NEW_IAEM_2

2022-08-10

```
rm(list = ls())
```

```
library(dplyr)
```

```
##
## Attaching package: 'dplyr'

## The following objects are masked from 'package:stats':
##
##     filter, lag

## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```
library(stringr)
library(readr)
library(tidyverse)
```

```
## -- Attaching packages --------------------------------------- tidyverse 1.3.1 --

## v ggplot2 3.3.5     v purrr   0.3.4
## v tibble  3.1.6     v forcats 0.5.1
## v tidyr   1.2.0

## -- Conflicts ------------------------------------------ tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
```

```
library(psych)
```

```
##
## Attaching package: 'psych'

## The following objects are masked from 'package:ggplot2':
##
##     %+%, alpha
```

```r
library(janitor)
```

```
##
## Attaching package: 'janitor'

## The following objects are masked from 'package:stats':
##
##     chisq.test, fisher.test
```

```r
library(tidyr)
library(rstanarm)
```

```
## Loading required package: Rcpp

## This is rstanarm version 2.21.3

## - See https://mc-stan.org/rstanarm/articles/priors for changes to default priors!

## - Default priors may change, so it's safest to specify priors, even if equivalent to the defaults.

## - For execution on a local, multicore CPU with excess RAM we recommend calling

##   options(mc.cores = parallel::detectCores())

##
## Attaching package: 'rstanarm'

## The following object is masked from 'package:psych':
##
##     logit
```

```r
setwd("/Users/calvinzhang/Desktop/IAEM project")

data2 <- read.csv("numeric.csv")
```

```r
new_data <- data2[-c(1:6,8:17)]
new_datafram <- data.frame(new_data)
```

```r
# filter people answered 1 or 2 and 4 or 5
group1.index <- which(str_detect(new_datafram$Q2, "1|2"))
group2.index <- which(str_detect(new_datafram$Q2, "4|5"))
```

```r
# filter people answered 1 or 2, also contain 4 or 5.
inter <- intersect(group1.index, group2.index)
```

```r
# remove people answered 4 or 5 in people answered 1 or 2
group1.ind <- group1.index[-which( group1.index %in%  inter)]
# remove people answered 1 or 2 in people answered 4 or 5
group2.ind <- group2.index[-which( group2.index %in%  inter)]
# filter people only answered 3
which(new_datafram$Q2 =='3')
```

```
## [1]   8  29  36  98 143 171 189
```

```r
# create new columns with group #s
new_datafram$group <- NA
new_datafram$group[c(group1.ind, which(new_datafram$Q2 =='3'))] <- "group1"
new_datafram$group[group2.ind] <- "group2"
new_datafram$group[inter] <- "group3"
```

```r
# reorder the Q4-13 answers
x <-c()
for(i in 5:14){
  x <- new_datafram[,i]
  ind1<- which(x=='1')
  ind2<- which(x=='5')
  ind3<- which(x=='2')
  ind4<- which(x=='4')
  x[ind1] <- '5'
  x[ind2] <- '1'
  x[ind3] <- '4'
  x[ind4] <- '2'
  new_datafram[,i] <- x
}
new_num <- na.omit(new_datafram)
```

```r
# create new column with sum
numeric_sum <- apply(new_num[,5:14], 2, as.numeric)
```

```
## Warning in apply(new_num[, 5:14], 2, as.numeric): NAs introduced by coercion

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## Warning in apply(new_num[, 5:14], 2, as.numeric): NAs introduced by coercion
```

```r
sum <- c()
for (j in 1:nrow(numeric_sum)) {
  sum[j] = sum(numeric_sum[j,],na.rm = T)
}
new_num$sum <- sum
final_num <- new_num[-which(new_num$sum==0),]
```

```r
df <- cbind(ID = 1:nrow(final_num), final_num)
df$group <- gsub("group3", "group1", df$group)
df
```

```
##       ID Finished Q1       Q2 Q3 Q4_1 Q5_1 Q6_1 Q7_1 Q8_1 Q9_1 Q10_1 Q11_1 Q12_1
## 7      1        1  1      3,5 50    3    4    5    5    4    3     4     4     4
## 8      2        1  1        3  1    3    2    3    3    4    2     2     3     3
## 9      3        1  1        5  9    2    1    1    2    5    3     1     2     2
## 10     4        1  1      4,5 33    4    4    4    4    2    4     4     4     4
## 11     5        1  1        5 42    4    4    4    2    2    3     3     4     3
## 12     6        1  1    3,5,7  3    2    2    2    4    4    2     2     2     2
## 13     7        1  1        5 33    2    2    2    4    4    2     2     3     4
## 14     8        1  1    1,3,5 31    3    4    1    4    5    1     2     4     5
## 15     9        1  1        5  6    2    2    2    2    4    2     2     2     2
## 16    10        1  1      1,5 22    3    4    4    3    5    3     2     2     2
## 17    11        1  1        5  5    2    5    2    3    4    4     2     2     2
## 18    12        1  1      1,5 48    3    4    2    3    4    4     3     4     4
## 19    13        1  1        5 48    4    5    3    4    3    3     5     4     4
## 20    14        1  1        5 25    3    4    3    4    4    5     3     4     4
## 21    15        1  1 1,2,3,5 14    4    2    3    3    5    1     5     5     5
## 22    16        1  1        5  2    4    4    4    4    4    4     2     4     4
## 23    17        1  1    1,2,5 39    3    3    2    2    5    1     1     1     3
## 24    18        1  1      3,5  5    4    3    1    4    5    4     2     2     2
## 25    19        1  1        5 48    4    2    2    3    5    2     2     2     2
## 26    20        1  1        5  7    5    5    5    5    5    4     4     4     4
## 27    21        1  1        5 11    2    3    3    4    4    3     3     2     2
## 28    22        1  1      1,5 40    4    4    4    3    4    3     3     4     4
## 29    23        1  1        3 21    4    3    5    4    5    3     4     3     4
## 30    24        1  1        5 38    2    2    2    4    4    2     2     2     2
## 31    25        1  1      3,5 47    4    4    4    4    4    4     4     4     4
## 32    26        1           5 15    4    4    2    2    5    2     2     3     3
## 33    27        1  1      1,5 22    2    2    4         4    3     2
## 34    28        1  1    1,3,5 11    4    5    4    4    4    2     2     4     4
## 35    29        1  1        5 47    3    4    3    4    4    3     3     4     4
## 36    30        1  1        3 44    1    2    2    2    5    1     1     1     1
## 37    31        1  1      1,2 22    4    4    3    3    5    5     5     4     5
## 38    32        1  1      3,5 44    1    2    2    1    1    2     1     1     2
## 39    33        1  1 1,2,3,5  5    3    3    4    4    4    2     2     2     2
## 40    34        1  1   1,2,3 39    2    1    1    1    5    1     1     1     1
## 41    35        1  1     1,3 48    3    2    2    3    3    4     2     4     5
## 42    36        1  1        5 21    3    3    3    4    4    3     2     2     3
## 43    37        1           5 48    3    2    2    1    5    2     2     3     3
## 44    38        1  1        5 37    3    2    4    4    4    4     2     4     3
## 45    39        1  1    1,3,5 33    3    2    2    4    5    1     5     5     3
## 46    40        1  1        1       4    5    3    5    5    4     2     5     5
## 47    41        1  1        5 43    3    4    4    4    4    4     2     5     2
## 48    42        1  1        5  1    4    5    4    5    4    2     3     4     4
## 49    43        1  1    1,2,3  5    1    1    1    2    3    4     1     1     2
## 50    44        1  1      2,5 39    3    2    4    4    4    4     1     2     2
## 51    45        1  1        5 10    4    3    5    5    4    4     3     5     5
## 52    46        1  1        5 47    4    4    4    5    3    5     4     4     4
## 53    47        1  1    1,3,5 36    4    4    2    4    4    4     2     2     4
## 54    48        1  1      3,5  3    3    4    4    4    4    4     4     4     4
```

```
## 55   49        1  1       5 47    2    4    4    5    5    3    2    4    4
## 56   50        1  1       5 47    4    4    3    4    4    4    3    4    4
## 57   51        1  1     4,5 47    2    2    3    3    3    5    2    1    1
## 58   52        1  1       5 29    4    4    4    3    4    4    2    3    4
## 59   53        1  1     3,5 44    2    2    2    2    4    4    1    2    2
## 60   54        1  1       5 47    3    4    4    4    5    2    2    4    4
## 61   55        1  1     1,5 47    4    4    4    4    4    3    3    3    3
## 62   56        1  1       5 47    2    2    4    3    4    3    3    3    4
## 63   57        1  1       5 43    4    4    4    4    4    4    4    3    4
## 64   58        1  1     1,5 47    4    4    4    4    5         4    4    4
## 65   59        1  1   1,2,5 47    2    2    1    4    5    4    2    2    3
## 67   60        1  1       5 47    4    4    2    4    5    4    4    4    2
## 68   61        1  1     1,5 47    2    2    2    4    4    3    2    3    4
## 69   62        1  1 1,2,3,5  6    2    2    4    2    5    2    4    4    4
## 70   63        1  1       5 44    2    4    1    2    5    1    2    2    2
## 71   64        1  1       5 47    2    2    4    4    5    4    2    3    3
## 72   65        1  1     1,5 44    2    3    3    4    4    3    3    2    3
## 73   66        1  1     1,5 47    3    1    1    3    4    4    1    1    2
## 74   67        1  1       5 44    4    5    4    5    5    4    3    4    4
## 75   68        1  1     1,5 44    2    2    3    2    5    4    1    1    1
## 76   69        1  1   1,3,7 33    3    4    4    3    4    2    1    3    3
## 77   70        1  1   1,3,5 22    2    2    2    2    4    2    2    3    3
## 78   71        1  1       5           3
## 79   72        1  1       5 44    3    4    3    4    4    4    3    2    3
## 80   73        1  1   1,3,5 44    3    2    2    3    4    4    2    2    2
## 81   74        1  1       5 47    2    3    3    3    4    2    2    2    2
## 82   75        1  1       5 47    3    5    4    3    4    4    4    3    4
## 83   76        1  1     3,5  5    2    2    1    2    5    2    2    3    4
## 84   77        1  1       5 21    2    2    4    5    4    4    1    2    2
## 85   78        1  1     3,5 39    1    3    1    2    4    2    2    3    3
## 86   79        1  1   3,4,5  6    2    2    2    3    4    2    3    3    2
## 87   80        1  1       5 14    4    5    5    4    5    5    3    4    4
## 88   81        1  1 1,2,3,5  5    5    5    4    4    4    3    4    5    5
## 89   82        1  1   1,2,3  5    1    1    1    1    3    4    1    1    2
## 90   83        1  1       5 31    2    2    2    4    4    2    2    4    2
## 91   84        1  1     2,5 30    2    4    3    2    4    4    2    2    2
## 92   85        1  1       5 11    2    4    4    3    5    4    5    4    3
## 93   86        1  1       5 21    3    2    2    4    4    2    2    3    3
## 94   87        1  1       5 23    3    4    3    2    5    4    2    3    4
## 95   88        1  1       5 11    3    2    3    3    3    4    2    2    2
## 96   89        1  1       5       3    2    2    4    5    4    2    2    2
## 97   90        1  1     3,5 36    2    2    4    4    5    4    4    4    4
## 101  91        1  1       5 44    2    4    2    4    5    1    4    1    2
## 113  92        1  1       5 47    4    2    4    4    4    2    1    2    2
## 116  93        1  1       5 10    3    2    4    4    4    4    1    1    1
## 117  94        1  1     3,5 39    2    2    2    3    5    3    1    2    3
## 120  95        1  1       5 22    2    4    1    2    4    1    1    2    2
## 124  96        1  1     3,5  6    2    4    3    4    5    4    2    4    4
## 125  97        1  1       5  5    2    1    1    3    4    4    2    4    4
## 130  98        1  1     3,5 38    2    4    2    2    5    3    1    3    4
## 133  99        1  1     1,2  5    2    2    3    2    5    3    2    3    3
## 135 100        1  1       5 22    4    4    4    3    3    3    2    4    4
## 138 101        1  1       5 33    4    3    4    4    3    2    2    4    4
## 141 102        1  1       5 43    2    2    4    4    5    5    3    4    3
```

```
## 144 103        1  1   1,3,5 39    2    2    4    4    3    4    1    2    2
## 148 104        1  1       5 26    4    2    1    4    2    4    3    3    2
## 149 105        1  1   1,2,3 33    3    3    2    4    5    4    2    2    2
## 157 106        1  1       5 17    4    4    4    3    4    4    2    4    2
## 165 107        1  1   3,4,5 32    2    2    3    1    4    2    2    1    1
## 168 108        1  1       1 44    3    4    3    3    4    4    3    3    4
## 171 109        1  1       3 22    3    3    2    3    4    2    3    2    2
## 172 110        1  1     3,4 22    1    2    2    2    1    2    2    4    2
## 173 111        1  1   1,3,7 47    3    3    3    4    4    5    3    3    3
## 174 112        1  1     3,5 49    4    3    2    2    5    2    1    1    2
## 175 113        1  1     1,5 39    2    2    1    2    4    3    2    2    2
## 177 114        1  1     5,7 29    2    2    2    2    5    2    1    1    2
## 179 115        1  1       5 29    2    1    2    3    4    2    1    2    3
## 181 116        1  1     1,3 48    4    2    4    4    5    4    2    4    5
## 182 117        1  1   2,3,5 39    3    2    3    4    5    4    2    3    2
## 183 118        1  1       5 29    2    3    2    2    4    2    2    2    2
## 188 119        1  1     3,5  6    2    1    2    2    4    2    2    2    1
## 195 120        1  1       5 19    2    2    2    1    4    4    3    1    2
## 196 121        1  1 1,2,3,5 14    2    2    3    4    5    1    2    4    3
## 197 122        1         5 23    5    4    4    4    5    4    2    2    4
## 198 123        1  1       5 33    4    4    4    4    4    2    1    4    4
## 199 124        1  1     3,5 19    4    3    4    4    4    3    4    3    4
## 200 125        1  1     3,5 33    2    1    1    4    3    2    1    2    1
## 202 126        1  1       5 20    2    2    4    4    5    2    2    3    3
## 203 127        1         5 38    4    4    4    4    5    3    4    5    5
## 204 128        1  1       5 26    3    3    2    4    5    5    4    4    4
## 205 129        1  1       5 47    2    2    4    4    4    2    2    3    3
## 206 130        1  1   2,3,5 28    2    2    1    2    4    1    1    2    2
## 207 131        1  1   1,3,5 19    2    2    2    2    5    4    1    4    4
## 208 132        1  1       5       5    5    5    5    5    2    1    4    4
## 209 133        1       3,5  5    2    4    2    4    4    3    5    5    5
## 210 134        1  1       5 18    2    2    4    3    4    3    2    2    2
## 211 135        1         5  5    2    1    4    2    4    2    2    3    3
## 212 136        1  1     3,5 31    4    2    4    4    5    3    2    4    4
## 213 137        1  1   2,3,5 48    1    1    2    2    5    1    1    3    3
## 226 138        1  1 1,2,3,5  6    4    2    2    2    4    2    2    4    2
## 227 139        1  1       5 22    4    3    3    4    5    3    2    3    3
## 231 140        1  1 1,2,3,5 22    2    2    4    2    4    1    1    1    2
## 232 141        1     1,2,3 29    1    2    1    1    5    1    1    3    2
## 233 142        1  1       5 22    2    4    4    4    4    2    3    2    2
## 234 143        1  1     1,5 38    2    2    3    4    5    1    2    2    3
##     Q13_1 Q14 Q15 Q16 Q17  group sum
## 7       4   2   2   5   2 group2  40
## 8       2   4   2   5   2 group1  27
## 9       3   2   1   1   2 group2  22
## 10      4   2   1   5   2 group2  38
## 11      2   2   1   5   2 group2  31
## 12      4   1   1   5   2 group2  26
## 13      2   2   1   5   2 group2  27
## 14      3   1   2   5   2 group1  32
## 15      2   3   2   5   1 group2  22
## 16      3   2   2   5   2 group1  31
## 17      4   1   2   5   2 group2  30
## 18      4   3   1   6   1 group1  35
```

