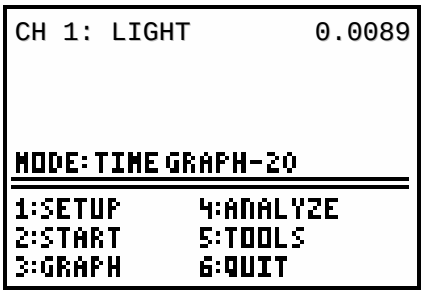
Using the CBL2 and Light Probe to Collect Data

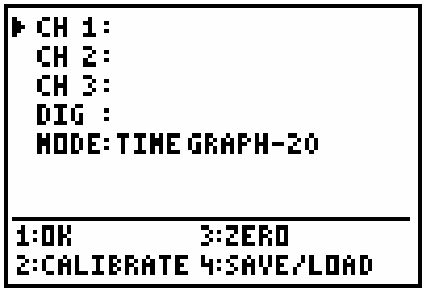
1. Plug the light sensor into a Channel port of your CBL2. Run a data collection program, such as the DataMate App. Press [APPS], then use [▼] to scroll down to DataMate.

   The DataMate program will automatically recognize the light sensor. The number in the top right corner is the reading of light intensity in milliwatts per square centimeter.

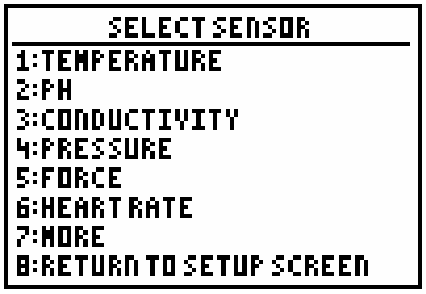
2. If DataMate does not automatically recognize the light sensor, then select option 1: SETUP by pressing [1].

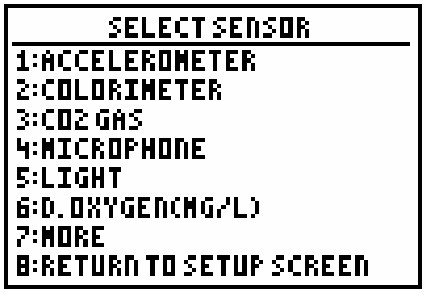


3. Select the Channel port into which you plugged the light sensor. Press [▲] or [▼] so that the arrow is next to the appropriate Channel. Press [ENTER].

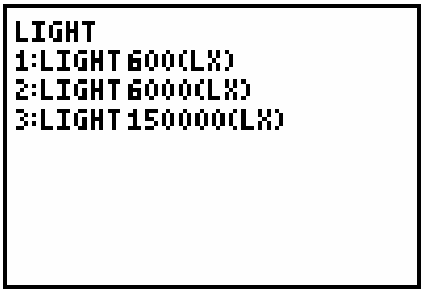


4. Look for the `LIGHT` sensor. If you do not see it on the current screen, select `7: MORE` by pressing [7]. When you see `LIGHT` listed, select `5: LIGHT` by pressing [5].

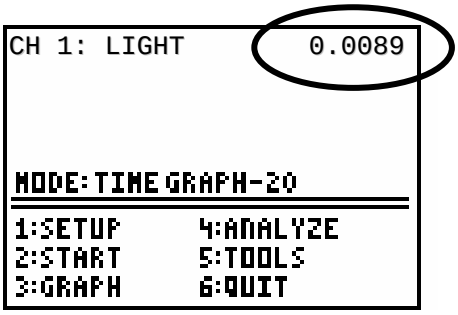




5. Select the light probe that you are using by pressing 1, 2, or 3. You will be returned to the main screen.



6. Read the light intensity (in milliwatts per square centimeter) by observing the number in the top-right corner of the screen.

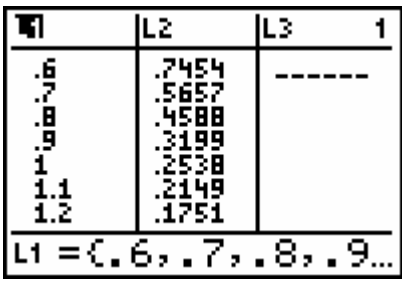


7. To collect the next data point, move the light probe away from the light source, then read the intensity. Continue until you have collected the necessary data.

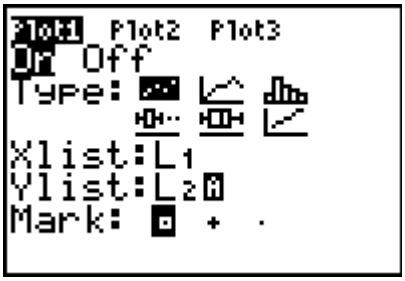
8. Press 6 to return to the home screen.

Generating a Scatterplot Using a Graphing Calculator

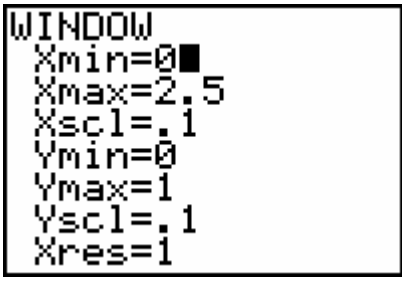
1. Enter data into the [STAT] lists.



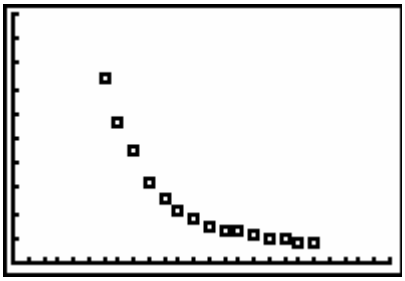
2. Turn on the [STAT PLOT] by pressing [2nd][Y=]. Select the necessary options. In this case, choose a scatterplot with independent variable in [L1] and dependent variable in [L2].



3. Choose an appropriate window by pressing [WINDOW] and specifying the appropriate domain and range. Use [▲][▼] to move up and down the list. Type the desired value then press [ENTER].

