for these data.
    d. **[3 pts]** Fully and carefully interpret the meanings of β_1, γ_1, and δ_2.
    e. **[2 pts]** Show the simple and full models for the parallel lines test.
    f. **[2 pts]** Show the simple and full models for the equal intercepts test (assuming parallel lines).

6. **[5 pts XC]** In most regression models, the interpretation of the y-intercept is non-sensical. Explain how the explanatory variable could be modified so that the interpretation of the y-intercept makes sense and is useful. Also, carefully explain what the interpretation of the y-intercept from the modified scale represents on the original scale.