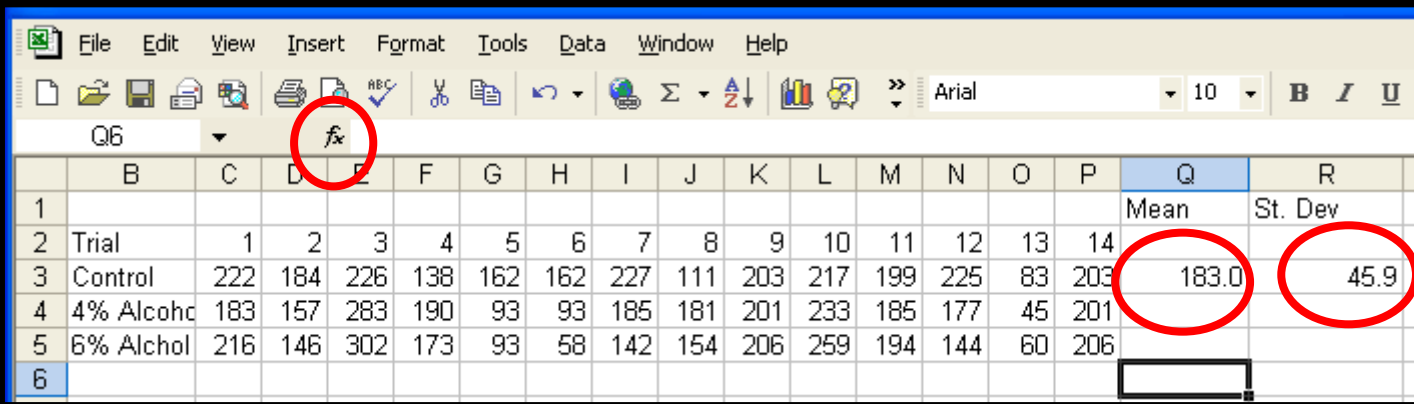


Graphing using Microsoft Excel

Tutorial #3- Graphing with standard error bars

Step 1. Enter data and prepare a graph as described in “Excel tutorial # 1”

For this demonstration, we shall use some class measurements of Daphnia heart rate upon exposure to alcohol.



The screenshot shows the Microsoft Excel interface with a data table. The formula bar (fx) is highlighted with a red circle. In the table, the mean value (183.0) and standard deviation value (45.9) are also circled in red.

	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1																Mean	St. Dev
2	Trial	1	2	3	4	5	6	7	8	9	10	11	12	13	14		
3	Control	222	184	226	138	162	162	227	111	203	217	199	225	83	203	183.0	45.9
4	4% Alcohol	183	157	283	190	93	93	185	181	201	233	185	177	45	201		
5	6% Alcohol	216	146	302	173	93	58	142	154	206	259	194	144	60	206		
6																	

