# MOD 10 GRAPHING CALCULATOR DIRECTIONS

**Find the Standard Error $S_e = \sqrt{\frac{\text{SSE}}{n-2}}$**

*Enter the data into the STAT LIST editor* for the independent variable (a.k.a. the explanatory variable $x$) in L1 and the corresponding data for the dependent variable (a.k.a. the response variable $y$) in L2. (See the Mod 12 Graphing Calculator Directions to review how to do this.)

Find the *least squares regression line* for the $x$ data entered in L1 and the $y$ entered in L2. (See the Mod 12 Graphing Calculator Directions to review how to do this.)

For the remainder of these directions, we'll use the Starbucks data and pretend that the least squares regression line is $y = -1106 + 488x$. But of course, you will use other data, so this will not be your regression line. In which case, you would not use the *slope* $= 488$. Instead you would use the slope from the regression line you found above. And in place of the *y-intercept* $= -1106$, you will use the y-intercept from the regression line you found above. But for this example we'll use $y = -1106 + 488x$.

To populate L3 with the *predicted values* from your regression line, go to list L3 and scroll up until L3 is highlighted at the top. Now we need to enter the right-hand side of the equation $y = -1106 + 488x$, but we need to remember that the $x$ data is in L1. So, with L3 highlighted, we type $-1106 + 488 * \text{L1}$ (to access L1, press the **2nd** button and then the number 1). At the bottom of the screen you should see the following.

$$\text{L3} = -1106 + 488 * \text{L1}$$

Press **ENTER**.

Here is a summary of what we should have in our lists right now.

| L1 | L2 | L3 | L4 | L5 |
|---|---|---|---|---|
| Values of $x$. | The **observed** values of $y$. | The **predicted** values of $y$. | | |

O.K. Now it's time to populate L4 with the predicted errors (a.k.a. the residuals). We calculate the errors with the following formula.

$$error = observed\ y - predicted\ y$$

Since the observed values of $y$ are in L2, and the predicated values of $y$ are in L3, we just need to enter L2 – L3 as our formula for L4. Go to the L4 list and scroll up until L4 is highlighted.

To enter L2, press the **2nd** button and then press the number 2. Now we need to subtract, so press the **subtract** button. To enter L3, press the **2nd** button and then press the number 3. At the bottom of the screen you should see the following.

$$L4 = L2 - L3$$

Press **ENTER**.

Here is an updated summary of what we should have in our lists right now.

| L1 | L2 | L3 | L4 | L5 |
|---|---|---|---|---|
| Values of $x$. | The **observed** values of $y$. | The **predicted** values of $y$. | The predicted **errors** (a.k.a. the residuals). | |

O.K. Now it's time to populate L5 with the "squared errors" (also known as the "SE"). Since the errors are stored in L4, we just need to enter $L4^2$ as the formula for L5. Go to L5 and scroll up until L5 is highlighted. To enter L4, press the **2nd** button and then press the number 2. Now press the **^** button followed by the number 2. At the bottom of the screen you should see the following.

$$L5 = L4^2$$

Press **ENTER**.

Whew! The *squared errors* (a.k.a. the SE) are now in L5. Here is a summary of what we have in our lists right now.

| L1 | L2 | L3 | L4 | L5 |
|---|---|---|---|---|
| Values of $x$. | The **observed** values of $y$. | The **predicted** values of $y$. | The predicted **errors** (a.k.a. the residuals). | The **SE**, i.e. the *squared errors*. |

O.K. the formula the standard error is $S_e = \sqrt{\frac{\text{SSE}}{n-2}}$. Did you notice the additional S before SE in the formula? That S stands for "sum". So we need to "sum" the SE.

But the SE are stored in L5, so we need to return to our home screen and sum(L5).

To return to the home screen, we need to "quit" the current screen. Press the **2nd** button and then press the **MODE** button right next to the 2nd button.

The "sum" function is in the *catalog*. To access the catalog, press the **2nd** button, and then press the number 0. Scroll until you find *sum* (not *summation*). With the arrow pointing at *sum* press **ENTER**.

You should see the following on your screen.

sum(

Enter L5 by typing the **2nd** button followed by the number 5. Close the parentheses by pressing the **)** button. Press **ENTER**.

The number on your screen is the SSE part of the formula $S_e = \sqrt{\frac{\text{SSE}}{n-2}}$. You are now ready to divide by $n - 2$ and then take the square root.