

Using the CBL2 and Light Probe to Collect Data

 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.

Look for the LI GHT sensor. If you do not see it on the current screen, select 7: MORE by pressing 7. When you see LI GHT listed, select 5: LI GHT by pressing 5.



CH 1: LIG	GHT 0. C	089
HODE:TIHE 1:Setup 2:Start 3:Graph	<u>GRAPH-20</u> 4:ANALYZE 5:TOOLS 6:QUIT	

▶ CH 1: CH 2: CH 3: DIG : MODE:TIME(JRAPH-20
1:OK	3:ZERO
2:Calibrate	4:Save/Load

SELECT SENSOR
1:TENPERATURE
2:PH
3:CONDUCTIVITY
4:PRESSURE
5:FORCE
6:HEARTRATE
7:NORE
B:RETURN TO SETUP SCREEN
SELECT SENSOR
SELECT SENSOR 1:Accelerometer
SELECT SENSOR 1:Accelerometer 2:Colorimeter
SELECT SENSOR 1:Accelerometer 2:Colorimeter 3:Co2 gas
SELECT SENSOR 1:Accelerometer 2:Colorimeter 3:Co2 GAS 4:Microphone
SELECT SENSOR 1:ACCELEROMETER 2:Colorimeter 3:Co2 GAS 4:Microphone 5:Light
SELECT SENSOR 1:ACCELEROMETER 2:Colorimeter 3:Co2 GAS 4:Microphone 5:Light 6:D.Oxygen(Mg/L)
SELECT SENSOR 1:ACCELEROMETER 2:COLORIMETER 3:CO2 GAS 4:Microphone 5:Light 6:D.OXYgen(NG/L) 7:More



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

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A 1



- 6. Read the light intensity (in milliwatts per square centimeter) by observing the number in the top-right corner of the screen.
- CH 1: LIGHT 0.0089 <u>Mode: Time Graph-20</u> 1:Setup 4:Analyze 2:Start 5:Todls 3:Graph 6:Quit
- 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.



Algebra 2 I've Seen the Light!

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 I to move up and down the list. Type the desired value then press ENTER.

4. To view the graph, select GRAPH.











Algebra 2 I've Seen the Light!

Generating a Scatterplot Using Microsoft Excel

1. Enter your data into a blank Excel spreadsheet.

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6			0.7	0.5657						
7			0.8	0.4588						
8			0.9	0.3199						
9		3	1	0.2538						
10			1.1	0.2149						
11			1.2	0.1751						
12			1.3	0.1479						
13			1.4	0.1333						
14			1.5	0.1236						
15			1.6	0.11						
16			1.7	0.0973						
17		1	1.8	0.0906					1	
18			1.9	0.0808						
19			2	0.075						
20										

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

Microsoft Excel - Book1									
:2)	<u>File E</u> dit	⊻iew	Inse	ert	F <u>o</u> rmat	<u>T</u> ools	Dat	a <u>W</u> indo	w <u>H</u> elp
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3. Select **XY** (Scatter) from the Chart Type selection box then click Next.

Chart Wizard - Step 1 of 4 - Chart Type	? 🗙
Standard Types Custom Types Chart type: Chart sub-type: Column Image: Chart sub-type: Bar Image: Chart sub-type: Chart sub-type: Image: Chart sub-type: Pie Image: Chart sub-type: Marea Image: Chart sub-type: Doughnut Image: Chart sub-type: Surface Image: Chart sub-type: Stock Image: Chart sub-type:	
Scatter. Compares pairs of values. Press and Hold to <u>Vi</u> ew Sample	
Cancel < Back Next > Eir	ish

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

Chart Wizard	- Step 2 of 4 - Chart Source Data	?×
Data Range	Series	
To create workshee want in ti	e a chart, click in the Data range box. Then, on the it, select the cells that contain the data and labels you ne chart.	
<u>D</u> ata range:		R
Series in:	O Rows	~
	Columns	



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.

	Distance	Intensity							
Н	(D)	(I) 2	Chart W	izard - Ste	p 2 of 4 - (Chart Sour	ce Data - D	ata r 👔	
	(m)	(mW/cm ⁻)	=Sheet14	C\$5:\$D\$19					
	0.6	0.7454							
	0.7	0.5657							
ł	0.8	0.4588							
Į	0.9	0.3199							
	1	0.2538							
I	1.1	0.2149							
I	1.2	0.1751							
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	1.4	0.1333							
I	1.5	0.1236							
I	1.6	0.11							
Į	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.