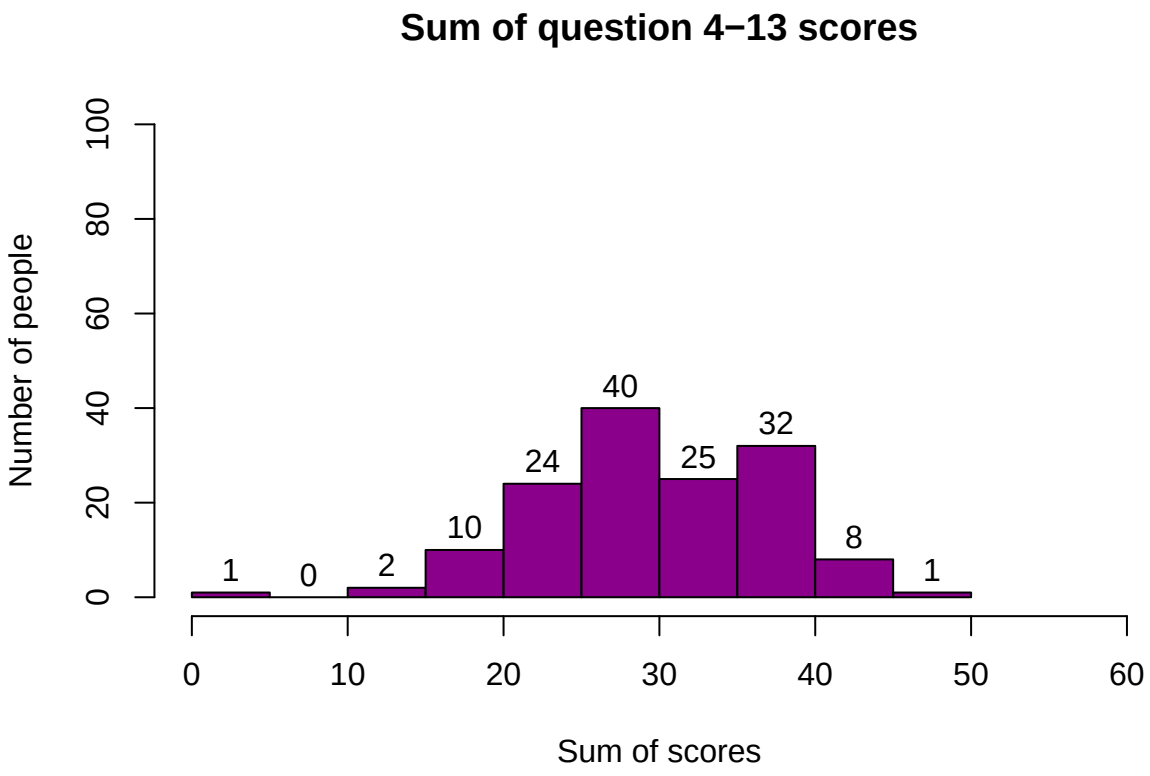
```
## 19      4   2   5   7   3 group2  39
## 20      3   3   2   6   2 group2  37
## 21      5   1   1   5   2 group1  38
## 22      4   3   1   5   2 group2  38
## 23      2   3   1   5   2 group1  23
## 24      2   1   1   7   1 group2  29
## 25      4   3   1   5   2 group2  28
## 26      5   3   2   5   2 group2  46
## 27      3   2   2   5   2 group2  29
## 28      3   2   1   5   2 group1  36
## 29      4   3   1   5   2 group1  39
## 30      2   2   1   5   2 group2  24
## 31      4   3   1   1   2 group2  40
## 32      4   3   2   5   2 group2  31
## 33          2   1   5   2 group1  17
## 34      4   3   1   5   2 group1  37
## 35      4   1   1   5   2 group2  36
## 36      1   2   2   2   2 group1  17
## 37      4   3   1   5   2 group1  42
## 38      1   1   1   5   2 group2  14
## 39      2   3   2   5   2 group1  28
## 40      1   1   3   5   2 group1  15
## 41      3   3   1   5   2 group1  31
## 42      3   2   2   1   2 group2  30
## 43      2   3   1   5   2 group2  25
## 44      3   2   1   5   2 group2  33
## 45      4   3   2   5   2 group1  34
## 46      4   2   2   5   2 group1  42
## 47      4   3   1   5   2 group2  36
## 48      4   3   1   5   2 group2  39
## 49      3   3   2   5   2 group1  19
## 50      4   2   1   5   2 group1  30
## 51      5   3   1   5   2 group2  43
## 52      4   2   1   5   2 group2  41
## 53      4   5   5   7   3 group1  34
## 54      4   2   2   1   2 group2  39
## 55      4   5   5   7   3 group2  37
## 56      5   4   1   5   2 group2  39
## 57      2   5   2   5   2 group2  24
## 58      4   3   1   5   2 group2  36
## 59      2   1   2   5   2 group2  23
## 60      4   3   1   5   2 group2  36
## 61      3   2   1   5   2 group1  35
## 62      4   2   1   7   2 group2  32
## 63      3   2   2   5   2 group2  38
## 64      5   3   2   5   2 group1  38
## 65      3   4   1   5   2 group1  28
## 67      3   2   1   5   2 group2  36
## 68      2   2   1   5   2 group1  28
## 69      2   3   1   5   2 group1  31
## 70      4   1   1   6   1 group2  25
## 71      4   3   1   5   2 group2  33
## 72      4   2   1   5   2 group1  31
## 73      2   2   1   5   2 group1  22
```

```
## 74      5   1   2   5   1 group2  43
## 75      2   2   2   5   2 group1  23
## 76      2   1   4   5   2 group1  29
## 77      2   4   2   5   2 group1  24
## 78                        group2   3
## 79      3   4   1   5   2 group2  33
## 80      4   3   1   6   2 group1  28
## 81      4   2   2   5   2 group2  27
## 82      5   3   1   5   2 group2  39
## 83      2   4   2   5   1 group2  25
## 84      4   2   2   5   1 group2  30
## 85      2   1   2   5   2 group2  23
## 86      4   1   2   5   2 group2  27
## 87      4   3   1   5   2 group2  43
## 88      5   4   2   5   2 group1  44
## 89      3   3   2   5   2 group1  18
## 90      4   3   1   5   2 group2  28
## 91      3   1   2   5   2 group1  28
## 92      4   1   1   5   2 group2  38
## 93      4   2   1   5   2 group2  29
## 94      4   2   2   5   2 group2  34
## 95      4   5   5   7   3 group2  28
## 96      4   3   1   5   2 group2  30
## 97      4   3   1   5   2 group2  37
## 101     2   2   1   2   2 group2  27
## 113     4   2   1   5   2 group2  29
## 116     4   3   1   2   2 group2  28
## 117     2   2   4   5   2 group2  25
## 120     2   3   1   5   2 group2  21
## 124     4   4   1   5   2 group2  36
## 125     3   3   1   5   2 group2  28
## 130     5   3   1   5   2 group2  31
## 133     3   2   3   5   2 group1  28
## 135     2   2   2   5   2 group2  33
## 138     4   2   2   5   2 group2  34
## 141     5   2   1   5   2 group2  37
## 144     5   4   2   5   2 group1  29
## 148     4   1   1   5   2 group2  29
## 149     2   2   1   2   2 group1  29
## 157     4   1   1   5   2 group2  35
## 165     1   2   1   5   1 group2  19
## 168     3   3   1   5   2 group1  34
## 171     3   3   2   5   2 group1  27
## 172         3   2   5   2 group2  18
## 173     1   3   1   5   2 group1  32
## 174     2   2   2   5   2 group2  24
## 175     2   2   1   6   1 group1  22
## 177     3   2   1   5   2 group2  22
## 179     1   2   2   5   2 group2  21
## 181     2   3   1   5   2 group1  36
## 182     2   2   2   5   2 group1  30
## 183     2   3   1   5   2 group2  23
## 188     2   2   2   5   2 group2  20
## 195     2   1   2   5   2 group2  23
```

```
## 196     1   1   1   5   2 group1  27
## 197     4   3   1   5   2 group2  38
## 198     3   4   1   5   2 group2  34
## 199     4   1   2   5   2 group2  37
## 200     1   1   1   5   2 group2  18
## 202     2   2   1   5   2 group2  29
## 203     5   3   1   5   1 group2  43
## 204     3   1   1   5   2 group2  37
## 205     4   2   1   5   2 group2  30
## 206     1   2   1   5   2 group1  18
## 207     2   1   2   3   1 group1  28
## 208     4   1   1   5   2 group2  40
## 209     5   1   2   5   1 group2  39
## 210     3   3   1   5   2 group2  27
## 211     4   1   1   7   1 group2  27
## 212     2   1   2   5   2 group2  34
## 213     2   1   2   5   2 group1  21
## 226     2   3   1   5   2 group1  26
## 227     4   3   1   5   2 group2  34
## 231     2   2   2   5   2 group1  21
## 232     2   2   2   5   2 group1  19
## 233     1   3   1   5   2 group2  28
## 234     1   1   1   5   2 group1  25
```

```
write.csv(df,"final_numeric.csv")
```

```
# histogram for number of people vs. sum of scores
h <- hist(df$sum,
     main = "Sum of question 4-13 scores",
     xlab = "Sum of scores",
     ylab = "Number of people",
     xlim = c(0,60),
     ylim = c(0,100),
     col = "darkmagenta", breaks = 12)
text(h$mids,h$counts,labels=h$counts, adj=c(0.5, -0.5))
```




```
# details about dataset df (cleaned)
summary(df)
```

```
##        ID          Finished             Q1                Q2
##  Min.   :  1.0   Length:143         Length:143         Length:143
##  1st Qu.: 36.5   Class :character   Class :character   Class :character
##  Median : 72.0   Mode  :character   Mode  :character   Mode  :character
##  Mean   : 72.0
##  3rd Qu.:107.5
##  Max.   :143.0
##       Q3                Q4_1               Q5_1               Q6_1
##  Length:143         Length:143         Length:143         Length:143
##  Class :character   Class :character   Class :character   Class :character
##  Mode  :character   Mode  :character   Mode  :character   Mode  :character
##
##
##
##      Q7_1               Q8_1               Q9_1              Q10_1
##  Length:143         Length:143         Length:143         Length:143
##  Class :character   Class :character   Class :character   Class :character
##  Mode  :character   Mode  :character   Mode  :character   Mode  :character
##
##
##
##     Q11_1              Q12_1              Q13_1              Q14
```

```
##  Length:143         Length:143         Length:143         Length:143
##  Class :character   Class :character   Class :character   Class :character
##  Mode  :character   Mode  :character   Mode  :character   Mode  :character
##
##
##
##      Q15                Q16                Q17                group
##  Length:143         Length:143         Length:143         Length:143
##  Class :character   Class :character   Class :character   Class :character
##  Mode  :character   Mode  :character   Mode  :character   Mode  :character
##
##
##
##       sum
##  Min.   : 3.00
##  1st Qu.:25.00
##  Median :30.00
##  Mean   :30.16
##  3rd Qu.:36.00
##  Max.   :46.00
```

```
data_matrix <- data.matrix(df)
scale(data_matrix, center = T, scale = T)
```

```
##              ID Finished         Q1          Q2          Q3       Q4_1
## 7   -1.71395615      NaN  0.2260767  0.26823756  1.17685090  0.1992379
## 8   -1.68981592      NaN  0.2260767 -0.28500241 -1.95326348  0.1992379
## 9   -1.66567570      NaN  0.2260767  0.82147753  1.45303747 -0.7832110
## 10  -1.64153547      NaN  0.2260767  0.63706420 -0.01995754  1.1816868
## 11  -1.61739524      NaN  0.2260767  0.82147753  0.53241559  1.1816868
## 12  -1.59325501      NaN  0.2260767  0.45265088 -0.38820629 -0.7832110
## 13  -1.56911479      NaN  0.2260767  0.82147753 -0.01995754 -0.7832110
## 14  -1.54497456      NaN  0.2260767 -1.20706902 -0.20408191  0.1992379
## 15  -1.52083433      NaN  0.2260767  0.82147753  1.26891309 -0.7832110
## 16  -1.49669410      NaN  0.2260767 -0.83824237 -0.94057941  0.1992379
## 17  -1.47255388      NaN  0.2260767  0.82147753  1.08478872 -0.7832110
## 18  -1.44841365      NaN  0.2260767 -0.83824237  0.90066434  0.1992379
## 19  -1.42427342      NaN  0.2260767  0.82147753  0.90066434  1.1816868
## 20  -1.40013319      NaN  0.2260767  0.82147753 -0.75645504  0.1992379
## 21  -1.37599297      NaN  0.2260767 -1.76030899 -1.67707692  1.1816868
## 22  -1.35185274      NaN  0.2260767  0.82147753 -1.21676598  1.1816868
## 23  -1.32771251      NaN  0.2260767 -1.57589566  0.34829121  0.1992379
## 24  -1.30357228      NaN  0.2260767  0.26823756  1.08478872  1.1816868
## 25  -1.27943206      NaN  0.2260767  0.82147753  0.90066434  1.1816868
## 26  -1.25529183      NaN  0.2260767  0.82147753  1.36097528  2.1641357
## 27  -1.23115160      NaN  0.2260767  0.82147753 -1.76913910 -0.7832110
## 28  -1.20701137      NaN  0.2260767 -0.83824237  0.44035340  1.1816868
## 29  -1.18287115      NaN  0.2260767 -0.28500241 -1.03264160  1.1816868
## 30  -1.15873092      NaN  0.2260767  0.82147753  0.25622903 -0.7832110
## 31  -1.13459069      NaN  0.2260767  0.26823756  0.80860215  1.1816868
## 32  -1.11045046      NaN -4.3923464  0.82147753 -1.58501473  1.1816868
## 33  -1.08631024      NaN  0.2260767 -0.83824237 -0.94057941 -0.7832110
## 34  -1.06217001      NaN  0.2260767 -1.20706902 -1.76913910  1.1816868
## 35  -1.03802978      NaN  0.2260767  0.82147753  0.80860215  0.1992379
```

```
## 36  -1.01388955      NaN  0.2260767 -0.28500241  0.71653996 -1.7656599
## 37  -0.98974933      NaN  0.2260767 -2.12913563 -0.94057941  1.1816868
## 38  -0.96560910      NaN  0.2260767  0.26823756  0.71653996 -1.7656599
## 39  -0.94146887      NaN  0.2260767 -1.76030899  1.08478872  0.1992379
## 40  -0.91732864      NaN  0.2260767 -1.94472231  0.34829121 -0.7832110
## 41  -0.89318842      NaN  0.2260767 -1.39148234  0.90066434  0.1992379
## 42  -0.86904819      NaN  0.2260767  0.82147753 -1.03264160  0.1992379
## 43  -0.84490796      NaN -4.3923464  0.82147753  0.90066434  0.1992379
## 44  -0.82076773      NaN  0.2260767  0.82147753  0.16416684  0.1992379
## 45  -0.79662751      NaN  0.2260767 -1.20706902 -0.01995754  0.1992379
## 46  -0.77248728      NaN  0.2260767 -2.31354895 -2.04532567  1.1816868
## 47  -0.74834705      NaN  0.2260767  0.82147753  0.62447778  0.1992379
## 48  -0.72420682      NaN  0.2260767  0.82147753 -1.95326348  1.1816868
## 49  -0.70006660      NaN  0.2260767 -1.94472231  1.08478872 -1.7656599
## 50  -0.67592637      NaN  0.2260767 -0.46941573  0.34829121  0.1992379
## 51  -0.65178614      NaN  0.2260767  0.82147753 -1.86120129  1.1816868
## 52  -0.62764591      NaN  0.2260767  0.82147753  0.80860215  1.1816868
## 53  -0.60350569      NaN  0.2260767 -1.20706902  0.07210465  1.1816868
## 54  -0.57936546      NaN  0.2260767  0.26823756 -0.38820629  0.1992379
## 55  -0.55522523      NaN  0.2260767  0.82147753  0.80860215 -0.7832110
## 56  -0.53108500      NaN  0.2260767  0.82147753  0.80860215  1.1816868
## 57  -0.50694478      NaN  0.2260767  0.63706420  0.80860215 -0.7832110
## 58  -0.48280455      NaN  0.2260767  0.82147753 -0.48026848  1.1816868
## 59  -0.45866432      NaN  0.2260767  0.26823756  0.71653996 -0.7832110
## 60  -0.43452409      NaN  0.2260767  0.82147753  0.80860215  0.1992379
## 61  -0.41038387      NaN  0.2260767 -0.83824237  0.80860215  1.1816868
## 62  -0.38624364      NaN  0.2260767  0.82147753  0.80860215 -0.7832110
## 63  -0.36210341      NaN  0.2260767  0.82147753  0.62447778  1.1816868
## 64  -0.33796318      NaN  0.2260767 -0.83824237  0.80860215  1.1816868
## 65  -0.31382296      NaN  0.2260767 -1.57589566  0.80860215 -0.7832110
## 67  -0.28968273      NaN  0.2260767  0.82147753  0.80860215  1.1816868
## 68  -0.26554250      NaN  0.2260767 -0.83824237  0.80860215 -0.7832110
## 69  -0.24140227      NaN  0.2260767 -1.76030899  1.26891309 -0.7832110
## 70  -0.21726205      NaN  0.2260767  0.82147753  0.71653996 -0.7832110
## 71  -0.19312182      NaN  0.2260767  0.82147753  0.80860215 -0.7832110
## 72  -0.16898159      NaN  0.2260767 -0.83824237  0.71653996 -0.7832110
## 73  -0.14484136      NaN  0.2260767 -0.83824237  0.80860215  0.1992379
## 74  -0.12070114      NaN  0.2260767  0.82147753  0.71653996  1.1816868
## 75  -0.09656091      NaN  0.2260767 -0.83824237  0.71653996 -0.7832110
## 76  -0.07242068      NaN  0.2260767 -1.02265570 -0.01995754  0.1992379
## 77  -0.04828045      NaN  0.2260767 -1.20706902 -0.94057941 -0.7832110
## 78  -0.02414023      NaN  0.2260767  0.82147753 -2.04532567 -2.7481088
## 79   0.00000000      NaN  0.2260767  0.82147753  0.71653996  0.1992379
## 80   0.02414023      NaN  0.2260767 -1.20706902  0.71653996  0.1992379
## 81   0.04828045      NaN  0.2260767  0.82147753  0.80860215 -0.7832110
## 82   0.07242068      NaN  0.2260767  0.82147753  0.80860215  0.1992379
## 83   0.09656091      NaN  0.2260767  0.26823756  1.08478872 -0.7832110
## 84   0.12070114      NaN  0.2260767  0.82147753 -1.03264160 -0.7832110
## 85   0.14484136      NaN  0.2260767  0.26823756  0.34829121 -1.7656599
## 86   0.16898159      NaN  0.2260767  0.08382424  1.26891309 -0.7832110
## 87   0.19312182      NaN  0.2260767  0.82147753 -1.67707692  1.1816868
## 88   0.21726205      NaN  0.2260767 -1.76030899  1.08478872  2.1641357
## 89   0.24140227      NaN  0.2260767 -1.94472231  1.08478872 -1.7656599
## 90   0.26554250      NaN  0.2260767  0.82147753 -0.20408191 -0.7832110
```

```
## 91   0.28968273      NaN  0.2260767 -0.46941573 -0.29614410 -0.7832110
## 92   0.31382296      NaN  0.2260767  0.82147753 -1.76913910 -0.7832110
## 93   0.33796318      NaN  0.2260767  0.82147753 -1.03264160  0.1992379
## 94   0.36210341      NaN  0.2260767  0.82147753 -0.84851723  0.1992379
## 95   0.38624364      NaN  0.2260767  0.82147753 -1.76913910  0.1992379
## 96   0.41038387      NaN  0.2260767  0.82147753 -2.04532567  0.1992379
## 97   0.43452409      NaN  0.2260767  0.26823756  0.07210465 -0.7832110
## 101  0.45866432      NaN  0.2260767  0.82147753  0.71653996 -0.7832110
## 113  0.48280455      NaN  0.2260767  0.82147753  0.80860215  1.1816868
## 116  0.50694478      NaN  0.2260767  0.82147753 -1.86120129  0.1992379
## 117  0.53108500      NaN  0.2260767  0.26823756  0.34829121 -0.7832110
## 120  0.55522523      NaN  0.2260767  0.82147753 -0.94057941 -0.7832110
## 124  0.57936546      NaN  0.2260767  0.26823756  1.26891309 -0.7832110
## 125  0.60350569      NaN  0.2260767  0.82147753  1.08478872 -0.7832110
## 130  0.62764591      NaN  0.2260767  0.26823756  0.25622903 -0.7832110
## 133  0.65178614      NaN  0.2260767 -2.12913563  1.08478872 -0.7832110
## 135  0.67592637      NaN  0.2260767  0.82147753 -0.94057941  1.1816868
## 138  0.70006660      NaN  0.2260767  0.82147753 -0.01995754  1.1816868
## 141  0.72420682      NaN  0.2260767  0.82147753  0.62447778 -0.7832110
## 144  0.74834705      NaN  0.2260767 -1.20706902  0.34829121 -0.7832110
## 148  0.77248728      NaN  0.2260767  0.82147753 -0.66439285  1.1816868
## 149  0.79662751      NaN  0.2260767 -1.94472231 -0.01995754  0.1992379
## 157  0.82076773      NaN  0.2260767  0.82147753 -1.49295254  1.1816868
## 165  0.84490796      NaN  0.2260767  0.08382424 -0.11201972 -0.7832110
## 168  0.86904819      NaN  0.2260767 -2.31354895  0.71653996  0.1992379
## 171  0.89318842      NaN  0.2260767 -0.28500241 -0.94057941  0.1992379
## 172  0.91732864      NaN  0.2260767 -0.10058908 -0.94057941 -1.7656599
## 173  0.94146887      NaN  0.2260767 -1.02265570  0.80860215  0.1992379
## 174  0.96560910      NaN  0.2260767  0.26823756  0.99272653  1.1816868
## 175  0.98974933      NaN  0.2260767 -0.83824237  0.34829121 -0.7832110
## 177  1.01388955      NaN  0.2260767  1.00589085 -0.48026848 -0.7832110
## 179  1.03802978      NaN  0.2260767  0.82147753 -0.48026848 -0.7832110
## 181  1.06217001      NaN  0.2260767 -1.39148234  0.90066434  1.1816868
## 182  1.08631024      NaN  0.2260767 -0.65382905  0.34829121  0.1992379
## 183  1.11045046      NaN  0.2260767  0.82147753 -0.48026848 -0.7832110
## 188  1.13459069      NaN  0.2260767  0.26823756  1.26891309 -0.7832110
## 195  1.15873092      NaN  0.2260767  0.82147753 -1.30882817 -0.7832110
## 196  1.18287115      NaN  0.2260767 -1.76030899 -1.67707692 -0.7832110
## 197  1.20701137      NaN -4.3923464  0.82147753 -0.84851723  2.1641357
## 198  1.23115160      NaN  0.2260767  0.82147753 -0.01995754  1.1816868
## 199  1.25529183      NaN  0.2260767  0.26823756 -1.30882817  1.1816868
## 200  1.27943206      NaN  0.2260767  0.26823756 -0.01995754 -0.7832110
## 202  1.30357228      NaN  0.2260767  0.82147753 -1.12470379 -0.7832110
## 203  1.32771251      NaN -4.3923464  0.82147753  0.25622903  1.1816868
## 204  1.35185274      NaN  0.2260767  0.82147753 -0.66439285  0.1992379
## 205  1.37599297      NaN  0.2260767  0.82147753  0.80860215 -0.7832110
## 206  1.40013319      NaN  0.2260767 -0.65382905 -0.57233066 -0.7832110
## 207  1.42427342      NaN  0.2260767 -1.20706902 -1.30882817 -0.7832110
## 208  1.44841365      NaN  0.2260767  0.82147753 -2.04532567  2.1641357
## 209  1.47255388      NaN -4.3923464  0.26823756  1.08478872 -0.7832110
## 210  1.49669410      NaN  0.2260767  0.82147753 -1.40089035 -0.7832110
## 211  1.52083433      NaN -4.3923464  0.82147753  1.08478872 -0.7832110
## 212  1.54497456      NaN  0.2260767  0.26823756 -0.20408191  1.1816868
## 213  1.56911479      NaN  0.2260767 -0.65382905  0.90066434 -1.7656599
```

```
## 226  1.59325501      NaN  0.2260767 -1.76030899  1.26891309  1.1816868
## 227  1.61739524      NaN  0.2260767  0.82147753 -0.94057941  1.1816868
## 231  1.64153547      NaN  0.2260767 -1.76030899 -0.94057941 -0.7832110
## 232  1.66567570      NaN -4.3923464 -1.94472231 -0.48026848 -1.7656599
## 233  1.68981592      NaN  0.2260767  0.82147753 -0.94057941 -0.7832110
## 234  1.71395615      NaN  0.2260767 -0.83824237  0.25622903 -0.7832110
##           Q5_1       Q6_1      Q7_1       Q8_1        Q9_1      Q10_1
## 7    0.96172220  1.8200298  1.592351 -0.2260767  0.05902741  1.5455697
## 8   -0.77911671  0.1077649 -0.214841 -0.2260767 -0.78506455 -0.2885918
## 9   -1.64953617 -1.6045000 -1.118437  0.9285291  0.05902741 -1.2056726
## 10   0.96172220  0.9638974  0.688755 -2.5352882  0.90311936  1.5455697
## 11   0.96172220  0.9638974 -1.118437 -2.5352882  0.05902741  0.6284889
## 12  -0.77911671 -0.7483675  0.688755 -0.2260767 -0.78506455 -0.2885918
## 13  -0.77911671 -0.7483675  0.688755 -0.2260767 -0.78506455 -0.2885918
## 14   0.96172220 -1.6045000  0.688755  0.9285291 -1.62915650 -0.2885918
## 15  -0.77911671 -0.7483675 -1.118437 -0.2260767 -0.78506455 -0.2885918
## 16   0.96172220  0.9638974 -0.214841  0.9285291  0.05902741 -0.2885918
## 17   1.83214165 -0.7483675 -0.214841 -0.2260767  0.90311936 -0.2885918
## 18   0.96172220 -0.7483675 -0.214841 -0.2260767  0.90311936  0.6284889
## 19   1.83214165  0.1077649  0.688755 -1.3806824  0.05902741  2.4626504
## 20   0.96172220  0.1077649  0.688755 -0.2260767  1.74721132  0.6284889
## 21  -0.77911671  0.1077649 -0.214841  0.9285291 -1.62915650  2.4626504
## 22   0.96172220  0.9638974  0.688755 -0.2260767  0.90311936 -0.2885918
## 23   0.09130274 -0.7483675 -1.118437  0.9285291 -1.62915650 -1.2056726
## 24   0.09130274 -1.6045000  0.688755  0.9285291  0.90311936 -0.2885918
## 25  -0.77911671 -0.7483675 -0.214841  0.9285291 -0.78506455 -0.2885918
## 26   1.83214165  1.8200298  1.592351  0.9285291  0.90311936  1.5455697
## 27   0.09130274  0.1077649  0.688755 -0.2260767  0.05902741  0.6284889
## 28   0.96172220  0.9638974 -0.214841 -0.2260767  0.05902741  0.6284889
## 29   0.09130274  1.8200298  0.688755  0.9285291  0.05902741  1.5455697
## 30  -0.77911671 -0.7483675  0.688755 -0.2260767 -0.78506455 -0.2885918
## 31   0.96172220  0.9638974  0.688755 -0.2260767  0.90311936  1.5455697
## 32   0.96172220 -0.7483675 -1.118437  0.9285291 -0.78506455 -0.2885918
## 33  -0.77911671  0.9638974 -2.925629 -0.2260767  0.05902741 -0.2885918
## 34   1.83214165  0.9638974  0.688755 -0.2260767 -0.78506455 -0.2885918
## 35   0.96172220  0.1077649  0.688755 -0.2260767  0.05902741  0.6284889
## 36  -0.77911671 -0.7483675 -1.118437  0.9285291 -1.62915650 -1.2056726
## 37   0.96172220  0.1077649 -0.214841  0.9285291  1.74721132  2.4626504
## 38  -0.77911671 -0.7483675 -2.022033 -3.6898940 -0.78506455 -1.2056726
## 39   0.09130274  0.9638974  0.688755 -0.2260767 -0.78506455 -0.2885918
## 40  -1.64953617 -1.6045000 -2.022033  0.9285291 -1.62915650 -1.2056726
## 41  -0.77911671 -0.7483675 -0.214841 -1.3806824  0.90311936 -0.2885918
## 42   0.09130274  0.1077649  0.688755 -0.2260767  0.05902741 -0.2885918
## 43  -0.77911671 -0.7483675 -2.022033  0.9285291 -0.78506455 -0.2885918
## 44  -0.77911671  0.9638974  0.688755 -0.2260767  0.90311936 -0.2885918
## 45  -0.77911671 -0.7483675  0.688755  0.9285291 -1.62915650  2.4626504
## 46   1.83214165  0.1077649  1.592351  0.9285291  0.90311936 -0.2885918
## 47   0.96172220  0.9638974  0.688755 -0.2260767  0.90311936 -0.2885918
## 48   1.83214165  0.9638974  1.592351 -0.2260767 -0.78506455  0.6284889
## 49  -1.64953617 -1.6045000 -1.118437 -1.3806824  0.90311936 -1.2056726
## 50  -0.77911671  0.9638974  0.688755 -0.2260767  0.90311936 -1.2056726
## 51   0.09130274  1.8200298  1.592351 -0.2260767  0.90311936  0.6284889
## 52   0.96172220  0.9638974  1.592351 -1.3806824  1.74721132  1.5455697
## 53   0.96172220 -0.7483675  0.688755 -0.2260767  0.90311936 -0.2885918
```

