

Digital Maestro Magazine



Google Sheets Graph Math Functions

Linear
and
quadratic
equations

Graph equations and
learn basic spreadsheet
operations

digitalmaestro.org

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Linear Equations

Linear equations represent a pattern of numbers. These numbers are either increasing or decreasing. The beginning point and the amount by which it moves is the y-Intercept and the Slope. The slope is the amount by which the line is moving. A linear equation looks much like this equation " $y=mx+b$ ". The variable " b " represents the Intercept, or where the line begins. The variable " m " represents the slope or the amount by which the line changes. Linear equations and the graph of these equations can be used to help make predictions. Graphing the equation can give us a better sense of patterns in the data.

Spreadsheets

Spreadsheets are very useful and are used for a variety of reasons. They are often used to collect and organize data. Spreadsheets are used to gather and make sense of financial information. They are often used in financial institutions. Spreadsheets are also used by scientists and mathematicians to organize and make sense of data. One way of making sense of large data is to generate a graph. We will be generating a visual representation of a linear equation and the data points used in that equation.

Why Spreadsheets and not graphing calculators? Graphing calculators are an excellent tool in classrooms but they are expensive and not all schools can afford

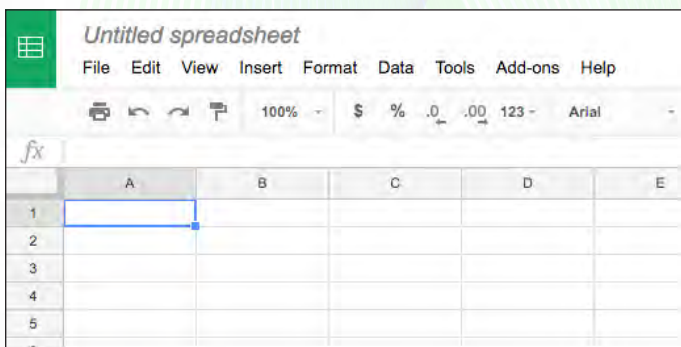
them. Schools or teachers may not be willing to allow students to take graphing calculators home.

Another reason for using a spreadsheet instead of a calculator is that spreadsheets are shareable. Students use Google Sheets to create their graphs and submit them to the teacher. Multiple equations can be graphed on one spreadsheet with each graph being placed onto a separate sheet in the workbook. For example, a teacher can assign twenty problems and students would use twenty sheets in one workbook to graph each equation. All spreadsheets share the basic math functions we will be using in these lessons. The instructions in these lessons are applicable in Excel and other similar spreadsheet applications.

Graphing linear equation

Create a new spreadsheet in google sheets. Here are some helpful links to help get you to the location when you can create a spreadsheet. This link, "<https://sheets.google.com>" will take you to the Google Sheets application page where you can click the create button to create a new spreadsheet. This link, "<https://sheets.google.com/create>" will take you right to a brand new spreadsheet. Login to your Google Account for the sheet to be created.

I like to provide a descriptive name to my documents right from the beginning. It's a habit I learned early in my computer experience when files were not automatically saved until you saved them. Click on the "Untitled spreadsheet" name.

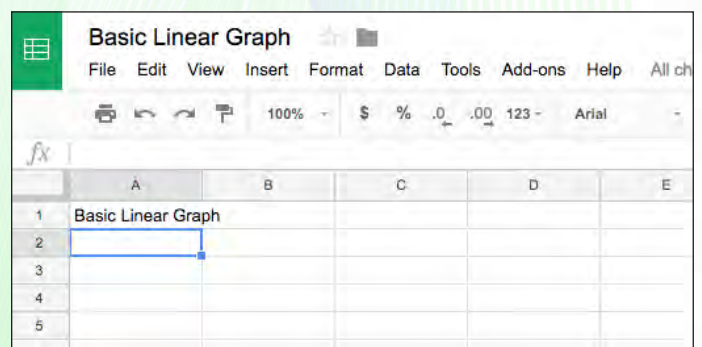


Title the document "Basic Linear Graph". Google Sheets does not have a save button because all changes are automatically saved.

