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ECO 634
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1.

```
rm(list = ls())
rope = read.csv(here("data", "rope.csv"))

rope$rope.type = as.factor(rope$rope.type)
levels(rope$rope.type)

# of observations/groups
n_obs = length(rope[,1])
n_groups = length(unique(rope$rope.type))

ss_tot = sum((rope$p.cut - mean(rope$p.cut))**2)
df_tot = n_obs - 1

#aggregated residuals
agg_resids = aggregate(rope$p.cut,
                       by = list(rope$rope.type),
                       FUN = function(x) x - mean(x))

#aggregated sum-squared residuals
agg_sum_sq_resids = aggregate(rope$p.cut,
                              by = list(rope$rope.type),
                              FUN = function(x) sum((x - mean(x))**2))

#sum squares
ss_within = sum(agg_sum_sq_resids$x)
ss_among = ss_tot - ss_within

#degrees of freedom
df_within = (n_obs - n_groups)
df_among = (n_groups - 1)

#mean squares
ms_among = (ss_among / (df_among))
ms_within = (ss_within / (df_within))

#f-stat ratio
f_ratio = (ms_among / ms_within)
f_pval = 1 - pf(f_ratio,
```

df_among,
df_within)

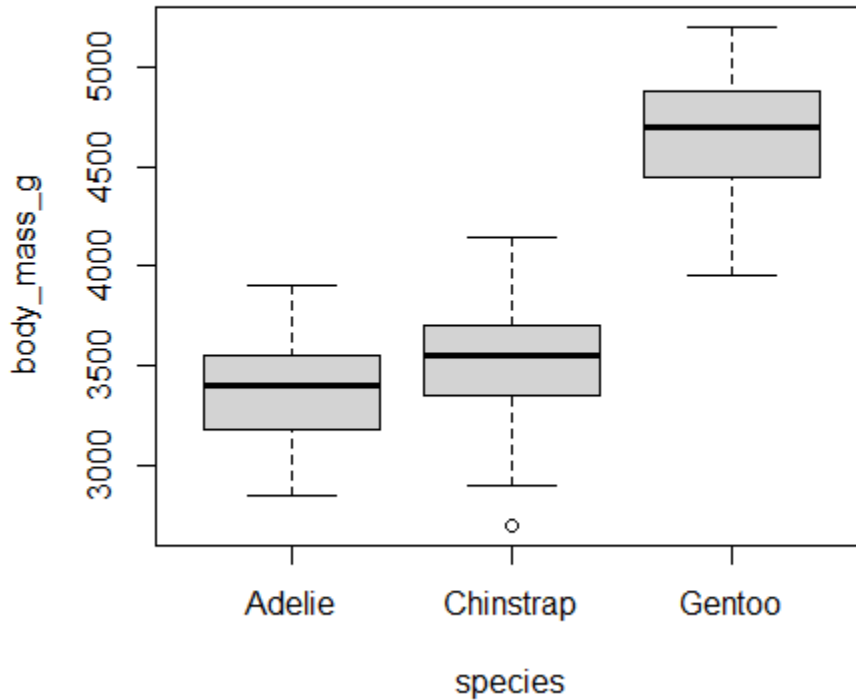
2. No, I do not think that there is equal variance between the plotted groups.
3. `bartlett.test(rope$p.cut ~ rope$rope.type)`

data: rope\$p.cut by rope\$rope.type

Bartlett's K-squared = 19.687, df = 5, p-value = 0.00143

4. Yes, ANOVA analysis is appropriate. Even though my visual assessment was that the variances were not equal, the Bartlett test was significant and suggests homogeneity of variance.
5. BLAZE is the base case rope type
6. It is the intercept value from the anova table, 0.36714
7. $0.36714 + (-0.10164) = 0.2655$ is the mean p.cut for XTC
8. p-value = $7.238e-07$
9. No, the model residuals don't meet the criteria for normality. The H_0 for the shapiro test is that the residuals come from a normally distributed dataset and the low p-value allowed us to reject the null.
10. The second, third, and fourth groups meet the assumption criteria for normality. These correspond to the BS, PI, and SB type ropes.
11. I do not think that it is appropriate. Not all of the included groups meet the assumptions necessary for one-way AOV.

12.



13. .

14. No, the p-value is far above the alpha value for the test. We can reject the null hypothesis that the variances between groups are equal.

15. p-value = 0.3639. Yes, the normality assumption is met for the residuals. We were unable to reject the null hypothesis that the population is normally distributed.

16. Gentoo penguin body masses were significantly different when compared to both Adelie and Chinstrap penguins.

17. The results of the Tukey test are reflected well within the graphical representation. Gentoo penguins have much more mass on average than the other two species.