

Name: _____

Date: _____

Data Analysis in Excel

Fenway High School Science

Terms

Define:

Independent variable: _____

Dependent variable: _____

Standard deviation: _____

Background

For your science fair project, you should carry out multiple trials for each value of your independent variable.

Why? _____

When you are done, for each value of the independent variable, you will have several values of your dependent variable. For example, if you were measuring the speed of a ball when it reaches the ground from different heights, your data table might look something like this:

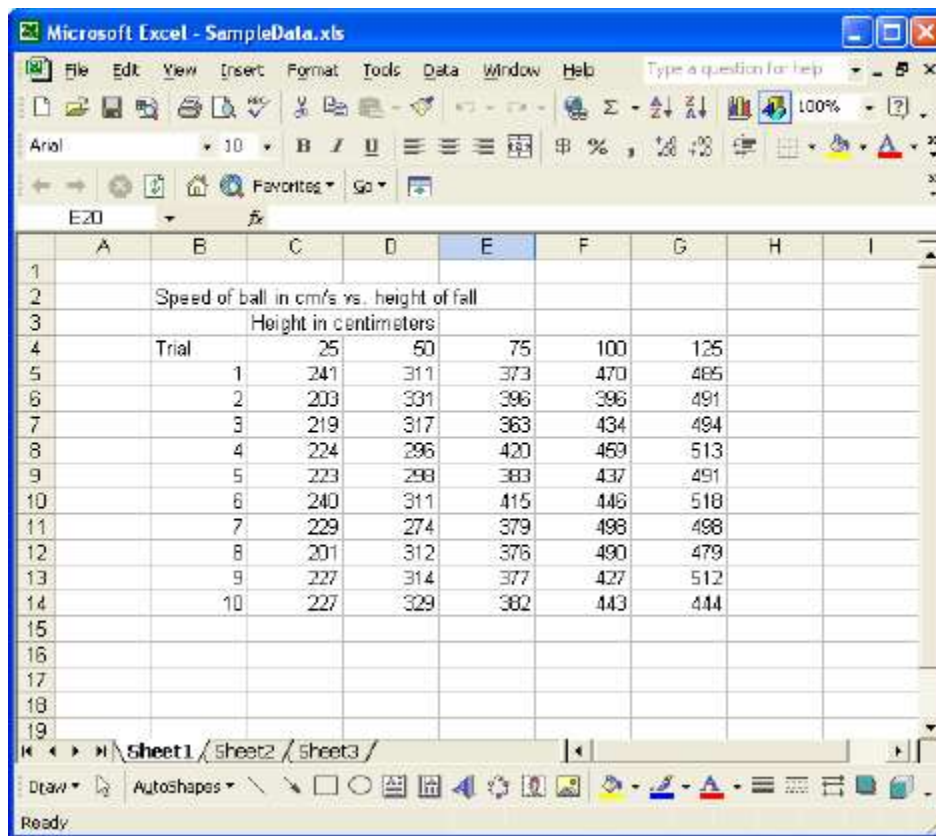
Speed of ball in cm/s vs. height of fall					
	Height in centimeters				
Trial	25	50	75	100	125
1	241	311	373	470	485
2	203	331	396	396	491
3	219	317	363	434	494
4	224	296	420	459	513
5	223	298	383	437	491
6	240	311	415	446	518
7	229	274	379	498	498
8	201	312	376	490	479
9	227	314	377	427	512
10	227	329	382	443	444

For this experiment, what is the independent variable? _____

What is the dependent variable? _____

Working in Excel

Type the data into Excel, in the same form as in the data table. (If you already have data for your experiment, you can use that instead.) It should look something like this:



The screenshot shows a Microsoft Excel spreadsheet titled 'SampleData.xls'. The data is organized as follows:

	A	B	C	D	E	F	G	H	I
1									
2		Speed of ball in cm/s vs. height of fall							
3		Height in centimeters							
4		Trial	25	50	75	100	125		
5		1	241	311	373	470	465		
6		2	203	331	396	396	491		
7		3	219	317	363	434	494		
8		4	224	296	420	469	513		
9		5	223	298	383	437	491		
10		6	240	311	415	446	518		
11		7	229	274	379	498	498		
12		8	201	312	376	490	479		
13		9	227	314	377	427	512		
14		10	227	329	382	443	444		

Statistics

The first goal is to calculate the average and standard deviation for your data. Label the rows below your data table as "Average" and "Standard Deviation":

	8	201	312	376	
	9	227	314	377	
	10	227	329	382	
	Average				
	Standard Deviation				

Then type in the formula below each column. Put the cursor below the first column of data, and press the “=” key:

	9	227	314
	10	227	329
Average	=		
Standard Deviation			

Type the name of the “average” function, **Average**, and an open parenthesis, ((Excel will prompt you with a guide to using the function):

	8	201	312	376
	9	227	314	377
	10	227	329	382
Average	=Average(
Standard De	AVERAGE(number1, [number2], ...)			

Select the column of data values for the dependent variable (*careful*: don’t include the value for the independent variable):

Speed of ball in cm/s vs. height of fal			
	Height in centimeters		
Trial	25	50	
1	241	311	
2	203	331	
3	219	317	
4	224	296	
5	223	298	
6	240	311	
7	229	274	
8	201	312	
9	227	314	
10	227	329	
Average	=Average(C10R x 1C		
Standard De	AVERAGE(number1, [num		

Then type the close parenthesis,), and hit the Enter key.

	7	229	274
	8	201	312
	9	227	314
	10	227	329
Average	224		
Standard Deviation			

Below that cell, enter the formula for standard deviation. First press the “=” key. Then type the name of the standard deviation function, **Stdev**, and an open parenthesis:

	10	227	329	382
Average		224		
Standard Deviation		=Stdev(
		STDEV(number1, [number2], ...)		

Once again, select the column of data values for the dependent variable (*careful*: don't include the average or the value for the independent variable):

Speed of ball in cm/s vs. height of fall				
	Height in centimeters			
Trial	25	50	75	
1	241	311	373	
2	203	331	396	
3	219	317	363	
4	224	296	420	
5	223	298	383	
6	240	311	415	
7	229	274	379	
8	201	312	376	
9	227	314	377	
10	227	329	382	
Average	224			
Standard Deviation	=Stdev(C5:C14)			
		STDEV(number1, [number2], ...)		

Type a close parenthesis, and press the "Enter" key:

	10	227	329
Average		224	
Standard Deviation		13.17147	

Next, copy the formulas that you entered over to all of your data columns. But do this the nifty way. First, select the cells for the formulas you just entered:

	8	201	312
	9	227	314
	10	227	329
Average		224	
Standard Deviation		13.17147	

Then put the cursor over the small black box to the bottom right of the cell selection box. The cursor will change to a small "+" sign:

	9	227	314	377	427	512
	10	227	329	382	443	444
Average		224	309	387	450	493
Standard Deviation		13.17147	16.7873	18.46076	30.34518	21.33835

Click, and while holding down the left mouse button, drag the cells to the right:

	7	229	274	379	498	498
	8	201	312	376	490	479
	9	227	314	377	427	512
	10	227	329	382	443	444
Average		224	309	387	450	493
Standard Deviation		13.17147	16.7873	18.46076	30.34518	21.33835

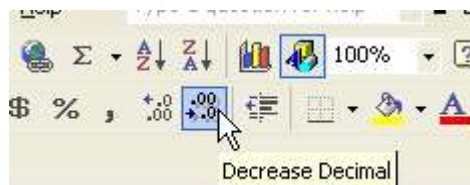
Let go, and the formulas will be copied:

	9	227	314	377	427	512
	10	227	329	382	443	444
Average		224	309	387	450	493
Standard Deviation		13.17147	16.7873	18.46076	30.34518	21.33835

Next, adjust the number of decimal places for the standard deviation. The values are misleadingly precise. First, select the standard deviation row:

	10	227	329	382	443	444
Average		224	309	387	450	493
Standard Deviation		13.17147	16.7873	18.46076	30.34518	21.33835

Next, press the “Decrease Decimal” button to reduce the number of decimal places:



Press it until no values are shown after the decimal point:

	9	227	314	377	427	512
	10	227	329	382	443	444
Average		224	309	387	450	493
Standard Deviation		13	17	18	30	21

Graphing the Data

The next goal is to graph the *average* values for your dependent variable against the values for your independent variable.