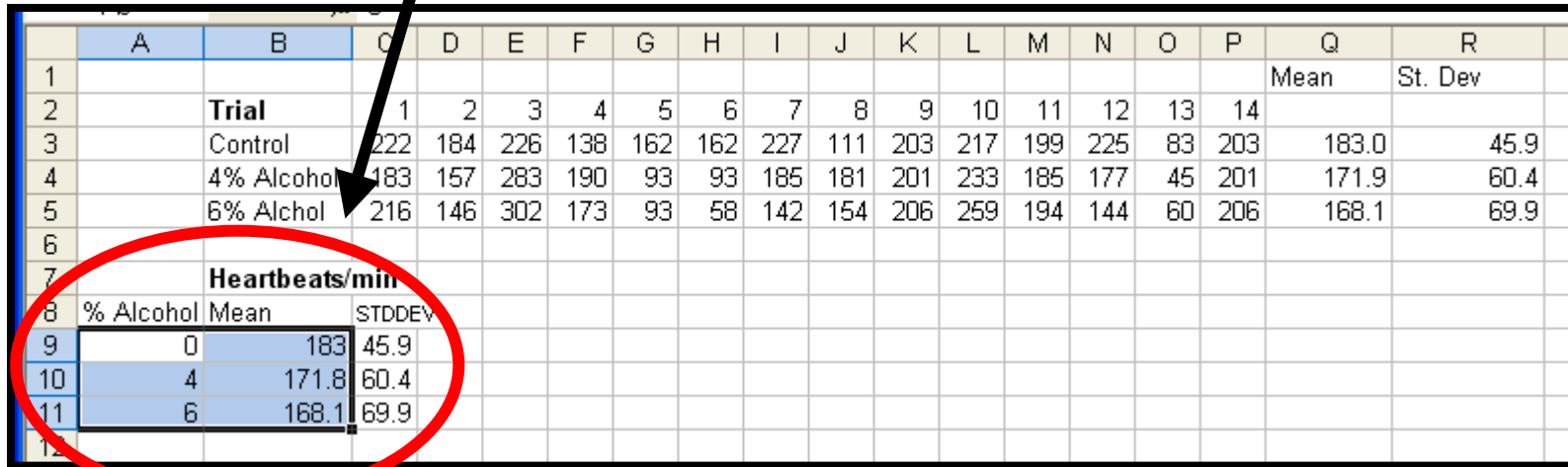
As described in “Excel Tutorial #2”, the mean and standard deviation values for each set of data were determined as follows:

The mean and standard deviation are determined by selecting the appropriate box, then selecting “fx”, then selecting AVERAGE or STDEV, then selecting the data you wish to analyze.

Note: Columns Q and R were also formatted to show only one decimal place.

I also formatted columns Q and R to give only one decimal place.

Step 2 - Retype your mean and standard deviation values below the original table, then use the latter data to prepare a graph.



