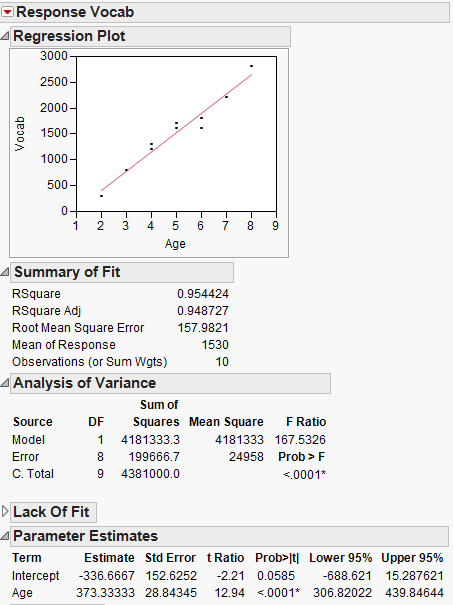
**Regression Output**



**Calculate**

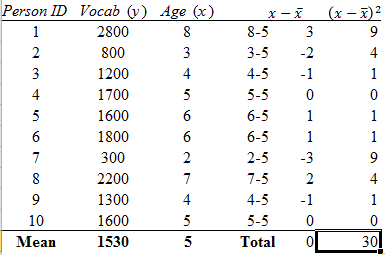
Recall that

First, let’s calculate the numerator, *s*:

Here, SSE = 199666.7 and n = 10.

Now, let’s calculate the denominator.

Looking at the data, .



Then, =5.47723.

So,

Compare with JMP output:



Let’s do the same thing for . Recall that

We can use the information above to plug it into the formula:

Compare with JMP Output:



**Hypothesis Testing for**

Recall that and are sample statistics which are point estimators of the true (and unknown) population parameters and , respectively. Because and are statistics, they have sampling distributions, and it is known that the quantity

has a t-distribution with *n – 2* degrees of freedom.

When is true and , the formula for *T* above reduces to

Specifically, for ,

And for ,

In our case,

The p-value corresponding to with *n – 2* = 8degrees of freedom and *α* = 0.05 may be obtained from Excel by entering: *=TDIST(ABS(-2.21),8,2)*. The resulting p-value is 0.0581. Compare these results ( and p-value) with the corresponding results from JMP:



Ultimately, we are *not* able to reject for because p-value > α = 0.05.

Said differently, *p* = 0.0585 is the probability of having a sample where is at least units, or *words*, away from 0 when the true value of in the population is 0. That is, it seems that (because of the large standard error) it’s not that unlikely to get such a value of when = 0.

Similarly,

The p-value corresponding to with *n – 2* = 8degrees of freedom and *α* = 0.05 may be obtained from Excel by entering: *=TDIST(12.94,8,2)*. The resulting p-value is 0.0000012. Compare these results ( and p-value) with the corresponding results from JMP:



Ultimately, we are able to reject for because p-value < α = 0.05.

Said differently, *p* = 0.0000012 is the probability of having a sample where is at least when the true value of in the population is 0. In the context of this problem, age is a statistically significant predictor of vocabulary in children.

**Confidence Intervals for**

We can also calculate the 95% confidence intervals for and .

For a 95% confidence interval, the formula is

Specifically, for , the 95% CI is:

And for , the 95% CI is:

For our sample, (where in our case *n* = 10),may be computed with the Excel formula *=TINV(0.05,8)* = 2.306.

Plugging in all the values into the formula, the confidence intervals we get for and are, respectively,

Check the corresponding results in JMP:



Confidence intervals give plausible values for and . That is, we’re 95% confident that is between 306.82 and 439.85. Because 0 is not part of the interval, it’s not a likely value for . This is not surprising, because we rejected for at *α* = 0.05.

Furthermore, we are 95% confident that is between -688.621 and 15.288. Because 0 *is* part of the interval, it is a plausible value for . This is not surprising, because we failed to reject for at *α* = 0.05.