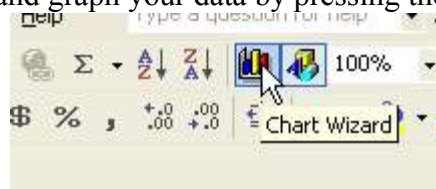
First, select the row containing your independent variable values:

Speed of ball in cm/s vs. height of fall						
	Height in centimeters					
Trial	25	50	75	100	125	
1	241	311	373	470	485	
2	203	331	396	396	491	
3	219	317	363	434	494	
4	224	296	420	459	513	
5	223	298	383	437	491	
6	240	311	415	446	518	
7	229	274	379	498	498	
8	201	312	376	490	479	
9	227	314	377	427	512	
10	227	329	382	443	444	
Average	224	309	387	450	493	
Standard C	13	17	18	30	21	

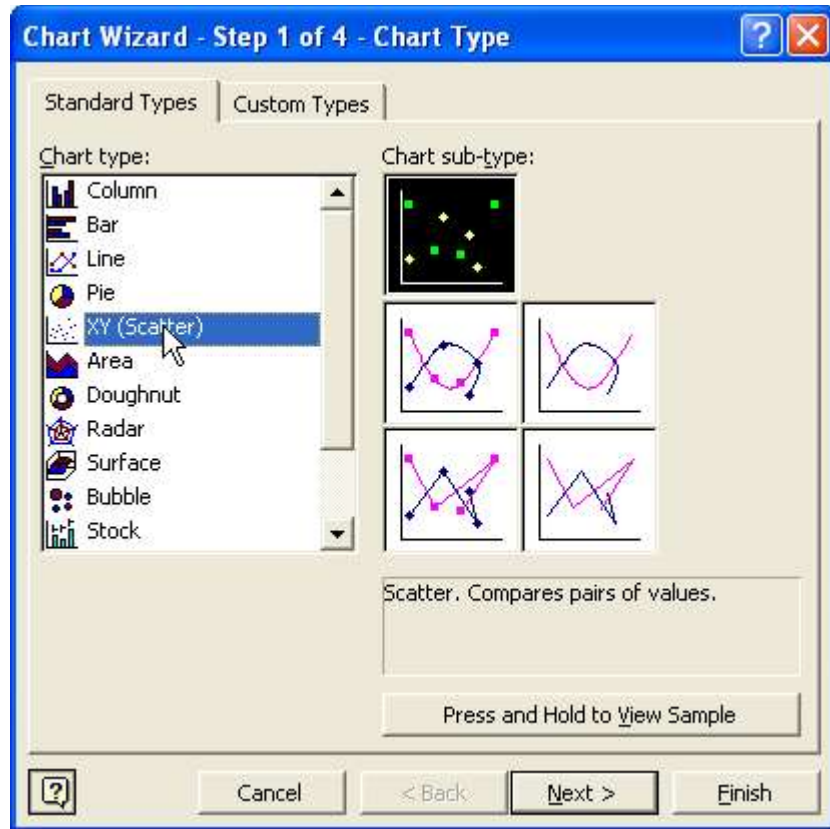
Then, while holding down the Control (Ctrl) key, select the row for your average dependent variable values:

Speed of ball in cm/s vs. height of fall						
	Height in centimeters					
Trial	25	50	75	100	125	
1	241	311	373	470	485	
2	203	331	396	396	491	
3	219	317	363	434	494	
4	224	296	420	459	513	
5	223	298	383	437	491	
6	240	311	415	446	518	
7	229	274	379	498	498	
8	201	312	376	490	479	
9	227	314	377	427	512	
10	227	329	382	443	444	
Average	224	309	387	450	493	
Standard C	13	17	18	30	21	