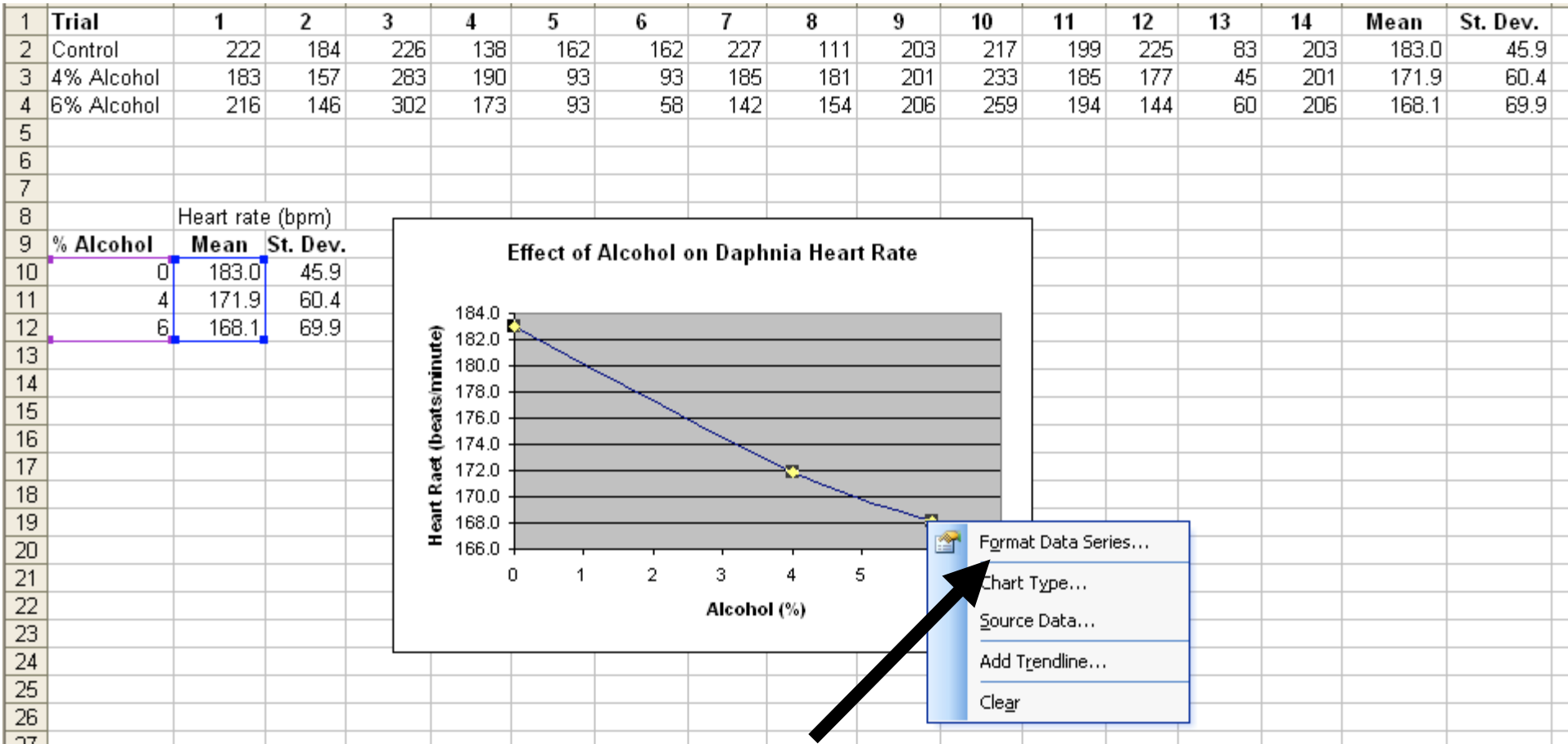
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1																	Mean	St. Dev
2		Trial	1	2	3	4	5	6	7	8	9	10	11	12	13	14		
3		Control	222	184	226	138	162	162	227	111	203	217	199	225	83	203	183.0	45.9
4		4% Alcohol	183	157	283	190	93	93	185	181	201	233	185	177	45	201	171.9	60.4
5		6% Alcohol	216	146	302	173	93	58	142	154	206	259	194	144	60	206	168.1	69.9
6																		
7		Heartbeats/min																
8	% Alcohol	Mean	STDDEV															
9	0	183	45.9															
10	4	171.8	60.4															
11	6	168.1	69.9															
12																		

Alternatively, you can cut and paste the data, but then you will need to use “Paste Special” and select “Values”. Otherwise, it will paste the *formula* used to calculate mean or standard deviation..

Step 3. Select the area highlighted in blue above and make a graph using the Chart Wizard.

