UNIVERSITY OF Southampton

Producing Charts in Excel 2010

Charts

Introduction

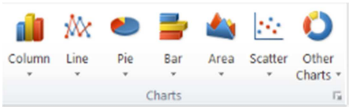
Excel can create a variety of charts however, for biomedical data only a subset of them are really useful and some important chart types are not available.

Useful Charts	Column, Bar, XY Scatter and sometimes Pie charts
Less useful (unlikely to use)	Line (commonly mistaken for XY scatter with line), Area, Surface, Radar, Doughnut, Bubble, Stock, Cylinder, Cone and Pyramid

When analysing data, the importance of plotting your data cannot be over-emphasised. Unless you are simply interested in frequency tables or crosstabulations, you should plot your data. Doing so will allow you to:

- study the distribution of your data (does it follow a normal distribution, for example?)
- check for any outliers or extreme values that need to be further investigated
- examine the relationships between two or more variables

The computation of any statistics, whether it be summary statistics such as means or medians or performing statistical tests, such as t-tests or correlation coefficients, should only proceed after plotting the data.



Creating a chart

The key to producing the type of chart you want is to organise your data correctly. Arrange the data in columns and place a label in the cell above the data in each column used. You might wish to select and copy the data that you want to plot onto a new worksheet. Ensure that the labels for categories used in a bar chart, or the X (horizontal) axis values for a scatter plot are in the first column. Then highlight the data and select the **Insert** ribbon and choose the type of chart you want to create.

Note: Excel tries to identify the data that it thinks you want to plot. So sometimes you can get away with selecting a single cell and choosing a chart but this can lead to charts being created that do not display the data in a sensible manner. So highlighting all the data is better.

Producing a Column Bar Chart

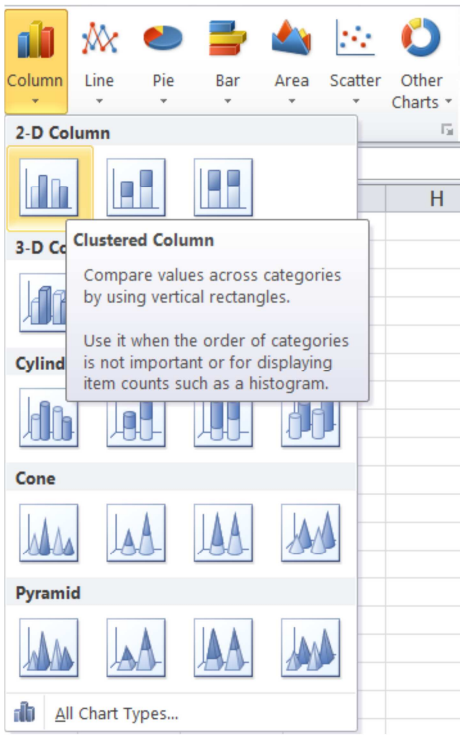
Suppose we wish to produce a bar chart showing the counts of people in a various health professions. The data is entered so that the categories are in cells 2 to 6 of column A and the counts in cells 2 to 6 of column B. Titles have be entered in row 1.

	A	B
1	**Profession**	**Number**
2	Doctor	9
3	Nurse	13
4	Pharmacist	2
5	Physiotherapist	5
6	Radiographer	3

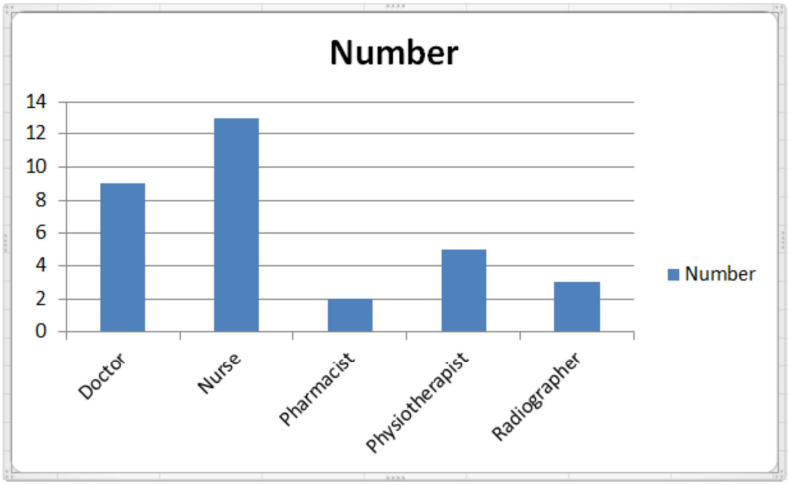
Highlight cells A1 to B6 and select the Column button 

Select the type of Column chart you want.