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## 54   0.96172220  0.9638974  0.688755 -0.2260767  0.90311936  1.5455697
## 55   0.96172220  0.9638974  1.592351  0.9285291  0.05902741 -0.2885918
## 56   0.96172220  0.1077649  0.688755 -0.2260767  0.90311936  0.6284889
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## 58   0.96172220  0.9638974 -0.214841 -0.2260767  0.90311936 -0.2885918
## 59  -0.77911671 -0.7483675 -1.118437 -0.2260767  0.90311936 -1.2056726
## 60   0.96172220  0.9638974  0.688755  0.9285291 -0.78506455 -0.2885918
## 61   0.96172220  0.9638974  0.688755 -0.2260767  0.05902741  0.6284889
## 62  -0.77911671  0.9638974 -0.214841 -0.2260767  0.05902741  0.6284889
## 63   0.96172220  0.9638974  0.688755 -0.2260767  0.90311936  1.5455697
## 64   0.96172220  0.9638974  0.688755  0.9285291 -2.47324845  1.5455697
## 65  -0.77911671 -1.6045000  0.688755  0.9285291  0.90311936 -0.2885918
## 67   0.96172220 -0.7483675  0.688755  0.9285291  0.90311936  1.5455697
## 68  -0.77911671 -0.7483675  0.688755 -0.2260767  0.05902741 -0.2885918
## 69  -0.77911671  0.9638974 -1.118437  0.9285291 -0.78506455  1.5455697
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## 71  -0.77911671  0.9638974  0.688755  0.9285291  0.90311936 -0.2885918
## 72   0.09130274  0.1077649  0.688755 -0.2260767  0.05902741  0.6284889
## 73  -1.64953617 -1.6045000 -0.214841 -0.2260767  0.90311936 -1.2056726
## 74   1.83214165  0.9638974  1.592351  0.9285291  0.90311936  0.6284889
## 75  -0.77911671  0.1077649 -1.118437  0.9285291  0.90311936 -1.2056726
## 76   0.96172220  0.9638974 -0.214841 -0.2260767 -0.78506455 -1.2056726
## 77  -0.77911671 -0.7483675 -1.118437 -0.2260767 -0.78506455 -0.2885918
## 78   0.09130274 -2.4606324 -2.925629 -4.8444998 -2.47324845 -2.1227534
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## 80  -0.77911671 -0.7483675 -0.214841 -0.2260767  0.90311936 -0.2885918
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## 83  -0.77911671 -1.6045000 -1.118437  0.9285291 -0.78506455 -0.2885918
## 84  -0.77911671  0.9638974  1.592351 -0.2260767  0.90311936 -1.2056726
## 85   0.09130274 -1.6045000 -1.118437 -0.2260767 -0.78506455 -0.2885918
## 86  -0.77911671 -0.7483675 -0.214841 -0.2260767 -0.78506455  0.6284889
## 87   1.83214165  1.8200298  0.688755  0.9285291  1.74721132  0.6284889
## 88   1.83214165  0.9638974  0.688755 -0.2260767  0.05902741  1.5455697
## 89  -1.64953617 -1.6045000 -2.022033 -1.3806824  0.90311936 -1.2056726
## 90  -0.77911671 -0.7483675  0.688755 -0.2260767 -0.78506455 -0.2885918
## 91   0.96172220  0.1077649 -1.118437 -0.2260767  0.90311936 -0.2885918
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## 93  -0.77911671 -0.7483675  0.688755 -0.2260767 -0.78506455 -0.2885918
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## 95  -0.77911671  0.1077649 -0.214841 -1.3806824  0.90311936 -0.2885918
## 96  -0.77911671 -0.7483675  0.688755  0.9285291  0.90311936 -0.2885918
## 97  -0.77911671  0.9638974  0.688755  0.9285291  0.90311936  1.5455697
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## 113 -0.77911671  0.9638974  0.688755 -0.2260767 -0.78506455 -1.2056726
## 116 -0.77911671  0.9638974  0.688755 -0.2260767  0.90311936 -1.2056726
## 117 -0.77911671 -0.7483675 -0.214841  0.9285291  0.05902741 -1.2056726
## 120  0.96172220 -1.6045000 -1.118437 -0.2260767 -1.62915650 -1.2056726
## 124  0.96172220  0.1077649  0.688755  0.9285291  0.90311936 -0.2885918
## 125 -1.64953617 -1.6045000 -0.214841 -0.2260767  0.90311936 -0.2885918
## 130  0.96172220 -0.7483675 -1.118437  0.9285291  0.05902741 -1.2056726
## 133 -0.77911671  0.1077649 -1.118437  0.9285291  0.05902741 -0.2885918
## 135  0.96172220  0.9638974 -0.214841 -1.3806824  0.05902741 -0.2885918
## 138  0.09130274  0.9638974  0.688755 -1.3806824 -0.78506455 -0.2885918
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## 157  0.96172220  0.9638974 -0.214841 -0.2260767  0.90311936 -0.2885918
## 165 -0.77911671  0.1077649 -2.022033 -0.2260767 -0.78506455 -0.2885918
## 168  0.96172220  0.1077649 -0.214841 -0.2260767  0.90311936  0.6284889
## 171  0.09130274 -0.7483675 -0.214841 -0.2260767 -0.78506455  0.6284889
## 172 -0.77911671 -0.7483675 -1.118437 -3.6898940 -0.78506455 -0.2885918
## 173  0.09130274  0.1077649  0.688755 -0.2260767  1.74721132  0.6284889
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## 177 -0.77911671 -0.7483675 -1.118437  0.9285291 -0.78506455 -1.2056726
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## 183  0.09130274 -0.7483675 -1.118437 -0.2260767 -0.78506455 -0.2885918
## 188 -1.64953617 -0.7483675 -1.118437 -0.2260767 -0.78506455 -0.2885918
## 195 -0.77911671 -0.7483675 -2.022033 -0.2260767  0.90311936  0.6284889
## 196 -0.77911671  0.1077649  0.688755  0.9285291 -1.62915650 -0.2885918
## 197  0.96172220  0.9638974  0.688755  0.9285291  0.90311936 -0.2885918
## 198  0.96172220  0.9638974  0.688755 -0.2260767 -0.78506455 -1.2056726
## 199  0.09130274  0.9638974  0.688755 -0.2260767  0.05902741  1.5455697
## 200 -1.64953617 -1.6045000  0.688755 -1.3806824 -0.78506455 -1.2056726
## 202 -0.77911671  0.9638974  0.688755  0.9285291 -0.78506455 -0.2885918
## 203  0.96172220  0.9638974  0.688755  0.9285291  0.05902741  1.5455697
## 204  0.09130274 -0.7483675  0.688755  0.9285291  1.74721132  1.5455697
## 205 -0.77911671  0.9638974  0.688755 -0.2260767 -0.78506455 -0.2885918
## 206 -0.77911671 -1.6045000 -1.118437 -0.2260767 -1.62915650 -1.2056726
## 207 -0.77911671 -0.7483675 -1.118437  0.9285291  0.90311936 -1.2056726
## 208  1.83214165  1.8200298  1.592351  0.9285291 -0.78506455 -1.2056726
## 209  0.96172220 -0.7483675  0.688755 -0.2260767  0.05902741  2.4626504
## 210 -0.77911671  0.9638974 -0.214841 -0.2260767  0.05902741 -0.2885918
## 211 -1.64953617  0.9638974 -1.118437 -0.2260767 -0.78506455 -0.2885918
## 212 -0.77911671  0.9638974  0.688755  0.9285291  0.05902741 -0.2885918
## 213 -1.64953617 -0.7483675 -1.118437  0.9285291 -1.62915650 -1.2056726
## 226 -0.77911671 -0.7483675 -1.118437 -0.2260767 -0.78506455 -0.2885918
## 227  0.09130274  0.1077649  0.688755  0.9285291  0.05902741 -0.2885918
## 231 -0.77911671  0.9638974 -1.118437 -0.2260767 -1.62915650 -1.2056726
## 232 -0.77911671 -1.6045000 -2.022033  0.9285291 -1.62915650 -1.2056726
## 233  0.96172220  0.9638974  0.688755 -0.2260767 -0.78506455  0.6284889
## 234 -0.77911671  0.1077649  0.688755  0.9285291 -1.62915650 -0.2885918
##          Q11_1       Q12_1      Q13_1        Q14        Q15         Q16
## 7    0.9499880  0.91211973  0.7588635 -0.3357967  0.5619954  0.04956737
## 8    0.1009362  0.03081486 -0.8729783  1.6649918  0.5619954  0.04956737
## 9   -0.7481156 -0.85049002 -0.0570574 -0.3357967 -0.6198478 -3.49449983
## 10   0.9499880  0.91211973  0.7588635 -0.3357967 -0.6198478  0.04956737
## 11   0.9499880  0.03081486 -0.8729783 -0.3357967 -0.6198478  0.04956737
## 12  -0.7481156 -0.85049002  0.7588635 -1.3361909 -0.6198478  0.04956737
## 13   0.1009362  0.91211973 -0.8729783 -0.3357967 -0.6198478  0.04956737
## 14   0.9499880  1.79342461 -0.0570574 -1.3361909  0.5619954  0.04956737
## 15  -0.7481156 -0.85049002 -0.8729783  0.6645975  0.5619954  0.04956737
## 16  -0.7481156 -0.85049002 -0.0570574 -0.3357967  0.5619954  0.04956737
## 17  -0.7481156 -0.85049002  0.7588635 -1.3361909  0.5619954  0.04956737
```

