5303HW1

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Problem 1.2

There are totally 4 experimental units in this design. It is because that there are totally 4 different treatments, the 4 organs are the things that treatments are applied. So there are 4 experimental units. Would it means that the measurement units are 12? Because they are used to measure the responses?

Problem 1.3

Overall I don't think it's a good design of the study. This design does not involve much confounding though, such like it happens within one state, so there is no impact of location etc. While I think first of all, there is not a good way to randomize simply via choosing by school itself. Some school that constitutes of the students with low capicity of studying may choose the standard of easy graduation. Second is that 10 years time is so long that many other things can impact the students, that increase the confounding. The third is that the response is not so good because it involves college graduation standard which is another story, different college has different graduation standard, and the level of the difficuity of the specific school also can impact the graduation.

Exercise 2.5

1.

```r
uniform <- c(243, 229, 305, 395, 210, 311, 289, 269, 282, 399, 222, 331, 369)
notched <- c(215, 202, 273, 292, 253, 247, 350, 246, 352, 398, 267, 331, 342)
t.test(uniform,notched)
```

```
##
##  Welch Two Sample t-test
##
## data:  uniform and notched
## t = 0.27353, df = 23.911, p-value = 0.7868
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -43.31049  56.54126
## sample estimates:
## mean of x mean of y
##  296.4615  289.8462
```

From the outcome of the standard frequentist, I can find that the p-value is 0.7868, and for $\alpha = 0.05$, I can fail to reject the null hypothesis, and conclude that the strenth of the boards is equal for the two shapes.

2.

```r
library(perm)
uniform <- c(243, 229, 305, 395, 210, 311, 289, 269, 282, 399, 222, 331, 369)
notched <- c(215, 202, 273, 292, 253, 247, 350, 246, 352, 398, 267, 331, 342)
permTS(uniform,notched)
```

```
##
##  Permutation Test using Asymptotic Approximation
##
## data:  uniform and notched
## Z = 0.27874, p-value = 0.7804
## alternative hypothesis: true mean uniform - mean notched is not equal to 0
## sample estimates:
## mean uniform - mean notched
##                    6.615385
```

In comparison with the t-test, I found that the p-value of these two tests are same. They are both 0.7804

Problem 2.3

As known, P-value is the probability of repeated experiments when the null is true would we observe the test statistic this extreme or more extreme(that away from the null hypothesis towards the alteranative hypothesis). Normally the P value is 0.05. In my study, I study both in Economics and Stat, while I know p-value is very useful in Econometrics, I am not very professional in the exact p-value the people often use in Economics, while I think, I see p=0,05 mostly. While I do think that the real data is more useful in comparison with the p-value, p-value can be changed by people via changing the data, like controling the p-value in some interval, people can simply change the data, therefor change the p-value.

Problem 2.5

In this question, the parameter we want to study is mean. Confidence interval is the probability of repeated experiments would this procdedure produce an interval that contains the parameter of interest. It may be more intuitive to say this way: a t-based confidence interval for the mean of the result with coverage rate of 0.95 is 1.73 to 2.11. The statement have a big mistake of the logic, that first is the t-based confidence interval, not just t-interval. The second is under what confidence level that we find what interval is.