

## Excel Tutorial

During this introduction you will learn the basics of how to use Excel, which means making a spreadsheet, creating a graph from that spreadsheet, and then interpreting the data to answer some basic questions.

First, you have to know what a spreadsheet is. A spreadsheet consists of a grid of columns and rows. A column is vertical, and a row is horizontal. The intersection of a column and a row is called a cell. It is helpful to put your information into spreadsheets on a computer because then you can use the computer to create graphs or perform calculations on the data.

Look at this simple spreadsheet and then answer the questions below.

	A	B	C	D	E
1		Cost of Toothpaste	Cost of Chocolate	Cost of Movie	
2	2000	1.86	0.72	7.25	
3	2001	1.96	0.78	7.5	
4	2002	2.01	0.84	7.75	
5					
6					
7					
8					

In the spreadsheet above, circle cell A2. Place an “x” in cell C3. Check the answers with a neighbor.

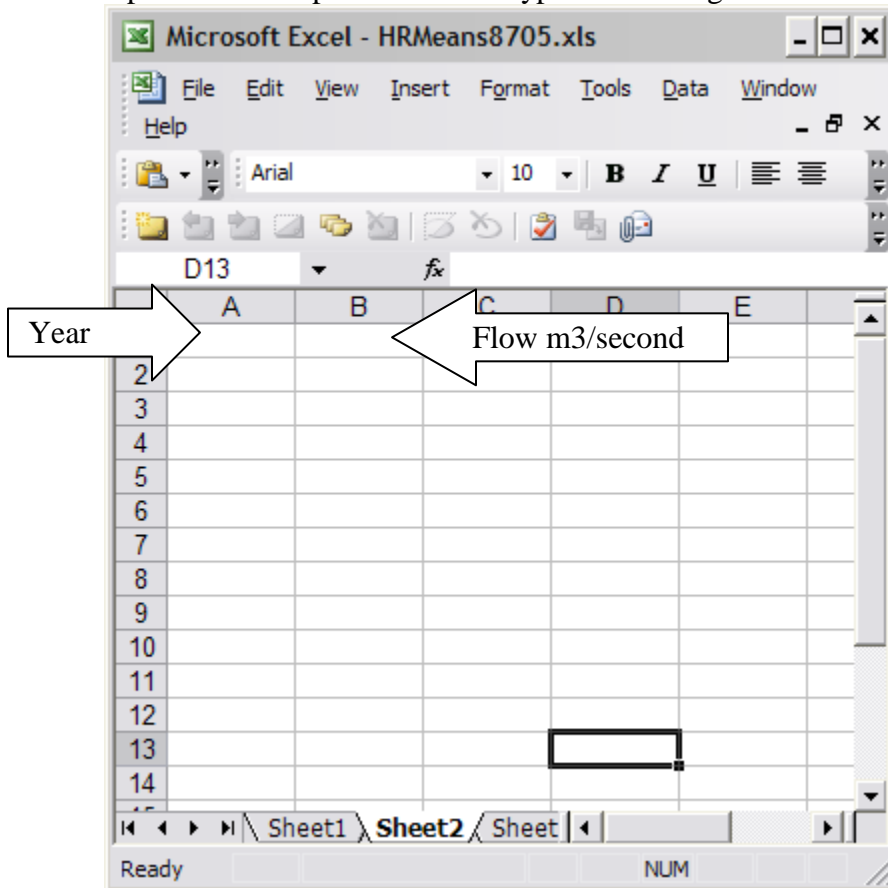
In each cell, you could have numbers, words, or formulas. The words that you use are for you to remember what you are doing. They do not have a value associated with them. Your labels could include things like Price, Number of Species, Temperature, Interest Rate, etc.

There are lots of things you can do with Excel, for instance, find the average or calculate the sum of a set of numbers, make three-dimensional charts, etc. For now, we will focus on a simple, two-variable spreadsheet and then make a graph from these data.

## Creating a Simple Spreadsheet

In this first part of the tutorial, we will graph the rate of water flow from the Hudson River for a ten year period. We will put year on the x-axis, because it is the independent variable, and Flow (m<sup>3</sup>/second) on the y-axis, because it is the dependent variable. Remember, a dependent variable is something you are measuring, and an independent variable is what you are in control of or what you can manipulate. In this case, we can choose the years we want to measure, but we can't control the flow.

Open an Excel spreadsheet and type the headings below:



Now, use these data to fill in the chart:

1989	2647.01
1990	2029.38
1991	1021.96
1992	2304.53
1993	1242.96
1994	1348.17
1995	580.18
1996	2374.82
1997	1392.27
1998	1471.37

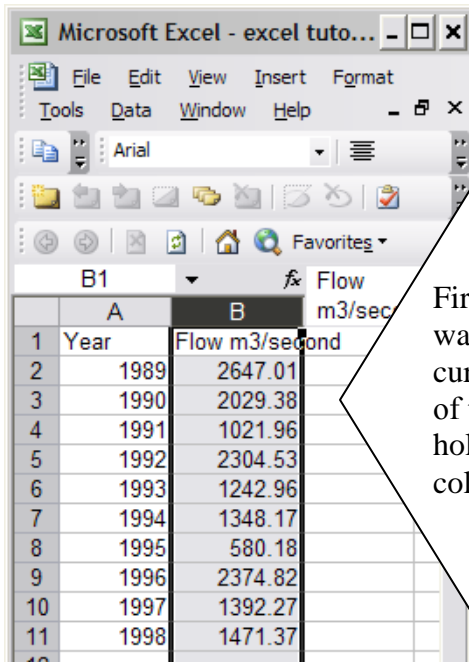
Your data should look like this:

	A	B	C
1	Year	Flow m3/second	
2	1989	2647.01	
3	1990	2029.38	
4	1991	1021.96	
5	1992	2304.53	
6	1993	1242.96	
7	1994	1348.17	
8	1995	580.18	
9	1996	2374.82	
10	1997	1392.27	
11	1998	1471.37	
12			
13			
14			
15			
16			
17			

But there is a problem! Your heading for column B doesn't fit! Go on to the next section to find out how to fix this.

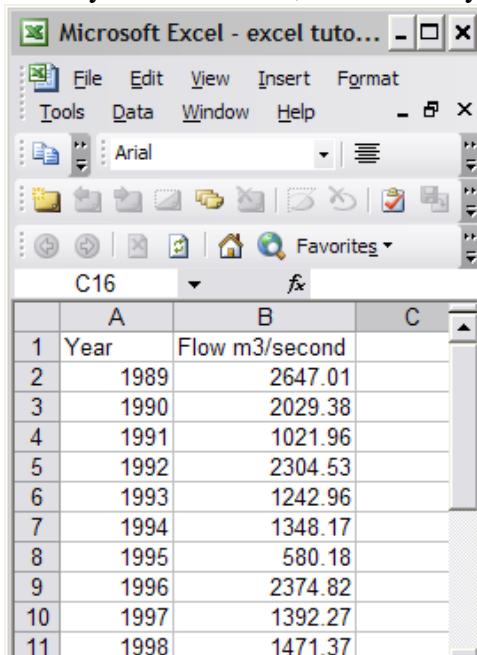
## Formatting your Spreadsheet

You can try two things to make a heading fit in the space you are given. First, you could make the column itself wider.