Spreadsheets consist of a series of sheets. These sheets are part of a document called a workbook. The name we just provided this file is for the workbook and not for an individual spreadsheet. A workbook can have hundreds of sheets. Each sheet contains a series of columns and rows. Each column and row has a rectangular box. This box is called a cell. Each cell is referenced by its coordinate location. The first cell is referred to as cell A2. To find cell C3 we would look at column C and count 3 rows down. The letter and number combination is called a cell reference. We will be using cell references in the creation of our linear graph.

Preparing the equation

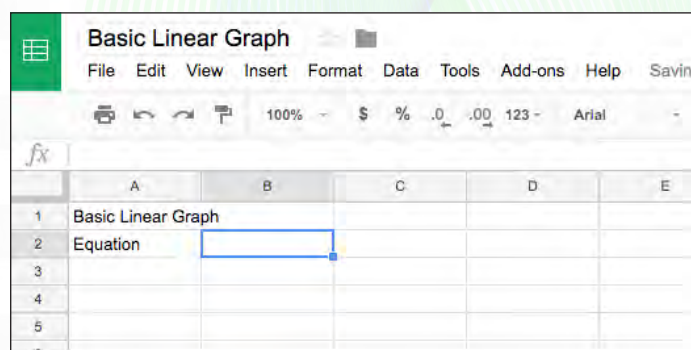
Cells are versatile. They are designed to contain text, numbers, formulas, functions, images, and links to web pages. In the first cell A2, type Basic Linear Graph.



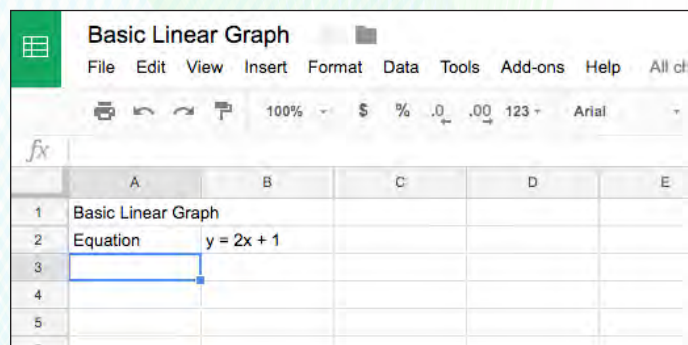
The text we just typed appears in the cell. The text happens to be longer than the width of the cell. This is fine because the cell temporarily expands to accommodate the text as we type it. The cell will continue to expand as long as we continue to type within the cell.

Above the column letters we have a long bar. This is called the formula bar. The text that appears in our selected cell appears in this bar. The formula bar is a convenient location to edit cell text or as the name implies, cell formulas. Press the return key on your keyboard or click on the cell below the text we just typed.

The cell below the previous cell is selected. Selected cells are highlighted with a blue border. Type the word Equation and press the tab key or click the cell to the right.

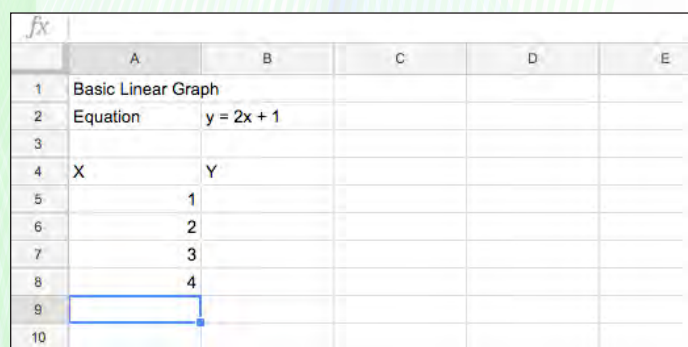


Pressing the tab key will select the cell to the right of the previously selected cell. Type the equation $y = 2x + 1$ and press the return key.



Pressing the return key will select the next cell in the current column. Press the return key one more time, type a capital letter "X", and press the Tab key to move to the adjacent cell. This is where we will enter the different values for our line. The slope of the line is "X" in our equation. Type a "Y" in the adjacent cell. Select the cell below the "X".

Below the "X" we will supply several values that will be used in our equation. These numbers and the resulting answers in the "Y" column will provide the coordinates to connect in our graph. Enter the numbers 1 through 4 down the column with one number in each cell.