```
## 18   0.9499880  0.91211973  0.7588635  0.6645975 -0.6198478  1.23092311
## 19   0.9499880  0.91211973  0.7588635 -0.3357967  4.1075249  2.41227885
## 20   0.9499880  0.91211973 -0.0570574  0.6645975  0.5619954  1.23092311
## 21   1.7990398  1.79342461  1.5747843 -1.3361909 -0.6198478  0.04956737
## 22   0.9499880  0.91211973  0.7588635  0.6645975 -0.6198478  0.04956737
## 23  -1.5971674  0.03081486 -0.8729783  0.6645975 -0.6198478  0.04956737
## 24  -0.7481156 -0.85049002 -0.8729783 -1.3361909 -0.6198478  2.41227885
## 25  -0.7481156 -0.85049002  0.7588635  0.6645975 -0.6198478  0.04956737
## 26   0.9499880  0.91211973  1.5747843  0.6645975  0.5619954  0.04956737
## 27  -0.7481156 -0.85049002 -0.0570574 -0.3357967  0.5619954  0.04956737
## 28   0.9499880  0.91211973 -0.0570574 -0.3357967 -0.6198478  0.04956737
## 29   0.1009362  0.91211973  0.7588635  0.6645975 -0.6198478  0.04956737
## 30  -0.7481156 -0.85049002 -0.8729783 -0.3357967 -0.6198478  0.04956737
## 31   0.9499880  0.91211973  0.7588635  0.6645975 -0.6198478 -3.49449983
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## 36  -1.5971674 -1.73179490 -1.6888991 -0.3357967  0.5619954 -2.31314410
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## 39  -0.7481156 -0.85049002 -0.8729783  0.6645975  0.5619954  0.04956737
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## 46   1.7990398  1.79342461  0.7588635 -0.3357967  0.5619954  0.04956737
## 47   1.7990398 -0.85049002  0.7588635  0.6645975 -0.6198478  0.04956737
## 48   0.9499880  0.91211973  0.7588635  0.6645975 -0.6198478  0.04956737
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```