In this example use the basic 2-D clustered column, even though we are not comparing groups.

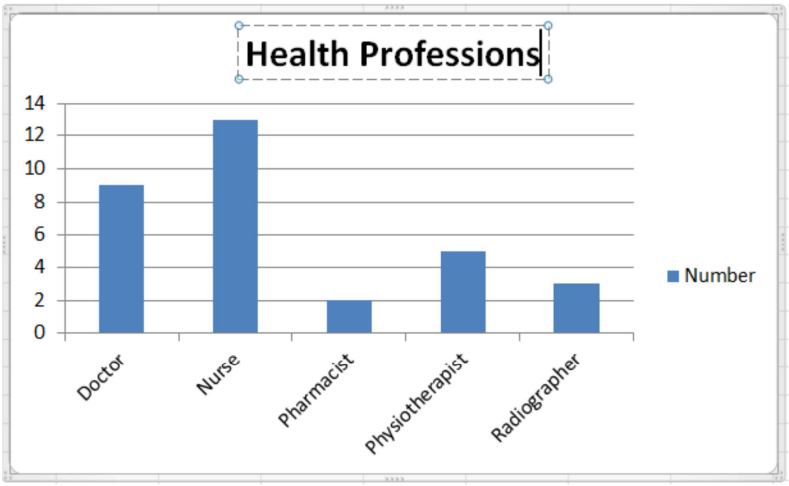


The chart is created and placed in the current sheet.

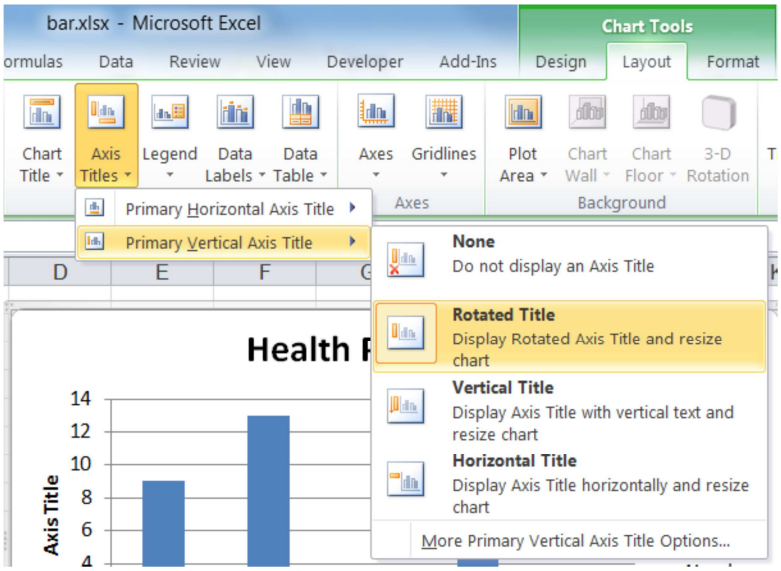


To change the Chart title from ***Number*** to: ***Health Professions***, click twice on the word Number, delete it and enter **Health Professions**.

If you accidently delete the title box, use the undo icon to restore it.

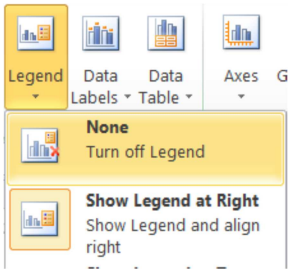


To add the word Count to the Y (vertical) axis, click anywhere on the chart to select it.
Select the ***Chart Tools*** | ***Layout*** ribbon
Select ***Axis Titles*** | ***Primary Vertical Axis*** |***Rotated Title***.

