

Part I. (100 points) Do all calculations in SAS. Use a word processor of your choice to write a report. Insert computer text output and graphics to support what you are saying, but you need to write something that looks like an academic paper — not a pile of computer output. Turn in a hard copy of your HW in class (i.e., don't email me your HW). Also:

1. Clearly specify parameters and hypotheses when appropriate.
2. Write a coherent conclusion.

(100^{pts})

1. Kangaroo skull regression analysis

The data to be analyzed here are selected skull measurements on 148 kangaroos of known sex and species. (See HW 5 for data.) There are 11 columns of data, corresponding to the following features. Columns, from left to right:

1. sex (1=M, 2=F)
2. species (0=M.\ giganteus, 1=M.f.\ melanops, 2=M.f.\ fuliginosus)
3. post orbit width
4. rostral width
5. supra-occipital - paroccipital depth
6. crest width
7. incisive foramina length
8. mandible length
9. mandible width
10. mandible depth
11. ascending ramus height (cols 3-11 are in mm times 10)

The first 4 observations in the data set are given below. Some of the observations in the data set are missing. These are represented by the SAS default missing value id of a period.

```
1 0 249 227 531 153 88 1086 131 179 591
1 0 233 248 632 141 100 1158 148 181 643
1 0 244 240 575 144 107 1131 116 169 610
1 0 224 242 568 116 79 1090 132 189 594
```

I am interested in you building a model, or models, that relates the (9) mandible width (i.e., the response) to the (8) mandible length and (10) mandible depth. Furthermore, I wish to understand how this relationship depends, if at all, on both the (2) species and the (1) sex of the kangaroo.

You can use any tools to answer this question. However, there is a lot you can do with this problem using simple plots and simple analyses.

Write up a careful summary of your analysis and provide a careful summarization/interpretation of your findings. Below is a recommended strategy.

- (a) (20 pts) Plot mandible width against each of mandible length and mandible depth with colors/symbols indicating species and sex. Discuss the relationships you see, as well as any need for transformation.
- (b) (25 pts) Perform a model selection process to arrive at a parsimonious explanation of the data.
- (c) (20 pts) Assess assumptions of your candidate final model visually (plots).
- (d) (35 pts) Interpret the model coefficients. Use GLM's LSMEANS to make any sex or species comparisons you feel are relevant.

100 pts

100 pts