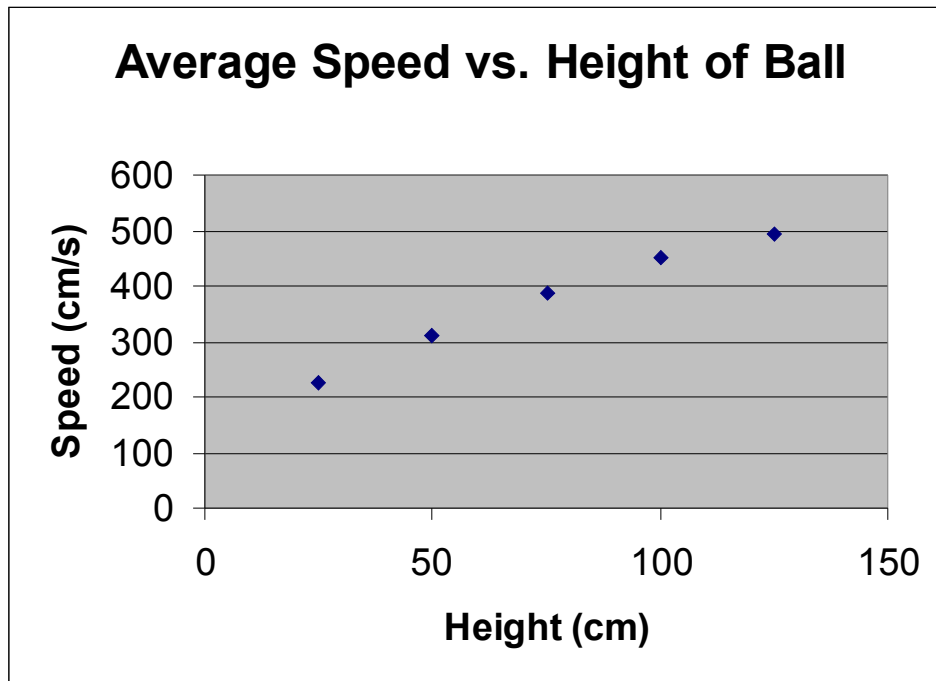
Now let go of the Ctrl key and graph your data by pressing the “Chart Wizard” button:



On the chart wizard, select the “XY (Scatter)” option:



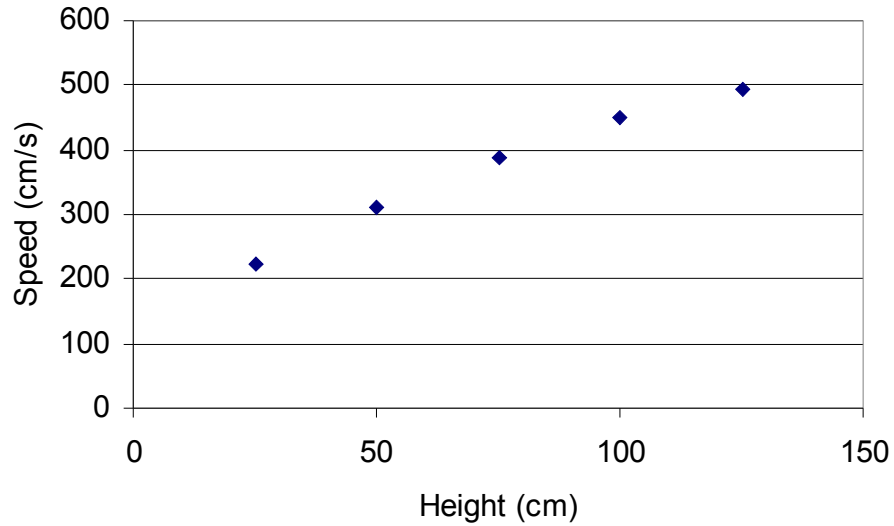
Go through the steps of the wizard to create your graph. It should look something like this:



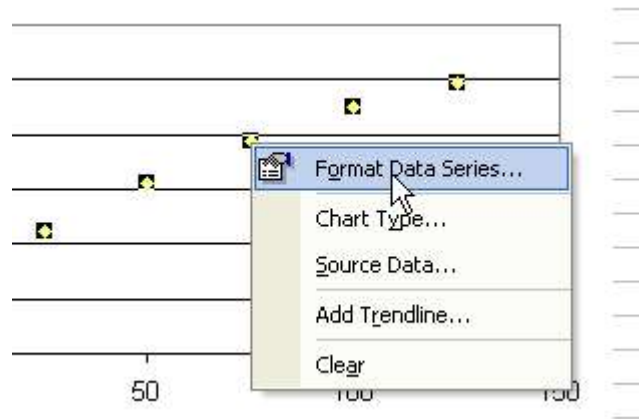
You may want to change some of the settings, like the size of font, etc. Here's my

reorganized chart:

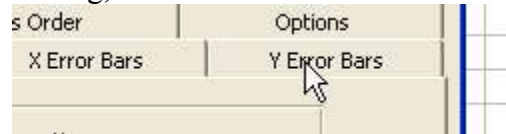
Average Speed vs. Height of Ball



Now add the standard deviations as *error bars*. Right-click on any of the data points on the graph, and choose “Format Data Series” from the menu:



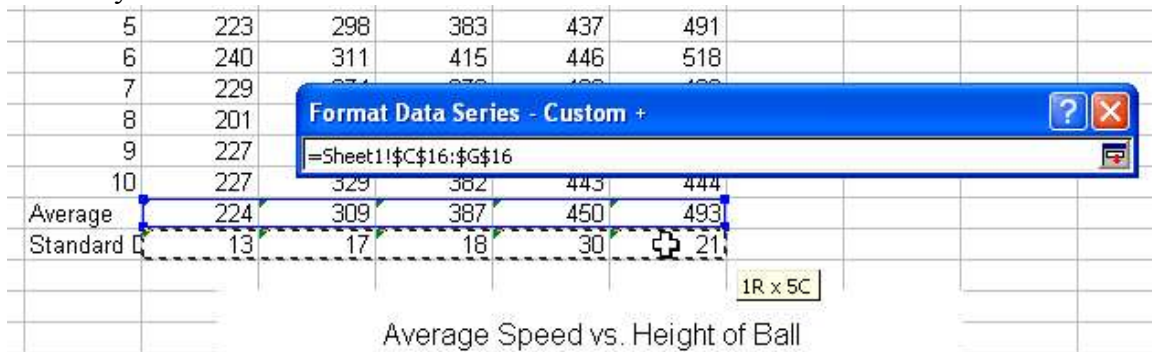
In the Format Data Series dialog, select the “Y Error Bars” tab:



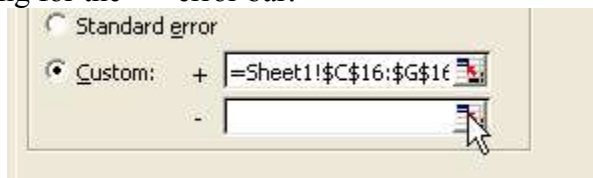
You will create a custom error bar. Press the button next to the custom error bar entry field for “+” error bars:



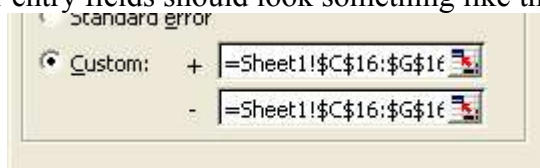
This will let you browse for data. Select your row of standard deviations, and press the Enter key:



Then do the same thing for the “-” error bar:



In the end, the error bar entry fields should look something like this:



When you're done, press the “OK” button. Your graph should now look something like this:

