Interpreting Minitab (computer) printouts

Does the weight of a bar of soap follow a linear pattern over time?

We estimate the model using least square method. The computation from the minitab is as follows:

```
The regression equation is
Weight = 123 - 5.57 Day
```

Interpretation: the line intersects y axis at 123 with a slope of -5.57. that is on the day=0, weight is 123gm and for each increase in a day, the weight of the soap decreases on the average by 5.57 grams.

```
Predictor     Coef  SE Coef       T      P
Constant   123.141    1.382   89.09  0.000
Day        -5.5748   0.1068  -52.19  0.000
```

Interpretation: the sample estimates of y-intercept (alpha) and slope (beta) are 123.141 and -5.57 respectively. The corresponding test statistics are 89.09 and -52.10 indicating that these are too large values of t-statististics and lie on the extreme ends of t-curve. Thus we reject the null hypothesis of alpha =o and beta=o. And conclude that the beta and alpha play a significant role in the regression model.

```
S = 2.94921   R-Sq = 99.5%   R-Sq(adj) = 99.5%
```

Interpretation: the standard deviation of the error terms is 2.94. A 99.5%. R-sqadj indicates that whenever we observe a variation in the value of y, 99.5% of it is due to the model (or due to change in x) and only .5% is due error or some unexplained factor. That is this data fits well to the linear model.

```
Analysis of Variance

Source          DF     SS     MS        F      P
Regression       1  23694  23694  2724.11  0.000
Residual Error  13    113      9
Total           14  23807
```

Interpretation: In this case ANOVA tests the hypothesis that beta=0. In fact F is nothing but T-square. A low p-value suggest that beta plays a significant role in the model, this is just reassurance of the t-test.

```
Unusual Observations

Obs   Day  Weight     Fit  SE Fit  Residual  St Resid
 10  12.0  50.000  56.244   0.772    -6.244    -2.19R
 15  22.0   6.000   0.496   1.418     5.504     2.13R

R denotes an observation with a large standardized residual.
```

Interpretation: the observation number 10 and number 15 are outliers. We need to go back and review what happened on those days, either soap is used too much or too less. To improve the model, we would like to delete those observations and recompute the line.

The following is from the book:

The following example looks at Blood Alcohol Content (y) after x number of beers

Regression Analysis: BAC versus Beers

```
The regression equation is
BAC = - 0.0127 + 0.0180 Beers
```

b_0 b_1

Standard error of β_1 **Test stat. for test H_0: β_1=0**

```
Predictor      Coef   SE Coef      T      P
Constant   -0.01270   0.01264  -1.00  0.332
Beers      0.017964  0.002402   7.48  0.000
```

P-value for test H_0: β_1=0

```
S = 0.0204410   R-Sq = 80.0%   R-Sq(adj) = 78.6%
```

Estimate of σ
SD of Y for fixed X

r^2=SSM/SST

```
Analysis of Variance

Source          DF        SS        MS      F      P
Regression       1  0.023375  0.023375  55.94  0.000
Residual Error  14  0.005850  0.000418
Total           15  0.029225
```

Degrees of Freedom for CI's and Significance Tests (n-2)

SSM **s^2 or MSE** **$t^2=(7.48)^2=F$**

SSE

SST

Estimates the variation in the estimated mean response for a given set of predictor values. The smaller, the more precise.

```
Obs  Beers      BAC      Fit   SE Fit  Residual  St Resid
  1   5.00  0.10000  0.07712  0.00513   0.02288      1.16
  2   2.00  0.03000  0.02323  0.00847   0.00677      0.36
  3   9.00  0.19000  0.14897  0.01128   0.04103      2.41R
  .
  .
 16   4.00  0.05000  0.05915  0.00547  -0.00915     -0.46

R denotes an observation with a large standardized residual.
```

x **y** **y** **y-y**

```
Predicted Values for New Observations

New
Obs     Fit   SE Fit        95% CI              95% PI
  1  0.05915  0.00547  (0.04742, 0.07089)  (0.01377, 0.10454)


Values of Predictors for New Observations

New
Obs  Beers
  1   4.00
```