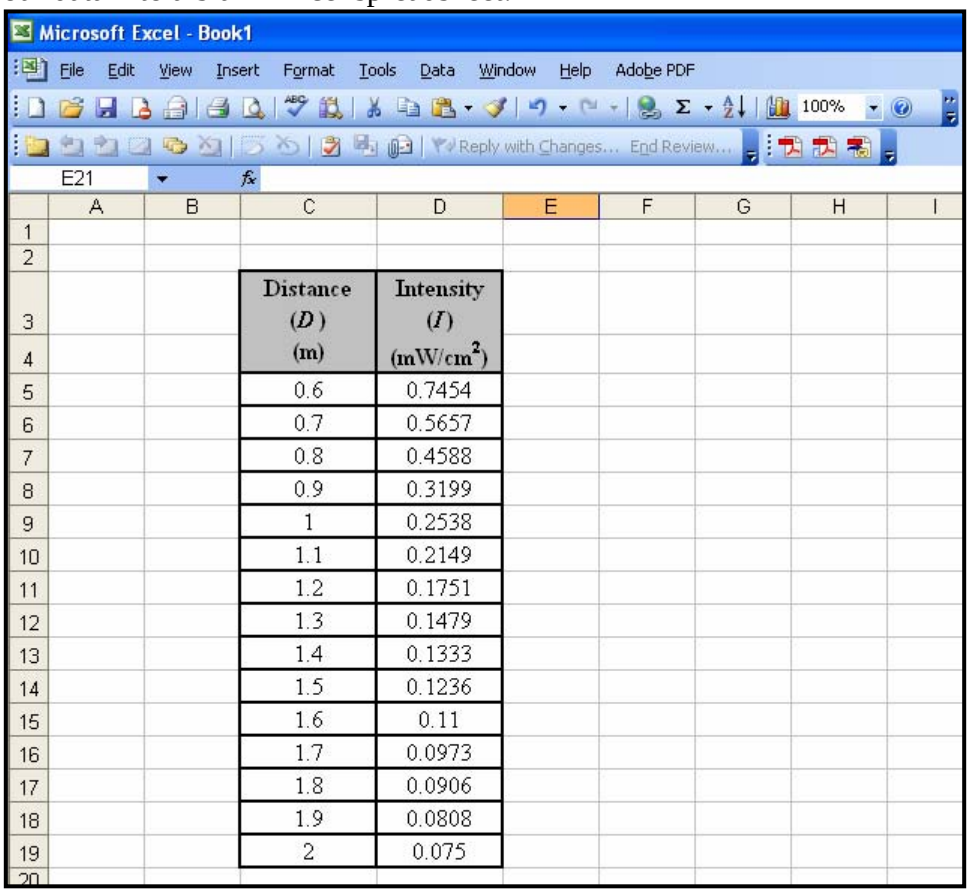


4. To view the graph, select [GRAPH].



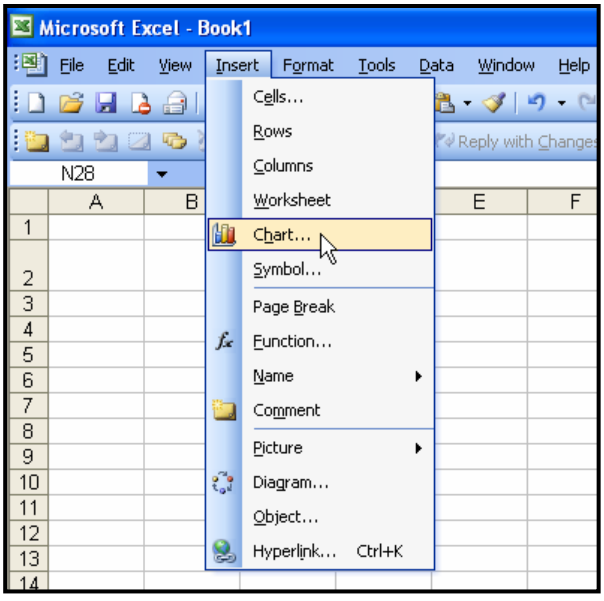
Generating a Scatterplot Using Microsoft Excel

1. Enter your data into a blank Excel spreadsheet.

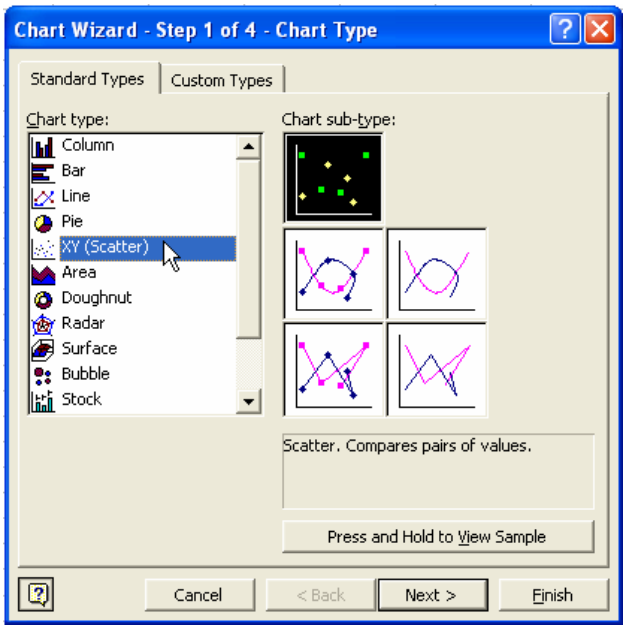


Distance (D) (m)	Intensity (I) (mW/cm^2)
0.6	0.7454
0.7	0.5657
0.8	0.4588
0.9	0.3199
1	0.2538
1.1	0.2149
1.2	0.1751
1.3	0.1479
1.4	0.1333
1.5	0.1236
1.6	0.11
1.7	0.0973
1.8	0.0906
1.9	0.0808
2	0.075

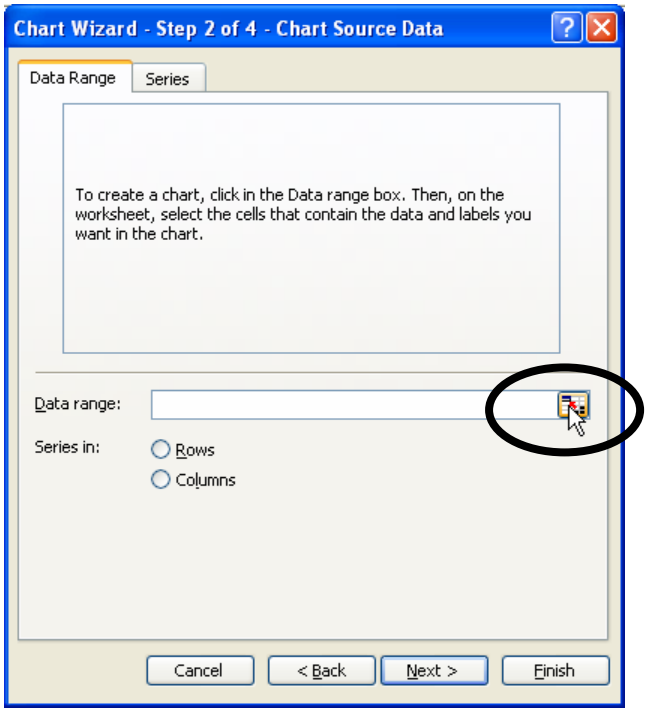
2. Choose **Chart** from the **Insert** menu.



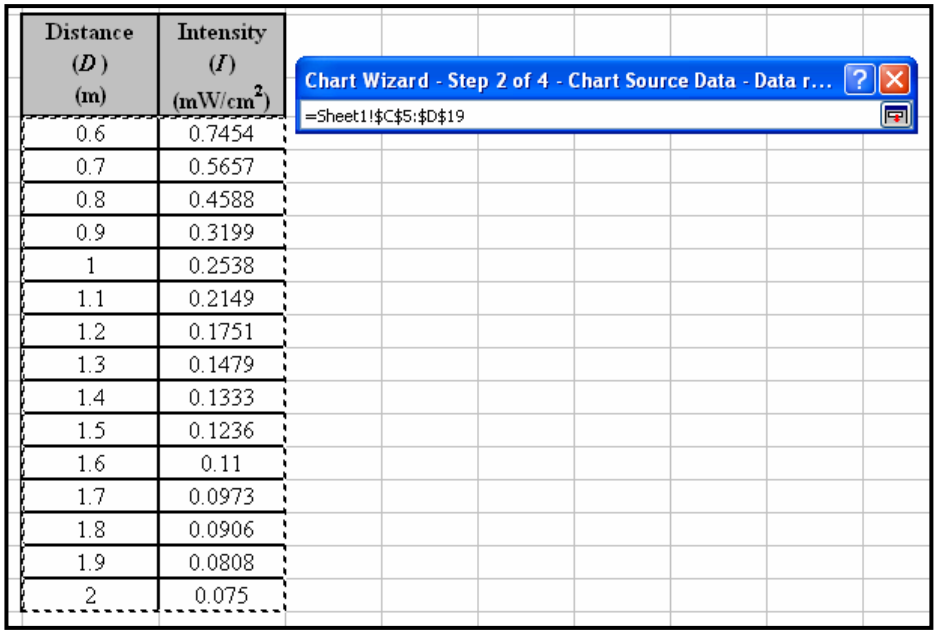
3. Select **XY (Scatter)** from the **Chart Type** selection box then click **Next**.



4. To select the Data Range, click the **Collapse Dialog** button next to the **Data Range** text box.



5. Select the cells containing your data then click the **Collapse Dialog** button next to the floating **Chart Source Data** box. You will return to the **Chart Wizard** dialog box.