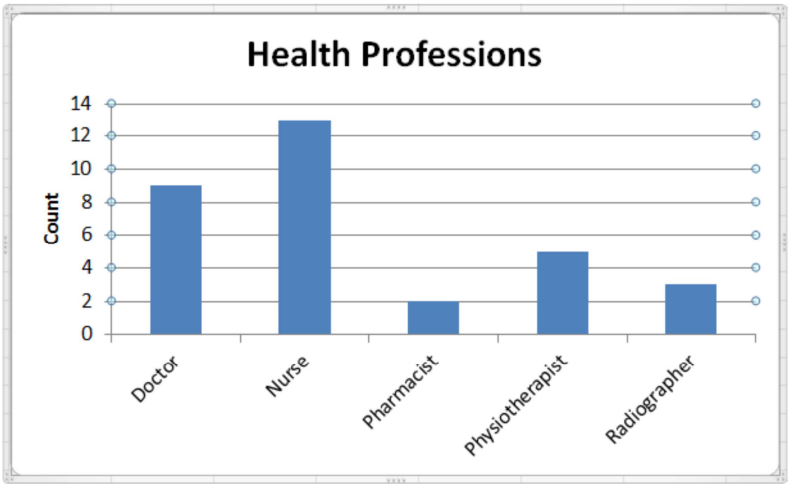


The text Axis Title is added to your chart for the vertical axis. Click twice on the text to select it and replace it with the word ***Count***

Remove the legend by selecting the button and choosing ***None***



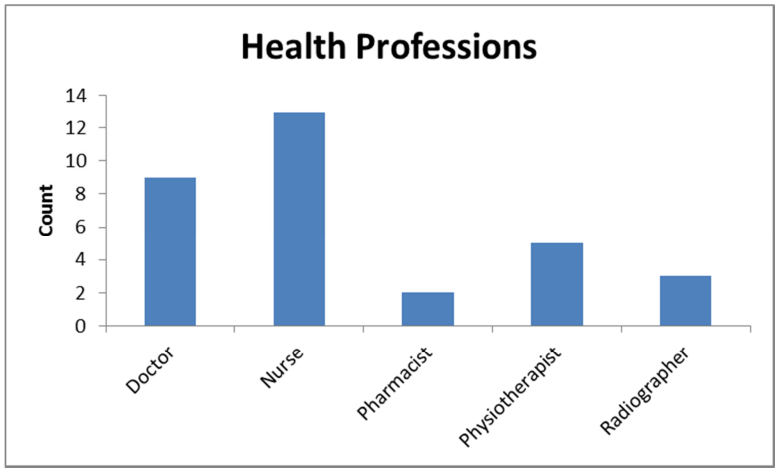
To remove the horizontal lines, carefully place the cursor over one of them (not the top one) and click. All the lines should be highlighted with blue circles at either end of them. Press the ***Delete*** button.



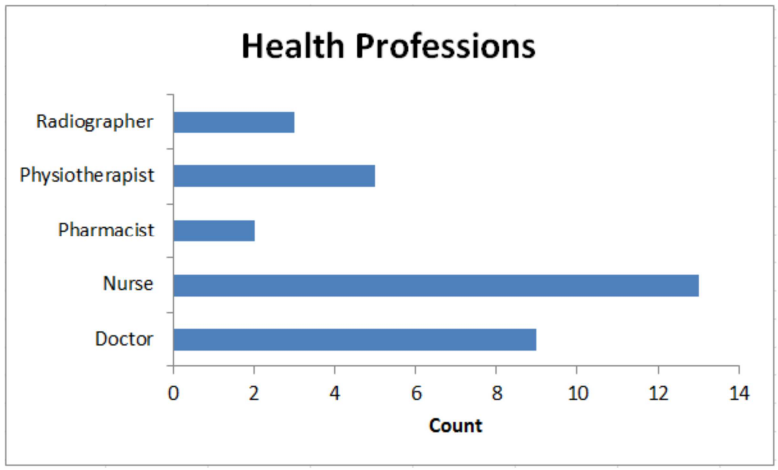
Alternatively use the Gridlines button 

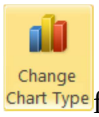
If your chart disappears, the lines were not selected correctly! Use the Undo button to restore the chart

Your finished chart should look as follows



Sometimes it might be better to display the data as what Excel refers to as a Bar chart as shown below. This is because the category labels may be too big.



