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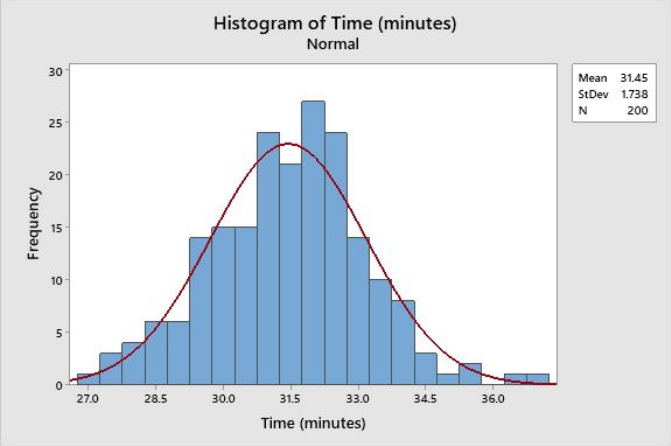
Purchase Order Processing Times

Problem:

A purchasing manager within your company has asked you to provide a summary of the time required to create and process a purchase order within the purchasing manager's functional group. At the start of 2017, the purchasing manager had established a goal of 31.25 minutes to create and process a purchase order. The ability to track purchase order processing time is enabled by the company's purchasing database.

You have extracted samples of process data for the same time periods in both 2017 and 2018. The purchasing manager has asked you to provide a summary for the following:

1. Was the process time goal met if the results from 2017 and 2018 are combined?
   - To find the quick and easy answer, I graphed the time for both years as a histogram.



From this we can see that the time goal of 31.25 minutes was not met when 2017 and 2018 are combined because the mean time is 31.45 minutes. Unfortunately that doesn't tell us how far from our goal we are. To do that, we use a one sample t-test.

Descriptive Statistics

N	Mean	StDev	SE Mean	95% CI for μ
200	31.447	1.738	0.123	(31.204, 31.689)

μ: mean of Time (minutes)

Test

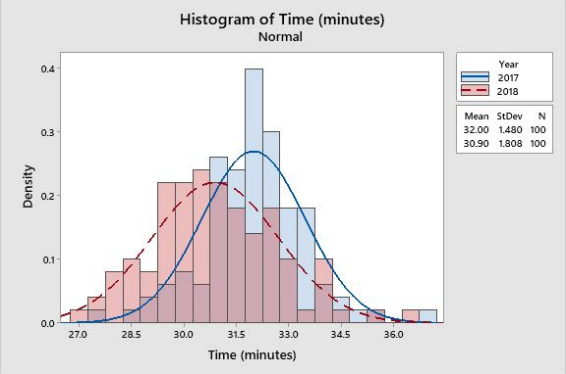
Null hypothesis $H_0: \mu = 31.25$
Alternative hypothesis $H_1: \mu \neq 31.25$

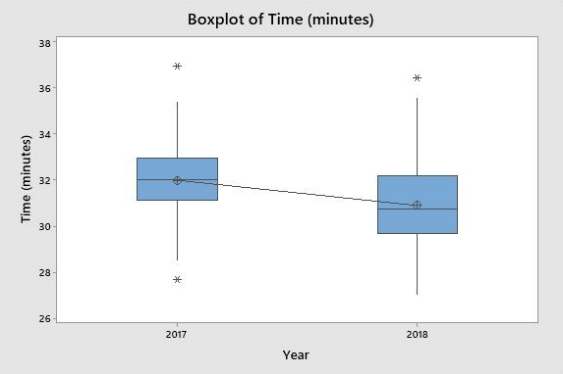
T-Value	P-Value
1.60	0.111

With a p-value greater than .05, we accept the null hypothesis that the times are

close to the mean and therefore acceptable. If we look at the 95% confidence interval, we see that the desired value of 31.25 fits between 31.204 and 31.689.

2. Was there a statistically significant difference in the process times when comparing 2017 to 2018?
   - I once again used a histogram to get a quick visual of how different the times are between 2017 and 2018. However, it is easier to compare values outside the second and third quartile by comparing boxplots.





We can see that the means are different with a mean of 32.00 for 2017 and 30.90 for 2018. With a standard deviation of 1.480, the times in 2017 had a tighter grouping than those from 2018 with a standard deviation of 1.808.

Method

μ_1: mean of Time (minutes) when Year = 2017
μ_2: mean of Time (minutes) when Year = 2018
Difference: $\mu_1 - \mu_2$

Equal variances are not assumed for this analysis.

Descriptive Statistics: Time (minutes)

Year	N	Mean	StDev	SE Mean
2017	100	32.00	1.48	0.15
2018	100	30.90	1.81	0.18

Estimation for Difference

Difference	95% CI for Difference
1.099	(0.638, 1.560)

Test

Null hypothesis H_0: $\mu_1 - \mu_2 = 0$
Alternative hypothesis H_1: $\mu_1 - \mu_2 \neq 0$

T-Value	DF	P-Value
4.70	190	0.000

With a p-value less than .05, we reject the null hypothesis that the mean times are similar and accept the alternative that they are significantly different.

3. What do you recommend as a next step?

- Without knowing the ins and outs of the process, I'm not sure what I would recommend. However, as I noted earlier, the 2017 times had a tighter grouping than the 2018 times. While the overall process for 2018 is faster, there is greater variance in the output. If I were in charge, I would try to decrease the variation in the times while maintaining the new mean time of 30.90 seconds. If we were able to maintain the mean time while decreasing the standard deviation to 2017 levels, the p-value would drop below .05 and the new processing time would be significantly better than the goal of 31.25 seconds.