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## 84  -0.7481156 -0.85049002  0.7588635 -0.3357967  0.5619954  0.04956737
## 85   0.1009362  0.03081486 -0.8729783 -1.3361909  0.5619954  0.04956737
## 86   0.1009362 -0.85049002  0.7588635 -1.3361909  0.5619954  0.04956737
## 87   0.9499880  0.91211973  0.7588635  0.6645975 -0.6198478  0.04956737
## 88   1.7990398  1.79342461  1.5747843  1.6649918  0.5619954  0.04956737
## 89  -1.5971674 -0.85049002 -0.0570574  0.6645975  0.5619954  0.04956737
## 90   0.9499880 -0.85049002  0.7588635  0.6645975 -0.6198478  0.04956737
## 91  -0.7481156 -0.85049002 -0.0570574 -1.3361909  0.5619954  0.04956737
## 92   0.9499880  0.03081486  0.7588635 -1.3361909 -0.6198478  0.04956737
## 93   0.1009362  0.03081486  0.7588635 -0.3357967 -0.6198478  0.04956737
## 94   0.1009362  0.91211973  0.7588635 -0.3357967  0.5619954  0.04956737
## 95  -0.7481156 -0.85049002  0.7588635  2.6653860  4.1075249  2.41227885
## 96  -0.7481156 -0.85049002  0.7588635  0.6645975 -0.6198478  0.04956737
## 97   0.9499880  0.91211973  0.7588635  0.6645975 -0.6198478  0.04956737
## 101 -1.5971674 -0.85049002 -0.8729783 -0.3357967 -0.6198478 -2.31314410
## 113 -0.7481156 -0.85049002  0.7588635 -0.3357967 -0.6198478  0.04956737
## 116 -1.5971674 -1.73179490  0.7588635  0.6645975 -0.6198478 -2.31314410
## 117 -0.7481156  0.03081486 -0.8729783 -0.3357967  2.9256818  0.04956737
## 120 -0.7481156 -0.85049002 -0.8729783  0.6645975 -0.6198478  0.04956737
## 124  0.9499880  0.91211973  0.7588635  1.6649918 -0.6198478  0.04956737
## 125  0.9499880  0.91211973 -0.0570574  0.6645975 -0.6198478  0.04956737
## 130  0.1009362  0.91211973  1.5747843  0.6645975 -0.6198478  0.04956737
## 133  0.1009362  0.03081486 -0.0570574 -0.3357967  1.7438386  0.04956737
## 135  0.9499880  0.91211973 -0.8729783 -0.3357967  0.5619954  0.04956737
## 138  0.9499880  0.91211973  0.7588635 -0.3357967  0.5619954  0.04956737
## 141  0.9499880  0.03081486  1.5747843 -0.3357967 -0.6198478  0.04956737
## 144 -0.7481156 -0.85049002  1.5747843  1.6649918  0.5619954  0.04956737
## 148  0.1009362 -0.85049002  0.7588635 -1.3361909 -0.6198478  0.04956737
## 149 -0.7481156 -0.85049002 -0.8729783 -0.3357967 -0.6198478 -2.31314410
## 157  0.9499880 -0.85049002  0.7588635 -1.3361909 -0.6198478  0.04956737
## 165 -1.5971674 -1.73179490 -1.6888991 -0.3357967 -0.6198478  0.04956737
## 168  0.1009362  0.91211973 -0.0570574  0.6645975 -0.6198478  0.04956737
## 171 -0.7481156 -0.85049002 -0.0570574  0.6645975  0.5619954  0.04956737
## 172  0.9499880 -0.85049002 -2.5048200  0.6645975  0.5619954  0.04956737
## 173  0.1009362  0.03081486 -1.6888991  0.6645975 -0.6198478  0.04956737
## 174 -1.5971674 -0.85049002 -0.8729783 -0.3357967  0.5619954  0.04956737
## 175 -0.7481156 -0.85049002 -0.8729783 -0.3357967 -0.6198478  1.23092311
## 177 -1.5971674 -0.85049002 -0.0570574 -0.3357967 -0.6198478  0.04956737
## 179 -0.7481156  0.03081486 -1.6888991 -0.3357967  0.5619954  0.04956737
## 181  0.9499880  1.79342461 -0.8729783  0.6645975 -0.6198478  0.04956737
## 182  0.1009362 -0.85049002 -0.8729783 -0.3357967  0.5619954  0.04956737
## 183 -0.7481156 -0.85049002 -0.8729783  0.6645975 -0.6198478  0.04956737
## 188 -0.7481156 -1.73179490 -0.8729783 -0.3357967  0.5619954  0.04956737
```

```
## 195 -1.5971674 -0.85049002 -0.8729783 -1.3361909  0.5619954  0.04956737
## 196  0.9499880  0.03081486 -1.6888991 -1.3361909 -0.6198478  0.04956737
## 197 -0.7481156  0.91211973  0.7588635  0.6645975 -0.6198478  0.04956737
## 198  0.9499880  0.91211973 -0.0570574  1.6649918 -0.6198478  0.04956737
## 199  0.1009362  0.91211973  0.7588635 -1.3361909  0.5619954  0.04956737
## 200 -0.7481156 -1.73179490 -1.6888991 -1.3361909 -0.6198478  0.04956737
## 202  0.1009362  0.03081486 -0.8729783 -0.3357967 -0.6198478  0.04956737
## 203  1.7990398  1.79342461  1.5747843  0.6645975 -0.6198478  0.04956737
## 204  0.9499880  0.91211973 -0.0570574 -1.3361909 -0.6198478  0.04956737
## 205  0.1009362  0.03081486  0.7588635 -0.3357967 -0.6198478  0.04956737
## 206 -0.7481156 -0.85049002 -1.6888991 -0.3357967 -0.6198478  0.04956737
## 207  0.9499880  0.91211973 -0.8729783 -1.3361909  0.5619954 -1.13178836
## 208  0.9499880  0.91211973  0.7588635 -1.3361909 -0.6198478  0.04956737
## 209  1.7990398  1.79342461  1.5747843 -1.3361909  0.5619954  0.04956737
## 210 -0.7481156 -0.85049002 -0.0570574  0.6645975 -0.6198478  0.04956737
## 211  0.1009362  0.03081486  0.7588635 -1.3361909 -0.6198478  2.41227885
## 212  0.9499880  0.91211973 -0.8729783 -1.3361909  0.5619954  0.04956737
## 213  0.1009362  0.03081486 -0.8729783 -1.3361909  0.5619954  0.04956737
## 226  0.9499880 -0.85049002 -0.8729783  0.6645975 -0.6198478  0.04956737
## 227  0.1009362  0.03081486  0.7588635  0.6645975 -0.6198478  0.04956737
## 231 -1.5971674 -0.85049002 -0.8729783 -0.3357967  0.5619954  0.04956737
## 232  0.1009362 -0.85049002 -0.8729783 -0.3357967  0.5619954  0.04956737
## 233 -0.7481156 -0.85049002 -1.6888991  0.6645975 -0.6198478  0.04956737
## 234 -0.7481156  0.03081486 -1.6888991 -1.3361909 -0.6198478  0.04956737
##            Q17      group        sum
## 7    0.2041841  0.7419375  1.3356954
## 8    0.2041841 -1.3383971 -0.4290933
## 9    0.2041841  0.7419375 -1.1078582
## 10   0.2041841  0.7419375  1.0641895
## 11   0.2041841  0.7419375  0.1139186
## 12   0.2041841  0.7419375 -0.5648463
## 13   0.2041841  0.7419375 -0.4290933
## 14   0.2041841 -1.3383971  0.2496716
## 15  -2.4502088  0.7419375 -1.1078582
## 16   0.2041841 -1.3383971  0.1139186
## 17   0.2041841  0.7419375 -0.0218344
## 18  -2.4502088 -1.3383971  0.6569305
## 19   2.8585769  0.7419375  1.1999424
## 20   0.2041841  0.7419375  0.9284365
## 21   0.2041841 -1.3383971  1.0641895
## 22   0.2041841  0.7419375  1.0641895
## 23   0.2041841 -1.3383971 -0.9721053
## 24  -2.4502088  0.7419375 -0.1575874
## 25   0.2041841  0.7419375 -0.2933404
## 26   0.2041841  0.7419375  2.1502133
## 27   0.2041841  0.7419375 -0.1575874
## 28   0.2041841 -1.3383971  0.7926835
## 29   0.2041841 -1.3383971  1.1999424
## 30   0.2041841  0.7419375 -0.8363523
## 31   0.2041841  0.7419375  1.3356954
## 32   0.2041841  0.7419375  0.1139186
## 33   0.2041841 -1.3383971 -1.7866232
## 34   0.2041841 -1.3383971  0.9284365
## 35   0.2041841  0.7419375  0.7926835
```

```
## 36   0.2041841 -1.3383971 -1.7866232
## 37   0.2041841 -1.3383971  1.6072014
## 38   0.2041841  0.7419375 -2.1938821
## 39   0.2041841 -1.3383971 -0.2933404
## 40   0.2041841 -1.3383971 -2.0581291
## 41   0.2041841 -1.3383971  0.1139186
## 42   0.2041841  0.7419375 -0.0218344
## 43   0.2041841  0.7419375 -0.7005993
## 44   0.2041841  0.7419375  0.3854245
## 45   0.2041841 -1.3383971  0.5211775
## 46   0.2041841 -1.3383971  1.6072014
## 47   0.2041841  0.7419375  0.7926835
## 48   0.2041841  0.7419375  1.1999424
## 49   0.2041841 -1.3383971 -1.5151172
## 50   0.2041841 -1.3383971 -0.0218344
## 51   0.2041841  0.7419375  1.7429544
## 52   0.2041841  0.7419375  1.4714484
## 53   2.8585769 -1.3383971  0.5211775
## 54   0.2041841  0.7419375  1.1999424
## 55   2.8585769  0.7419375  0.9284365
## 56   0.2041841  0.7419375  1.1999424
## 57   0.2041841  0.7419375 -0.8363523
## 58   0.2041841  0.7419375  0.7926835
## 59   0.2041841  0.7419375 -0.9721053
## 60   0.2041841  0.7419375  0.7926835
## 61   0.2041841 -1.3383971  0.6569305
## 62   0.2041841  0.7419375  0.2496716
## 63   0.2041841  0.7419375  1.0641895
## 64   0.2041841 -1.3383971  1.0641895
## 65   0.2041841 -1.3383971 -0.2933404
## 67   0.2041841  0.7419375  0.7926835
## 68   0.2041841 -1.3383971 -0.2933404
## 69   0.2041841 -1.3383971  0.1139186
## 70  -2.4502088  0.7419375 -0.7005993
## 71   0.2041841  0.7419375  0.3854245
## 72   0.2041841 -1.3383971  0.1139186
## 73   0.2041841 -1.3383971 -1.1078582
## 74  -2.4502088  0.7419375  1.7429544
## 75   0.2041841 -1.3383971 -0.9721053
## 76   0.2041841 -1.3383971 -0.1575874
## 77   0.2041841 -1.3383971 -0.8363523
## 78  -5.1046017  0.7419375 -3.6871649
## 79   0.2041841  0.7419375  0.3854245
## 80   0.2041841 -1.3383971 -0.2933404
## 81   0.2041841  0.7419375 -0.4290933
## 82   0.2041841  0.7419375  1.1999424
## 83  -2.4502088  0.7419375 -0.7005993
## 84  -2.4502088  0.7419375 -0.0218344
## 85   0.2041841  0.7419375 -0.9721053
## 86   0.2041841  0.7419375 -0.4290933
## 87   0.2041841  0.7419375  1.7429544
## 88   0.2041841 -1.3383971  1.8787073
## 89   0.2041841 -1.3383971 -1.6508702
## 90   0.2041841  0.7419375 -0.2933404
```

