````
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title: "homework3"
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output: word_document
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```{r setup, include=FALSE}
knitr::opts_chunk$set(echo = TRUE)
library(readxl)
mane6313_homework3 <- read_excel("mane6313_homework3.xlsx")
```

## Problem 2.28

### part a


```{r echo=TRUE}
var.test(mane6313_homework3$p2_28_type1,mane6313_homework3$p2_28
_type2,alternative = "two.sided",conf.level = 0.95)
```

The p-value for the F-test is 0.9744. Using $\alpha$= 0.05, the
conclusion of the hypothesis test $H_0:\frac{\sigma^2_1}{\sigma^2
_2}=1$ versus $H_1:\frac{\sigma^2_1}{\sigma^2_2}\neq 1$ is fail
to reject $H_0$. Thus, it can be assumed that the variances are
equal.

### Part b

Conduct a two-sample t-test to determine if the means are equal.
Use $\alpha=0.05.$

```{r}
t.test(mane6313_homework3$p2_28_type1,mane6313_homework3$p2_28
_type2,alternative = "two.sided",mu=
0,paired=FALSE,var.equal=TRUE, conf.level = 0.95)

```


The p-value for the t-test is 0.9622. Using $\alpha$= 0.05, the
conclusion of the hypothesis test $H_0:\mu_1=\mu_2=0$ versus $H_
1:\mu_1\neq \mu_2$ is fail to reject $H_0$. Thus, it can be
assumed that the means are equal.

### Part c

Test for normality.

```{r}
library(car)
````
````

```
qqPlot(mane6313_homework3$p2_28_type1)
qqPlot(mane6313_homework3$p2_28_type2)
```

Observing both normal probability plots (qqPlots), all points for both plots lie within the confidence bands. Therefore, it can be assume that both samples are from a normal distribution.

Problem 2.33

Part a

Construct a 95% confidence interval for σ^2.

```{r}
library(EnvStats) # import library
varTest(mane6313_homework3$p2_33,alternative = "two.sided",
conf.level = 0.95, sigma.squared=1.0)
```

From the output, the 95% confidence interval for σ^2 is (0.4571524, 1.6862395)

Part b

Perform a hypothesis test of $H_0:\sigma^2=1$ versus $H_1:\sigma^2\neq1$. Use $\alpha=0.05$.

```{r}
library(EnvStats) # import library
varTest(mane6313_homework3$p2_33,alternative = "two.sided",
conf.level = 0.95, sigma.squared=1.0)
```

From the varTest output, the p-value is 0.5572. Since p-value is greater than α, the conclusion is fail to reject H_0 and accept the null hypothesis that σ^2 is equal to one.

Part c

Check the assumption of normality.

```{r}
library(car)
car::qqPlot(mane6313_homework3$p2_33)
```

Notice that a point is beyond the confidence bands. Therefore, the data is not from a normal distribution and it is not appropriate to use the t-test. A non-parametric test such as Kruskall-Wallis test should be used.

Problem 2.34

Part a

Conduct a test of hypothesis using $\alpha=0.05$ to determine if $H_0: \mu_d=0$ versus $H_1:\mu_d\neq 1$.

```{r}
t.test(mane6313_homework3$p2_34_caliper1,mane6313_homework3$p2_34_caliper2,alternative = "two.sided",mu=0,paired=TRUE, conf.level = 0.95)

```
The critical value for the rejection region is given below.
```{r}
qt(.975,11)
  ```
Since the absolute value of the test statistics is not greater than the critical value, 2.200985. The conclusion is to fail to reject H_0 and accept the null hypothesis that the means are equal.

Part b

   The p-value, observed from the part a output, is 0.6742.

Part c
   The value of the two-sided 95% confidence interval, found in the part a output, is (-0.001024344, 0.001524344).