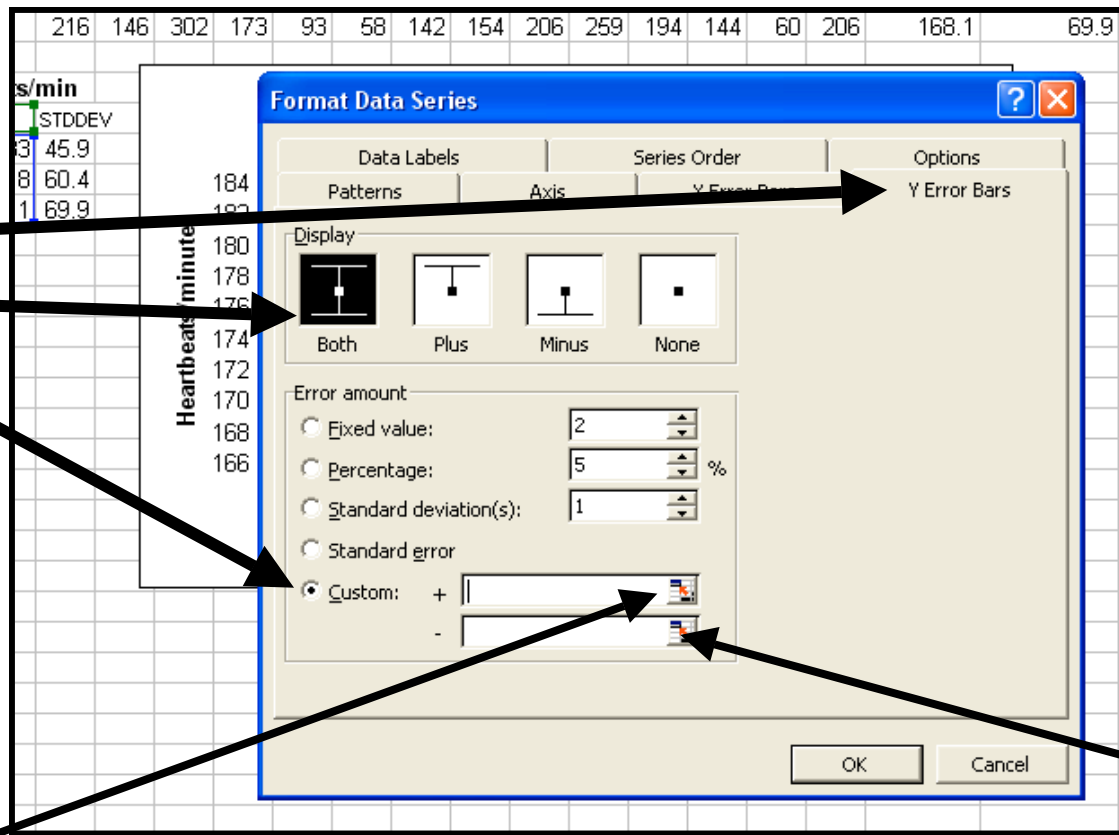
Note: Do NOT select the standard deviation values when graphing data!

Now your graph should something look like this:

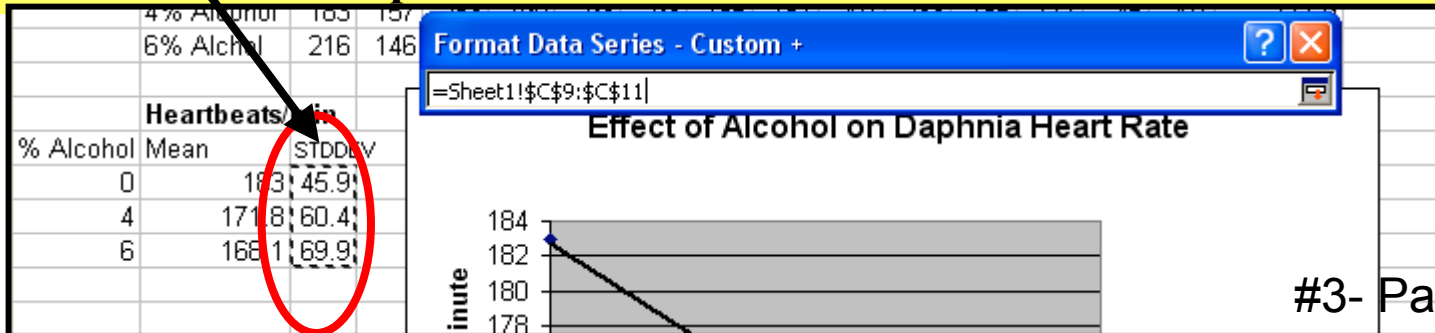


Step 4. To apply error bars, *left* click on any data point on the graph and select “Format Data Series”, then proceed to Step 5.

Step 5- Select the “Y Error Bars” tab, “Both”, and “Custom”



Step 6. Left-click this icon. The window below will appear (ignore this window). Now highlight the three standard deviation values and press “Enter”. This screen will reappear. Select the icon below the first one selected. Now again highlight the *same* standard deviation values and press “Enter”.



Now your graph should have error bars.