```
## 91   0.2041841 -1.3383971 -0.2933404
## 92   0.2041841  0.7419375  1.0641895
## 93   0.2041841  0.7419375 -0.1575874
## 94   0.2041841  0.7419375  0.5211775
## 95   2.8585769  0.7419375 -0.2933404
## 96   0.2041841  0.7419375 -0.0218344
## 97   0.2041841  0.7419375  0.9284365
## 101  0.2041841  0.7419375 -0.4290933
## 113  0.2041841  0.7419375 -0.1575874
## 116  0.2041841  0.7419375 -0.2933404
## 117  0.2041841  0.7419375 -0.7005993
## 120  0.2041841  0.7419375 -1.2436112
## 124  0.2041841  0.7419375  0.7926835
## 125  0.2041841  0.7419375 -0.2933404
## 130  0.2041841  0.7419375  0.1139186
## 133  0.2041841 -1.3383971 -0.2933404
## 135  0.2041841  0.7419375  0.3854245
## 138  0.2041841  0.7419375  0.5211775
## 141  0.2041841  0.7419375  0.9284365
## 144  0.2041841 -1.3383971 -0.1575874
## 148  0.2041841  0.7419375 -0.1575874
## 149  0.2041841 -1.3383971 -0.1575874
## 157  0.2041841  0.7419375  0.6569305
## 165 -2.4502088  0.7419375 -1.5151172
## 168  0.2041841 -1.3383971  0.5211775
## 171  0.2041841 -1.3383971 -0.4290933
## 172  0.2041841  0.7419375 -1.6508702
## 173  0.2041841 -1.3383971  0.2496716
## 174  0.2041841  0.7419375 -0.8363523
## 175 -2.4502088 -1.3383971 -1.1078582
## 177  0.2041841  0.7419375 -1.1078582
## 179  0.2041841  0.7419375 -1.2436112
## 181  0.2041841 -1.3383971  0.7926835
## 182  0.2041841 -1.3383971 -0.0218344
## 183  0.2041841  0.7419375 -0.9721053
## 188  0.2041841  0.7419375 -1.3793642
## 195  0.2041841  0.7419375 -0.9721053
## 196  0.2041841 -1.3383971 -0.4290933
## 197  0.2041841  0.7419375  1.0641895
## 198  0.2041841  0.7419375  0.5211775
## 199  0.2041841  0.7419375  0.9284365
## 200  0.2041841  0.7419375 -1.6508702
## 202  0.2041841  0.7419375 -0.1575874
## 203 -2.4502088  0.7419375  1.7429544
## 204  0.2041841  0.7419375  0.9284365
## 205  0.2041841  0.7419375 -0.0218344
## 206  0.2041841 -1.3383971 -1.6508702
## 207 -2.4502088 -1.3383971 -0.2933404
## 208  0.2041841  0.7419375  1.3356954
## 209 -2.4502088  0.7419375  1.1999424
## 210  0.2041841  0.7419375 -0.4290933
## 211 -2.4502088  0.7419375 -0.4290933
## 212  0.2041841  0.7419375  0.5211775
## 213  0.2041841 -1.3383971 -1.2436112
```

```
## 226  0.2041841 -1.3383971 -0.5648463
## 227  0.2041841  0.7419375  0.5211775
## 231  0.2041841 -1.3383971 -1.2436112
## 232  0.2041841 -1.3383971 -1.5151172
## 233  0.2041841  0.7419375 -0.2933404
## 234  0.2041841 -1.3383971 -0.7005993
## attr(,"scaled:center")
##        ID  Finished        Q1        Q2        Q3      Q4_1      Q5_1      Q6_1
## 72.000000  1.000000  1.951049 13.545455 23.216783  3.797203  2.895105  3.874126
##      Q7_1      Q8_1      Q9_1     Q10_1     Q11_1     Q12_1     Q13_1       Q14
##  4.237762  5.195804  3.930070  3.314685  3.881119  3.965035  4.069930  3.335664
##       Q15       Q16       Q17     group       sum
##  2.524476  4.958042  2.923077  1.643357 30.160839
## attr(,"scaled:scale")
##         ID   Finished         Q1         Q2         Q3       Q4_1       Q5_1
## 41.4246304  0.0000000  0.2165241  5.4226017 10.8622229  1.0178647  1.1488714
##       Q6_1       Q7_1       Q8_1       Q9_1      Q10_1      Q11_1      Q12_1
##  1.1680436  1.1066893  0.8660965  1.1847050  1.0904165  1.1777844  1.1346811
##      Q13_1        Q14        Q15        Q16        Q17      group        sum
##  1.2256091  0.9996060  0.8461359  0.8464851  0.3767340  0.4806919  7.3663207
```

#select group 1 and group 2 based on the sum using pivot wider

```
df2 <- df %>%
  dplyr::select(ID,group,sum)
num_group <- df2 %>%
  pivot_wider(names_from = group, values_from = sum)
```

#details about dataset "num_group"

```
summary(num_group)
scale(num_group, center = T, scale = T)
```

#check different groups means, median, range etc.

```
describe(num_group)
```

```
##        vars   n  mean    sd median trimmed   mad min max range  skew kurtosis
## ID        1 143 72.00 41.42   72.0   72.00 53.37   1 143   142  0.00    -1.23
## group2    2  92 30.95  7.48   30.5   31.24  8.15   3  46    43 -0.57     0.72
## group1    3  51 28.75  7.01   28.0   28.68  7.41  15  44    29  0.05    -0.65
##           se
## ID      3.46
## group2  0.78
## group1  0.98
```

#Calculating alpha values

```
df_alpha <- df %>%
  dplyr::select(ID, Q4_1, Q5_1, Q6_1, Q7_1, Q8_1, Q9_1, Q10_1, Q11_1, Q12_1, Q13_1)
df_alpha <- lapply(df_alpha,as.numeric)

df_alpha <- as.data.frame(df_alpha)
dim(df_alpha)
```

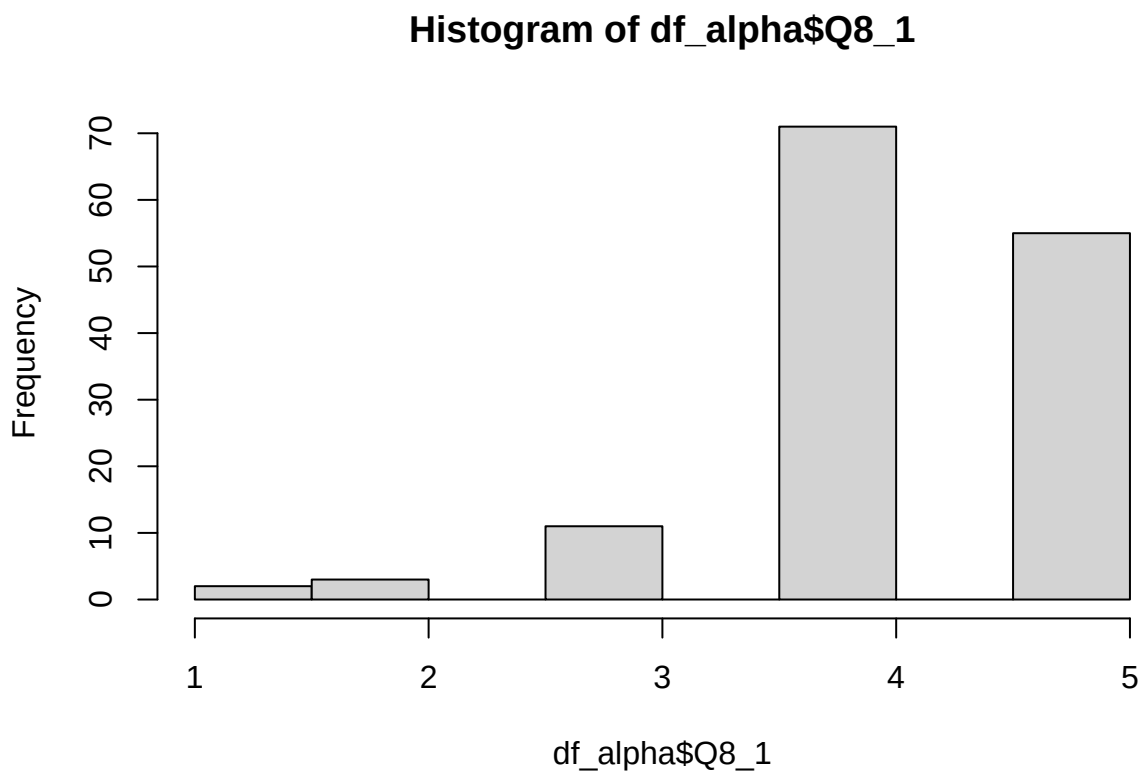
```
## [1] 143  11
```

```
cro_alpha <- psych::alpha(df_alpha[,2:11], na.rm = TRUE, check.keys=TRUE)

cro_alpha
```

```
##
## Reliability analysis
## Call: psych::alpha(x = df_alpha[, 2:11], na.rm = TRUE, check.keys = TRUE)
##
##   raw_alpha std.alpha G6(smc) average_r S/N   ase mean   sd median_r
##       0.84      0.84    0.85      0.34 5.2 0.018    3 0.69      0.4
##
##     95% confidence boundaries
##          lower alpha upper
## Feldt     0.80  0.84  0.88
## Duhachek  0.81  0.84  0.88
##
##  Reliability if an item is dropped:
##       raw_alpha std.alpha G6(smc) average_r S/N alpha se var.r med.r
## Q4_1       0.82      0.81    0.83      0.33 4.3    0.021 0.034  0.39
## Q5_1       0.82      0.81    0.83      0.33 4.4    0.021 0.034  0.38
## Q6_1       0.83      0.82    0.83      0.34 4.6    0.020 0.035  0.41
## Q7_1       0.82      0.81    0.83      0.33 4.4    0.021 0.036  0.39
## Q8_1       0.86      0.86    0.87      0.41 6.3    0.017 0.012  0.43
## Q9_1       0.85      0.84    0.85      0.37 5.3    0.018 0.032  0.43
## Q10_1      0.83      0.82    0.83      0.33 4.5    0.021 0.035  0.41
## Q11_1      0.82      0.81    0.81      0.32 4.3    0.022 0.029  0.38
## Q12_1      0.82      0.81    0.82      0.32 4.2    0.022 0.031  0.39
## Q13_1      0.82      0.81    0.83      0.33 4.4    0.021 0.035  0.38
##
##  Item statistics
##         n raw.r std.r r.cor r.drop mean   sd
## Q4_1  142  0.72  0.72 0.690  0.636  2.8 0.99
## Q5_1  143  0.71  0.71 0.676  0.619  2.9 1.15
## Q6_1  142  0.67  0.66 0.609  0.562  2.9 1.15
## Q7_1  141  0.70  0.71 0.666  0.616  3.3 1.04
## Q8_1  142  0.19  0.23 0.087  0.071  4.2 0.79
## Q9_1  141  0.48  0.47 0.372  0.341  3.0 1.14
## Q10_1 142  0.67  0.67 0.621  0.575  2.3 1.08
## Q11_1 141  0.75  0.74 0.744  0.663  2.9 1.13
## Q12_1 141  0.75  0.76 0.754  0.675  3.0 1.09
## Q13_1 140  0.72  0.71 0.664  0.619  3.1 1.15
##
## Non missing response frequency for each item
##          1    2    3    4    5 miss
## Q4_1  0.06 0.40 0.24 0.27 0.03 0.01
## Q5_1  0.08 0.41 0.14 0.30 0.08 0.00
## Q6_1  0.13 0.29 0.19 0.35 0.04 0.01
## Q7_1  0.05 0.22 0.20 0.46 0.07 0.01
## Q8_1  0.01 0.02 0.08 0.50 0.39 0.01
## Q9_1  0.11 0.28 0.20 0.35 0.06 0.01
## Q10_1 0.21 0.46 0.16 0.13 0.04 0.01
## Q11_1 0.11 0.28 0.23 0.32 0.06 0.01
```

```
## Q12_1 0.06 0.34 0.21 0.32 0.07 0.01
## Q13_1 0.08 0.27 0.18 0.38 0.09 0.02
```

```
#kendalls taw: non-parametric correlation test
hist(df_alpha$Q8_1)
```




```
describe(num_group)
```

```
##        vars   n  mean    sd median trimmed   mad min max range  skew kurtosis
## ID        1 143 72.00 41.42   72.0   72.00 53.37   1 143   142  0.00    -1.23
## group2    2  92 30.95  7.48   30.5   31.24  8.15   3  46    43 -0.57     0.72
## group1    3  51 28.75  7.01   28.0   28.68  7.41  15  44    29  0.05    -0.65
##           se
## ID      3.46
## group2  0.78
## group1  0.98
```

```
#mean scale for each question
#look at mean scales by age (are younger people or older people getting good scores), gender (are women
describe(df_alpha)
```

```
##       vars   n  mean    sd median trimmed   mad min max range  skew kurtosis
## ID       1 143 72.00 41.42     72   72.00 53.37   1 143   142  0.00    -1.23
## Q4_1     2 142  2.82  0.99      3    2.81  1.48   1   5     4  0.20    -0.98
```

