HW8

Getong Zhong

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```
data <- read.csv("C:/Users/tonyg/Desktop/Academic/Grad/HUDM 6026/acupuncture.csv")
data$diff_pk <- data$pk1 - data$pk5
pk1_diff <- data[data$group == 1, ]$diff_pk
pk5_diff <- data[data$group == 0, ]$diff_pk

observed_diff <- mean(pk1_diff) - mean(pk5_diff)
n <- 10000
permuted_diffs <- numeric(n)
```

permutation

```
sample(data$diff_pk)
```

```
##   [1]   5.50000   1.00000  -8.75000 -12.75000  15.50000   1.00000 -12.25000
##   [8]   0.66667  -4.75000  -5.25000   6.25000   3.00000  12.25000  18.00000
##  [15]  24.50000  -4.50000  16.75000   8.75000   1.00000  11.25000   4.00000
##  [22]  11.25000   8.00000   7.50000   6.50000  25.50000   3.00000   0.00000
##  [29]  -1.50000   7.75000   9.50000   2.00000  12.25000 -12.50000   0.50000
##  [36]  -4.50000   3.75000   8.75000   6.50000   0.00000  -5.00000   7.25000
##  [43]  -5.00000  13.75000  -3.25000  21.75000   4.00000  -1.50000   3.00000
##  [50]  12.50000  -6.75000  16.25000  11.50000  10.25000   1.00000   3.50000
##  [57]   7.50000   9.75000  10.00000   2.00000  18.25000  11.75000  27.50000
##  [64]  32.00000 -11.75000  31.25000  -0.75000 -10.00000  -7.50000  12.25000
##  [71]   6.00000  13.25000   9.75000  10.50000  11.00000  10.25000   2.25000
##  [78] -10.50000   9.75000 -10.75000  -2.25000   5.75000  10.75000 -14.25000
##  [85]  -8.75000  -3.75000   0.00000   3.75000   8.25000   2.50000  -4.00000
##  [92]   7.50000  10.75000  17.25000  15.25000   8.00000  16.00000   8.00000
##  [99]   8.75000  15.75000  44.75000  10.75000   4.00000  -2.00000   4.75000
## [106]  -8.25000   6.25000  -5.25000   7.50000  -5.00000   7.25000  24.75000
## [113]  31.00000 -10.50000  -7.75000   0.00000  10.25000   6.50000  -4.50000
## [120]  -3.25000  37.75000  -7.00000  18.00000  14.50000 -21.50000   3.00000
## [127]  12.25000  -9.25000   6.50000   8.00000  36.75000   0.75000   7.25000
## [134]  25.00000  -6.50000   1.00000  16.00000  -2.00000   2.00000   0.00000
## [141]  -2.25000  11.25000 -14.25000 -13.75000  -8.25000 -13.25000  34.50000
## [148]   6.50000  23.00000   4.00000  13.50000  36.00000  18.25000  13.25000
## [155] -12.25000  -3.25000  14.50000  14.00000  17.50000  -2.00000  27.50000
## [162]  -3.75000   4.75000 -22.75000  10.25000   7.75000   9.75000   5.75000
## [169]   7.75000   7.00000   4.00000 -29.00000   5.75000  -0.50000  -0.50000
## [176]   7.25000  17.50000   4.75000  11.50000   5.50000  35.25000   9.75000
```

```
## [183]   4.75000  10.25000   0.75000  16.00000  44.25000   7.25000  11.75000
## [190]  20.75000  33.75000  12.00000   8.75000  11.75000   2.50000   0.25000
## [197]  -6.50000  12.75000   5.50000   4.00000  34.50000   4.50000   2.50000
## [204]  12.00000  -1.00000  10.00000   7.25000  -1.75000  -7.75000  -2.25000
## [211]  11.75000   1.25000   3.00000  11.75000  29.75000   1.75000  13.50000
## [218]  12.50000   5.50000  19.00000  -5.00000  13.75000   4.75000  -2.25000
## [225]  13.00000   0.25000  22.75000   1.25000   9.00000   1.25000  -4.00000
## [232]   7.25000   3.50000   8.25000  12.25000   4.75000  33.25000   4.00000
## [239]   0.50000  -2.00000  26.25000  -0.75000   0.50000  10.00000  17.25000
## [246]   6.50000 -28.50000  31.00000  25.25000   2.00000   3.50000   8.75000
## [253]  -1.75000  17.00000 -28.73334   8.00000  10.50000   7.00000   2.50000
## [260]   5.00000   8.75000   2.50000  10.25000   1.50000   2.75000   7.25000
## [267]   2.25000  14.75000  -0.75000  -3.50000   4.00000  20.75000  -5.00000
## [274]  -7.75000  55.75000   9.50000  -5.25000  -1.75000  -5.75000   9.50000
## [281]  20.00000   7.50000   7.75000  -2.50000  15.25000   0.75000  -2.00000
## [288]   7.25000  -5.50000   7.75000  18.00000   5.00000   5.75000   8.75000
## [295]  22.50000  13.00000   3.50000  -0.25000  29.75000  -6.50000  -2.75000
```

```
set.seed(123)
for (i in 1:n) {
  sample_dat <- sample(data$diff_pk)
  permuted_diffs[i] <- mean(sample_dat[data$group == 1]) - mean(sample_dat[data$group == 0])
}
```

P value

```
p_value <- sum(abs(permuted_diffs) >= abs(observed_diff)) / n
p_value
```

```
## [1] 0.0032
```