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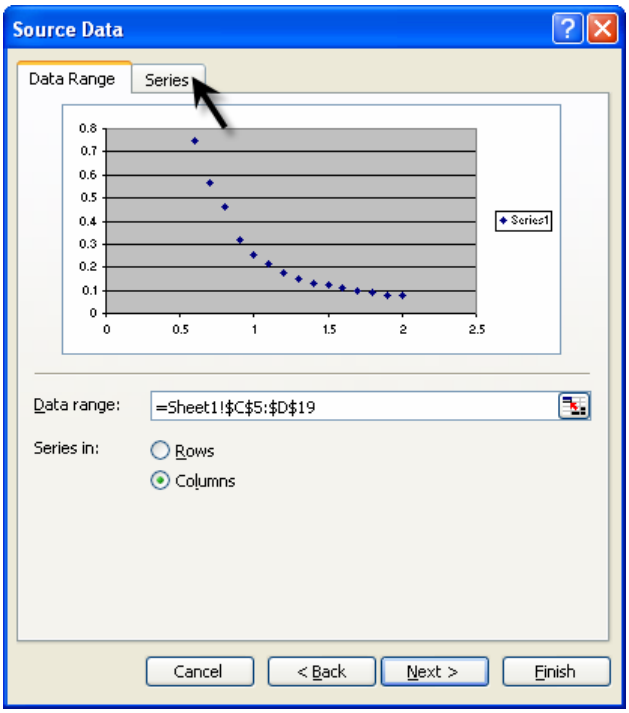
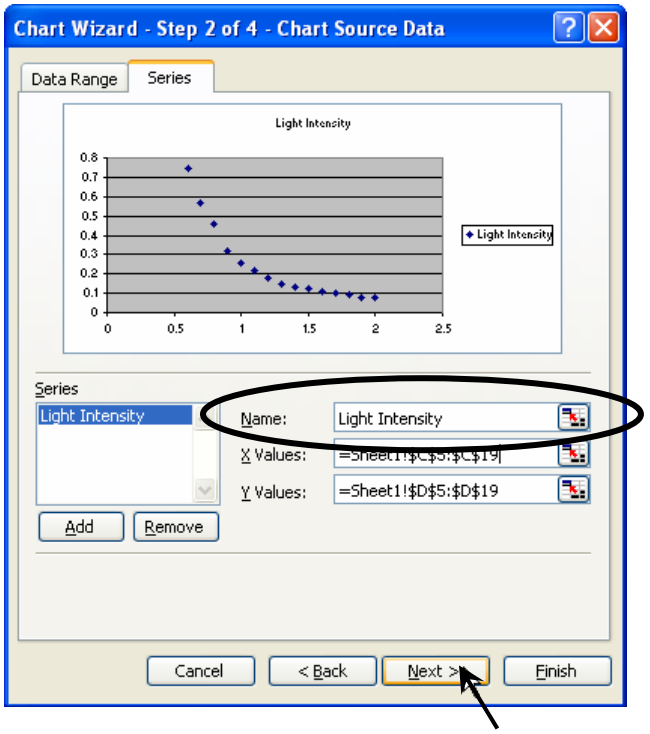
1.4	0.1333
1.5	0.1236
1.6	0.11
1.7	0.0973
1.8	0.0906
1.9	0.0808
2	0.075

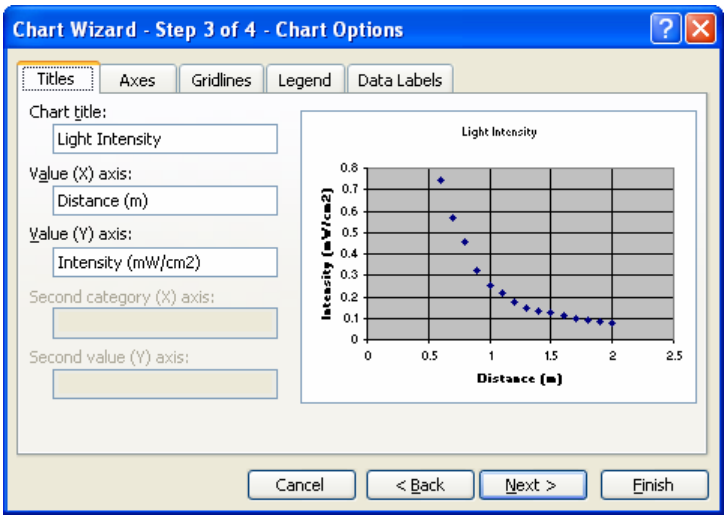
6. Click the **Series** tab to edit the source data features.



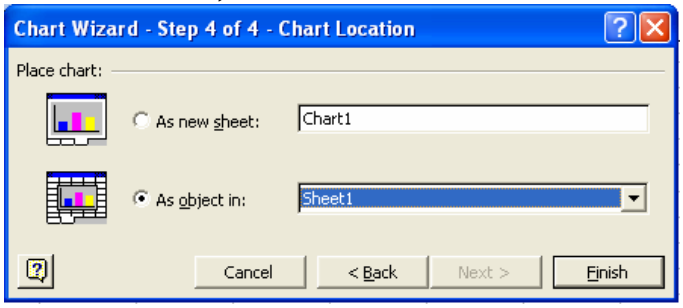
7. Give "Series 1" an appropriate name. Click inside the **Name** text box and type an appropriate name. In this example, we will use "Leg Length." Click **Next**.

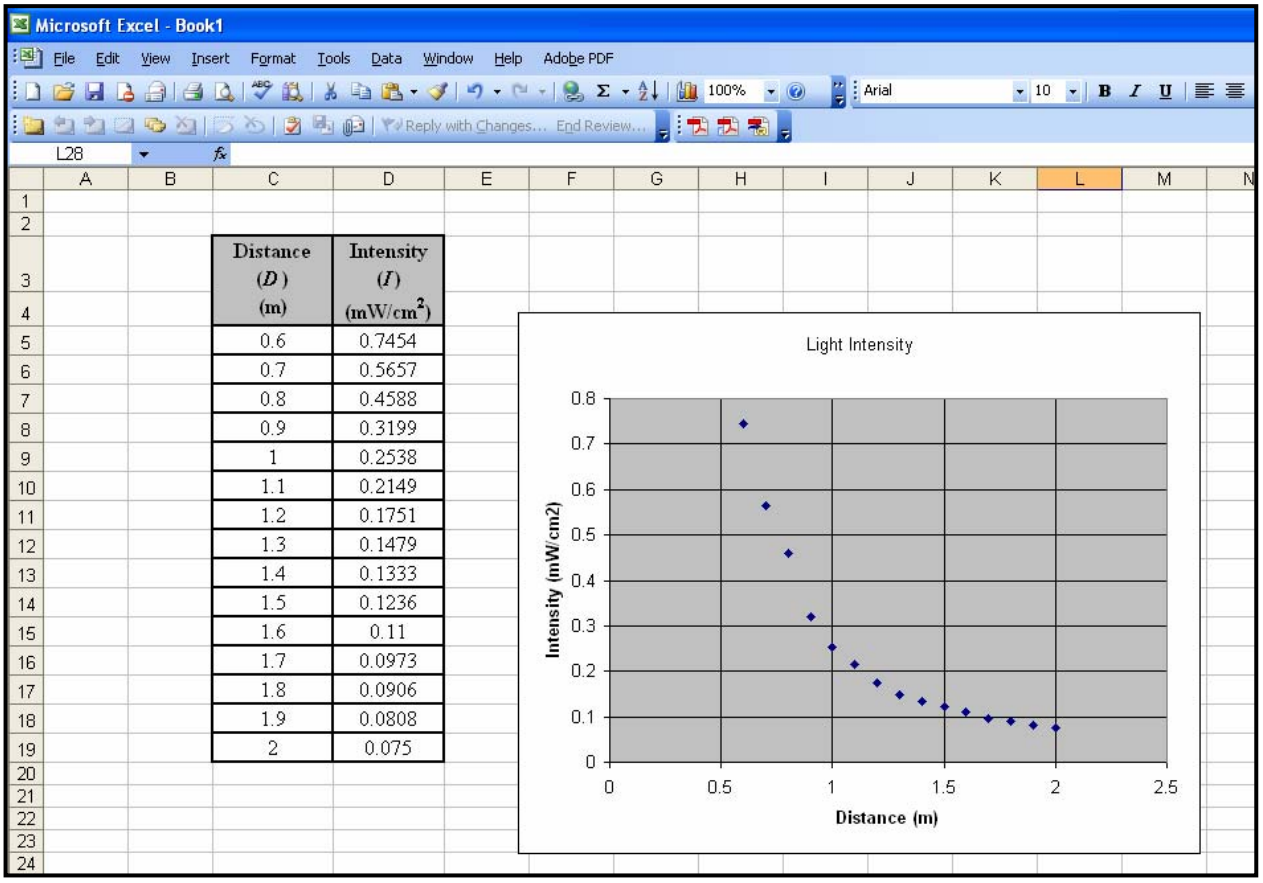


8. At this point you can customize the chart options, including the **Chart title**, **Value (*x*) axis**, and **Value (*y*) axis** labels. Enter the pertinent **Chart Options**, including appropriate labels for the x-axis and y-axis. You can also customize the axes, gridlines, legend, and data labels by clicking on the appropriate tab at the top of the dialog box. Click **Next** when you are ready to continue.



9. Select the location of the new chart, then click **Finish**.





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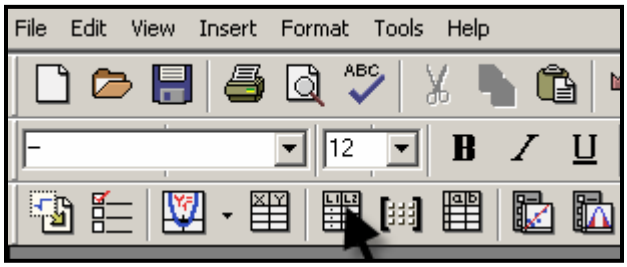
1.6	0.11
1.7	0.0973
1.8	0.0906
1.9	0.0808
2	0.075

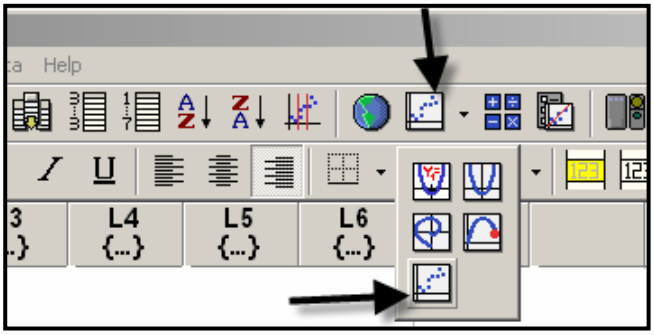
Generating a Scatterplot Using TI-Interactive

1. Open a new TI-Interactive document.

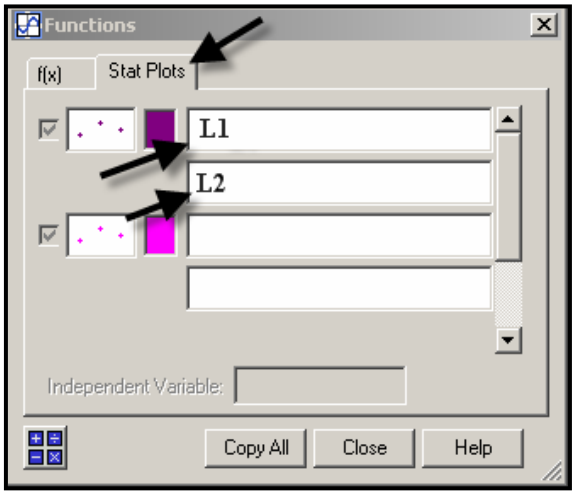
2. Select the list icon  from the scroll bar to activate the **DATA EDITOR**.



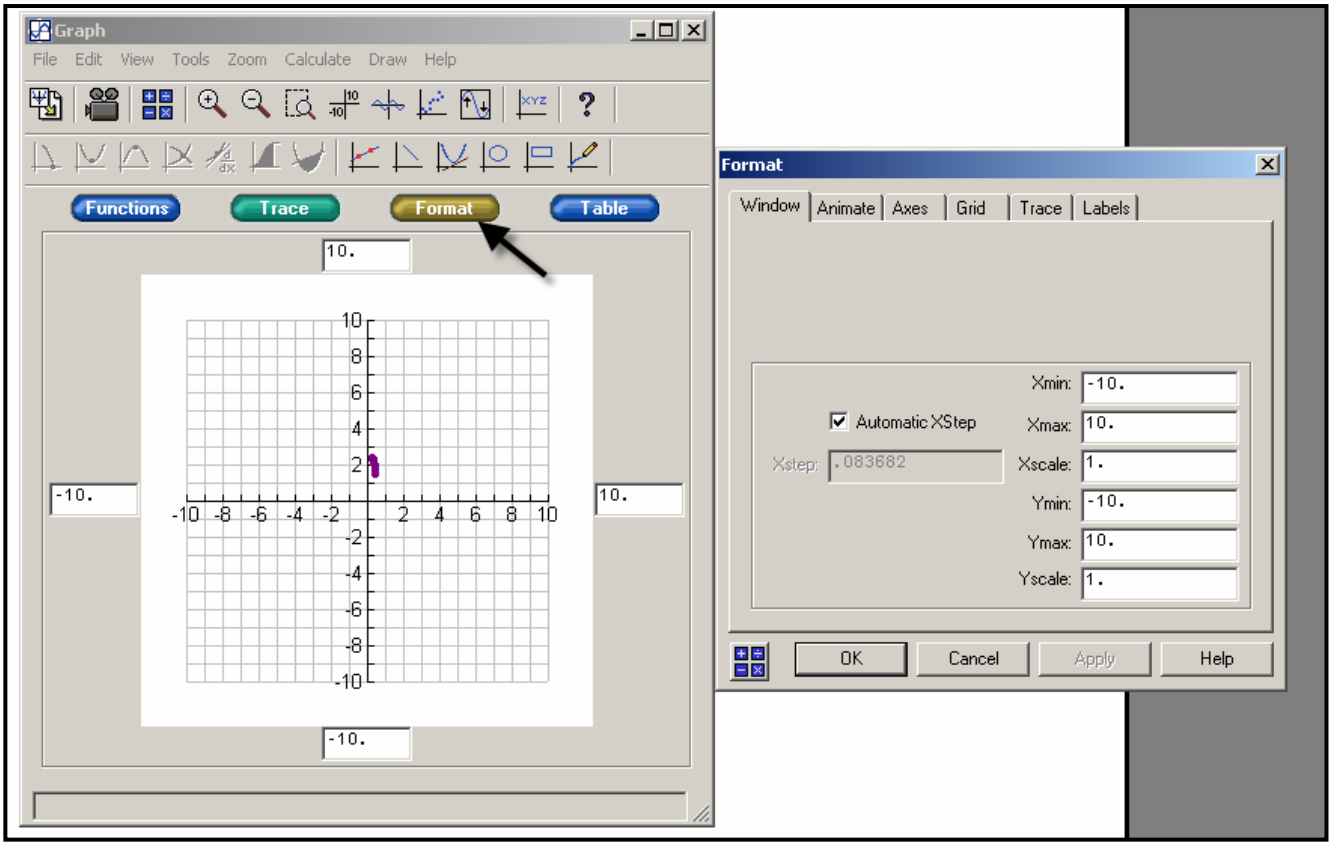
3. Create a scatterplot. Select the scatterplot icon  from the **DATA EDITOR** toolbar and from the drop down menu.



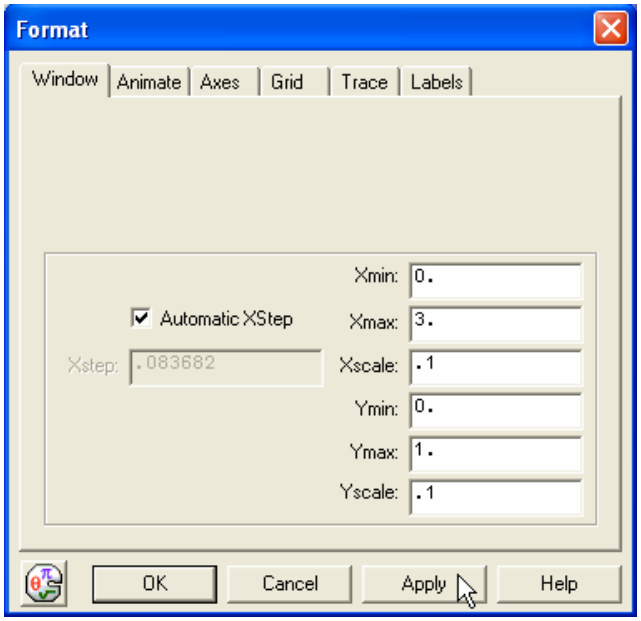
4. Click on the **STAT PLOTS** tab then enter the list names that contain the data, independent variable first and dependent variable second.



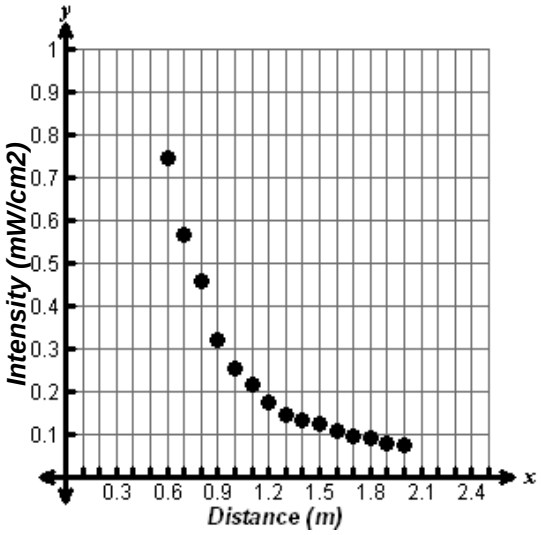
5. Set an appropriate window and label the axes by clicking the **FORMAT** button. In the **Window** tab, enter the appropriate domain and range for the function.