```
## Q5_1     3 143  2.90  1.15      3    2.87  1.48   1   5     4  0.20    -1.16
## Q6_1     4 142  2.89  1.15      3    2.94  1.48   1   5     4 -0.13    -1.16
## Q7_1     5 141  3.28  1.04      4    3.33  1.48   1   5     4 -0.47    -0.74
## Q8_1     6 142  4.23  0.79      4    4.34  0.74   1   5     4 -1.35     2.95
## Q9_1     7 141  2.97  1.14      3    3.02  1.48   1   5     4 -0.15    -1.09
## Q10_1    8 142  2.33  1.08      2    2.24  1.48   1   5     4  0.74    -0.15
## Q11_1    9 141  2.92  1.13      3    2.96  1.48   1   5     4 -0.08    -1.04
## Q12_1   10 141  3.01  1.09      3    2.99  1.48   1   5     4  0.05    -1.06
## Q13_1   11 140  3.14  1.15      3    3.15  1.48   1   5     4 -0.21    -1.06
##           se
## ID      3.46
## Q4_1    0.08
## Q5_1    0.10
## Q6_1    0.10
## Q7_1    0.09
## Q8_1    0.07
## Q9_1    0.10
## Q10_1   0.09
## Q11_1   0.10
## Q12_1   0.09
## Q13_1   0.10
```

```
df3 <- lapply(df, as.numeric)
```

```
## Warning in lapply(df, as.numeric): NAs introduced by coercion

## Warning in lapply(df, as.numeric): NAs introduced by coercion
```

```
table(df3$Q16)
```

```
##
##   1   2   3   5   6   7
##   4   4   1 121   5   7
```

#recode Q16 race variable to white and non-white and compare group1 and group2 by race

```
#0: non-white
#1: white
df4 <- df %>%
    mutate(Q16 = recode(Q16, "1" = "0",
                             "2" = "0",
                             "3" = "0",
                             "4" = "0",
                             "5" = "1",
                             "6" = "0",
                             "7" = "NA"))
df4 <- df4 %>%
  dplyr::select(ID,Q16,group,sum)
df4$Q16 <- as.factor(df4$Q16)
df4$Q16[df4$ID == 71] = "NA"
```

```r
df4 <- filter(df4, ID != 13 & ID != 18 & ID != 47 & ID != 49 & ID != 56 & ID != 71 & ID != 88 & ID != 13
fit_race <- lm(sum ~ group + Q16, data = df4)
summary(fit_race)
```

```
##
## Call:
## lm(formula = sum ~ group + Q16, data = df4)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -17.3085  -5.2321  -0.3085   5.6915  15.2217
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)   27.626      2.020  13.675   <2e-16 ***
## groupgroup2    2.530      1.260   2.008   0.0466 *
## Q161           1.153      1.995   0.578   0.5645
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 7.063 on 132 degrees of freedom
## Multiple R-squared:  0.03275,    Adjusted R-squared:  0.0181
## F-statistic: 2.235 on 2 and 132 DF,  p-value: 0.111
```

```r
mean_race_list <- tapply(df4$sum, df4$Q16, mean,
                         simplify = FALSE)
mean_race_list
```

```
## [[1]]
## NULL
##
## $`0`
## [1] 29.07143
##
## $`1`
## [1] 30.38843
##
## $`NA`
## NULL
```

```r
df4 %>%
  group_by(Q16) %>%
  summarise(
    count = n(),
    mean = mean(sum),
    median = median(sum)
  )
```

```
## # A tibble: 2 x 4
##   Q16   count  mean median
##   <fct> <int> <dbl>  <dbl>
## 1 0        14  29.1     28
## 2 1       121  30.4     30
```

```
#1 dependent variable: sum; #2 independent variables: group and race

#post1 <- stan_glm(sum ~ group + Q16, data = df4,
                   #family = gaussian(link = "identity"),
                   #seed = 12345)
#summary(post1)

#08.23.22 Data Services
df4 <- df4 %>%
  rowwise() %>%
  mutate(group_Q16 = paste(as.character(group), as.character(Q16)))

#using group1 1 (group 1 white as the reference)
#Linear Regression
df4$group_Q16 <- factor(df4$group_Q16,levels = c("group1 1","group1 0", "group2 0", "group2 1"))
lm_race <- lm(sum ~ group_Q16, data=df4)
summary(lm_race)
```

```
##
## Call:
## lm(formula = sum ~ group_Q16, data = df4)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -17.2208  -5.0763  -0.2208   5.7792  15.0682
##
## Coefficients:
##                    Estimate Std. Error t value Pr(>|t|)
## (Intercept)          28.932      1.068  27.100   <2e-16 ***
## group_Q16group1 0    -2.432      3.082  -0.789   0.4315
## group_Q16group2 0     2.068      2.722   0.760   0.4487
## group_Q16group2 1     2.289      1.338   1.710   0.0896 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 7.082 on 131 degrees of freedom
## Multiple R-squared:  0.03495,    Adjusted R-squared:  0.01285
## F-statistic: 1.581 on 3 and 131 DF,  p-value: 0.197
```

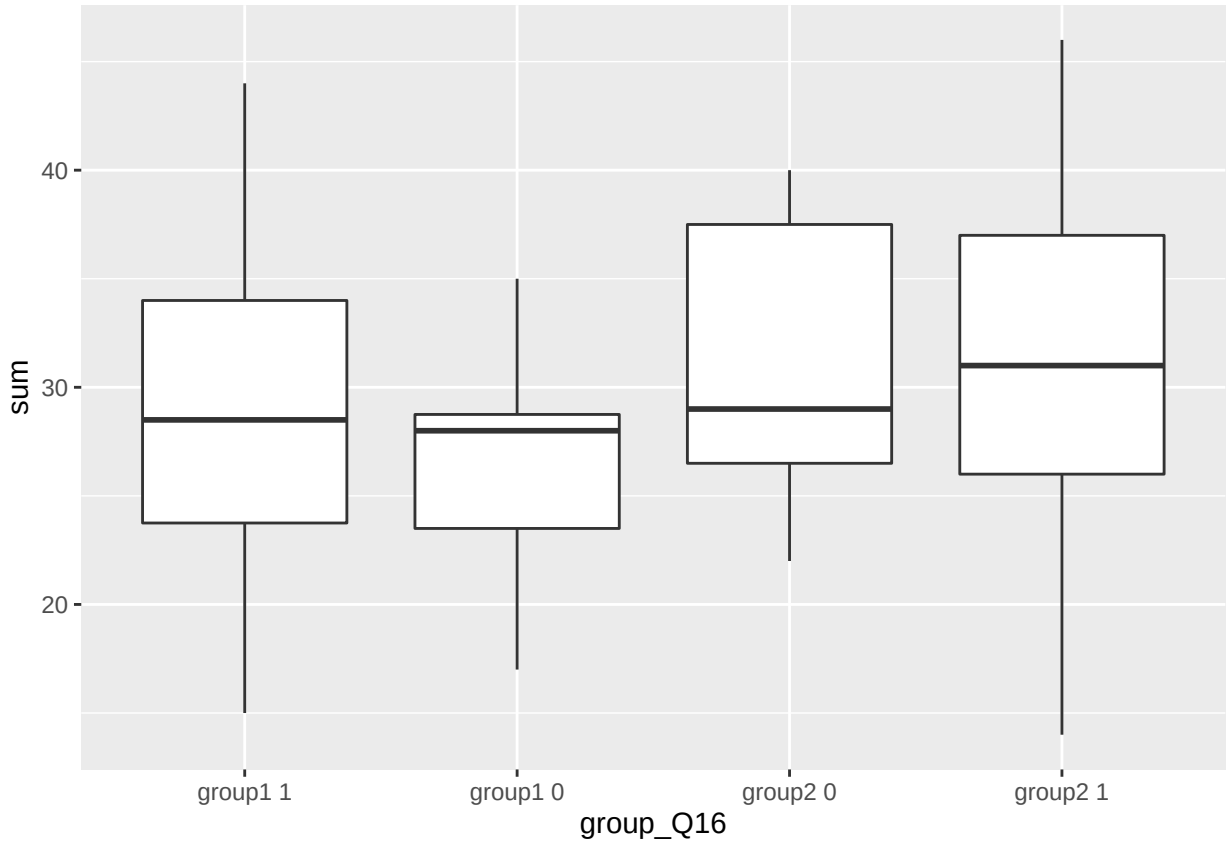
```
#Anova test
aov_race <- aov(sum ~ group_Q16, data=df4)
summary(aov_race)
```

```
##              Df Sum Sq Mean Sq F value Pr(>F)
## group_Q16     3    238   79.30   1.581  0.197
## Residuals   131   6570   50.15
```

```
coefficients(aov_race)
```

```
##       (Intercept) group_Q16group1 0 group_Q16group2 0 group_Q16group2 1
##         28.931818         -2.431818          2.068182          2.288961
```

```r
#pvalue: 0.197 show that there is no significant difference among these four groups.

#Creating graph
ggplot(data = df4,
       aes(x = group_Q16, y = sum))+
  geom_boxplot()
```



#compare group1 and group2 by gender

```r
df5 <- df %>%
  dplyr::select(ID,Q15,group,sum)
df5$Q15 <- as.factor(df5$Q15)
df5$Q15[df5$ID == 71] = "5"
df5 <- filter(df5, ID != 13 & ID != 71 & ID != 47 & ID != 49 & ID != 88)
#aggregate(sum ~ Q15 + group, df5, mean, exclude = NULL)


mean_sex_list <- tapply(df5$sum, df5$Q15, mean,
                        simplify = FALSE)
mean_sex_list
```

```
## [[1]]
## NULL
##
## $`1`
## [1] 31.11905
```

```
##
## $`2`
## [1] 29.22
##
## $`3`
## [1] 21.5
##
## $`4`
## [1] 27
##
## $`5`
## NULL
```

```
df5 %>%
  group_by(Q15) %>%
  summarise(
    count = n(),
    mean = mean(sum),
    median = median(sum)
  )
```

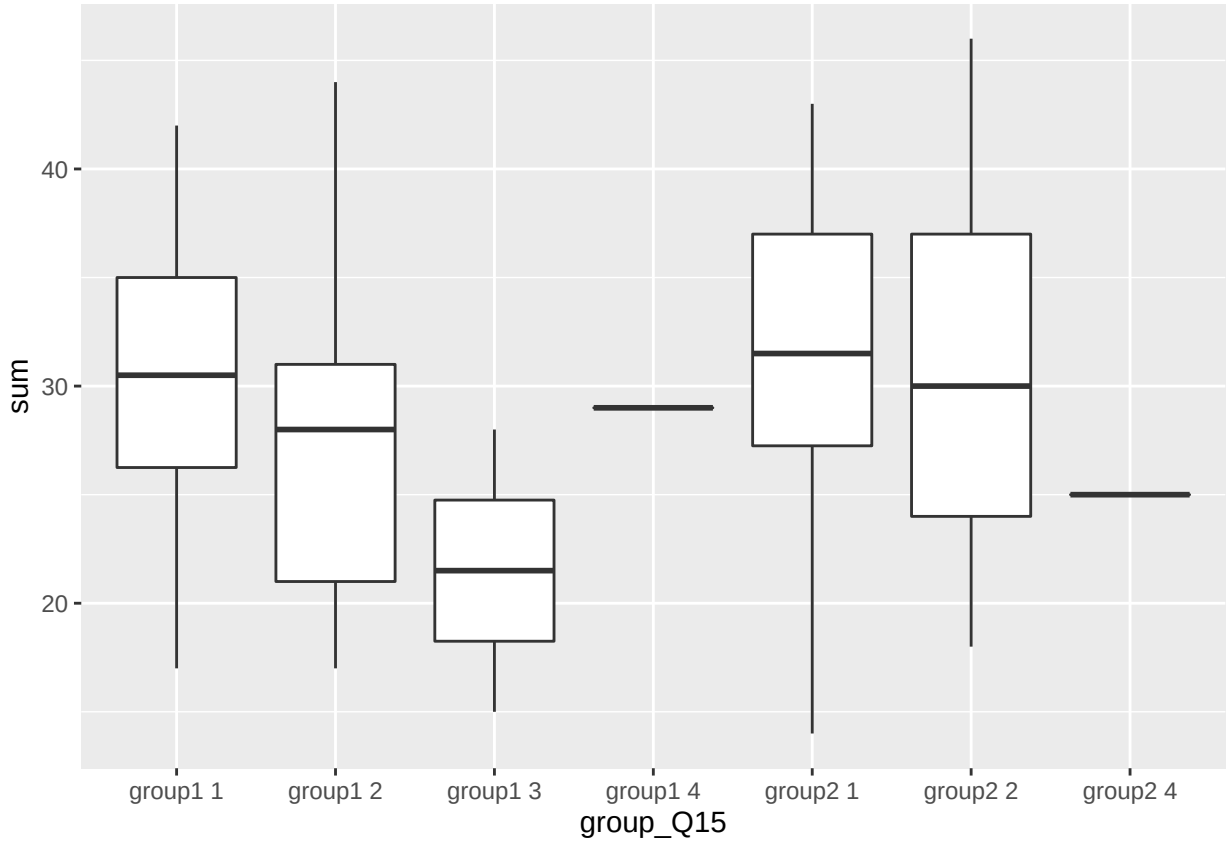
```
## # A tibble: 4 x 4
##   Q15   count  mean median
##   <fct> <int> <dbl>  <dbl>
## 1 1        84  31.1   31
## 2 2        50  29.2   28.5
## 3 3         2  21.5   21.5
## 4 4         2  27     27
```

```
df5 <- df5 %>%
  rowwise() %>%
  mutate(group_Q15 = paste(as.character(group), as.character(Q15)))

#Linear Regression, using group1 1 (group1 Male) as reference
lm_gender<- lm(sum ~ group_Q15, data=df5)
summary(lm_gender)
```

```
##
## Call:
## lm(formula = sum ~ group_Q15, data = df5)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -17.621  -4.621   0.000   5.285  16.381
##
## Coefficients:
##                   Estimate Std. Error t value Pr(>|t|)
## (Intercept)        30.0000     1.3691  21.913   <2e-16 ***
## group_Q15group1 2  -2.3810     2.0481  -1.162   0.2471
## group_Q15group1 3  -8.5000     5.1225  -1.659   0.0994 .
## group_Q15group1 4  -1.0000     7.1138  -0.141   0.8884
## group_Q15group2 1   1.6207     1.6476   0.984   0.3271
## group_Q15group2 2   0.3793     1.8854   0.201   0.8409
```