Source Data	. ? 🛛
Data Range	Series
0.8 0.7 0.6 0.5 0.4 0.3 0.2 0.1 0 0	• • • • • • • • • • • • • • • • • • •
 Data range: Series in:	=Sheet1!\$C\$5:\$D\$19
	Cancel < Back Next > Einish



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**.

Chart Wizard - Step 2	of 4 - Chart Source Data	· ? 🛛
Data Range Series		
	Light Intensity	
0.8		
0.6		A Linkk lakus sike
0.3	• • • •	
0.1	****	
0 0.5	1 1.5 2 2	2.5
Series		
	Name: Light Intensity	
×	Y Values: =Sheet1!\$D\$	5:\$D\$19
Add Remove		
Cancel	< <u>B</u> ack <u>N</u> ext	: >

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.

Chart Wizard - Step 3 of 4 - Ch	nart Options	?×
Titles Axes Gridlines Lei Chart title: Light Intensity Value (X) axis: Distance (m) Value (Y) axis: Intensity (mW/cm2) Second category (X) axis: Second value (Y) axis:	rgend Data Labels	2.5
Ca	ncel < <u>B</u> ack <u>N</u> ext > <u>F</u> i	nish



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

Chart Wizard - Step 4 of 4 - Chart Location						
Place chart: -						
	C As new <u>s</u> heet:	Chart1				
	• As object in:	Sheet1	•			
2	Cancel	< <u>B</u> ack Next	: > <u>Fi</u> nish			

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2			Distance	Intensity										-
3			(D)	(I)										
4			(m)	(mW/cm^2)	2 									2
-			0.6	0.7454	5				Light I	atoncity				
6			0.0	0.5657	2				Light i	nensny				
7			0.8	0.4588		0.8 - -								
8			0.9	0.3199										
9			1	0.2538		0.7						1		
10			1.1	0.2149		0.6 -		_						
11			1.2	0.1751		n2)		•						
12			1.3	0.1479		≥ 0.5 1			•			63		
13	1		1.4	0.1333		1 0.4								
14			1.5	0.1236		, it								
15			1.6	0.11		Ē 0.3 −		-	•			-		
16			1.7	0.0973		= n2 +								
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18			1.9	0.0808		0.1					* * * *	• •	_	
19			2	0.075										
20						0		0.5	1	1.	5	2	2.5	
21				-				10.00	Di	stance (m)	925	6629	inini i	
23									2.					
24														



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.

Functions
L2
Independent Variable:
Copy All Close Help



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.

Graph	
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$\square \sqcap \bowtie \And \checkmark \blacksquare \lor \vdash \sqcap \bowtie \bowtie \blacksquare $	Format X
Functions Trace Format Table	Window Animate Axes Grid Trace Labels
10.	
6	Xmin: [-10.
	Automatic XStep Xmax. 10.
	Ymin: -10.
	Ymax: 10.
	Yscale: 1.
-8	OK Cancel Apply Help
-10.	

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

Format 🔀
Window Animate Axes Grid Trace Labels
Xmin: D.
Automatic XStep Xmax: 3.
Xstep: 083682 Xscale: 1
Ymin: 0.
Ymax: 1.
Yscale: .1
OK Cancel Apply L Help



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



Algebra 2

Determining a Function Rule Using a Graphing Calculator

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

variation.

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Go to the List Editor by pressing [STAT][ENTER]. Use \checkmark to select the List 3 header. Enter the formula [L3] = [L1] [L2] by pressing $[2nd][1 \times [2nd][2]$. Press [ENTER].

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 $\forall =$ then enter the function. Press GRAPH to view the graph.

Algebra 2

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

Go to the List Editor by pressing STAT ENTER. Use \checkmark to select the List 4 header. Enter the formula [L4] = [L1]² [L2] by pressing 2nd 1 x² × 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.

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L2	L3	T 1 4
,7457 ,5657 ,5588 ,3199 ,2538 ,21751 ,1751	47299 47599 367091 37001 370000000000	
L4 =L1	²*L2∎	

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.

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 Δ Tbl, the value of the *x* increment.

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

X	Y1	Y2
,78 ,79 ,81 ,83 ,83 ,83 ,83	236 7376 487661 487661 487266 48724 4986 986 986 986 986 986 986 986 986 986	
X=.82		

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Algebra 2 I've Seen the Light!

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.

Add Trendline	e		×
Type Opti Trend/Regress Linear	ons ion type Logarithmic	Order: Polynomial Period:	
Power Based on geries Light Intensity	Exponential	Moving Average	
		OK Cancel	

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**.

