R wizardry Homework 3, 2017

Question 1a (1 point)

Four volunteers assited Willy Wonka and Chuck Norris with the methane measurements: "Tom", "Jerry", "Sylvester", and "Tweety" alternated sampling each sample number in the "compounds_triplicates_long.csv" dataset. Create a new data column that reflects this.

```
##    compound salinity      group day        staff mean_methane sd_methane
## 1 unamended brackish media_only   1 Chuck_Norris           NA         NA
## 2 unamended    fresh media_only   1 Chuck_Norris           NA         NA
## 3 unamended   saline media_only   1 Chuck_Norris           NA         NA
## 4   benzene brackish    sterile   1 Chuck_Norris           NA         NA
## 5    hexane brackish    sterile   1 Chuck_Norris           NA         NA
## 6   toluene brackish    sterile   1 Chuck_Norris           NA         NA
##   Volunteer
## 1       Tom
## 2     Jerry
## 3 Sylvester
## 4    Tweety
## 5       Tom
## 6     Jerry
```

Question 1b (2 points)

Upon reviewing your notes from this experiment, you discover that the volunteer "Tom" was confused about the procedure measuring all brackish and saline experimental groups on day 10, 86, and 116. Using 1 line of code, change the methane and standard deviation data for these measurements to NA. Then proceed to chastise Tom.

```
##      compound salinity      group day        staff mean_methane sd_methane
## 25  unamended brackish media_only  10 Chuck_Norris           NA         NA
## 29     hexane brackish    sterile  10 Chuck_Norris           NA         NA
## 37    benzene brackish  treatment  10 Chuck_Norris           NA         NA
## 45    toluene   saline  treatment  10 Chuck_Norris           NA         NA
## 73  unamended brackish media_only 116 Chuck_Norris           NA         NA
## 77     hexane brackish    sterile 116 Chuck_Norris           NA         NA
## 85    benzene brackish  treatment 116 Chuck_Norris           NA         NA
## 93    toluene   saline  treatment 116 Chuck_Norris           NA         NA
## 457 unamended brackish media_only  86 Chuck_Norris           NA         NA
## 461    hexane brackish    sterile  86 Chuck_Norris           NA         NA
##     Volunteer
## 25        Tom
## 29        Tom
## 37        Tom
## 45        Tom
## 73        Tom
## 77        Tom
## 85        Tom
## 93        Tom
## 457       Tom
```

```
## 461       Tom
```

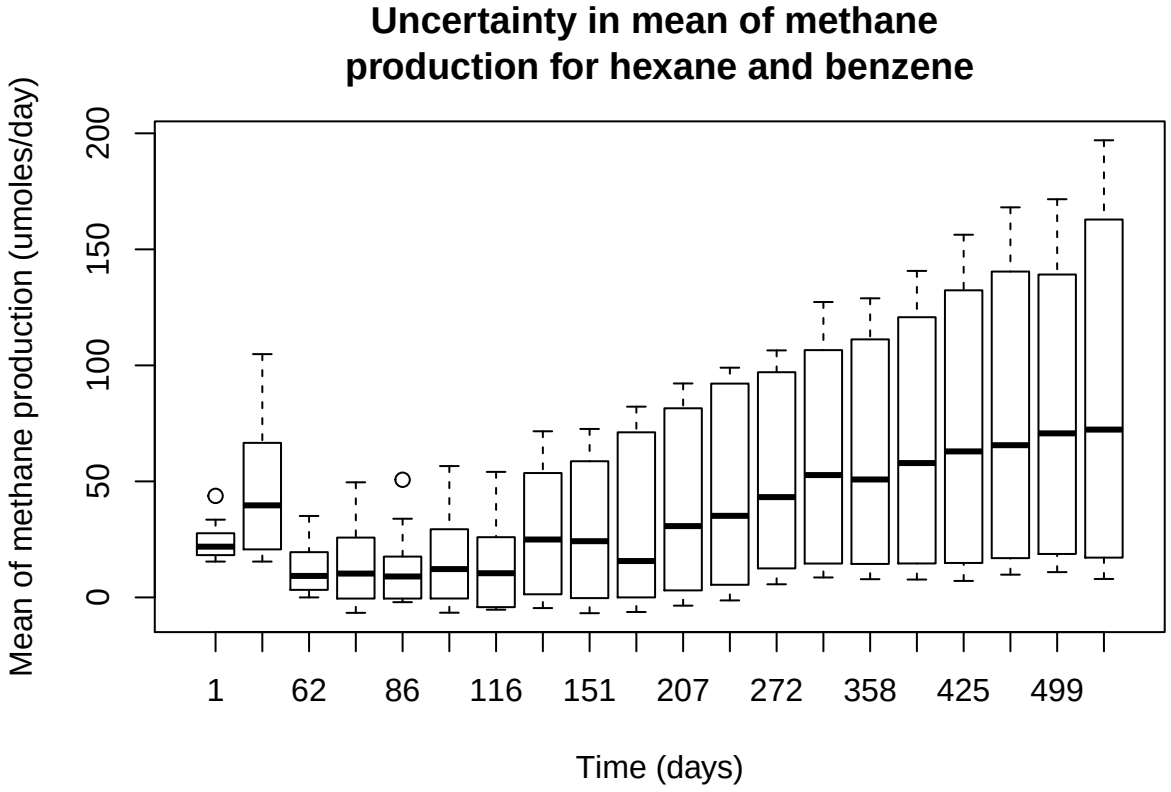
Question 2 (2 points)