This can be achieved by selecting the Change Chart Type button 

from the ***Chart Tools | Design*** ribbon and selecting a Bar chart  instead of the Column chart.
The horizontal axis title may be rotated by 90°. Right click on the horizontal axis label 'Count', select Format Axis Title and use the Alignment to change the Text layout - Text direction to horizontal.

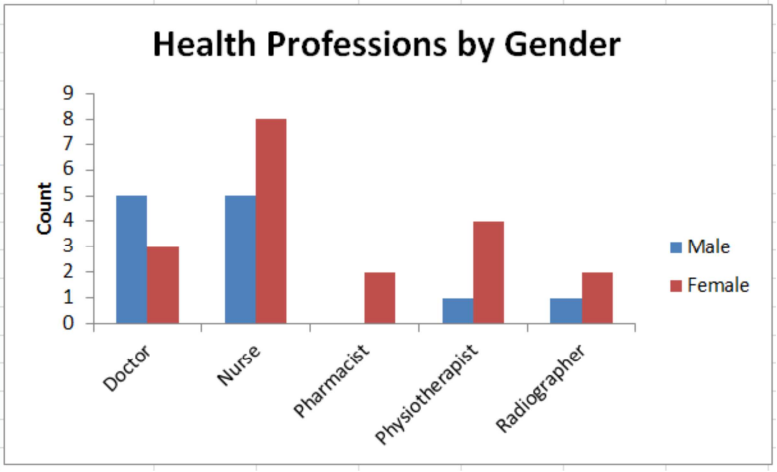
Producing a Clustered Bar Chart

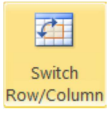
A clustered bar can be used to display categories grouped by an attribute such as Gender. The chart opposite was produced in the same way as for the previous bar chart. The cells in the range A1 to C6 were selected and a Column 2-D bar selected.

It was dragged to a position below the data.

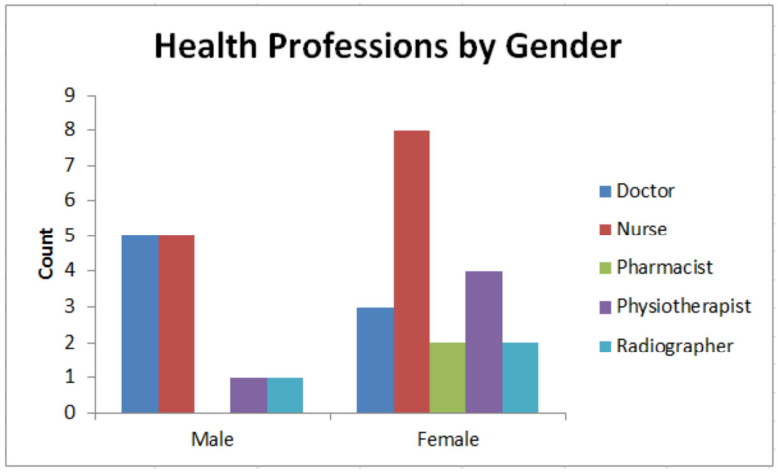
Chart and Axis Titles were added using the ***Chart Tools | Layout*** ribbon.

	A	B	C	D	E	F	G
1	**Profession**	**Male**	**Female**				
2	Doctor	5	3				
3	Nurse	5	8				
4	Pharmacist	0	2				
5	Physiotherapist	1	4				
6	Radiographer	1	2				



The ***Chart Tools | Design*** ribbon 

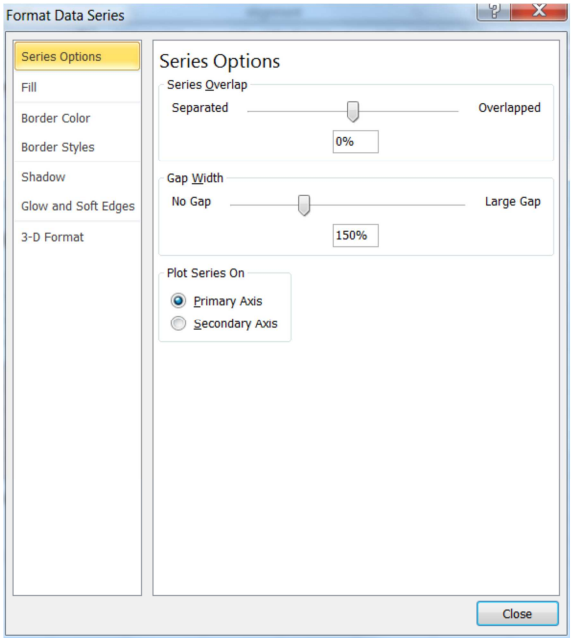
can be used to produce a different chart as shown opposite.