Add Trendline	
Type Options Trendline name O • Automatic: Power (Light Intensity) • Custom: • Custom: • Correcast • Forecast • Corward: • O • Set intercept = • Display equation on chart • Display R-squared value on chart	
	OK Cancel

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.

Format Data Labels		×
Patterns Font Number Eont: Arial Image: Arial Image: Arial Image: Arial Image: Arial Image: Arial <td>Alignment Font style: Bold Regular Italic Bold Bold Italic Color: Automatic Preview AaBt</td> <td>Size: 12 9 10 11 12 Background: Automatic</td>	Alignment Font style: Bold Regular Italic Bold Bold Italic Color: Automatic Preview AaBt	Size: 12 9 10 11 12 Background: Automatic
Subscript Auto scale This is a TrueType font. The sam your screen.	e font will be used on	both your printer and

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**.

Format Trendline	
Patterns Type Options Trendline name • Automatic: Power (Light Intensity) • Custom: • Custom: Forecast • Custom: Set intercept = • Display gquation on chart Display R-squared value on chart	
	OK Cancel

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.

🗰 Data Editor						
File Edit V	iew Insert	Format Lis	t Data He	lp		
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TI Math		▼ 10 ▼	BZ	<u> </u>		
listname formula	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.

		🏢 Data Ed	itor		(×
L3 Information		File Edit V	'iew Insert	Format Lis	t Data Help	5	
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L3	Palette	TI Math	<u></u>	▼ 10 ▼	BZ	<u>U</u>	
Formula:	Cancel	listname formula	L1 {}	L2 {}	L3 {}	L4 {}	
L1*L2		1	0.6	0.7454	0.44724		
	Help	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					
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3. From the List menu, choose Calculate, then choose Calculate Mean.

🗒 Data Edi	itor				×	
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listname	L1	L2	Calculate	×.	F	ind Minimum
formula	{}	{}	{}	- {}	F	ind Maximum
1	0.6	0.7454	0.44724		C	alculate Mean 📐
2	0.7	0.5657	0.39599		C	alculate Median ¹³
3	0.8	0.4588	0.36704		C	alculate Sum
4	0.9	0.3199	0.28791		C	alculate Product
5	1	0.2538	0.2538		0	alculate Standard Deviation
6	1.1	0.2149	0.23639		0	alculate Variance
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					-	
•				•		
Return the me	an value of a	list			11	

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

Calculate
Сору
Cancel
Help

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.

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File Edit V	'iew Insert	Format Lis	t Data He	lp		File Edit	t View Insert	Format Lis	st Data Hel	lp .	
₩ ¥	B B	50			1	E I	Y B B	5	Insert New Li	st	
									Edit List Form	ula	
TI Math		▼ 10 ▼	BZ	<u>U</u>		TI Math		▼ 10	Sort List Operations		
listname	L1	L2	L3	L4		listnam	ne L1	L2	Calculate	•	Find Minimum
formula	{}	{}	{}	{}		formul	a {}	{}	{}	{}	Find Maximum
1	0.6	0.7454	0.26834			1	0.6	0.7454	0.26834		Calculate Mean
2	0.7	0.5657	0.27719			2	0.7	0.5657	0.27719		Calculate Median
3	0.8	0.4588	0.29363			3	0.8	0.4588	0.29363		Calculate Sum
4	0.9	0.3199	0.25912			4	0.9	0.3199	0.25912		Calculate Product
5	1	0.2538	0.2538			5	1	0.2538	0.2538		Calculate Standard Deviation
6	1.1	0.2149	0.26003			6	1.1	0.2149	0.26003		Calculate Variance
7	1.2	0.1751	0.25214			7	1.2	0.1751	0.25214		
8	1.3	0.1479	0.24995		_	8	1.3	0.1479	0.24995		
9	1.4	0.1333	0.26127		_	9	1.4	0.1333	0.26127		
10	1.5	0.1236	0.2781			10	1.5	0.1236	0.2781		
11	1.6	0.11	0.2816		_	11	1.6	0.11	0.2816		
12	1.7	0.0973	0.2812			12	1.7	0.0973	0.2812		
13	1.8	0.0906	0.29354		_	13	1.8	0.0906	0.29354		
14	1.9	0.0808	0.29169		-	14	1.9	0.0808	0.29169		
15	2	0.075	0.3		_	15	2	0.075	0.3		
16					-	16					
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18						18					
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•					·						
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				C -1		1					
				Calcu	late n	nean					
				I	nput L	ist: L3	•	Calcu	late		
				Frequ	ency L	ist: (None)	-	Cop	y		
						Mean: .27	73441	Can	cel		
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Graph the function over the scatterplot, substituting the average value of L3 for k.

