

# WU #21

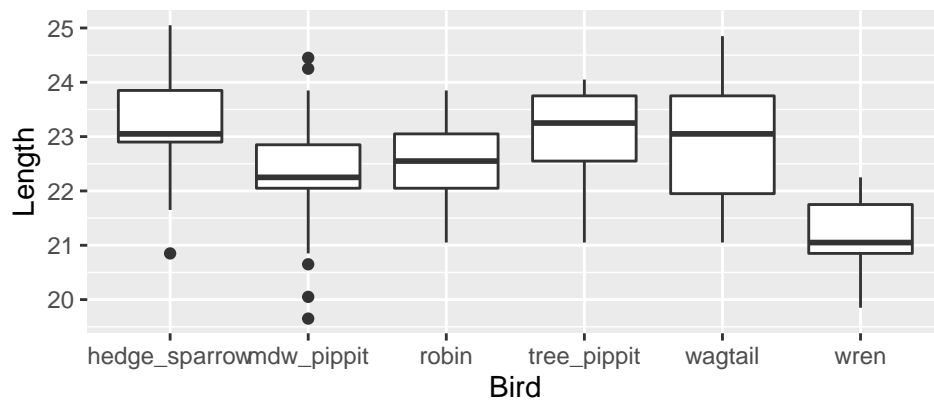
Math 58B, Spring 2022

Tuesday, April 12, 2022

Your Name: \_\_\_\_\_

Names of people you worked with: \_\_\_\_\_

**Instructions:** Work on this problem in class with your group. Do your best. This piece of paper will be collected during class.



**Task:** Using the model below, predict the average length of Cuckoo bird eggs for each of the 6 host birds.

Converting the *Bird* variable:

$$X_{mdw\_pippit} = \begin{cases} 1 & \text{if } mdw\_pippit \\ 0 & \text{otherwise} \end{cases} \quad X_{robin} = \begin{cases} 1 & \text{if } robin \\ 0 & \text{otherwise} \end{cases}$$

$$X_{tree\_pippit} = \begin{cases} 1 & \text{if } tree\_pippit \\ 0 & \text{otherwise} \end{cases} \quad X_{wagtail} = \begin{cases} 1 & \text{if } wagtail \\ 0 & \text{otherwise} \end{cases}$$

$$X_{wren} = \begin{cases} 1 & \text{if } wren \\ 0 & \text{otherwise} \end{cases}$$

So the model which describes the average egg length (denoted with the  $\hat{Y}$  notation) can be written as the following:

$$\hat{Y} = 23.12 - 0.82 \cdot X_{mdw\_pippit} - 0.54 \cdot X_{robin} - 0.03 \cdot X_{tree\_pippit} - 0.21 \cdot X_{wagtail} - 1.99 \cdot X_{wren}$$

Cuckoo %>%

```
lm(Length ~ Bird, data = .) %>%
tidy()
```

```
## # A tibble: 6 x 5
##   term                estimate std.error statistic    p.value
##   <chr>              <dbl>    <dbl>    <dbl>    <dbl>
## 1 (Intercept)        23.1      0.243     95.1 1.87e-110
## 2 Birdmdw_pippit    -0.823    0.278    -2.96 3.79e- 3
## 3 Birdrobin         -0.546    0.333    -1.64 1.03e- 1
## 4 Birdtree_pippit  -0.0314   0.338    -0.0930 9.26e- 1
## 5 Birdwagtail       -0.218    0.338    -0.645 5.20e- 1
## 6 Birdwren          -1.99     0.338    -5.89 3.91e- 8
```

**Solution:**

For each host bird, calculate the average predicted egg length by adding the relevant coefficient to the intercept. For the `hedge_sparrow`, use the intercept.

```
Cuckoo %>%  
  group_by(Bird) %>%  
  summarize(mean_length = mean(Length))
```

```
## # A tibble: 6 x 2  
##   Bird          mean_length  
##   <fct>          <dbl>  
## 1 hedge_sparrow    23.1  
## 2 mdw_pippit      22.3  
## 3 robin           22.6  
## 4 tree_pippit     23.1  
## 5 wagtail         22.9  
## 6 wren            21.1
```