MATH-650 Assignment-1

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Generate x,$y \sim N(0,1)$

Generate two sets of random numbers x,y:

```
##Set seed to ensure reproduciblity
set.seed(10)
x <- rnorm(10, mean=0, sd=1)
y <- rnorm(10, mean=0, sd=1)
mean_x <- mean(x)
mean_y <- mean(y)
difference_of_mean_xy <- mean_x - mean_y
print(difference_of_mean_xy)
```

```
## [1] -0.8602484
```

Difference of mean of x, y is: -0.8602484

t-test for $x, y \sim N(0,1)$

```
t_test <- t.test(x,y)
print(t_test)
```

```
##
##  Welch Two Sample t-test
##
## data:  x and y
## t = -2.8063, df = 17.967, p-value = 0.01169
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -1.5043525 -0.2161442
## sample estimates:
##  mean of x  mean of y
## -0.4906568  0.3695915
```

From the t-test results with degrees of freedom and a p-value of 0.0116922 and using a threshold level of significance of $\alpha = 0.01$, we *FAIL to reject* the null hypothesis that the means of two samples, x and y are equal. [Since p-value $< \alpha$]

Generate $x \sim N(0,1)$,$y \sim N(2,1)$

```r
##Set seed to ensure reproduciblity
set.seed(10)
x <- rnorm(10, mean=0, sd=1)
y <- rnorm(10, mean=2, sd=1)
mean_x <- mean(x)
mean_y <- mean(y)
difference_of_mean_xy <- mean_x - mean_y
print(difference_of_mean_xy)
```

```
## [1] -2.860248
```

Difference of mean of x, y is: -2.8602484

t-test for $x \sim N(0,1)$,$y \sim N(2,1)$

```r
t_test <- t.test(x,y)
print(t_test)
```

```
##
##  Welch Two Sample t-test
##
## data:  x and y
## t = -9.3307, df = 17.967, p-value = 2.607e-08
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -3.504352 -2.216144
## sample estimates:
##  mean of x  mean of y
## -0.4906568  2.3695915
```

From the t-test results with degrees of freedom 17.9674049 and a p-value of 2.6066356×10^{-8} and using a threshold level of significance of $\alpha = 0.01$, we *reject* the null hypothesis that the means of two samples, x and y are equal.[Since p-value of $2.6066356 \times 10^{-8} < \alpha$]