WU #13: Math 150, Spring 2023

Thursday 3/2/2023

Name: _____

Names of people you worked with: _____

1. What is your favorite item to buy at the coop store?
2. What should you prepare for Tuesday's class?
3. Consider the final forward model from the bird nest data.

```
nests %>% select(Location) %>% table()
```

```
## Location
##   bank  conif  decid ground  shrub   snag   wall
##      3     14     25     19     17      4      4
```

```
glm(`Closed?` ~ Length + Location + No.eggs + Nestling,
    data = nests, family="binomial") %>% tidy()
```

```
## # A tibble: 10 x 5
##     term          estimate std.error statistic p.value
##     <chr>            <dbl>     <dbl>     <dbl>   <dbl>
##  1 (Intercept)      11.1    3328.       0.00334 0.997
##  2 Length           -0.219    0.0754  -2.91     0.00364
##  3 Locationconif   -19.3    3328.      -0.00580 0.995
##  4 Locationdecid   -16.9    3328.      -0.00507 0.996
##  5 Locationground  -20.5    3328.      -0.00617 0.995
##  6 Locationshrub   -18.6    3328.      -0.00560 0.996
##  7 Locationsnag      0.695 4313.       0.000161 1.00
##  8 Locationwall    -18.3    3328.      -0.00550 0.996
##  9 No.eggs           0.795    0.262    3.04     0.00238
## 10 Nestling          0.398    0.144    2.76     0.00577
```

a. Find the odds ratio to compare the odds of a nest being `Closed` for birds on the ground with 3 eggs versus birds in coniferous trees with 6 eggs, holding `Length` and `Nestling` constant.

b. Using a single odds ratio, interpret the coefficient on `Locationsnag`, $b_6 = 0.69$.

Solution:

2. On Tuesday we will have time for questions in class. Therefore, you should plan to do some studying over the weekend so that you come prepared with lots of questions to ask in class.

3.   a. The first odds ratio is found by dividing the two separate odds values.

$$\widehat{\text{odds}}_1 = e^{11.1 - 0.22 \cdot \text{Length} - 20.52 \cdot 1 + 0.79 \cdot 3 + 0.40 \cdot \text{Nestling}}$$

$$\widehat{\text{odds}}_2 = e^{11.1 - 0.22 \cdot \text{Length} - 19.29 \cdot 1 + 0.79 \cdot 6 + 0.40 \cdot \text{Nestling}}$$

$$\widehat{\text{OR}} = e^{-20.52 + 19.29 + 0.79 \cdot (3-6)} = 0.027$$

For birds on the ground with 3 eggs, the odds of having a closed nest are 0.027 times the odds of having a closed nest for birds in coniferous trees with 6 eggs, holding `Length` and `Nestling` constant.

b. The second OR is given by comparing the level of interest to the baseline value

$$\widehat{\text{OR}} = e^{0.69} = 1.99$$

For birds on a snag, the odds of having a closed nest are 1.99 times the odds of having a closed nest **for birds on a bank**, holding all the other variables constant. Notice that the baseline level of `Location` is bank, there is no dummy variable for bank!