```
## group_Q15group2 4  -5.0000     7.1138  -0.703   0.4834
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 6.981 on 131 degrees of freedom
## Multiple R-squared:  0.06429,    Adjusted R-squared:  0.02144
## F-statistic:   1.5 on 6 and 131 DF,  p-value: 0.183
```

```
#Creating graph
ggplot(data = df5,
       aes(x = group_Q15, y = sum))+
  geom_boxplot()
```




```
library(boot)
```

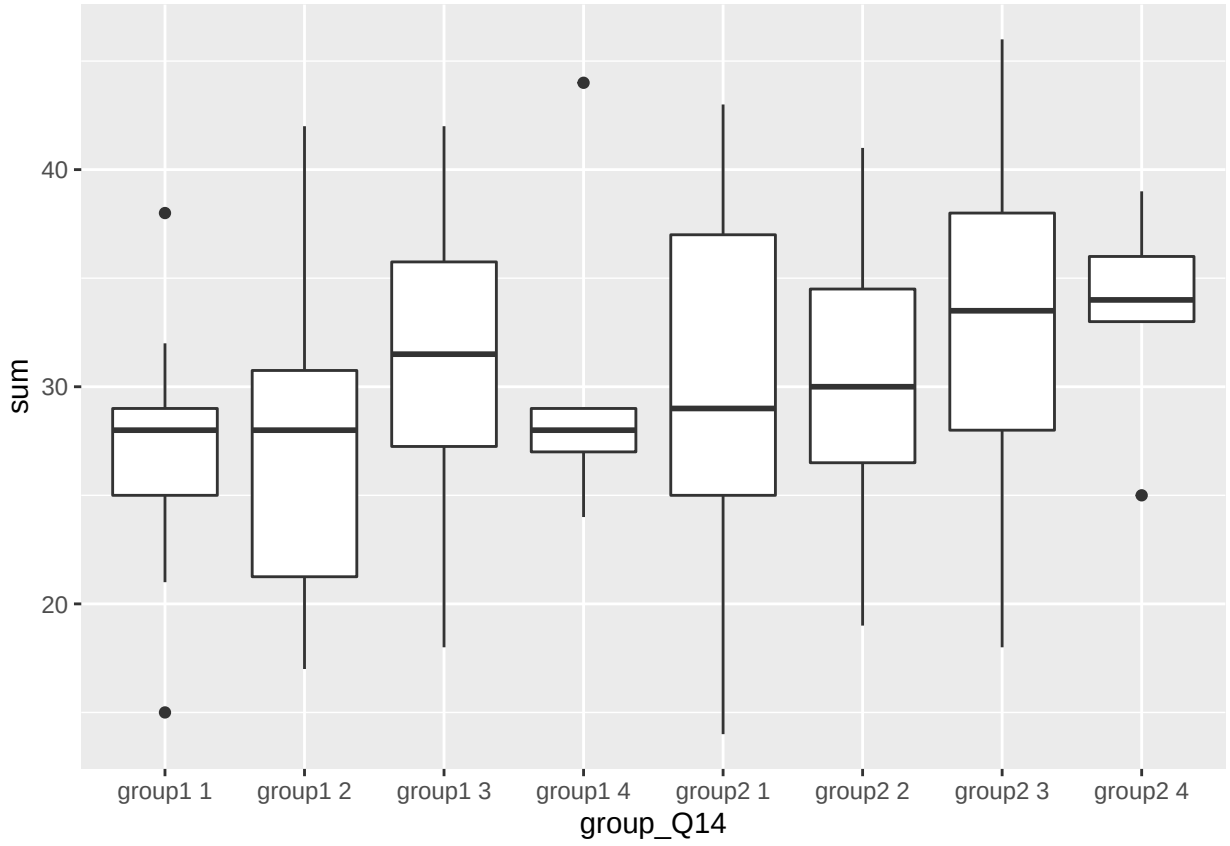
```
##
## Attaching package: 'boot'

## The following object is masked from 'package:rstanarm':
##
##     logit

## The following object is masked from 'package:psych':
##
##     logit
```

#compare group1 and group2 by age

```
df6 <- df %>%
    dplyr::select(ID, Q14, group, sum)
df6$Q14[df6$ID == 71] = "5"
df6$Q14 <- as.factor(df6$Q14)

df6 <- filter(df6, ID != 51 & ID != 71 & ID != 47 & ID != 49 & ID != 88)

df6 <- df6 %>%
  rowwise() %>%
  mutate(group_Q14 = paste(as.character(group), as.character(Q14)))

#Linear Regression, using group1 1 (group1 19-35) as reference
fit_age <- lm(sum ~ group_Q14, data=df6)
summary(fit_age)
```

```
##
## Call:
## lm(formula = sum ~ group_Q14, data = df6)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -16.143  -4.867   0.000   5.000  15.389
##
## Coefficients:
##                    Estimate Std. Error t value Pr(>|t|)
## (Intercept)         27.0000     2.3133  11.672   <2e-16 ***
## group_Q14group1 2  -0.3889     2.8332  -0.137   0.8910
## group_Q14group1 3   4.0000     2.8332   1.412   0.1604
## group_Q14group1 4   3.4000     3.8709   0.878   0.3814
## group_Q14group2 1   3.1429     2.7649   1.137   0.2578
## group_Q14group2 2   3.2812     2.6185   1.253   0.2124
## group_Q14group2 3   5.8667     2.6376   2.224   0.0279 *
## group_Q14group2 4   6.4000     3.8709   1.653   0.1007
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 6.94 on 130 degrees of freedom
## Multiple R-squared:  0.08716,    Adjusted R-squared:  0.038
## F-statistic: 1.773 on 7 and 130 DF,  p-value: 0.09796
```

```
#Creating graph
ggplot(data = df6,
       aes(x = group_Q14, y = sum))+
  geom_boxplot()
```




```
df6 %>%
  group_by(Q14) %>%
  summarise(
    count = n(),
    mean = mean(sum),
    median = median(sum)
  )
```

```
## # A tibble: 4 x 4
##   Q14   count  mean median
##   <fct> <int> <dbl>  <dbl>
## 1 1        30  29.2   28.5
## 2 2        50  29.0   29
## 3 3        48  32.2   32.5
## 4 4        10  31.9   31
```

#Comparing group1 and group2 by Hispanic race

```
#recode non-hispanic to 0 and hispanic to 1
df7 <- df %>%
    dplyr::select(ID, Q17, group, sum)
df7$Q17[df7$ID == 71] = "NA"
df7$Q17[df7$Q17 == 3] = "NA"
df7$Q17[df7$Q17 == 1] = "1"
df7$Q17[df7$Q17 == 2] = "0"
```

```r
df7$Q17 <- as.factor(df7$Q17)

df7 <- filter(df7, ID != 13  & ID != 47 & ID != 49 & ID != 71 & ID != 88)

df7 <- df7 %>%
  rowwise() %>%
  mutate(group_Q17 = paste(as.character(group), as.character(Q17)))

#Linear Linear Regression, using group1 1 (group 1 Hispanic as reference)
df7$group_Q17 <- factor(df7$group_Q17,levels = c("group1 1","group1 0", "group2 0", "group2 1"))
fit_hispanic <- lm(sum ~ group_Q17, data = df7)
summary(fit_hispanic)
```

```
##
## Call:
## lm(formula = sum ~ group_Q17, data = df7)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -17.2564  -5.0649  -0.2949   5.6428  15.3404
##
## Coefficients:
##                    Estimate Std. Error t value Pr(>|t|)
## (Intercept)         28.3333     4.0561   6.985  1.2e-10 ***
## group_Q17group1 0    0.3262     4.1836   0.078    0.938
## group_Q17group2 0    2.9231     4.1334   0.707    0.481
## group_Q17group2 1    1.8667     4.6247   0.404    0.687
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 7.025 on 134 degrees of freedom
## Multiple R-squared:  0.03062,    Adjusted R-squared:  0.008915
## F-statistic: 1.411 on 3 and 134 DF,  p-value: 0.2424
```

```r
mean_hispanic_list <- tapply(df7$sum, df7$Q17, mean,
                             simplify = FALSE)
mean_hispanic_list
```

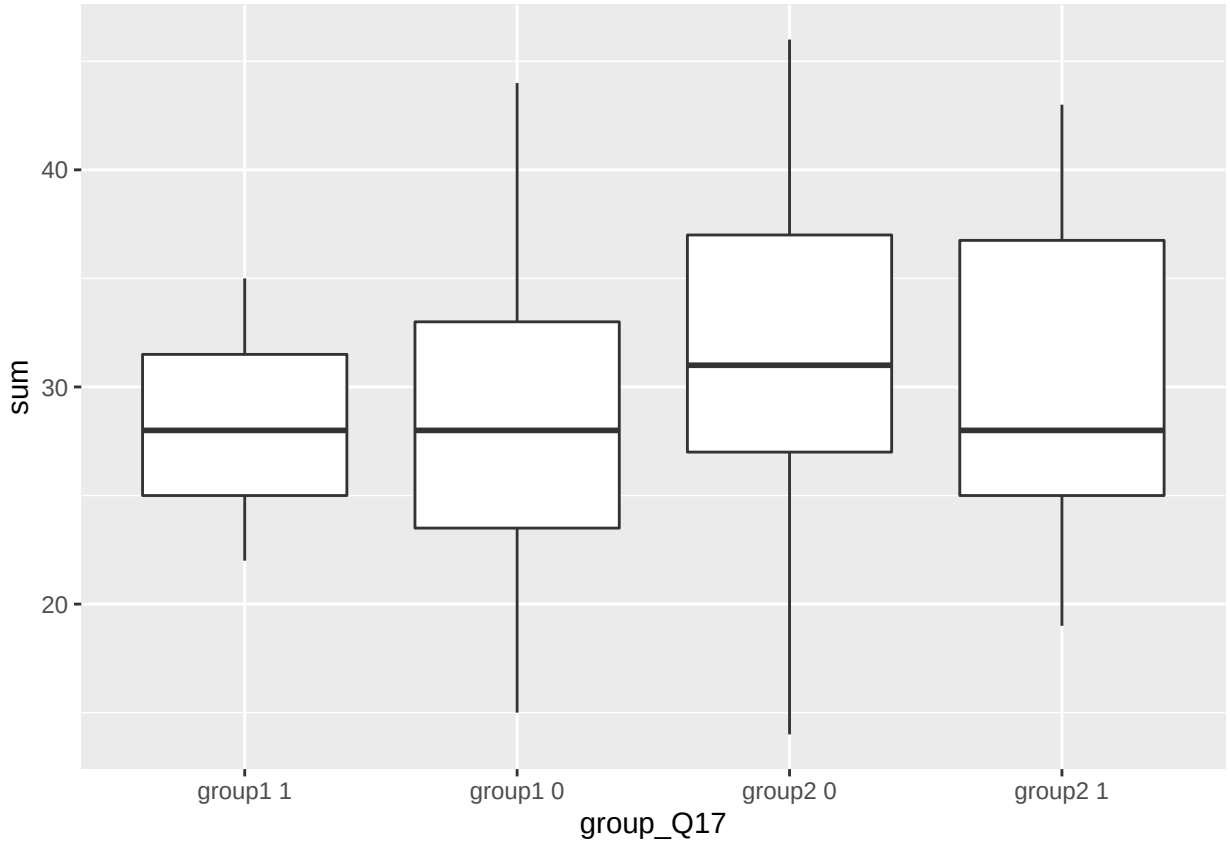
```
## $`0`
## [1] 30.28
##
## $`1`
## [1] 29.76923
##
## $`NA`
## NULL
```

```r
df7 %>%
  group_by(Q17) %>%
  summarise(
    count = n(),
    mean = mean(sum),
```

```
    median = median(sum)
  )
```

```
## # A tibble: 2 x 4
##   Q17   count  mean median
##   <fct> <int> <dbl>  <dbl>
## 1 0       125  30.3     30
## 2 1        13  29.8     28
```

```
#Creating graph
ggplot(data = df7,
       aes(x = group_Q17, y = sum))+
  geom_boxplot()
```



#Comparing means between group 1 and group 2 using Wilcoxon Test

```
#group 1 is normally distributed
#group 2 is not normally distributed
shapiro.test(num_group$group1)
```

```
##
##  Shapiro-Wilk normality test
##
## data:  num_group$group1
## W = 0.98121, p-value = 0.5913
```

```
shapiro.test(num_group$group2)
```

```
##
##  Shapiro-Wilk normality test
##
## data:  num_group$group2
## W = 0.96804, p-value = 0.02333
```

```
shapiro.test(log(num_group$group2))
```

```
##
##  Shapiro-Wilk normality test
##
## data:  log(num_group$group2)
## W = 0.72816, p-value = 9.297e-12
```

```
wilcoxtest <- wilcox.test(num_group$group1, log(num_group$group2),
                          alternative = "two.sided", mu=0, paired= FALSE)
wilcoxtest
```

```
##
##  Wilcoxon rank sum test with continuity correction
##
## data:  num_group$group1 and log(num_group$group2)
## W = 4692, p-value < 2.2e-16
## alternative hypothesis: true location shift is not equal to 0
```

#Comparing means between group 1 and group 2 using t test

```
ttest <- t.test(num_group$group1, log(num_group$group2), alternative = "two.sided", mu = 0, paired= FALS
ttest
```

```
##
##  Welch Two Sample t-test
##
## data:  num_group$group1 and log(num_group$group2)
## t = 25.799, df = 50.128, p-value < 2.2e-16
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  23.38065 27.32827
## sample estimates:
## mean of x mean of y
## 28.745098  3.390641
```