170s HW7

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Problem 1

```r
# Part a)
sample1 <- c(20,25,18,27,32,39,21,26,19,28,33,38,22,27,23,35,31)
sample2 <- c(39,21,23,24,29,28,27,29,31,33,36,37)

t.test(sample1, sample2, mu = 0, alternative = "two.sided", conf = 0.95)
```

```
##
##  Welch Two Sample t-test
##
## data:  sample1 and sample2
## t = -1.0765, df = 25.685, p-value = 0.2917
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -7.148029  2.236264
## sample estimates:
## mean of x mean of y
##  27.29412  29.75000
```

Since the p-value is greater than 0.05, we fail to reject the null hypothesis that the true difference in means is equal to 0.

```r
# Part b)
sample1 <- c(25,31,22.5,33.5,40,48.7,26.25,32.5,23.5,35,41.25,47.5,27.5,33.7,
             28.75,43.7,39,48,54,56)
sample2 <- c(48,26,28.7,30,36.2,35,33.7,36.2,38.7,41.5,45,46.5,25,26,27)

t.test(sample1, sample2, mu = 0, alternative = "two.sided", conf = 0.95)
```

```
##
##  Welch Two Sample t-test
##
## data:  sample1 and sample2
## t = 0.64556, df = 32.978, p-value = 0.523
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -4.233373  8.168373
## sample estimates:
## mean of x mean of y
##   36.8675   34.9000
```

Since the p-value is greater than 0.05, we fail to reject the null hypothesis that the true difference in means is equal to 0.

```r
# Part c)
sample1 <- c(209,277,221,215,247.7,253.7,218,212,244.7,250.7,215.0,209)
sample2 <- c(265,201,228,289,277,289,288,278,277,265,264,266,298,291,270)

t.test(sample1, sample2, mu = 0, alternative = "two.sided", conf = 0.95)
```

```
##
##  Welch Two Sample t-test
##
## data:  sample1 and sample2
## t = -4.1809, df = 24.69, p-value = 0.0003175
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -57.72604 -19.60730
## sample estimates:
## mean of x mean of y
##  231.0667  269.7333
```

Since the p-value is less than 0.05, we reject the null hypothesis that the true difference in means is equal to 0.

Problem 2

```r
# Part a)
sample1 <- c(55,56,59,51,82,88,72,84,71,80,66,67,52,81,57,72,69)
sample2 <- c(44,43,48,56,54,53,52,41,40,43,43,44,45,45,52,51,50)

t.test(sample1, sample2, mu = 0, alternative = "less", conf = 0.99)
```

```
##
##  Welch Two Sample t-test
##
## data:  sample1 and sample2
## t = 6.7222, df = 21.463, p-value = 1
## alternative hypothesis: true difference in means is less than 0
## 99 percent confidence interval:
##      -Inf 28.93205
## sample estimates:
## mean of x mean of y
##  68.35294  47.29412
```

Since the p-value is greater than 0.05, we fail to reject the null hypothesis that the mean of sample 1 is greater than that of sample 2.

```r
# Part b)
sample1 <- c(140,142,150,130.1,209,224,183,214,181,204,168,170,133,206,145,183,179)
sample2 <- c(105,102,115,135.8,130,128,125,97,95,102,102,105,108,107,125,123,120)

t.test(sample1, sample2, mu = 0, alternative = "less", conf = 0.99)
```

```
##
##  Welch Two Sample t-test
##
## data:  sample1 and sample2
## t = 7.6331, df = 21.485, p-value = 1
## alternative hypothesis: true difference in means is less than 0
```

```
## 99 percent confidence interval:
##      -Inf 81.02798
## sample estimates:
## mean of x mean of y
##  174.1824  113.2235
```

Since the p-value is greater than 0.05, we fail to reject the null hypothesis that the mean of sample 1 is greater than that of sample 2.

```r
# Part c)
sample1 <- c(53.4,52.88,58.13,62.27,70.9,72.5,65.7,60.7,55,60,56,57,53,62)
sample2 <- c(61,63,71,55,53,59,63,61,55,58,63,58,57,56)

t.test(sample1, sample2, mu = 0, alternative = "less", conf = 0.99)
```

```
##
##  Welch Two Sample t-test
##
## data:  sample1 and sample2
## t = 0.22168, df = 23.913, p-value = 0.5868
## alternative hypothesis: true difference in means is less than 0
## 99 percent confidence interval:
##      -Inf 5.667677
## sample estimates:
## mean of x mean of y
##  59.96286  59.50000
```

Since the p-value is greater than 0.05, we fail to reject the null hypothesis that the mean of sample 1 is greater than that of sample 2.