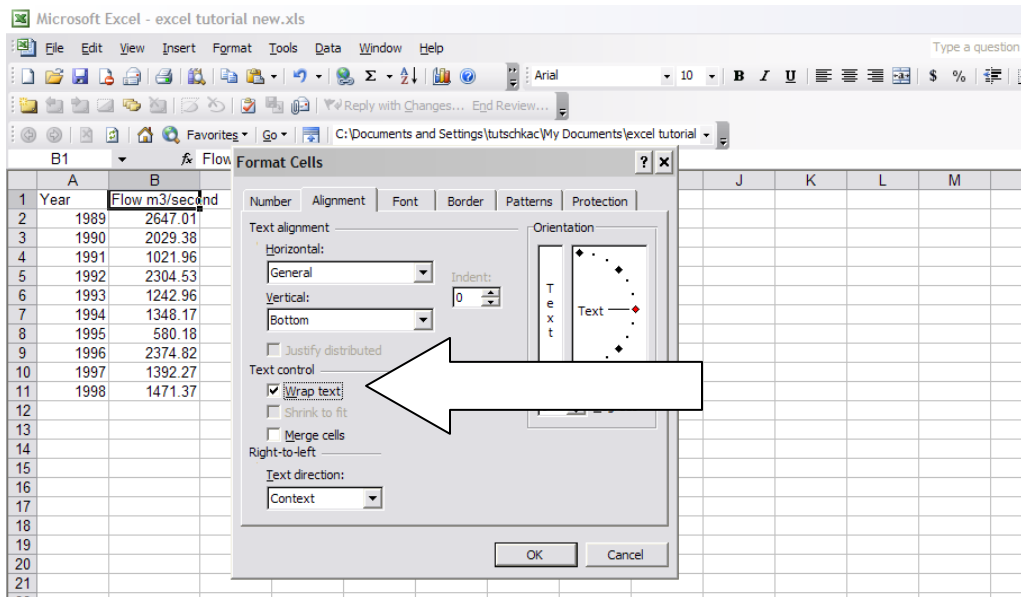
First, highlight the column that you want to make wider. Then, place the cursor of your mouse on the right side of the cell that is labeled “B”. Click, hold, and drag the mouse until the column is at the right size.

When you are finished, this is what your spreadsheet should look like:

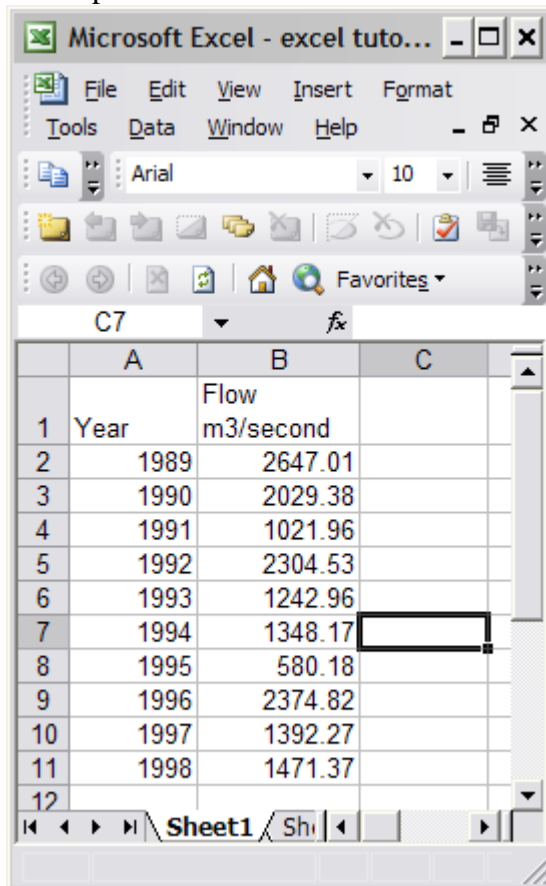


If you would rather keep your columns the same size, you can “wrap” the text. To do this, first click on the cell that has the heading that is too long for the current column

width. Then, click on “Format”, then “Cells”, “Alignment Tab”, and check the “Wrap Text” box.



Your spreadsheet should look this:



## Making a Graph

Excel has a chart (or graph) wizard built in, which allows you to make new graphs easily. You can make many different kinds of charts and graphs, but the most common are the bar, line, and pie graph.

To make a graph, you have to highlight the data you want to graph. Click on cell B1, and drag down to cell B11.

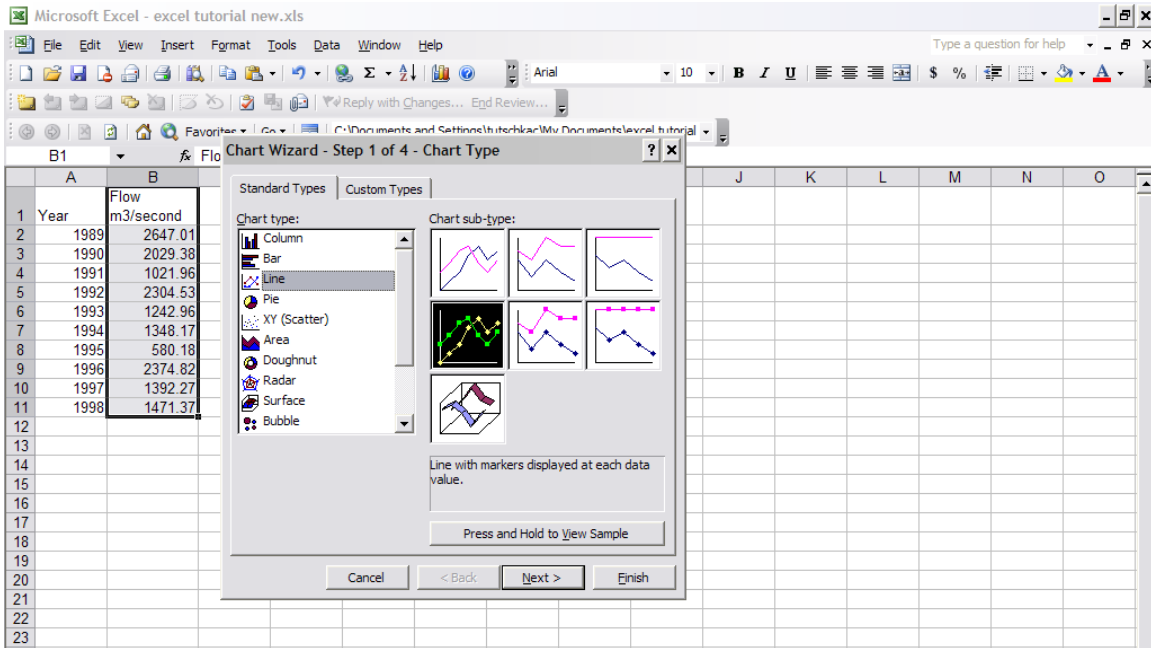
The screenshot shows a Microsoft Excel window titled "Microsoft Excel - excel tuto...". The spreadsheet has two columns: "Year" in column A and "Flow m3/second" in column B. The data is as follows:

	A	B
1	Year	Flow m3/second
2	1989	2647.01
3	1990	2029.38
4	1991	1021.96
5	1992	2304.53
6	1993	1242.96
7	1994	1348.17
8	1995	580.18
9	1996	2374.82
10	1997	1392.27
11	1998	1471.37
12		

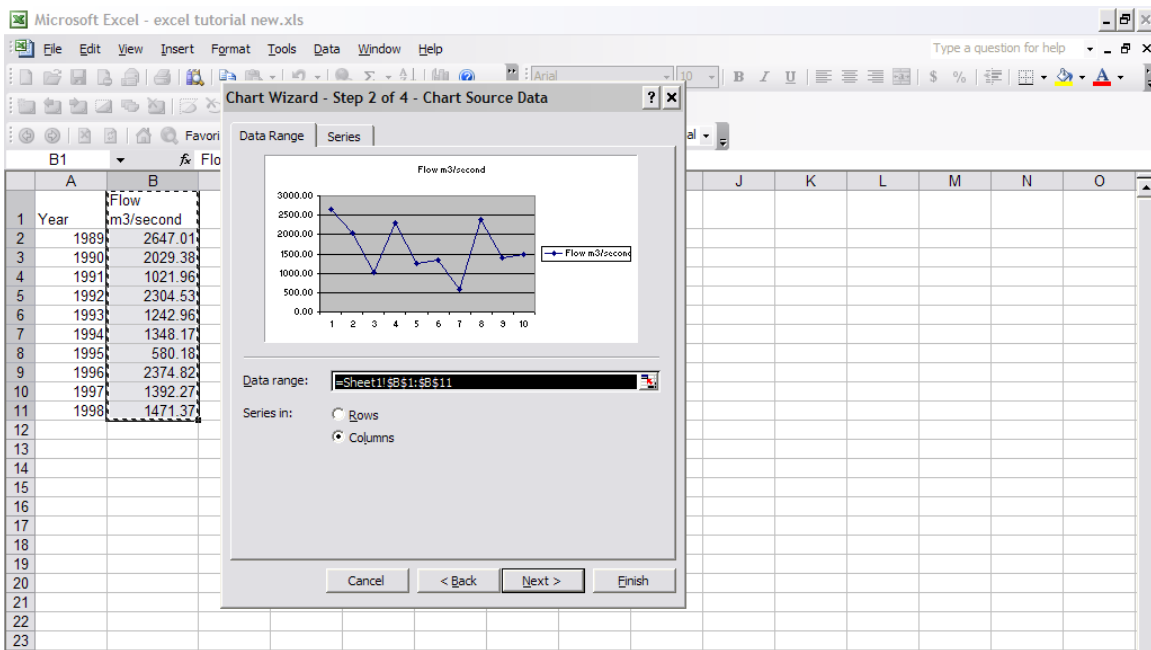
The cells B1 through B11 are highlighted with a black border. The status bar at the bottom shows "Sum=16412.66338".

How many cells are highlighted? \_\_\_\_\_

After you have highlighted the boxes, click on "Insert", then "Chart". You should see a box pop up for the Chart Wizard. In this box, you can choose what type of Chart you would like. For this first graph, let's choose "Line".



Click on the button “Next”. You see another box, Step 2 of 4 of the Chart Wizard. In this box, you can choose whether you want to graph the rows or columns. Leave this box alone (it is already checked with Columns).



Stay in Step 2. Click on the tab marked “Series”. You have only graphed the flow, so you have to now add the information of the Year.

Click here on this small dialog box at the end of the “Category (X) axis labels” box.

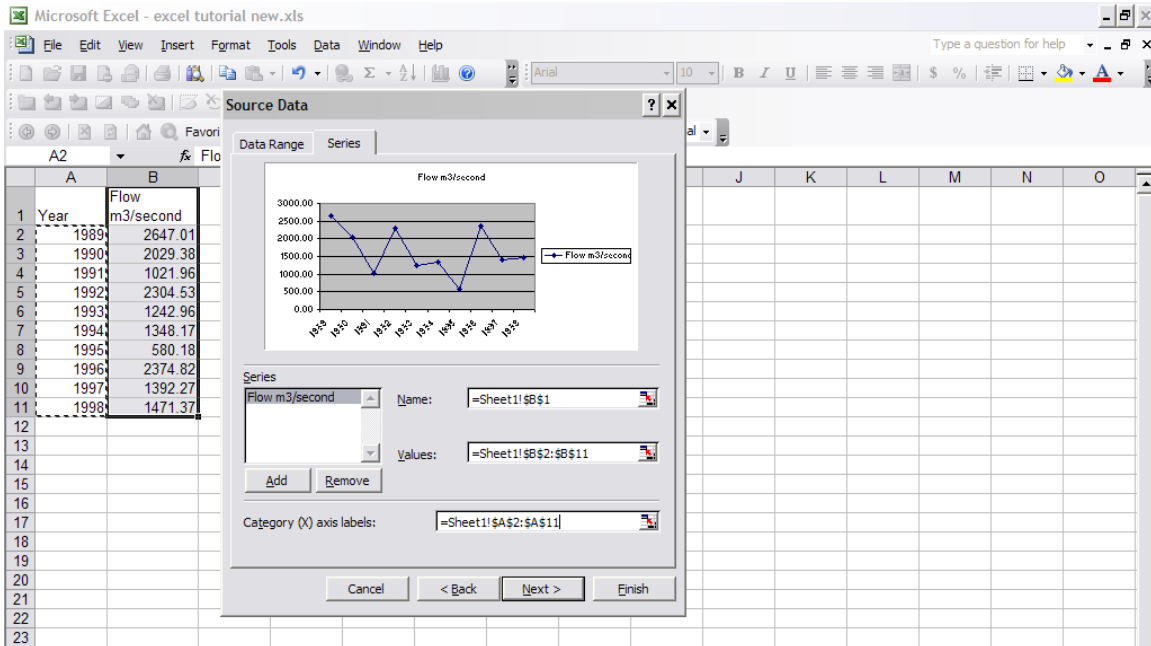
Year	Flow m3/second
1989	2647.01
1990	2029.38
1991	1021.96
1992	2304.53
1993	1242.96
1994	1348.17
1995	580.18
1996	2374.82
1997	1392.27
1998	1471.37

You will now get a small box that pops up on your spreadsheet. You have to highlight the next set of data points that you want to graph. To do this, take the mouse, click and drag to highlight the column for “Year”.