Editing Charts

Each part of a chart is considered to be a distinct object, for example the Main Title, the Horizontal or Category (X) axis, the plot area. Each object has its own set of attributes that can be changed, or the object can be deleted.

To edit a chart you can either select the object and use the ***Chart Tools*** ribbons: ***Design, Layout*** and ***Format*** to make changes.

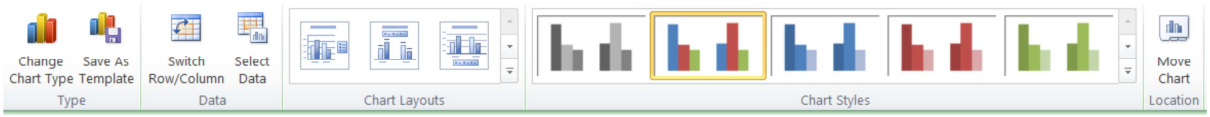


Or you can right click over an object and select the appropriate action from the menu that is displayed.

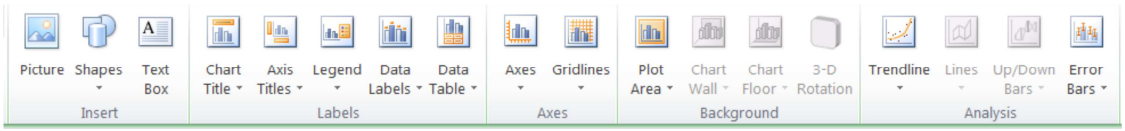
For example if you right click over a bar, in a bar chart, the ***Format Data Series*** dialogue box can be used to change the bar properties.

Note *If you select a bar using a left mouse click and click a second time, you will have selected that particular bar and not all bars of that series. The dialogue box will be called* **Format Data Point** *to reflect this.*

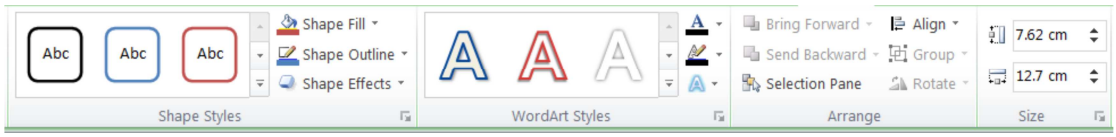
The ***Design*** ribbon allows you to Change Chart Type, for example from a Vertical Bar chart to a Horizontal Bar or a Pie chart (page 5), or the chart layout (described on page 8)



The ***Layout*** ribbon (shown below) provides buttons to modify chart labels, axes and other features.



The ***Format*** ribbon provides options to change the shape and style of text



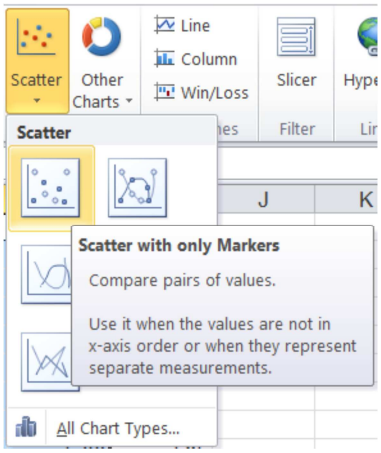
Producing a Scatterplot

Organise the data in two adjacent columns where the first column contains the values for the X (horizontal axis) and the next column the values for the Y (vertical axis) as shown opposite.

G	H
FEV1	FVC
4.10	4.90
4.31	5.09
3.45	3.94
4.09	4.80
4.65	5.67
4.53	5.38
4.74	5.60
4.53	5.30
4.31	5.00
4.41	5.27
3.98	4.70
4.19	4.90
4.62	5.56
4.02	4.99
4.36	5.20
3.65	4.31

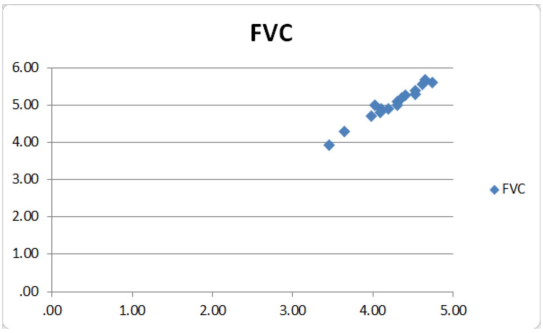
Then highlight the data you want plotted, including the labels (FEV1 and FVC).

Select the ***Insert*** ribbon from the ***Charts*** section choose the ***Scatter*** chart where the lines are not joined.



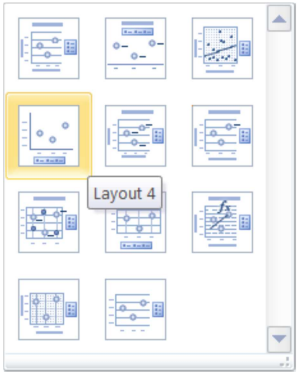
The chart opposite will be produced

You can then edit the chart to improve its appearance.

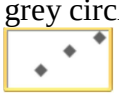


You could use the ***Chart Tools*** | ***Design*** ribbon to select a layout from the ***Chart Layouts*** section that is closest to the final design of your chart, for example Layout 4.

Unfortunately Excel does not offer layouts that are typically found in BioMedical journals.

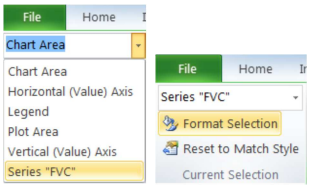


You might wish to remove change the data points on the chart from blue diamonds to dark grey circles.



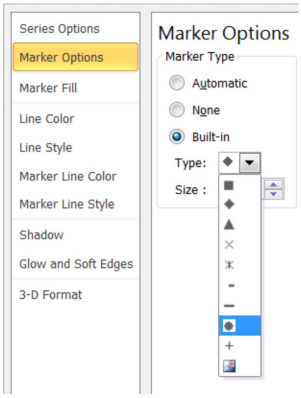
Select the Black coloured diamonds from the ***Chart Styles*** section.

To change the symbol shape you can either
Use the ***Layout*** ribbon and use the ***Current Selection*** area (shown opposite) to select the "FVC" and then choose the ***Format Selection*** option,
Or
You can right click on a symbol and select ***Format Data Series*** from the pop up menu.

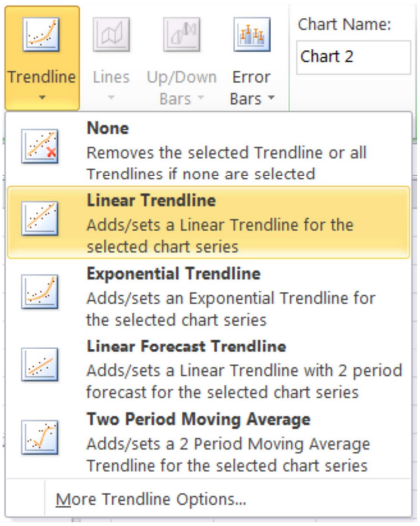


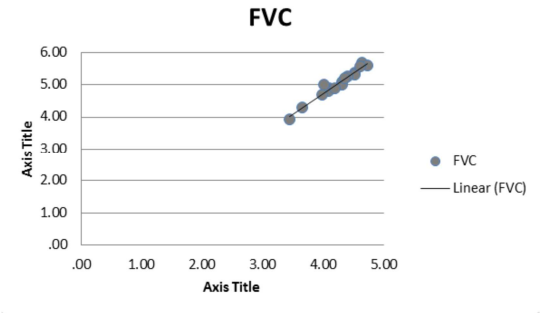
Use the Format Data Series dialogue, ***Marker Options*** to select the Circle symbol from the ***Built-in*** type.

