STAT 217: Parallel Lines Model (4-20)

Crab Claw Force and Size: As part of a study of the relationship between predatory intertidal crab species and snail populations, researchers measured the average closing forces (newtons) and propodus heights (mm) of the claws on several crabs of three species. They collected data on 14 crabs from the species *nudus*, 12 from species *bellus*, and 12 from species *productus*.

```
parallel.out <- lm(Force ~ Height+Species, data=crab.data)
summary(parallel.out)

##
## Call:
## lm(formula = Force ~ Height + Species, data = crab.data)
##
## Residuals:
##    Min     1Q Median     3Q    Max
## -8.532 -4.455  0.475  2.825 13.015
##
## Coefficients:
##                  Estimate Std. Error t value Pr(>|t|)
## (Intercept)        -1.755      4.071   -0.43  0.66913
## Height              1.968      0.457    4.31  0.00013
## Speciesnudus       -9.529      2.111   -4.52  7.2e-05
## Speciesproductus    0.169      2.402    0.07  0.94421
##
## Residual standard error: 5.35 on 34 degrees of freedom
## Multiple R-squared:  0.674,Adjusted R-squared:  0.645
## F-statistic: 23.4 on 3 and 34 DF,  p-value: 2.15e-08
```

1. Write out the response variable and the explanatory variable(s). Identify each as categorical or quantitative. Write out the levels of the categorical variable.

2. Write out the true model. Choose the same indicator variables that R chose!

3. Using the R output, write out the estimated model.

4. What is the reference level?

5. Write out the model for the *nudus* species.

6. Write out the model for the *bellus* species.

7. Write out the model for the *productus* species.

8. Plot the three estimated regression lines on the same graph. Why is this called a "parallel lines" model?