Golf Balls

1. Formulate and present the rationale for a hypothesis test that par could use to compare the driving distances of the current and new golf balls

A. Since the new golf ball has a new coating it would be worthwhile to see whether it has any effect on the distance covered by the current ball which is in use as suggested by one of the researchers. If the new ball exceeds the distances travelled by the old ball it would not be fit to use. Similarly, if it travels lesser distances than the current ball it would not be fit to use here either.

H_0: $\mu_{cur} - \mu_{new} = 0$ (no significant difference in distance travelled by the 2 balls)

H_a: $\mu_{cur} - \mu_{new} \neq 0$ (there is significant difference between the 2 balls)

Since the standard deviation of the population is not known to us, we shall use a t-Test statistic. Based on the given conditions we will use the 2-sample t-Test for the analysis. Here we shall use a 2-tailed test.

2. Analyze the data to provide the hypothesis testing conclusion. What is the p-value for your test? What is your recommendation for Par Inc.?

A. For the given data if we perform the 2-tailed t-test for 2 samples. The data is as follows

```
        Welch Two Sample t-test

data:  Current and New
t = 1.3284, df = 76.852, p-value = 0.188
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -1.384937  6.934937
sample estimates:
mean of x mean of y
  270.275   267.500
```

p-value: 0.188

α: 0.05

Since p-value>α, this implies that the null hypothesis cannot be rejected and therefore statistically there is no difference between μ_{cur} and μ_{new}. Therefore $\mu_{cur} = \mu_{new}$. Par Inc. should go ahead with its new ball.

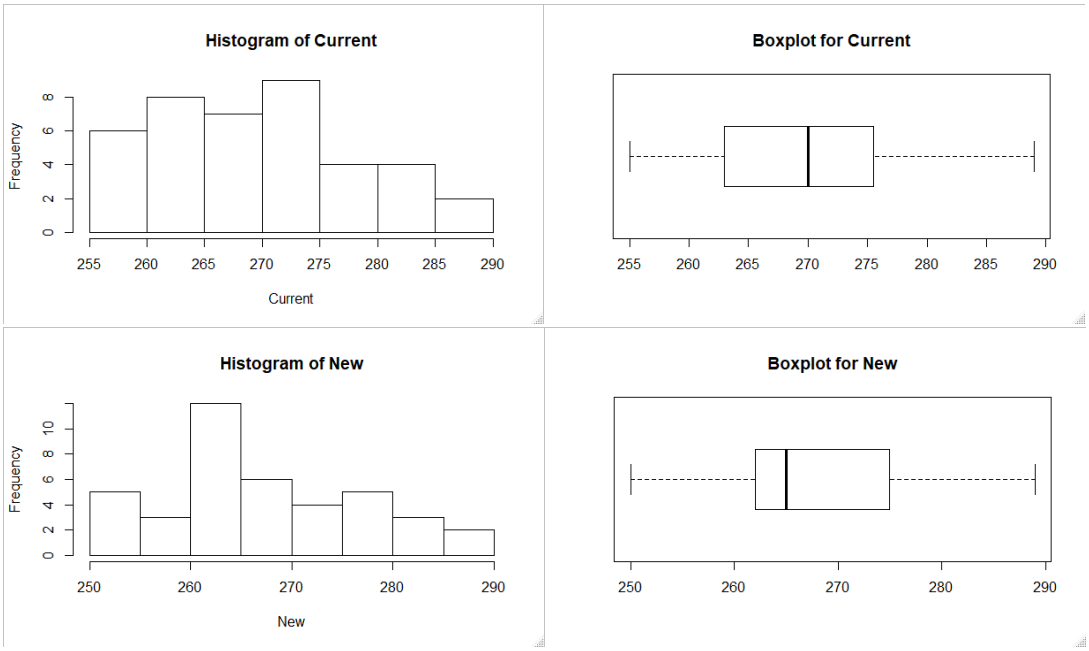
3. Provide descriptive statistical summaries of the data for each model

A. Descriptive Statistics are as follows:

- Sample Size: 40 (2 samples)
- Five point summary, mean and standard deviation for the data

```
    Current          New
Min.   :255.0   Min.   :250.0
1st Qu.:263.0   1st Qu.:262.0
Median :270.0   Median :265.0
Mean   :270.3   Mean   :267.5
3rd Qu.:275.2   3rd Qu.:274.5
Max.   :289.0   Max.   :289.0
> sd(Current)
[1] 8.752985
> sd(New)
[1] 9.896904
```

- Histogram and Boxplots for the data



- Both distributions are slightly right skewed, however since the skew is small both the distribution can be assumed to be normal.

4. What is the 95% confidence interval for the population mean of each model, and what is the 95% confidence interval for the difference between the means of the two population?

A. Confidence interval of the mean is given by mean $\pm$ $t_{0.025}(s/n^{1/2})$

For Current: mean=270.28, $t_{0.025}$=2.023, s=8.753, n=40

Confidence Interval is between 267.48 and 273.07.

For New: mean=267.50, $t_{0.025}$=2.023, s=9.90, n=40

Confidence interval is between 264.33 and 270.67.

Confidence interval of the difference of the means is given by mean1-mean2 $\pm$ $t_{0.025}(s_1^2/n+s_2^2/n)^{1/2}$

Mean1-Mean2=2.775, $t_{0.025}$=1.99, s_1=8.753, s_2=9.90

Confidence interval lies between -1.38 to 6.93.

5. Do you see a need for larger sample sizes and more testing with the golf balls? Discuss

A. The sample size is sufficiently large and gives us a good idea of the nature of the new ball. But it is still recommended that a large sample size be taken since it would make our analysis even more accurate and provide better confidence intervals. Also the samples should be taken over a longer period of time.