Note you could also use the ***Marker Fill*** section to change the symbol colour by selecting ***Solid Fill*** and choosing a ***Fill Colour***.

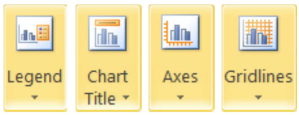


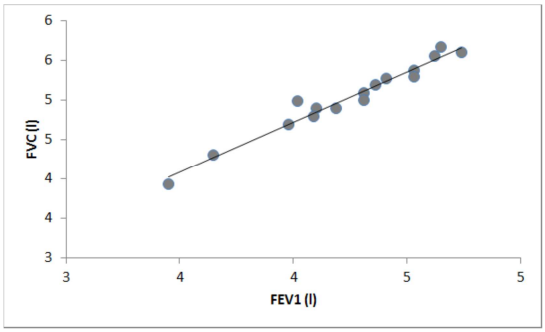
To add a Trendline, select the ***Layout*** ribbon, click select the ***Trendline*** button and choose the ***Linear Trendline*** to obtain the chart shown opposite.





Use the ***Layout*** ribbon buttons to enhance the chart by using the buttons opposite to:





- Remove the Legend
- Remove the overall title. It may not be needed if a figure caption is used, or the chart is inserted into Word or PowerPoint
- Enter Axes titles with units
- Edit the axes by adding tick marks, appropriate ranges and removing decimal places
- Remove Grid lines

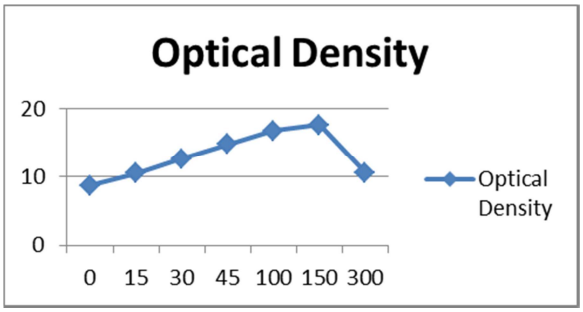
Plotting joined up data points

If you want to join up the data points with a line. You still need to use a ***Scatter*** plot. DO NOT use a Line Chart. The data opposite has been plotted as a Line Chart and a Scatter plot with lines as shown below.

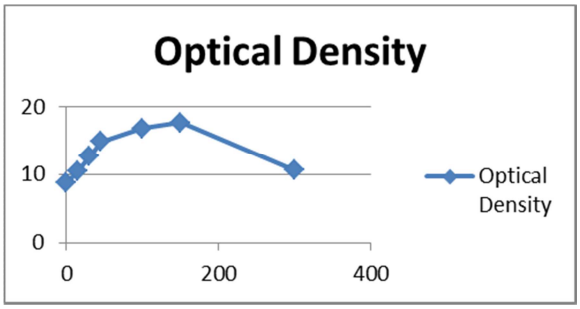
Look as the difference.

0	8.75
15	10.55
30	12.7
45	14.85
100	16.8
150	17.7
300	10.65

Line Chart

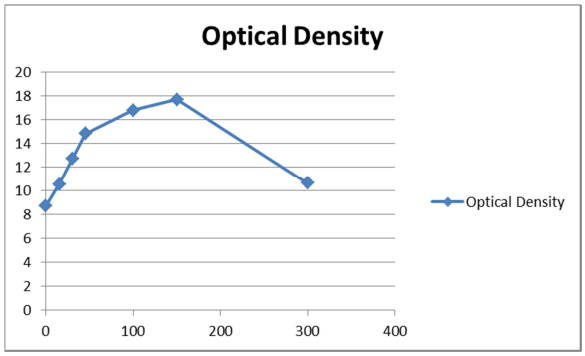


Scatter plot



The X axis on the line chart is not scaled correctly. The only time you can use a line chart is when the number values on the X axis are equally spaced.

The graph opposite is generated.



This can be improved by:

1. Adding Titles for the X and Y axis
2. Removing the Legend
3. Removing the Chart Title
4. Changing the data points to closed circles
5. Changing the line and data points to black
6. Using fewer tick marks on the Y axis
7. Remove the Horizontal Grid lines

The edited chart is show below.