Tutorial Week 2

Arthur Thiele

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Computer Exercises, Week 2

1. a)

```
pnorm(1.25)
```

```
## [1] 0.8943502
```

```
pnorm(1.23, mean = 1) - pnorm(0.5, mean = 1)
```

```
## [1] 0.2824166
```

```
pt(2.353, df = 3)
```

```
## [1] 0.9499835
```

```
pt(1.476, df = 5)- pt(-1.476, df = 5)
```

```
## [1] 0.8000297
```

b)

```
qt(0.05, df = 8)
```

```
## [1] -1.859548
```

```
qt(0.25, df = 7)
```

```
## [1] -0.7111418
```

```
qnorm(0.05)
```

```
## [1] -1.644854
```

```
abs(qnorm(0.025))
```

```
## [1] 1.959964
```

2. a)

```
data <- read.csv("amp.csv")
summary(data)
```

```
##  X.Microbiological Hydroxylamine
##  Min.   : 20.50    Min.   : 21.20
##  1st Qu.: 75.60    1st Qu.: 74.50
##  Median : 93.80    Median : 95.80
##  Mean   : 85.26    Mean   : 84.82
##  3rd Qu.: 96.70    3rd Qu.: 97.90
##  Max.   :105.80    Max.   :101.80
```

```
data
```

```
##    X.Microbiological Hydroxylamine
## 1               97.2          97.2
```

```
## 2              105.8          97.8
## 3               99.5          96.2
## 4              100.0         101.8
## 5               93.8          88.0
## 6               79.2          74.0
## 7               72.0          75.0
## 8               72.0          67.5
## 9               69.5          65.8
## 10              20.5          21.2
## 11              95.2          94.8
## 12              90.8          95.8
## 13              96.2          98.0
## 14              96.2          99.0
## 15              91.0         100.2
```

b) Since these tests are using different methods but on the same tablet (discussed with tutor Connor Smith), the null hypothesis is that there isn't a substantive difference between the measurement. If data[1] = X, data[2] = Y,

$$X_i - Y_i = d_i$$

Null Hypothesis H_0: $\mu_d = 0$ Alternative Hypothesis H_1: $\mu_d \neq 0$

```
method.A = data[,1]
method.B = data[,2]
ds = method.A - method.B
ds
```

```
##  [1]  0.0  8.0  3.3 -1.8  5.8  5.2 -3.0  4.5  3.7 -0.7  0.4 -5.0 -1.8 -2.8
## [15] -9.2
```

```
mean(ds)
```

```
## [1] 0.44
```

```
sd(ds)
```

```
## [1] 4.630767
```

Since there are 15 observed values, our observed test statistic is

```
T = abs(mean(ds))/(sd(ds)/sqrt(15))
T
```

```
## [1] 0.367998
```

This distribution then has 9 degrees of freedom, and so our p-value is:

```
p = 2*(1 - pt(T, df = 14))
p
```

```
## [1] 0.718379
```

This is evidence that there is no significant difference between the pill-testing methods, since $p = 0.71 > 0.05$

```
#toto: stemleaf, rest of tutorial
```