6. After entering the *Xmin*, *Xmax*, *Xscale*, *Ymin*, *Ymax*, and *Yscale*, click the **APPLY** button.



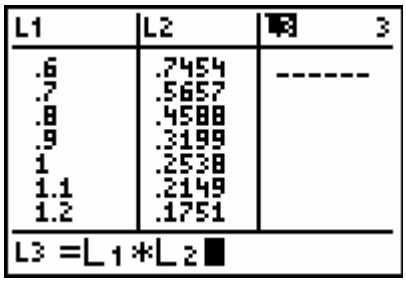
7. The scatterplot should be displayed with the specified domain and range.



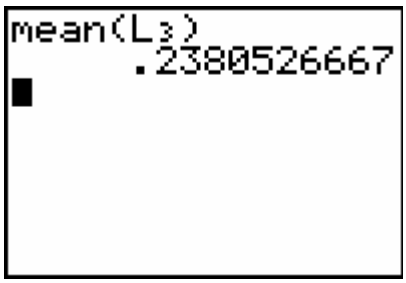
Determining a Function Rule Using a Graphing Calculator

1. The graph appears to be an inverse variation function, $y = \frac{k}{x}$, so multiply *xy* to find *k*, the constant of variation.

   Go to the List Editor by pressing [STAT] [ENTER]. Use [▼] [▲] to select the List 3 header. Enter the formula [L3] = [L1] [L2] by pressing [2nd] [1] [×] [2nd] [2]. Press [ENTER].

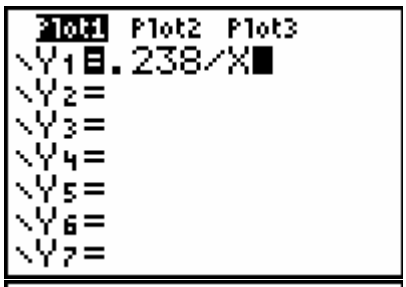


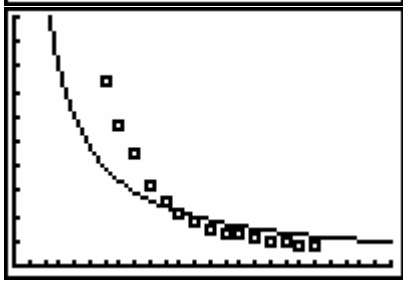
2. Find the average value of List 3 by returning to the home screen and using List operations. Press [2nd] [Y=]. Press [2nd] [STAT] [▶] [▶] [3]. Enter [L3] by pressing [2nd] [3], then press [ENTER].



3. Substitute this value of *k* into the parent function and verify using a graph.

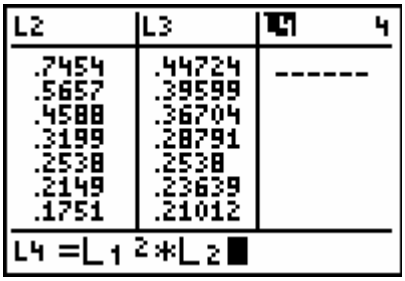
   Press [Y=] then enter the function. Press [GRAPH] to view the graph.



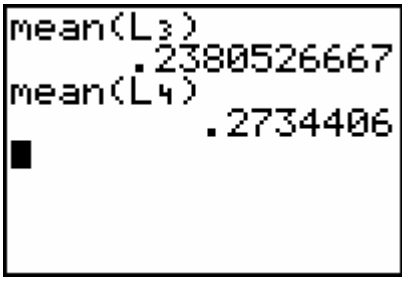


4. This function is not a good fit. Try inverse-square variation, $y = \frac{k}{x^2}$. Multiply $x^2 y$ in order to find an approximate value for *k*, the constant of variation.

   Go to the List Editor by pressing [STAT] [ENTER]. Use [▼] [▲] to select the List 4 header. Enter the formula [L4] = [L1]^2 [L2] by pressing [2nd] [1] [x^2] [×] [2nd] [2]. Press [ENTER].

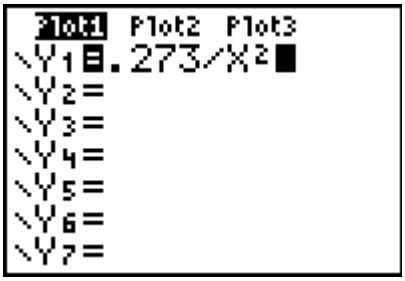


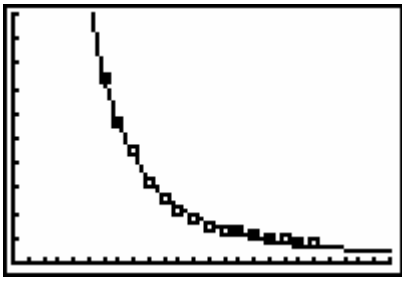
5. Find the average value of List 4 by returning to the home screen and using List operations. Press [2nd] [Y=]. Press [2nd] [STAT] [▶] [▶] [3]. Enter [L4] by pressing [2nd] [4], then press [ENTER].



6. Substitute this value of *k* into the parent function and verify using a graph.

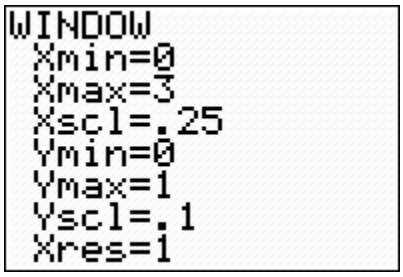
   Press [Y=], then enter the function. Press [GRAPH] to view the graph.



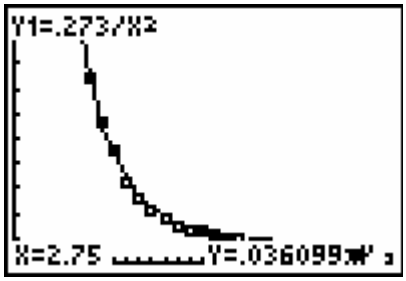


Using the Graph to Make Predictions

1. Press [WINDOW] to enlarge the window. Adjust the settings to make the window large enough to predict with.



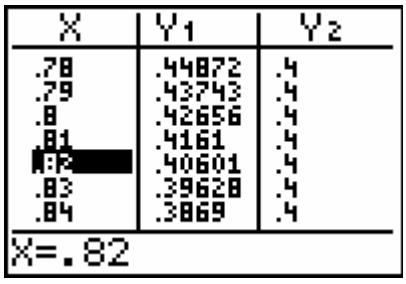
2. Press [GRAPH] then [TRACE]. Press [▲] to select the function then trace to the prediction using the right and left arrow keys, [◀][▶].



Using the Table to Make Predictions

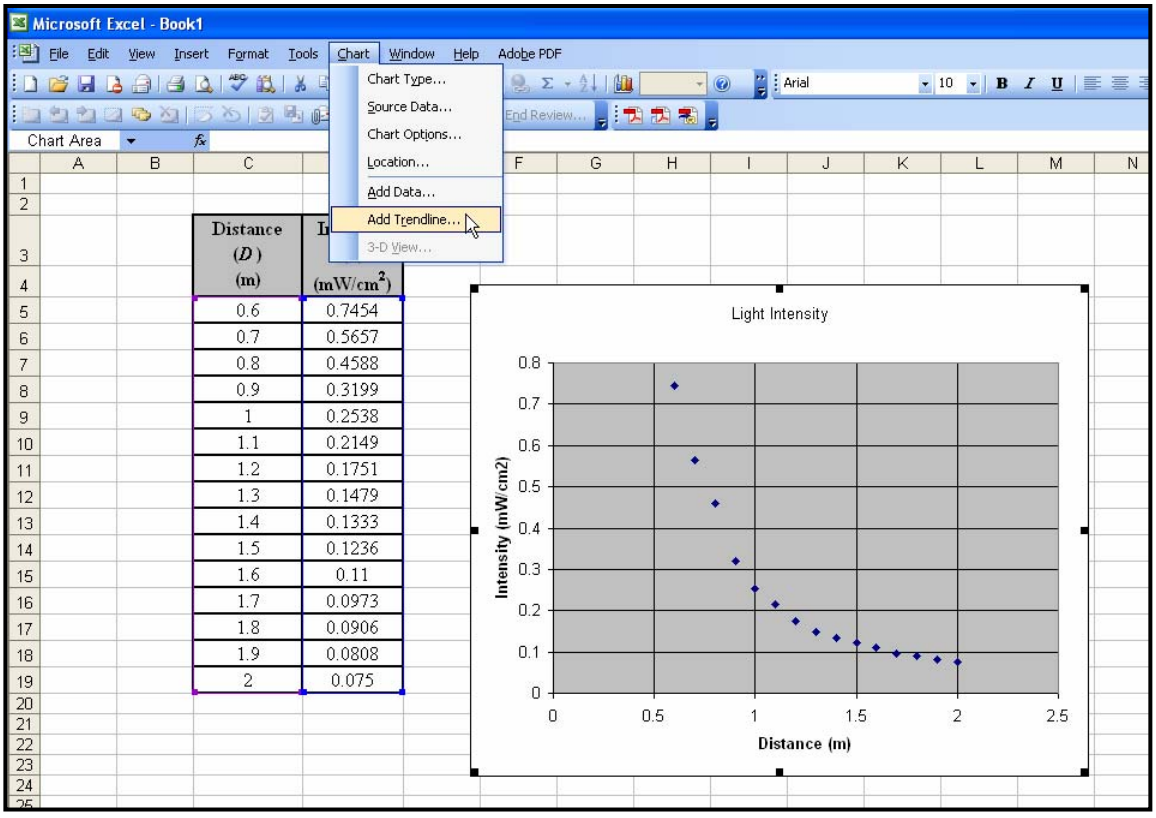
1. Press [2nd] [WINDOW]. Enter values for TblStart and ΔTbl, the value of the *x* increment.

2. Press [2nd] [GRAPH]. Use the up and down arrow keys, [▲] and [▼], to scroll to the desired value.

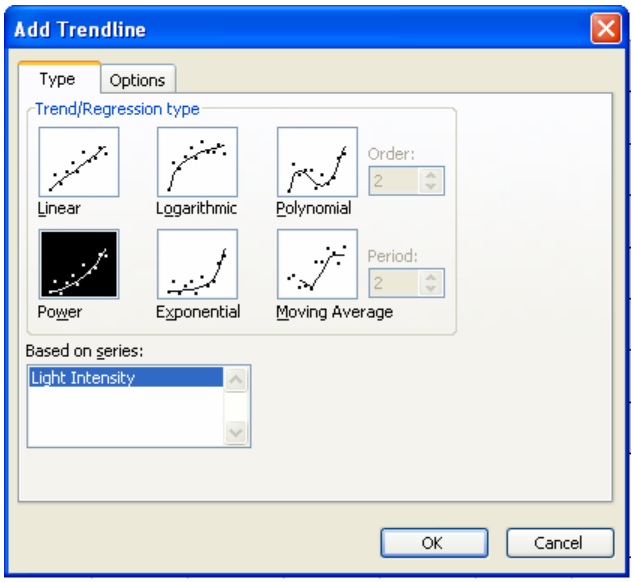


Determining a Function Rule Using Microsoft Excel

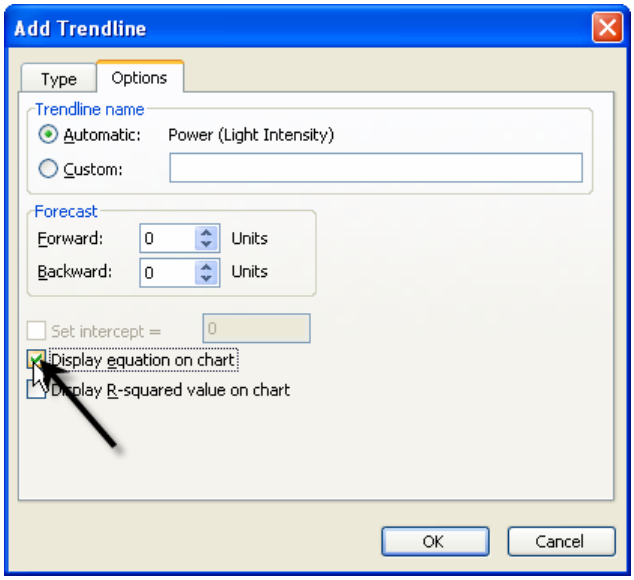
1. Click to select your chart. Choose **Add Trendline** from the **Chart** menu.



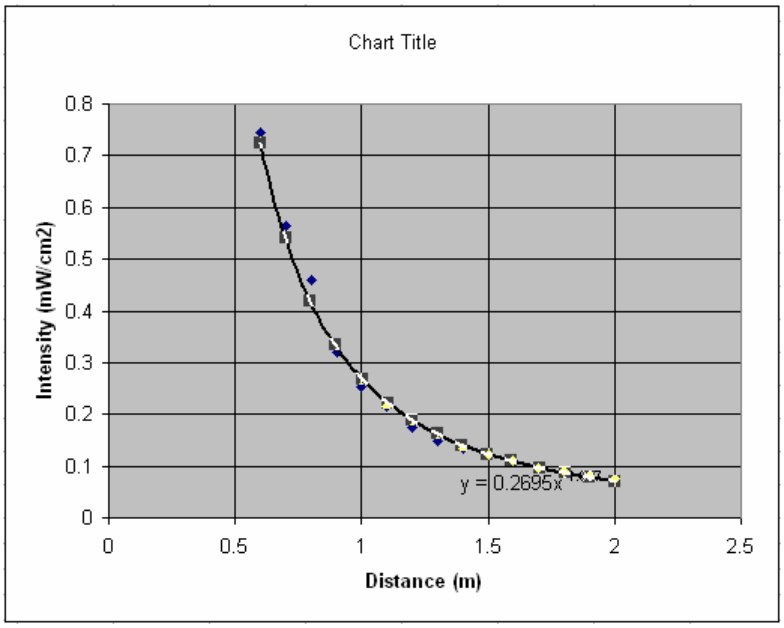
2. The **Add Trendline** dialog box will appear. Click on the **parent function** for the trendline you wish to graph. If you select **Polynomial** or **Moving Average**, be sure to select the order or period, respectively.

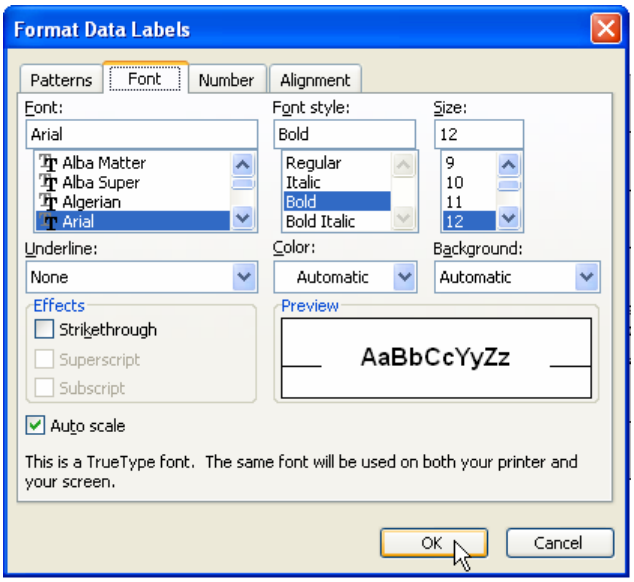


3. Click on the **Options** tab. Click on the **Display equation on chart** check box. Set any other features that you would like to customize related to your trend line. Click **OK**.



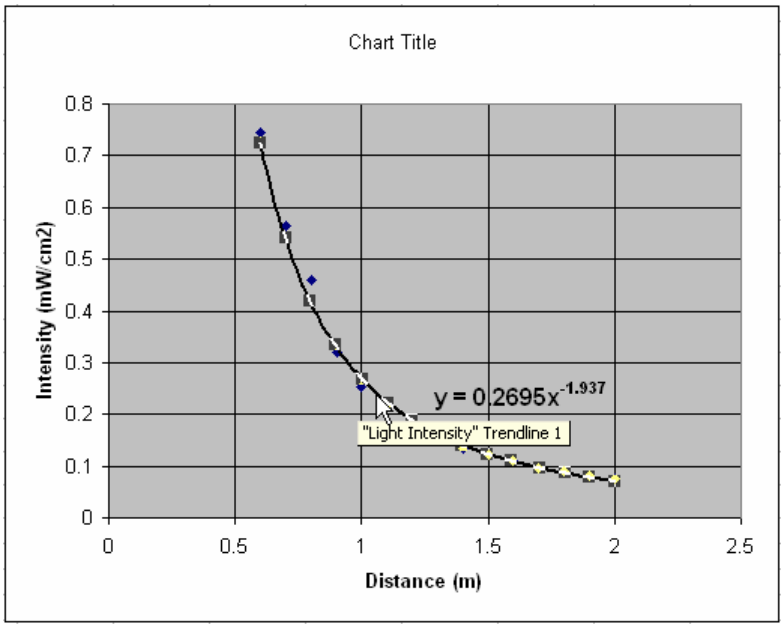
4. Customize the appearance of the equation by double-clicking on the equation. The **Format Data Labels** dialog box will appear. You can change the appearance of the equation, including font, number, and alignment. Click **OK** when you are finished.



