127 #3.11, 3.12, 3.13, 3.16

Question 3.11

1. A black text on a white background

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2. If we set α=0.05, we can see by the p-value of 0.000 in the table below that there is a statistically significant relationship between our regressor variables and our predictor variable.

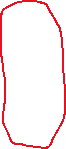
A table of numbers and letters

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1. Again, if we set α=0.05, we can see by the given t-values and p-values in the coefficient table below that ‘Pressure (bars)’, ‘Moisture (% by weight)’, and ‘Flow Rate (L/min)’ have a p-value greater that 0.05. This would suggest that these variables are not contributing to the model in a significant way. On the other hand, ‘Temp. (C)’ and ‘Particle Size (mm)’ have p-values of < 0.05. This suggests that these variables are contributing to the model in a significant way.

A table of numbers with text

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1. From the below photo, we can see that R-sq=93.72% and R-sq(adj)=90.58% for our original multiple linear regression model.

A close-up of a number

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From the below photo, we can see that R-sq=91.49% and R-sq(adj)=90.18% for the model relating yield to temperature and particle size.

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This is surprising, because we removed all of the variables that were not statistically significant to the model. But then we got a lower R-sq and R-sq(adj) value for our model.

1. **Model 1:**  
   Found critical t-value from t-table using degrees of freedom n-k-1=16-5-1=10. Critical t-value=2.228.   
   Margin of Error = Critical t-Value \* SE Coef for 'Temp. (°C)' = 2.228\*0.0576=0.1283328.

Confidence Interval = Coef for 'Temp. (°C)' ± Margin of Error=0.2821±0.1283328=(0.1537672,0.4104328).

**Model 2:**

Found critical t-value from t-table using degrees of freedom n-k-1=16-2-1=13. Critical t-value=2.160

Margin of Error = Critical t-Value \* SE Coef for 'Temp. (°C)' = 2.160\*0.0588=0.127008

Confidence Interval = Coef for 'Temp. (°C)' ± Margin of Error =0.2821±0.127008=(0.155092,0.409108).

In the first model, we are 95% confident that the true population parameter (the coefficient for 'Temp. (°C)') falls within the interval (0.1537672,0.4104328). In the second model, we are 95% confident that the true population parameter (the coefficient for 'Temp. (°C)') falls within the interval (0.155092,0.409108). The confidence interval got narrower in the second model.