STAT 351 Homework 1

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STAT 351-001

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Problem 1

```
testScores <- c(79,74,88,80,80,66,65,86,84,80,78,72,71,74,86,96,77,81,76,80,76,75,78,87,87,74,85,84,76,
summary(testScores)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   65.00   74.75   77.00   78.53   81.75   96.00
```

```
cat("There is initial evidence that the alternative hypothesis is true because the median is considerabl
```

```
## There is initial evidence that the alternative hypothesis is true because the median is considerably
```

```
# H0: Median = 70                                                    # Problem 1b
# HA: Median > 70
a = .05
binom.test(sum(testScores>70),length(testScores),alternative="greater")          # Problem 1c
```

```
##
##  Exact binomial test
##
## data:  sum(testScores > 70) and length(testScores)
## number of successes = 38, number of trials = 40, p-value = 7.467e-10
## alternative hypothesis: true probability of success is greater than 0.5
## 95 percent confidence interval:
##  0.850848 1.000000
## sample estimates:
## probability of success
##                   0.95
```

```
cat("We reject H0 at a = ",a,". There is sufficient evidence (p = ",binom.test(sum(testScores>70),lengt
```

```
## We reject H0 at a = 0.05. There is sufficient evidence (p = 7.466952e-10) that the median is greater
```

Problem 2

```
library(MASS)
library(perm)
```

```r
data <- data.frame(treatment=c(rep("1",4),rep("2",4)),obs=c(44,33,22,11,4,3,2,1))
permTS(data$obs~data$treatment,alternative="greater",exact=TRUE)$p.value
```

```
## [1] 0.01428571
```

```r
fractions(permTS(data$obs~data$treatment,alternative="greater",exact=TRUE)$p.value)
```

```
## [1] 1/70
```

```r
"For a permutation test in which all observations in one treatment are greater than all observations in
```

```
## [1] "For a permutation test in which all observations in one treatment are greater than all observati
```

Problem 3

```r
siblings <- data.frame(hometown=c(rep("rural",24),rep("urban",17)),siblings=c(3,2,1,1,2,1,3,2,2,2,2,5,1
# H0: r(t) = u(t) for all t (where r(t) is the distribution of the number of siblings in a rural hometo
# HA: r(t) = u(t - d)
a = .05
wilcox.test(siblings$siblings~siblings$hometown,alternative="two.sided",correct=FALSE,exact=TRUE)
```

```
##
##  Wilcoxon rank sum test
##
## data:  siblings$siblings by siblings$hometown
## W = 314.5, p-value = 0.001521
## alternative hypothesis: true location shift is not equal to 0
```

```r
cat("We reject H0 at a = ",a,". There is sufficient evidence (p = ",wilcox.test(siblings$siblings~siblin
```

```
## We reject H0 at a = 0.05. There is sufficient evidence (p = 0.001520718) that the distributions of th
```

```r
permTS(siblings$siblings~siblings$hometown,alternative="two.sided") # Problem 3b
```

```
##
##  Exact Permutation Test (network algorithm)
##
## data:  siblings$siblings by siblings$hometown
## p-value = 0.1275
## alternative hypothesis: true mean siblings$hometown=rural - mean siblings$hometown=urban is not equal
## sample estimates:
## mean siblings$hometown=rural - mean siblings$hometown=urban
##                                                   0.8063725
```

```r
cat("We fail to reject H0 at a = ",a,". There is insufficient evidence (p = ",permTS(siblings$siblings~s
```

```
## We fail to reject H0 at a = 0.05. There is insufficient evidence (p = 0.1274887) that the distributio
```

Problem 4

```r
data <- data.frame(y=c(rep("1",4),rep("2",4)),x=c(6,5,5,3,4,3,2,1))
wilcox.test(data$x~data$y,alternative="two.sided",correct=FALSE,exact=TRUE)
```

```
##
##  Wilcoxon rank sum test
##
## data:  data$x by data$y
```

```
## W = 14.5, p-value = 0.05755
## alternative hypothesis: true location shift is not equal to 0
```

```
t.test(data$x~data$y,alternative="two.sided")
```

```
##
##  Welch Two Sample t-test
##
## data:  data$x by data$y
## t = 2.4962, df = 5.9961, p-value = 0.0468
## alternative hypothesis: true difference in means between group 1 and group 2 is not equal to 0
## 95 percent confidence interval:
##  0.04403191 4.45596809
## sample estimates:
## mean in group 1 mean in group 2
##            4.75            2.50
```

```
cat("P-value (Wilcoxon rank-sum test): ",wilcox.test(data$x~data$y,alternative="two.sided",correct=FALSE
```

```
## P-value (Wilcoxon rank-sum test): 0.05754695
##      P-Value (Two-sample t-test): 0.04679704
```