Below the letter “Y” we will be inserting our equation. Select the cell below the letter “Y”. Equations in cells must begin with an equal sign. Type an equal sign in the cell.

	A	B	C	D	E
1	Basic Linear Graph				
2	Equation	$y = 2x + 1$			
3					
4	X	Y			
5		1	=		
6		2			
7		3			
8		4			
9					
10					

The equation will mimic the linear equation we wrote above. Type the number 2 after the equal sign.

In the equation we know that $2x$ is actually 2 multiplied by the variable “x”. Simply placing the letter “x” next to the number 2 will not multiply the number and the variable. We need to instruct the spreadsheet to multiply the number 2 by the variable “x”. The multiplication symbol is the asterisk. The asterisk on the keyboard is located above the number 8. Hold the shift key and press the number 8 to place an asterisk after the number 2.

	A	B	C	D	E
1	Basic Linear Graph				
2	Equation	$y = 2x + 1$			
3					
4	X	Y			
5		1	=2*		
6		2			
7		3			
8		4			
9					
10					

We entered all the numbers that represent the variable “x” in the column to the left. In the next step we will reference the numbers in the adjacent cell.

Type A5 after the asterisk. This combination is referencing the cell where I have the first variable in my equation. Notice that the reference cell is highlighted in orange. The reference to the cell is also in orange.

	A	B	C	D	E
1	Basic Linear Graph				
2	Equation	$y = 2x + 1$			
3					
4	X	2			
5		1	=2*A5		
6		2			
7		3			
8		4			
9					
10					

Finish the equation by entering the plus symbol followed by the number 1. Press the return key to finish the process.

	A	B	C	D	E
1	Basic Linear Graph				
2	Equation	$y = 2x + 1$			
3					
4	X	3			
5		1	=2*A5+1		
6		2			
7		3			
8		4			
9					
10					

The value for “Y” is 3. We can repeat the same process for getting the value of “Y” from the other values for “X”. The process is simple but can get tedious if we have lots of numbers.

Spreadsheets are powerful and they are designed to help process repetitive tasks. Click once on the cell with the equation we just created. The lower right corner of the cell includes a square when it is highlighted. Move the mouse pointer over the square until it changes to a "+" plus symbol.

	A	B	C	D	E
1	Basic Linear Graph				
2	Equation	$y = 2x + 1$			
3					
4	X	Y			
5		1	3		
6		2			
7		3			
8		4			
9					
10					

Click and drag this plus symbol down until the highlighted cells match the numbers in the adjacent cell and release the mouse.

	A	B	C	D	E
1	Basic Linear Graph				
2	Equation	$y = 2x + 1$			
3					
4	X	Y			
5		1	3		
6		2	5		
7		3	7		
8		4	9		
9					
10					

The values for "Y" will be calculated using the same equation.

Click once on any of the cells where the formula was duplicated. Look at the formula bar. The reference cell in the formula matches the adjacent cell where the formula is applied.

	A	B	C	D	E
1	Basic Linear Graph				
2	Equation	$y = 2x + 1$			
3					
4	X	Y			
5		1	3		
6		2	5		
7		3	7		
8		4	9		

When we change the numbers in the reference cell for the "X" variable the values for "Y" update.

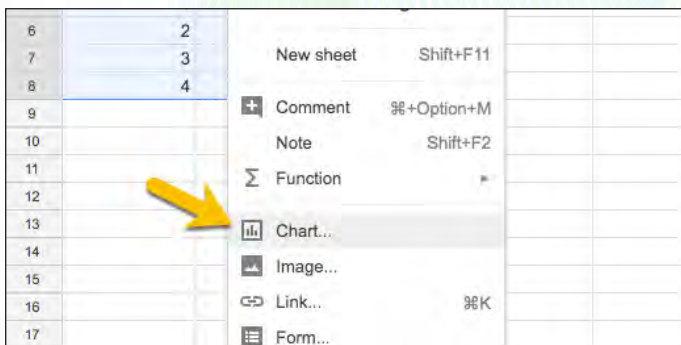
Creating the Line Graph

A line graph uses two points represented by the numbers in our table. We need to select these numbers before inserting a graph. There are multiple ways to select content. I will review a couple of the ways here. Click once on the cell with the letter "x", press and hold the shift key on the keyboard and click once on the last number for the values of "Y".