Problem 3

```r
# Part a)
sample1 <- c(55,56,59,51,82,88,72,84,71,80,66,67,52,81,57,72,69)
sample2 <- c(44,43,48,56,54,53,52,41,40,43,43,44,45,45,52,51,50)

wilcox.test(sample1, sample2, mu = 0, alternative = "less", conf.level = 0.99, exact = F)
```

```
##
##  Wilcoxon rank sum test with continuity correction
##
## data:  sample1 and sample2
## W = 278, p-value = 1
## alternative hypothesis: true location shift is less than 0
```

Since the p-value is greater than 0.05, we fail to reject the null hypothesis that the mean of sample 1 is greater than that of sample 2.

```r
# Part b)
sample1 <- c(140,142,150,130.1,209,224,183,214,181,204,168,170,133,206,145,183,179)
sample2 <- c(105,102,115,135.8,130,128,125,97,95,102,102,105,108,107,125,123,120)

wilcox.test(sample1, sample2, mu = 0, alternative = "less", conf.level = 0.99, exact = F)
```

```
##
##  Wilcoxon rank sum test with continuity correction
```

```
##
## data:  sample1 and sample2
## W = 287, p-value = 1
## alternative hypothesis: true location shift is less than 0
```

Since the p-value is greater than 0.05, we fail to reject the null hypothesis that the mean of sample 1 is greater than that of sample 2.

```r
# Part c)
sample1 <- c(53.4,52.88,58.13,62.27,70.9,72.5,65.7,60.7,55,60,56,57,53,62)
sample2 <- c(61,63,71,55,53,59,63,61,55,58,63,58,57,56)

wilcox.test(sample1, sample2, mu = 0, alternative = "less", conf.level = 0.99, exact = F)
```

```
##
##  Wilcoxon rank sum test with continuity correction
##
## data:  sample1 and sample2
## W = 94.5, p-value = 0.4451
## alternative hypothesis: true location shift is less than 0
```

Since the p-value is greater than 0.05, we fail to reject the null hypothesis that the mean of sample 1 is greater than that of sample 2.

Problem 4

```r
# Part a)
table1 <- matrix(c(34,39,32,47,41,44,55,52,48,49,42,45), nrow = 3, ncol = 4)
rownames(table1) <- c('M1','M2','M3')
colnames(table1) <- c('A','B','C','D')
table1
```

```
##     A  B  C  D
## M1 34 47 55 49
## M2 39 41 52 42
## M3 32 44 48 45
```

```r
chisq.test(table1)
```

```
##
##  Pearson's Chi-squared test
##
## data:  table1
## X-squared = 1.4185, df = 6, p-value = 0.9647
```

Since the p-value is greater than 0.05, we fail to reject the null hypothesis that the two variables are independent.

```r
# Part b)
table2 <- matrix(c(123,109,111,156,144,148,228,201,212), nrow = 3, ncol = 3)
rownames(table2) <- c('M1','M2','M3')
colnames(table2) <- c('A','B','C')
table2
```

```
##      A   B   C
## M1 123 156 228
## M2 109 144 201
```

```
## M3 111 148 212
```

```r
chisq.test(table2)
```

```
##
##  Pearson's Chi-squared test
##
## data:  table2
## X-squared = 0.15874, df = 4, p-value = 0.997
```

Since the p-value is greater than 0.05, we fail to reject the null hypothesis that the two variables are independent.

```r
# Part c)
table3 <- matrix(c(405,310,409,400,656,608,626,672,556,534,534,443,655,387,456,542),
                 nrow = 4, ncol = 4)
rownames(table3) <- c('M1','M2','M3','M4')
colnames(table3) <- c('A','B','C','D')
table3
```

```
##      A   B   C   D
## M1 405 656 556 655
## M2 310 608 534 387
## M3 409 626 534 456
## M4 400 672 443 542
```

```r
chisq.test(table3)
```

```
##
##  Pearson's Chi-squared test
##
## data:  table3
## X-squared = 69.405, df = 9, p-value = 1.991e-11
```

Since the p-value is less than 0.05, we reject the null hypothesis that the two variables are independent.