You have collected data for the methane production for each day for multiple compounds, treatment types, and saline treatments. Calculate and create two new columns in your dataset for the upper and lower 95% confidence intervals for each sample. The 95% confidence intervals are the methane production +/- 1.96 times the standard deviation for that sample.

```
##     compound salinity      group day        staff mean_methane sd_methane
## 1  unamended brackish media_only   1 Chuck_Norris           NA         NA
## 2  unamended    fresh media_only   1 Chuck_Norris           NA         NA
## 3  unamended   saline media_only   1 Chuck_Norris           NA         NA
## 4    benzene brackish    sterile   1 Chuck_Norris           NA         NA
## 5     hexane brackish    sterile   1 Chuck_Norris           NA         NA
## 6    toluene brackish    sterile   1 Chuck_Norris           NA         NA
## 7    benzene    fresh    sterile   1 Chuck_Norris           NA         NA
## 8     hexane    fresh    sterile   1 Chuck_Norris           NA         NA
## 9    toluene    fresh    sterile   1 Chuck_Norris           NA         NA
## 10   benzene   saline    sterile   1 Chuck_Norris           NA         NA
## 11    hexane   saline    sterile   1 Chuck_Norris           NA         NA
## 12   toluene   saline    sterile   1 Chuck_Norris           NA         NA
## 13   benzene brackish  treatment   1 Chuck_Norris        23.05  11.242998
## 14    hexane brackish  treatment   1 Chuck_Norris        20.65   2.050610
## 15   toluene brackish  treatment   1 Chuck_Norris        24.50   2.404163
##    Volunteer    Upper     Lower
## 1        Tom       NA        NA
## 2      Jerry       NA        NA
## 3  Sylvester       NA        NA
## 4     Tweety       NA        NA
## 5        Tom       NA        NA
## 6      Jerry       NA        NA
## 7  Sylvester       NA        NA
## 8     Tweety       NA        NA
## 9        Tom       NA        NA
## 10     Jerry       NA        NA
## 11 Sylvester       NA        NA
## 12    Tweety       NA        NA
## 13       Tom 45.08628  1.013724
## 14     Jerry 24.66919 16.630805
## 15 Sylvester 29.21216 19.787840
```

Question 3 (3 points)

Create a boxplot showing the uncertainty in mean methane production per day for the hexane and benzene compounds (i.e., combine the methane production for both compounds).



Question 4 (2 points)

Find the indices for where in the data methane production was greater than 3.5 but the standard deviation was less than or equal to 2 on day 1. Whoever ran the unamendend saline water part of this experiment did so perfectly and will merit coauthorship, but which one of your volunteers deserves this honor?

```
##     compound salinity     group day        staff mean_methane sd_methane
## 24 unamended   saline unamended   1 Chuck_Norris        12.45  0.6363961
##    Volunteer    Upper    Lower
## 24    Tweety 13.69734 11.20266
```