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#
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# Purpose: Homework 6
# Class: IST 772
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# Question 1

View(InsectSprays)

# The dependent variable is the number of insects killed by the spray. The
# independent variable is the type of spray used. There are 72 observations.

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summary(aov(InsectSprays$count ~ InsectSprays$spray))

# Question 2

# The Residuals is the within-group variance. The between group variance is
# the first line on the ANOVA report, and is typically a larger value than
# the second line of the report, the within-group variance. This is because
# the between group variance takes in account of the each group's mean
# together, while the within-group takes in account for each groups mean
# individually.

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# Question 3

# Between Group MnSq =  533.8   Within Group MnSq = 15.4
533.8/15.4

# F-Ratio = 34.66

# I would reject the null hypothesis, because in order to fail to reject the
# null hypothesis, the F-Ratio would be closer to 1. Here, the F-ratio is
# nearly 35.Also, the p value < 0.001, meaning that we should reject the
# null hypothesis.

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# Question 4

# The degrees of freedom between groups is 5 and the degrees of freedom
# within-groups is 66. The sum of these two values is 71; there are 72
# observations. The reason this is so because (the total value of)
# degrees of freedom is equal to the number of observations minus 1.

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# Question 5
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insectResults<- summary(aov(InsectSprays$count ~ InsectSprays$spray))
insectResults

# For the between group, the degrees of freedom is 5, the sum of squares is
# 2669, and the mean of squares is 533.8. For the within-group, the degrees
# of freedom is 66, the sum of squares is 1015, and the mean of squares is
# 15.4. The F-Value is 34.7, and the p-value is less than .001 (very low,
# thus we would reject the null hypothesis).
# H0: Mu1 = Mu(of sprays A-F)  Ha: Mu1 (does not equal) =/ Mu(of sprays A-F)

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# Question 6

install.packages("BayesFactor")
library(BayesFactor)

ISBF<- anovaBF(count ~ spray, data = InsectSprays)
# This analysis shows odds of 1.506e+14:1 in favor of the alternative
# hypothesis. This is a very strong indication to reject the null hypothesis.

summary(posterior(ISBF, iterations = 1000))
# This tells us that, in respect to the grand mu, sprays A, B and F are t
# he most effective, while sprays C, D, and E are the least effective;
# Spray F is most effective, and spray C is least effective.

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# Question 7
library(BEST)

plot(BESTmcmc(InsectSprays[InsectSprays$spray=="C",1]
         , InsectSprays[InsectSprays$spray=="F",1] ))

# This analysis concludes that the mean value of both groups are 100% less
# than 0, with 95% certainty that the mean is -14.5. The HDI of
# these two groups are between -19 and -10.2.
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