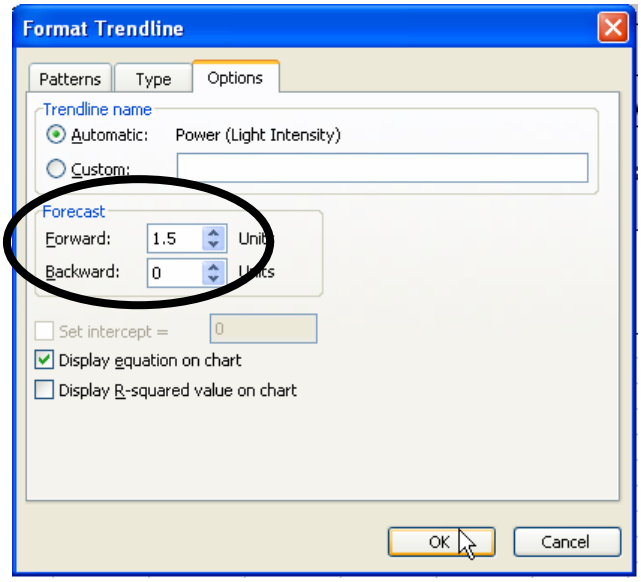


Using the Graph to Make Predictions

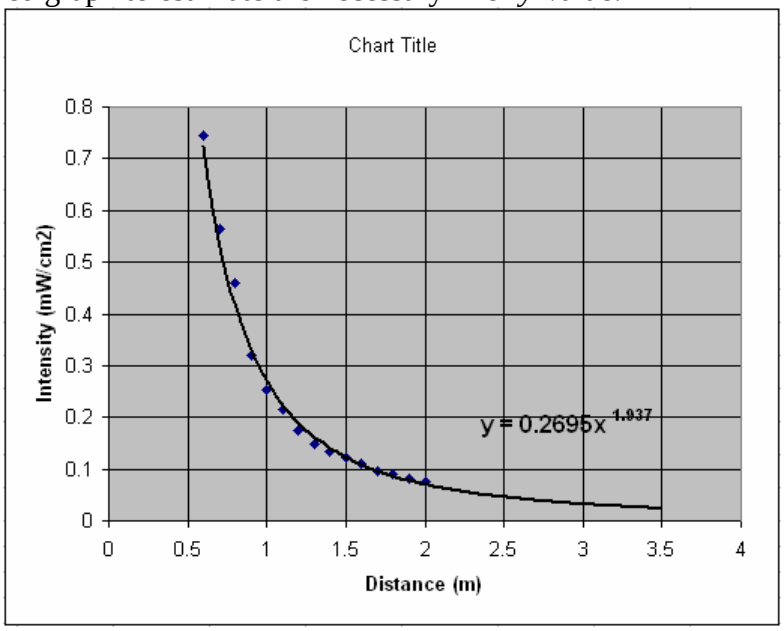
1. Double-click the trendline on your chart. The Format Trendline dialog box will appear.



2. Click the **Options** tab. In the **Forecast** text boxes, enter the number of units that you would like to extend the graph either **Forward** or **Backward** beyond your data set. Click **OK**.

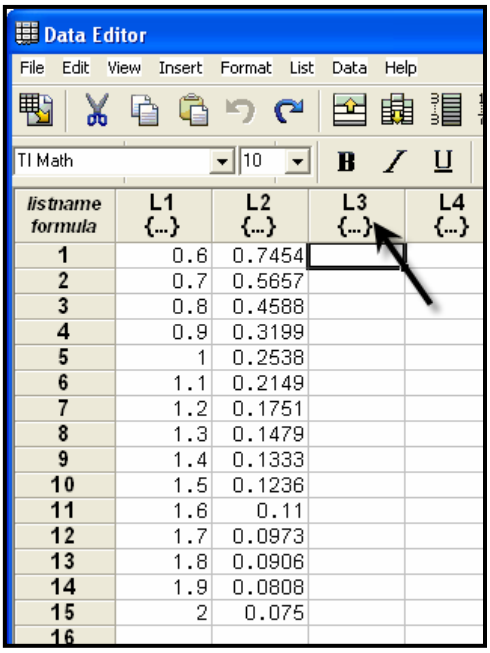


3. Use the extended graph to estimate the necessary *x*- or *y*-value.



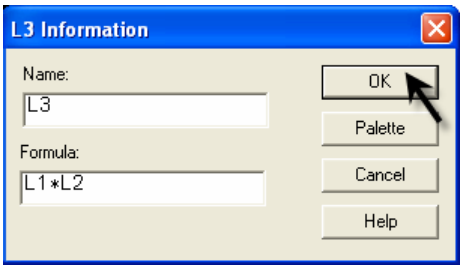
Determining a Function Rule Using TI-Interactive

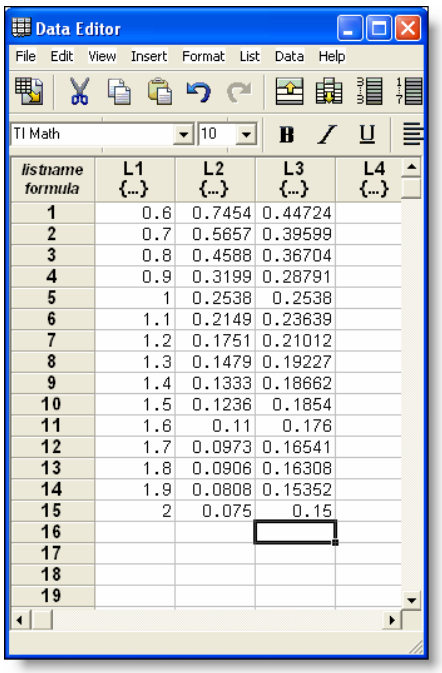
1. The graph appears to be an inverse variation function, $y = \frac{k}{x}$, so multiply *xy* to find *k*, the constant of variation then find the average value. In the **Data Editor**, click the **Formula** tab under the List 3 header.



	L1	L2	L3	L4
1	0.6	0.7454		
2	0.7	0.5657		
3	0.8	0.4588		
4	0.9	0.3199		
5	1	0.2538		
6	1.1	0.2149		
7	1.2	0.1751		
8	1.3	0.1479		
9	1.4	0.1333		
10	1.5	0.1236		
11	1.6	0.11		
12	1.7	0.0973		
13	1.8	0.0906		
14	1.9	0.0808		
15	2	0.075		
16				

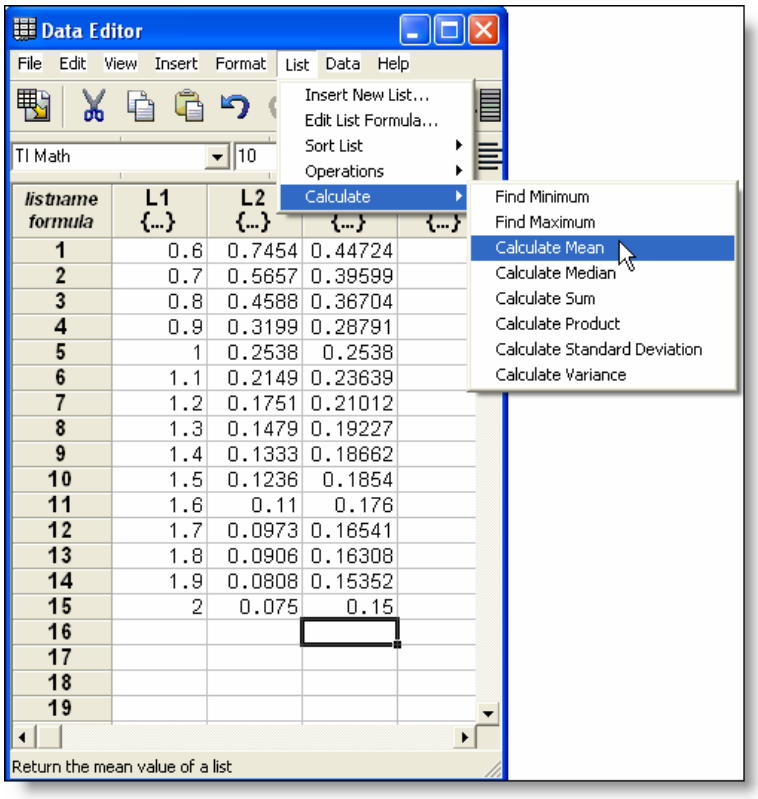
2. Enter the formula **L1*L2** inside the **Formula**: text box. Click **OK**.



