Practice Lab for Test #1

Consider again the simple linear regression of $y=\%\text{WhoGrad}$ on $x=\text{CSAT}$ in the MASSCOLL.MTW data set. Reproduce and be sure you are familiar with the following output.

**Descriptive Statistics: %WhoGrad, CSAT**

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>N*</th>
<th>Mean</th>
<th>SE Mean</th>
<th>StDev</th>
<th>Minimum</th>
<th>Q1</th>
<th>Median</th>
<th>Q3</th>
</tr>
</thead>
<tbody>
<tr>
<td>%WhoGrad</td>
<td>52</td>
<td>4</td>
<td>72.38</td>
<td>2.39</td>
<td>17.26</td>
<td>38.00</td>
<td>58.25</td>
<td>73.00</td>
<td>85.50</td>
</tr>
<tr>
<td>CSAT</td>
<td>53</td>
<td>3</td>
<td>1001.4</td>
<td>23.1</td>
<td>168.5</td>
<td>764.0</td>
<td>877.5</td>
<td>951.0</td>
<td>1135.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variable</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>%WhoGrad</td>
<td>100.00</td>
</tr>
<tr>
<td>CSAT</td>
<td>1400.0</td>
</tr>
</tbody>
</table>

**Correlations: %WhoGrad, CSAT**

Pearson correlation of %WhoGrad and CSAT = 0.704

**Regression Analysis: %WhoGrad versus CSAT**

The regression equation is

$$\%\text{WhoGrad} = 2.4 + 0.0700 \times \text{CSAT}$$

49 cases used, 7 cases contain missing values

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Coef</th>
<th>SE Coef</th>
<th>T</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>2.39</td>
<td>10.62</td>
<td>0.22</td>
<td>0.823</td>
</tr>
<tr>
<td>CSAT</td>
<td>0.07005</td>
<td>0.01032</td>
<td>6.79</td>
<td>0.000</td>
</tr>
</tbody>
</table>

$S = 11.9236$  $R-$Sq = 49.5%  $R-$Sq(adj) = 48.4%

**Analysis of Variance**

<table>
<thead>
<tr>
<th>Source</th>
<th>DF</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>1</td>
<td>6548.1</td>
<td>6548.1</td>
<td>46.06</td>
<td>0.000</td>
</tr>
<tr>
<td>Residual Error</td>
<td>47</td>
<td>6682.1</td>
<td>142.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>48</td>
<td>13230.2</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Make sure you can answer the following questions:

What are the least square estimates for the intercept and slope of the regression line?

Assuming normality of errors, what are the construct a 95% confidence intervals for slope and intercept?

Assuming normality of the errors, how do you test whether the slope in the regression is significantly different from zero?

What is the share of the overall variability in the response that is explained by the regression?

What do the quantities in the ANOVA table represent?

Consider the plot of residuals versus predictor:
Is there visual evidence that the relationship between mean response and predictor is non-linear?
Is there visual evidence that the error variance is not constant?
Is there visual evidence of outliers?

Construct a point estimate for the mean response, a 95% Confidence Interval for the mean response, and a 95% prediction interval for the response, when the CSAT score is 1200.

Make sure you are able to answer these questions based on information in the main Minitab output, as presented above.