Assignment 5
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Course: Statistical Inference
Code: PMDS503P Slot: L33+L34

1 Question 1

```
library(stats)
caliper_1 <- c(0.265, 0.265, 0.266, 0.267, 0.267, 0.265, 0.267, 0.267, 0.265, 0.268, 0.268,
caliper_2 <- c(0.264, 0.265, 0.264, 0.266, 0.267, 0.268, 0.264, 0.265, 0.265, 0.267, 0.268,

# Null Hypothesis (H0): The medians of the two samples are equal.
# Alternative Hypothesis (H1): The medians of the two samples are different.


# Perform Wilcoxon Signed-Rank Test
result1 <- wilcox.test(caliper_1, caliper_2, paired = TRUE, alternative = "two.sided", conf.

## Warning in wilcox.test.default(caliper_1, caliper_2, paired = TRUE,
alternative = "two.sided", : cannot compute exact p-value with ties
## Warning in wilcox.test.default(caliper_1, caliper_2, paired = TRUE,
alternative = "two.sided", : cannot compute exact p-value with zeroes

print(result1)

##
##  Wilcoxon signed rank test with continuity correction
##
## data:  caliper_1 and caliper_2
## V = 21.5, p-value = 0.6721
## alternative hypothesis: true location shift is not equal to 0
```

Given that the p-value is greater than 0.05, we accept our null hypothesis. Therefore, The medians of the 2 samples are equal.

2 Question 2

```
titanium_content <- c(8.32, 8.05, 8.93, 8.65, 8.25, 8.46, 8.52, 8.35, 8.36, 8.41,
                      8.42, 8.30, 8.71, 8.75, 8.60, 8.83, 8.50, 8.38, 8.29, 8.46)

# Null Hypothesis (H0): The median titanium content is 8.5.
# Alternative Hypothesis (H1): The median titanium content is different from 8.5.
```

```r
# Perform Wilcoxon Signed-Rank Test
mu_0 <- 8.5
result2 <- wilcox.test(titanium_content, mu = mu_0, alternative = "two.sided", conf.level =
```

```
## Warning in wilcox.test.default(titanium_content, mu = mu_0, alternative
= "two.sided", : cannot compute exact p-value with ties
## Warning in wilcox.test.default(titanium_content, mu = mu_0, alternative
= "two.sided", : cannot compute exact p-value with zeroes
```

```r
print(result2)
```

```
##
##  Wilcoxon signed rank test with continuity correction
##
## data:  titanium_content
## V = 80.5, p-value = 0.573
## alternative hypothesis: true location is not equal to 8.5
```

Given that the p-value is greater than 0.05, we accept our null hypothesis. The median titanium content is 8.5.

3 Question 3

```r
# Null Hypothesis (H0): The median current output of Circuit 1 is equal to Circuit 2.
# Alternative Hypothesis (H1): The median current output of Circuit 1 is greater than Circu
circuit_1 <- c(251, 255, 258, 257, 250, 251, 254, 250, 248)
circuit_2 <- c(250, 253, 249, 256, 259, 252, 260, 251)

# Perform Wilcoxon Rank-Sum Test
result3 <- wilcox.test(circuit_1, circuit_2, alternative = "greater", conf.level = 0.90)
```

```
## Warning in wilcox.test.default(circuit_1, circuit_2, alternative
= "greater", : cannot compute exact p-value with ties
```

```r
print(result3)
```

```
##
##  Wilcoxon rank sum test with continuity correction
##
## data:  circuit_1 and circuit_2
## W = 30, p-value = 0.7352
## alternative hypothesis: true location shift is greater than 0
```

Given that the p-value is greater than 0.10, we accept our null hypothesis. The median current output of both the circuits is the same.

4 Question 4

```
machine_data <- c(10.4, 10.6, 10.1, 10.3, 10.2, 10.9, 10.5, 10.8, 10.6, 10.5, 10.7, 10.2, 10
mu <- 10.5
sigma <- 0.15
# Null Hypothesis (H0): The wire length measurements follow a normal distribution N(10.5, 0
# Alternative Hypothesis (H1): The wire length measurements do not follow the normal distrib

# Standardize data
machine_data_std <- (machine_data - mu) / sigma

# Perform Kolmogorov-Smirnov Test
result4 <- ks.test(machine_data_std, "pnorm", mean = 0, sd = 1)
```

```
## Warning in ks.test.default(machine_data_std, "pnorm", mean = 0,
sd = 1): ties should not be present for the one-sample Kolmogorov-Smirnov
test
```

```
print(result4)
```

```
##
##  Asymptotic one-sample Kolmogorov-Smirnov test
##
## data:  machine_data_std
## D = 0.22129, p-value = 0.4136
## alternative hypothesis: two-sided
```

Given that the p-value is greater than 0.05, we accept the null hypothesis. The wire length measurements follows a normal distribution.