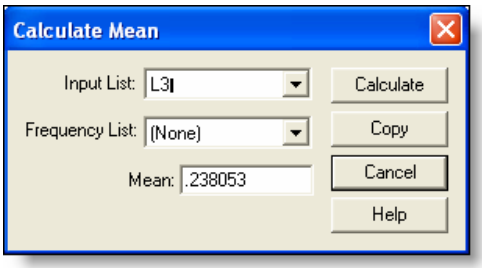


	L1	L2	L3	L4
1	0.6	0.7454	0.44724	
2	0.7	0.5657	0.39599	
3	0.8	0.4588	0.36704	
4	0.9	0.3199	0.28791	
5	1	0.2538	0.2538	
6	1.1	0.2149	0.23639	
7	1.2	0.1751	0.21012	
8	1.3	0.1479	0.19227	
9	1.4	0.1333	0.18662	
10	1.5	0.1236	0.1854	
11	1.6	0.11	0.176	
12	1.7	0.0973	0.16541	
13	1.8	0.0906	0.16308	
14	1.9	0.0808	0.15352	
15	2	0.075	0.15	
16				
17				
18				
19				

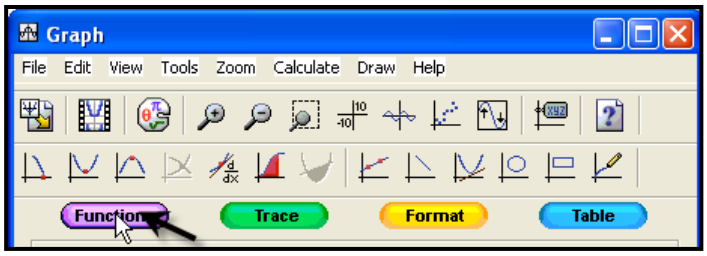
3. From the **List** menu, choose **Calculate**, then choose **Calculate Mean**.



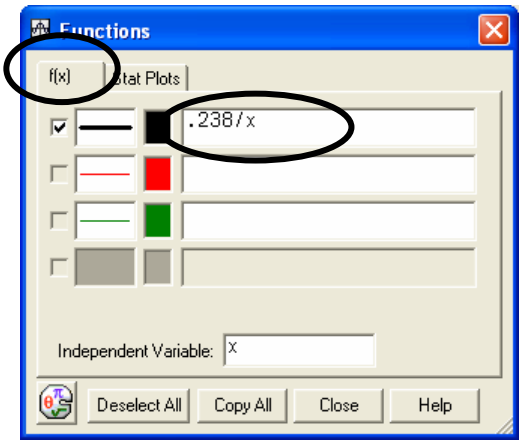
4. From the **Input List** drop-list box, choose **L3**. Click **Calculate**.

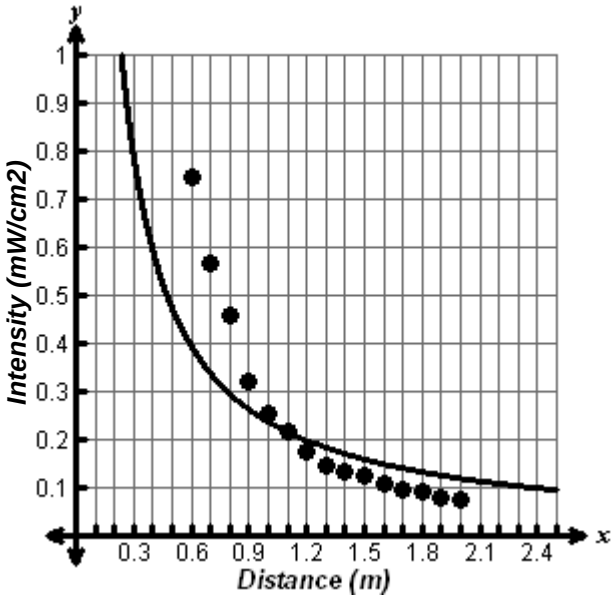


5. Substitute this value of *k* into the parent function and verify using a graph. From your Scatterplot, click the **Functions** button.

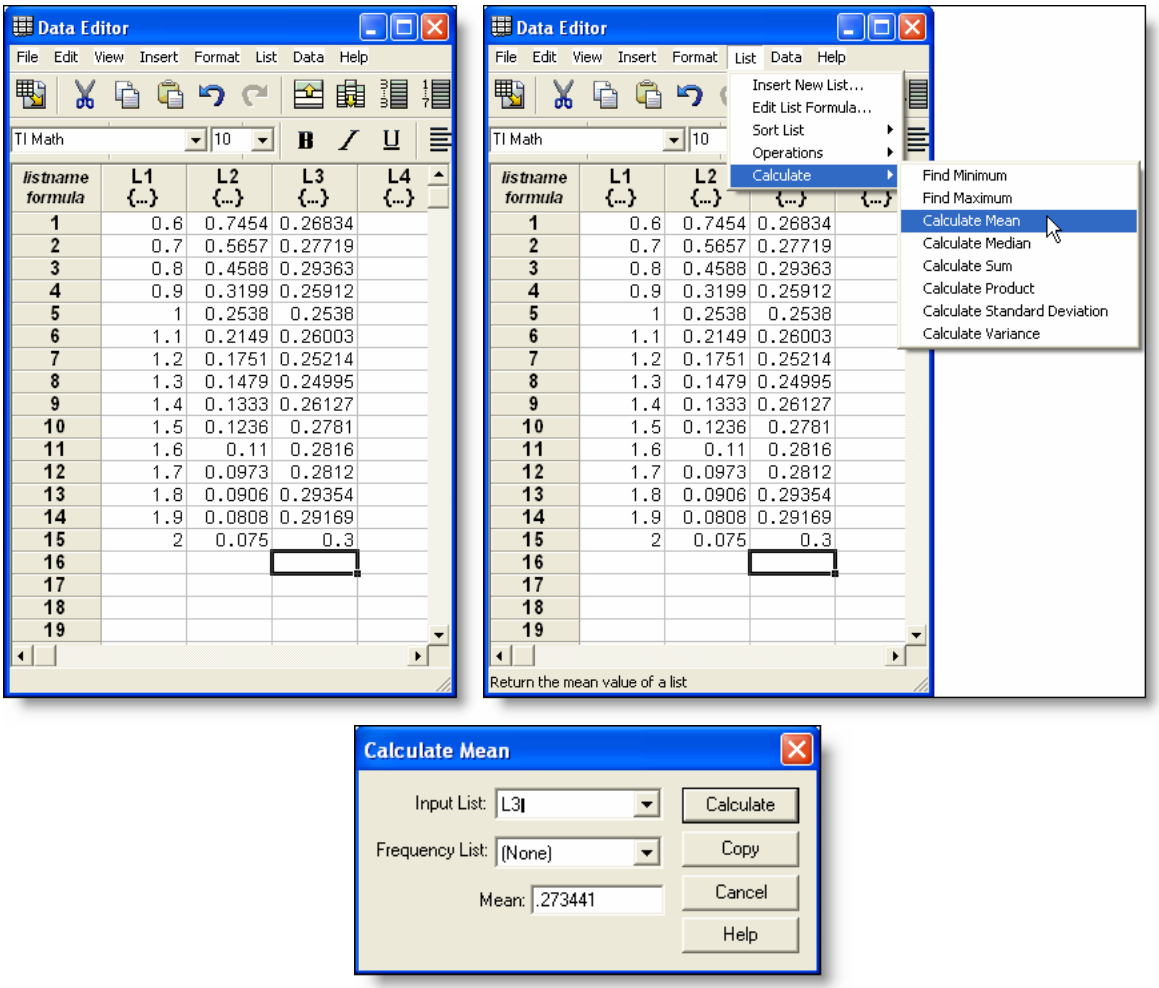


Inside the **Functions** dialog box, click the **f(x)** tab, then enter your function in the top text box. Click **Close** when complete.





6. This function is not a good fit. Try inverse-square variation, $y = \frac{k}{x^2}$. Multiply $x^2 y$ in order to find an approximate value for *k*, the constant of variation. In the **Data Editor**, clear **L3** then repeat Steps 1 through 5. Set **L3 = (L1)^2 × L2** by following steps 1 and 2. Find the average value of L3 by following Step 3.



Graph the function over the scatterplot, substituting the average value of L3 for *k*.