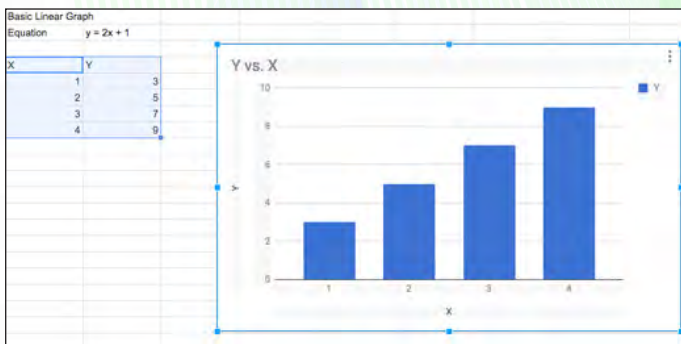
	A	B	C	D	E
1	Basic Linear Graph				
2	Equation	$y = 2x + 1$			
3					
4	X	Y			
5		1	3		
6		2	5		
7		3	7		
8		4	9		

Clicking the first cell and then clicking the last cell while holding down the shift key is how to select contiguous cells. This works with almost all applications not just spreadsheets. Contiguous means next to or touching.

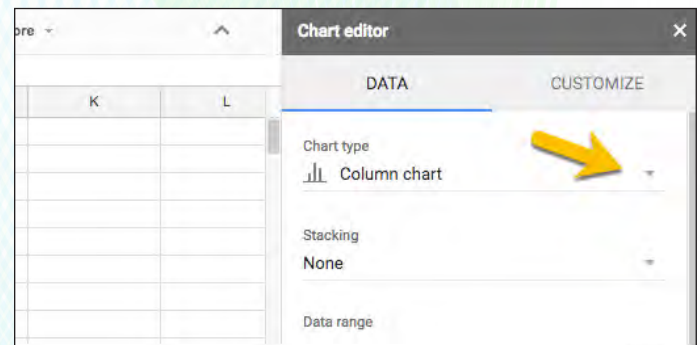
There is a button bar option for inserting a chart but this button might not be readily visible if you are using a computer with a small display. Instead of using this button we will go to the menu and click Insert. The option to insert a chart is located about two thirds of the way down.



Google Sheets will read the data and make the best guess as to the type of graph it should create. It created a bar chart in this example. We will change the chart type.

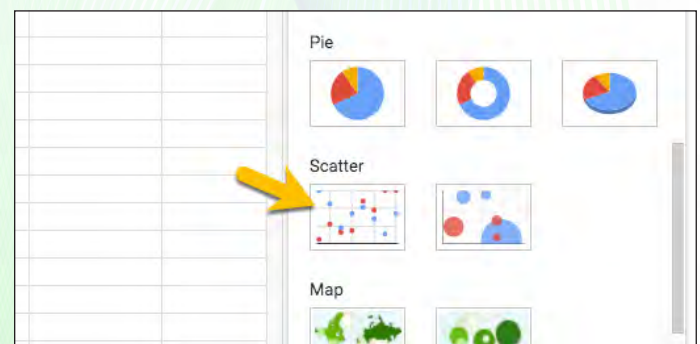


A chart editor panel will appear on the right side of the spreadsheet. The first option in the chart editor is the chart type. Click on the chart type selector.



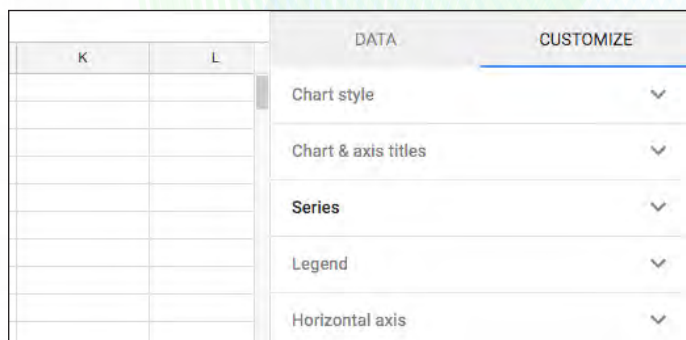
A list of available chart types will be displayed. Our first intuition might be to select the line chart type. This makes sense but I'm going to ask you to select a different chart type which will be more useful.