=Sheet1!\$A\$2:\$A\$11

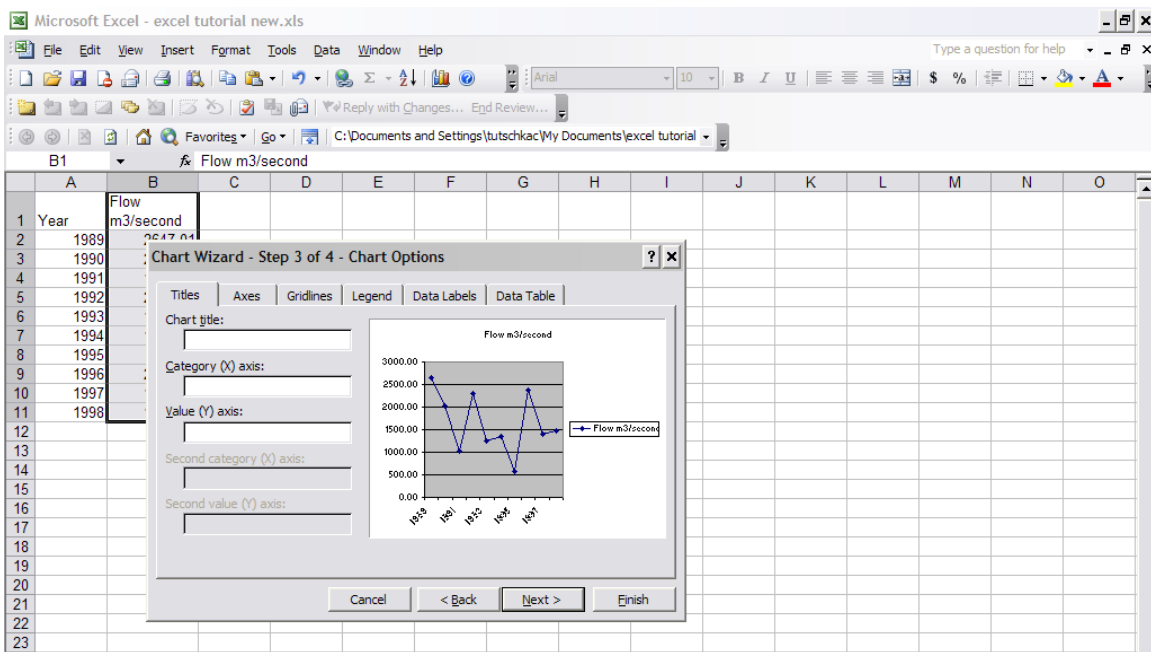
Year	Flow m3/second
1989	2647.01
1990	2029.38
1991	1021.96
1992	2304.53
1993	1242.96
1994	1348.17
1995	580.18
1996	2374.82
1997	1392.27
1998	1471.37

In the small box entitled “Source Data-Category (X) axis labels”, you will see that the names of the cells you have highlighted. Click on the small collapse dialog box again, and the Chart Wizard screen will pop back up. You should now notice that the “Years” have been placed along the “X” axis.

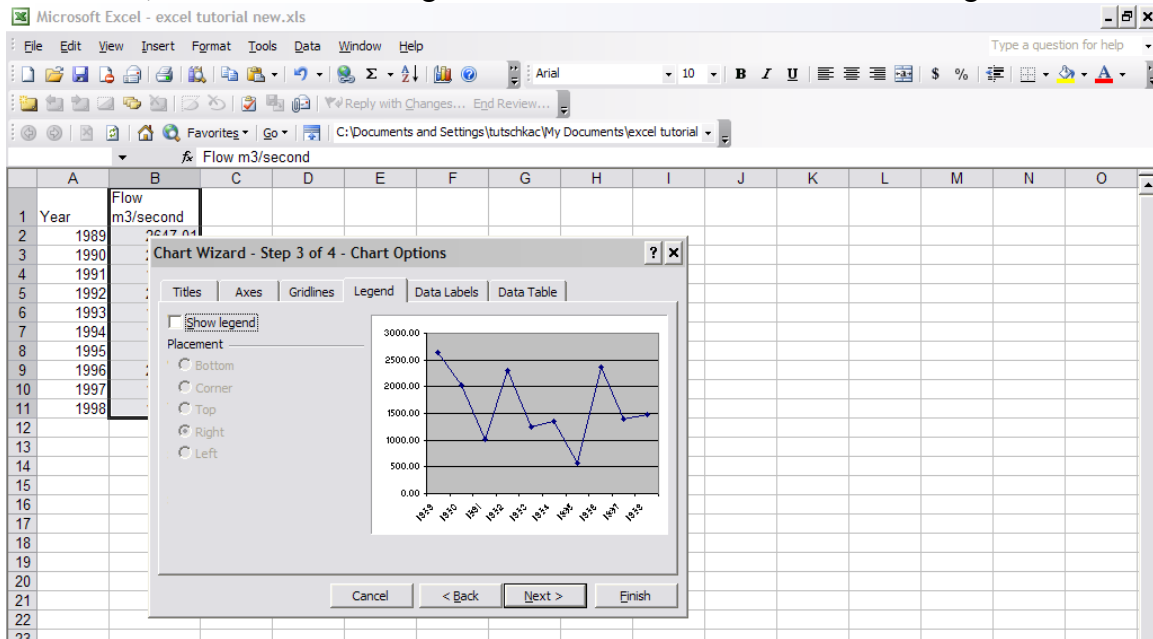


Now you come to Step 3 of 4 of the Chart Wizard. In this box, you have to choose what title to give your graph, and the names of the axes. Write these here and check them with a partner before finishing your graph:

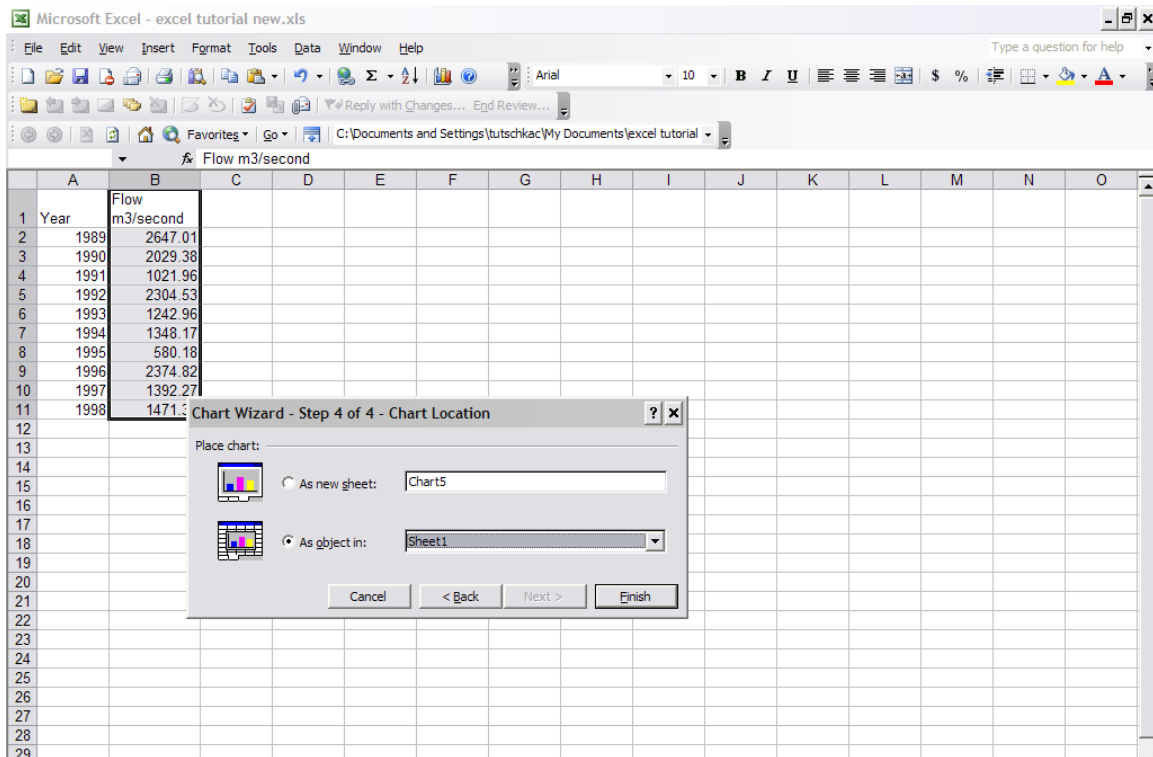
Title: \_\_\_\_\_  
 X-axis: \_\_\_\_\_  
 Y-axis: \_\_\_\_\_



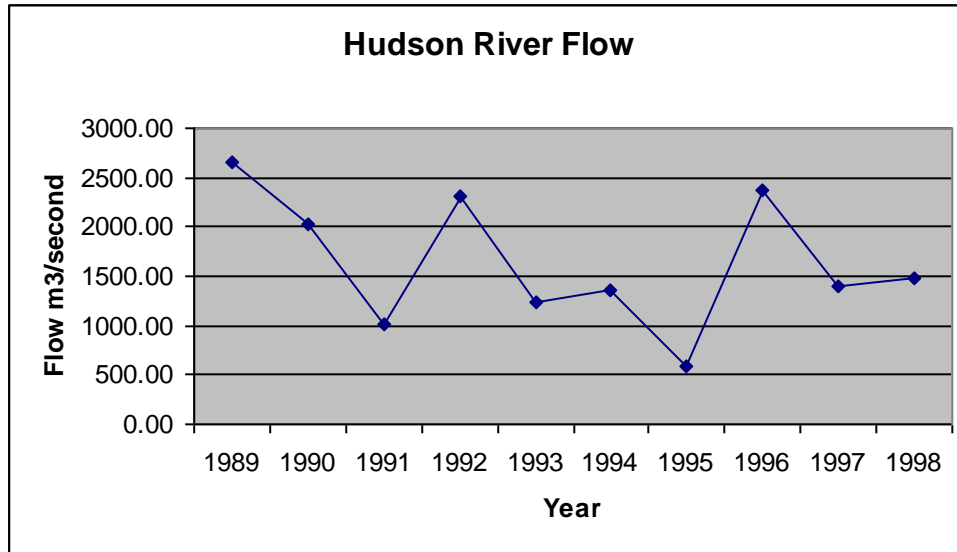
Before you click on “Next”, click the tab labeled “Legend”. Since we have added labels to our axes, we don’t need the legend. Un-click the box marked “Show Legend”.



You’re almost finished! After you have added the Titles for the chart and the axes, and removed the Legend, click on “Next”. You will come to the last step of the Chart Wizard. In this step, you are asked where you want to save your graph. Click on “As object in” and then click finish.



You should now have a graph that looks like this:



Based on this graph, answer the following questions:

What year was the flow in the Hudson the highest? \_\_\_\_\_ the lowest? \_\_\_\_\_

What are some of the reasons that flow might be higher or lower?

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What do you think are some of the effects of having a high flow rate in the Hudson? Of having a low flow rate?

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For homework, make two graphs of this data:

Sample	Chloride (mg/L)
1	17.34
2	16.69
3	15.2
4	13.94
5	14.36
6	15.61
7	14.96
8	15.16

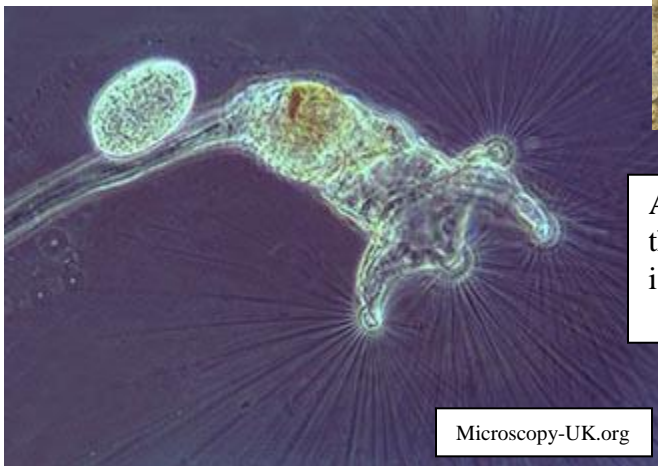
You should make one graph with "Sample" on the X-axis, and another graph with "Sample" on the y-axis. Print both graphs. When you are finished, answer the following on the back of your graph:

Which graph looks better? Why? What variable do you think should be placed on the X-axis? Why?

## Making a Spreadsheet: Part 2

Now it's time to practice using Excel to make a more complicated graph, where we will show more information on the Hudson River. Looking at ten years of data, you will compare the number of rotifers per liter of water with the number of copepods per liter of water. Later, you will add information about cladocerans. Later, you will add information about zebra mussels.

Zebra mussels are an invasive mollusk that arrived in the Hudson River in the early 1990s. They are filter feeders and reproduce quickly.



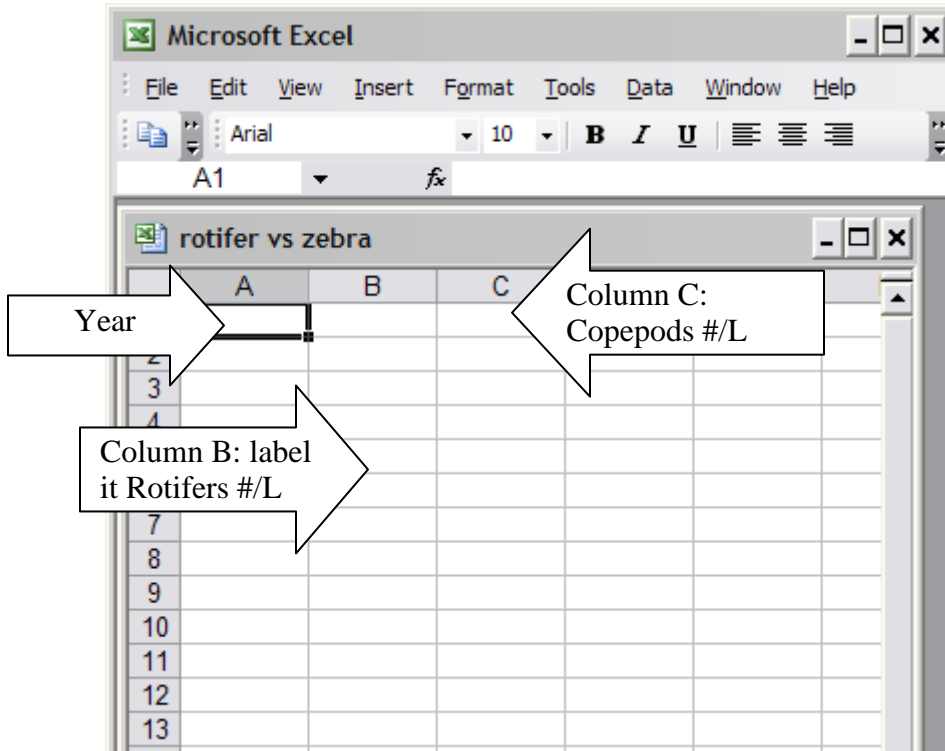
A rotifer is a tiny microscopic animal that lives just about anywhere that there is water.

A copepod is a microscopic crustacean that lives in water



Cladocerans are also microscopic crustaceans; they are sometimes called Water Fleas:

Open an Excel spreadsheet and type the headings shown below into the first row of each Column.



Use these data to fill in the chart:

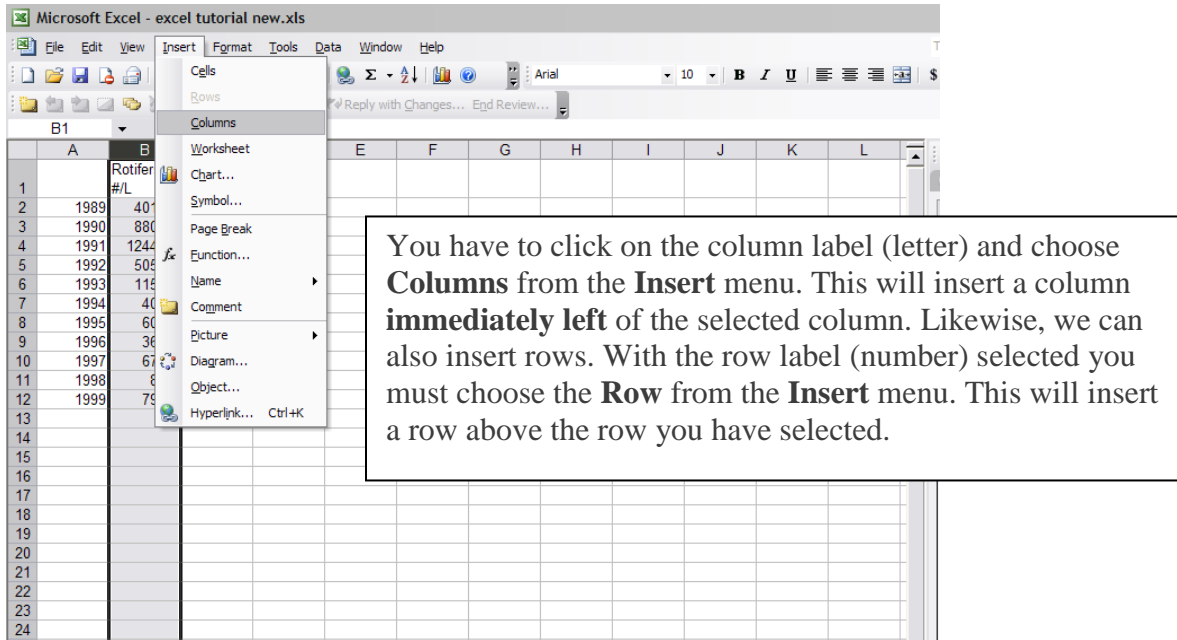
1989	401.38	4.72
1990	880.12	5.03
1991	1244.15	6.17
1992	505.67	2.14
1993	115.18	3.50
1994	40.00	4.40
1995	60.98	5.43
1996	36.92	2.78
1997	67.71	5.32
1998	8.82	3.39

Now, answer these questions:

- What is the value in Column B, Row 3? \_\_\_\_\_
- What is the value in Column A, Row 1? \_\_\_\_\_
- What is the value in Column C, Row 6? \_\_\_\_\_
- What is the value in Column A, Row 4? \_\_\_\_\_

Check your answers with another group before you go on.

Sometimes you might make mistakes or things change. If you have a spreadsheet designed and you forgot to include some important information, you can insert a column (or a row) into an existing spreadsheet.



Now try inserting a column into the spreadsheet you have made! Insert a column between Letters A and B. Label this new column: Cladocerans #/L. Use the numbers below to complete the column.

- 13.70
- 8.65
- 33.41
- 42.60
- 12.67
- 15.20
- 12.74
- 3.69
- 7.00
- 20.63

Answer the following questions after you have inserted the new column:

- A. What is the value in Column B, Row 3? \_\_\_\_\_
- B. What is the value in Column C, Row 5? \_\_\_\_\_
- C. What is the value in Column D, Row 6? \_\_\_\_\_

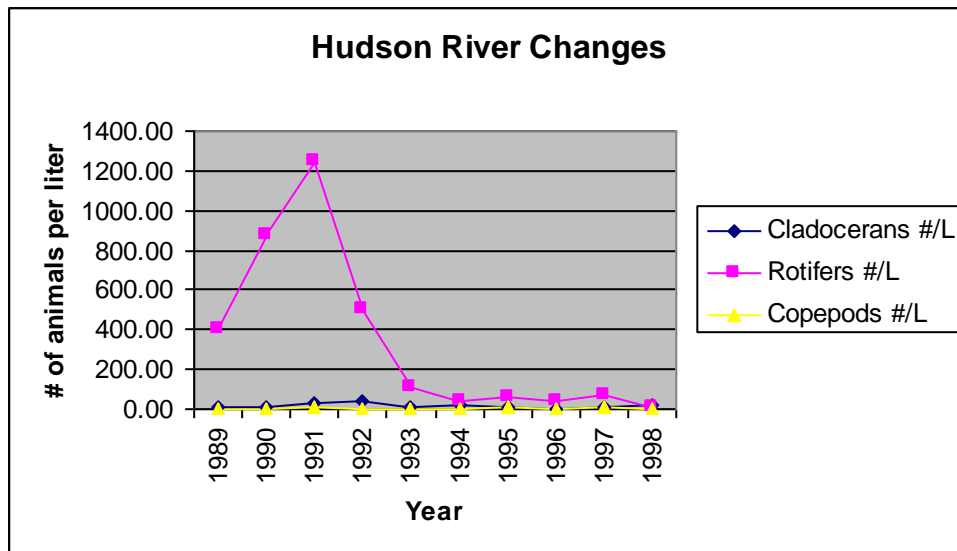
Check your answers again with another group. Your spreadsheet should look like this:

	A	B	C	D	E
1	Year	Cladocerans #/L	Rotifers #/L	Copepods #/L	
2	1989	13.70	401.38	4.72	
3	1990	8.65	880.12	5.03	
4	1991	33.41	1244.15	6.17	
5	1992	42.60	505.67	2.14	
6	1993	12.67	115.18	3.50	
7	1994	15.20	40.00	4.40	
8	1995	12.74	60.98	5.43	
9	1996	3.69	36.92	2.78	
10	1997	7.00	67.71	5.32	
11	1998	20.63	8.82	3.39	
12					

Now you are ready to create a graph from this data. Highlight the data you want to graph on the y-axis, then click on “Insert”, and then “Chart”. Again, select Line Graph. From this first step, you can also see what your graph will look like:

If you want to see what your chart will look like before you finish the process, click and hold “Press and Hold to View Sample”. If you are satisfied with your choice, click **Next**.

Complete the graphing process (remember that you have to select “Year” to be placed on the x-axis in Step 2 of the Chart Wizard). Your graph should look something like this:



You should be able to answer the following questions based on this graph:

Which animal population changed the most? \_\_\_\_\_ When did this change occur? \_\_\_\_\_

What could be a reason for the dramatic change in the rotifer population?

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What other kind of information do you need to know in order to decide what caused this change?

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Go on to the next part of the tutorial to learn how to change things about your graph!

## Changing Your Graphs

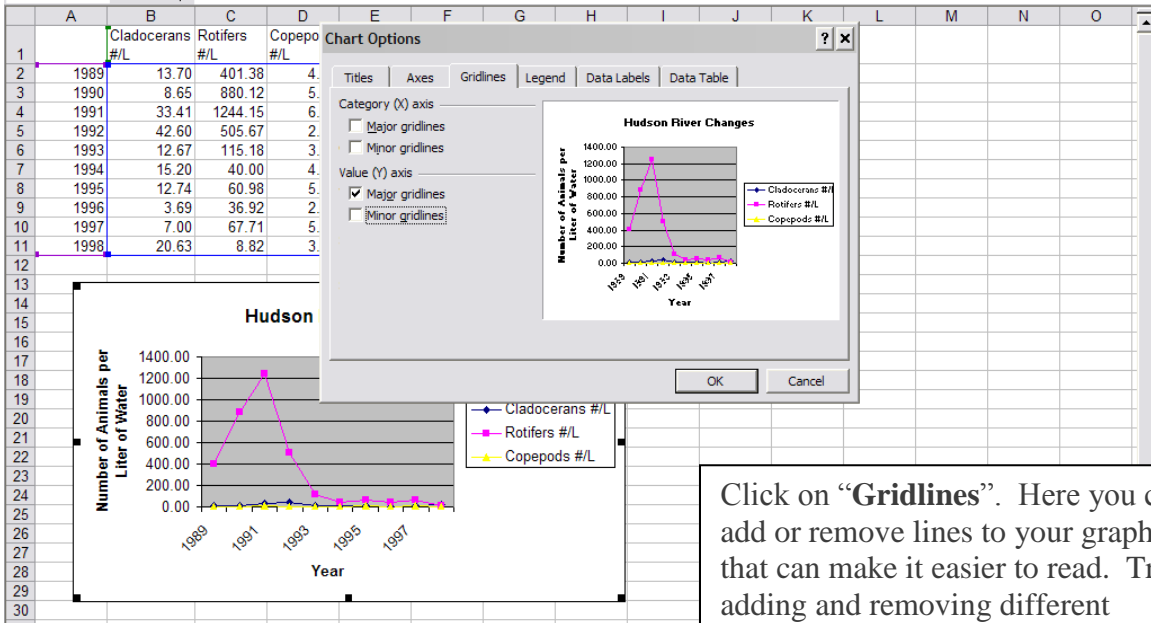
Using the same graph from the previous exercise, try working with the graph to change some things.

The screenshot shows an Excel spreadsheet with the following data:

Year	Cladocerans #/L	Rotifers #/L	Copepods #/L
1989	13.70	401.38	4.72
1990	8.65	880.12	5.03
1991	33.41	1244.15	6.17
1992	42.60	505.67	2.14
1993	12.67	115.18	3.50
1994	15.20	40.00	4.40
1995	12.74	60.98	5.43
1996	3.69	36.92	2.78
1997	7.00	67.71	5.32
1998	20.63	8.82	3.39

The graph 'Hudson River Changes' displays this data. A context menu is open over the graph with 'Chart Options...' selected. A text box on the right provides instructions: 'If you made a mistake, or you just want your graph to look better, you can change it by placing your mouse somewhere around the outside of the actual graph. Right click, and you will get a box that looks like the one on the right. Highlight "Chart Options".'

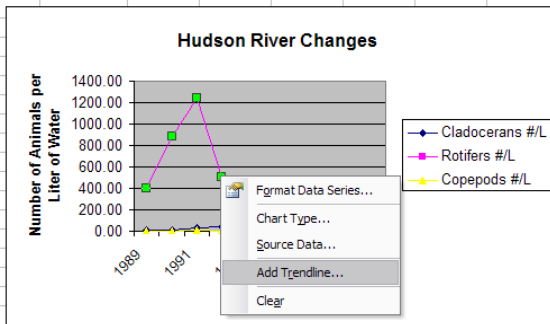
From "Chart Options", let's start with the "Gridlines" tab.



Click on “**Gridlines**”. Here you can add or remove lines to your graph that can make it easier to read. Try adding and removing different gridlines and then you can decide whether to leave them or not.

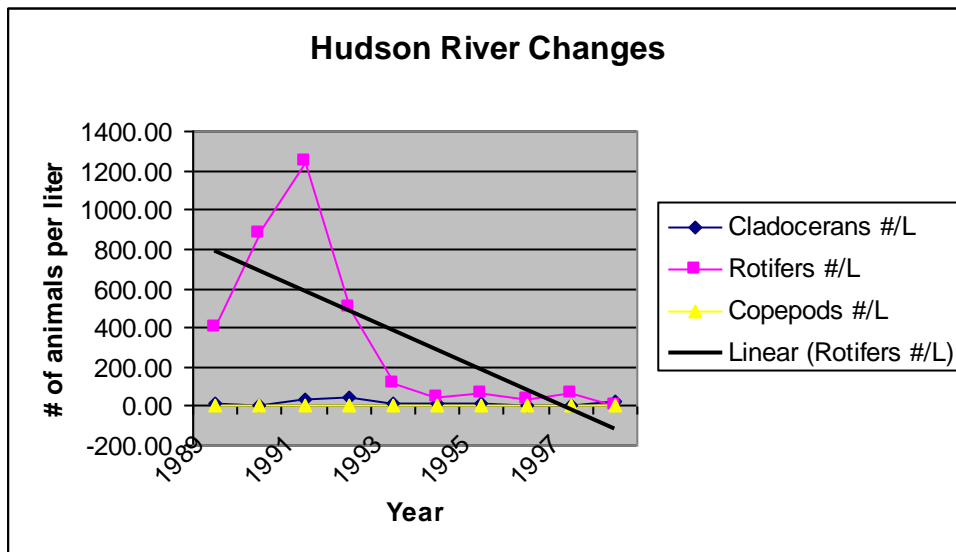
Now let’s try adding a trendline. This is a line that can show the direction of your variable.

Year	Cladocerans #/L	Rotifers #/L	Copepods #/L
1990	8.65	880.12	5.03
1991	33.41	1244.15	6.17
1992	42.60	505.67	2.14
1993	12.67	115.18	3.50
1994	15.20	40.00	4.40
1995	12.74	60.98	5.43
1996	3.69	36.92	2.78
1997	7.00	67.71	5.32
1998	20.63	8.82	3.39



Click on one of the **data points** for the Rotifers on the graph. The color and shape of the points will change. Then right click. You will see a small box with some options. Highlight and then click on “**Add Trendline...**” Select “**Linear**” and then say “**OK**”.

Your graph should now look like this:



The black line is your trendline. You can use trendlines to “predict” what might happen in the future, or what could have happened in the past. You can remove the trendline by clicking on the trendline, then clicking with the right mouse key, and selecting “Clear”.

Let’s try another type of change: adding a second Y-axis to your graph. Doing this allows you to see data more clearly, because it can graph one your variables on the second Y-axis. Try this by clicking on the data points for “Cladocerans”. Then, click on “Format Data Series”. Click on “Axis” tab.

Microsoft Excel - excel tutorial new.xls

Series "Clado..."     $=SERIES(Sheet2!$B$1,Sheet2!$A$2:$A$11,Sheet2!$B$2:$B$11,1)$

Year	Cladocerans #/L	Rotifers #/L	Copepods #/L
1989	13.70	401.38	4.72
1990	8.65	880.12	5.03
1991	33.41	1244.15	6.17
1992	42.60	505.67	2.14
1993	12.67	115.18	3.50
1994	15.20	40.00	4.40
1995	12.74	60.98	5.43
1996	3.69	36.92	2.78
1997	7.00	67.71	5.32
1998	20.63	8.82	3.39

**Format Data Series**

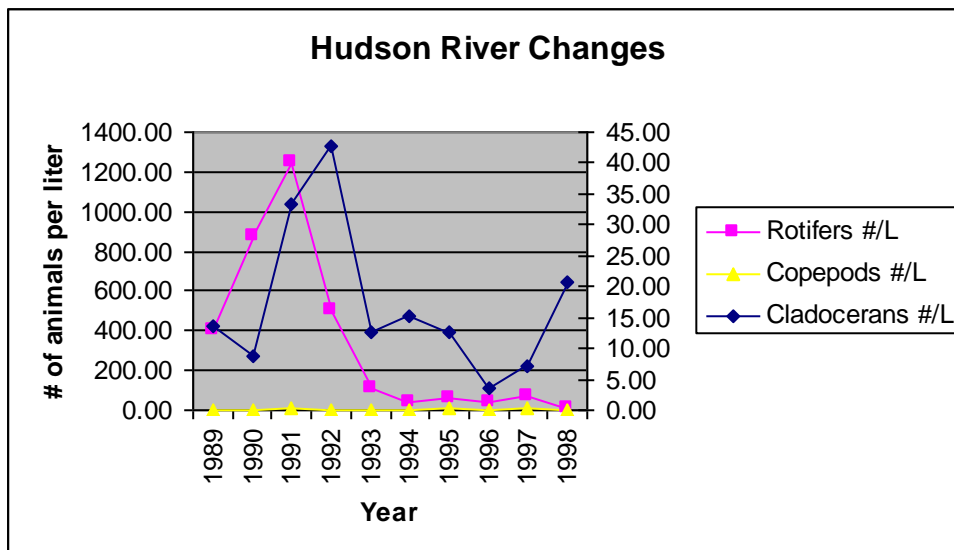
Plot series on:

Primary axis

Secondary axis

Click here on "Secondary Axis".

Once you have clicked on "Secondary Axis" and say "Ok", you should see your graph change dramatically:



Explain why this graph now looks so different:

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Does this change your answer to the earlier question about which animal species showed the most dramatic change? Why or why not? \_\_\_\_\_

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For homework, make a graph of the following data:

Year	Zebra Mussels Density (number/m <sup>2</sup> )	Rotifers #/L
1989	0.00	401.38
1990	0.00	880.12
1991	7	1244.15
1992	3929	505.67
1993	2571	115.18
1994	1357	40.00
1995	627	60.98
1996	346	36.92
1997	2792	67.71
1998	865	8.82

Then, answer these questions:

In what year did zebra mussels arrive in the Hudson Valley? \_\_\_\_\_

What happened to the rotifer population numbers after the arrival of the zebra mussels?

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Why do you think this happened? \_\_\_\_\_

What other information do you need to know to decide why the rotifer population reacted in this way to the zebra mussels? \_\_\_\_\_

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Add a trendline to your graph. What do you think will happen in ten years to the rotifer population? \_\_\_\_\_ to the zebra mussel population? \_\_\_\_\_