Scroll down the list of chart types and look for the Scatter chart types. Click on the first scatter chart type.

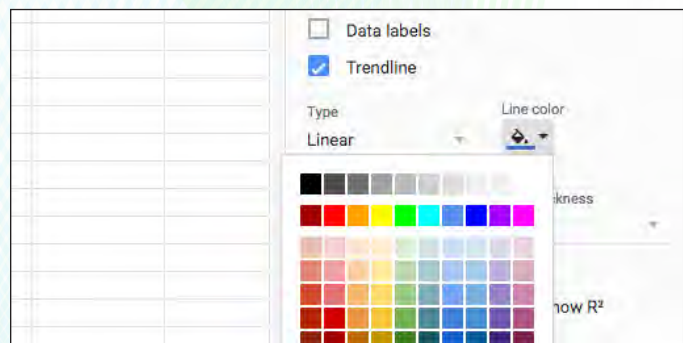


The scatter chart type will place a dot where each of our coordinate points meet. This is a little more useful than a simple line. If you would like to include a line that connects these points we can include that too.

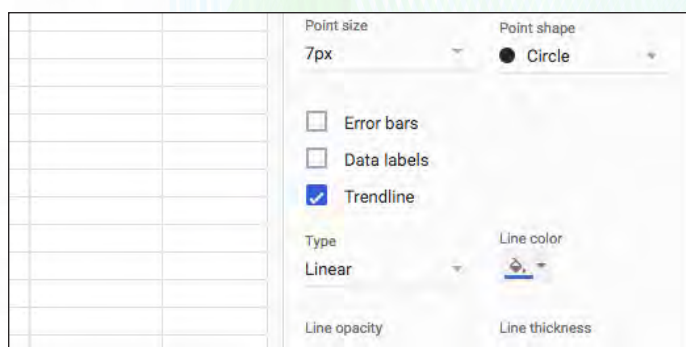
To include the line we need to go into the customize section of the chart editor panel. Click on the Series option.



The Trendline is the same color as the plotted points. We can change the color of the line by clicking the line color selector and choosing a color from the color palette.

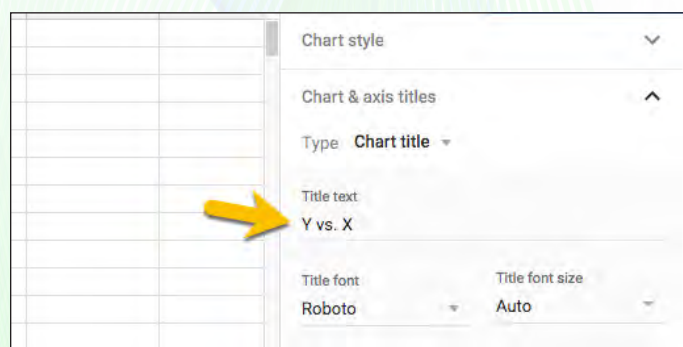
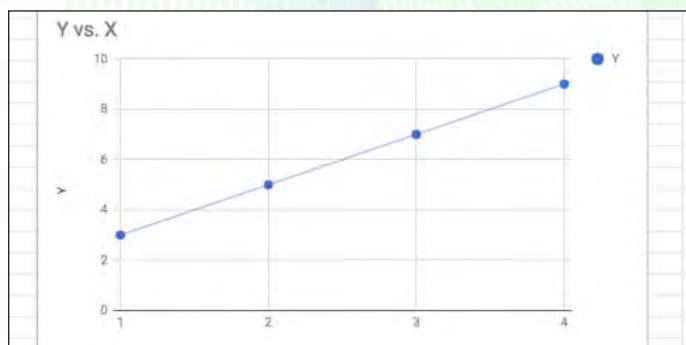


Place a checkmark on the Trendline option.



The chart is titled according to the selected data series. Find the Chart & axis titles option and click to reveal the options. Click on the title field and type the equation that is represented by this line graph.

The chart will update to include the Trendline that goes through the points.



Click the alignment option and center align the title above the chart. The graph of our linear equation is now complete.

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The function of education is to teach one to think intensively and to think critically. Intelligence plus character – that is the goal of true education.

Martin Luther King, Jr.

