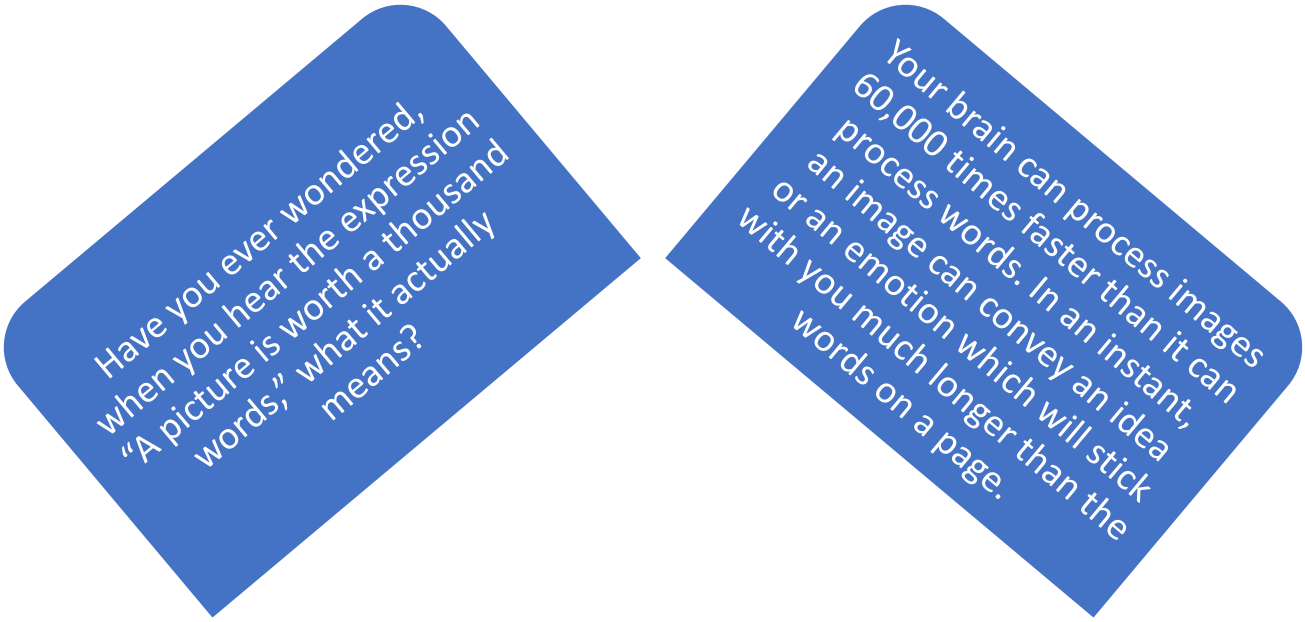
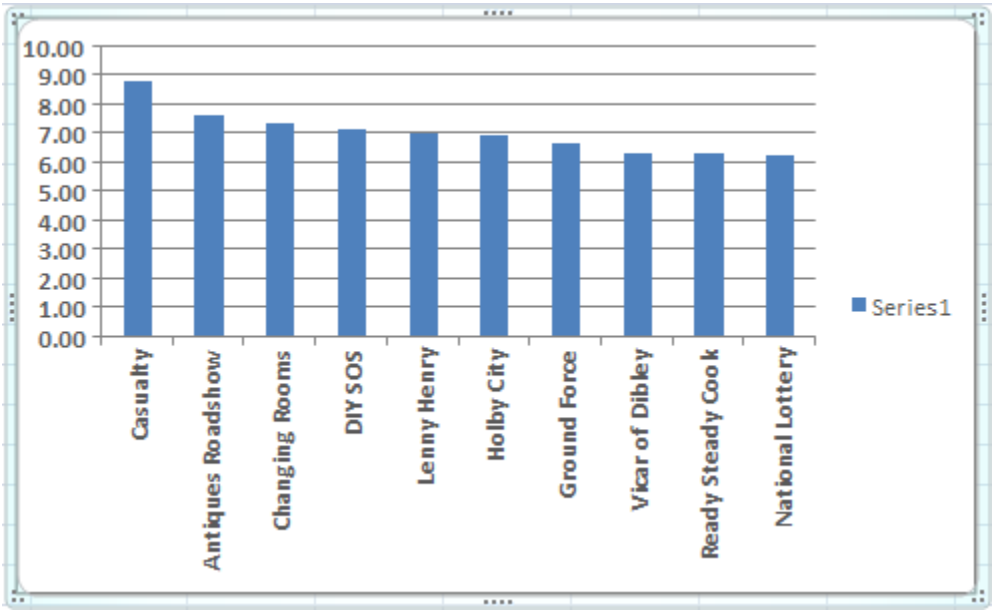


2.1 Let's Start with Excel Charts

So, in Excel we have charts which is a visual representation of data from a worksheet that can bring more understanding to the data than just looking at the numbers. A chart is often called a graph (although graph is a representation of mathematical function).

A chart is a powerful tool that allows you to visually display data in a variety of different chart formats such as Bar, Column, Pie, Line, Area, Doughnut, Scatter, Surface, or Radar charts. With Excel, it is easy to create a chart.

2.2 Create an Excel Chart

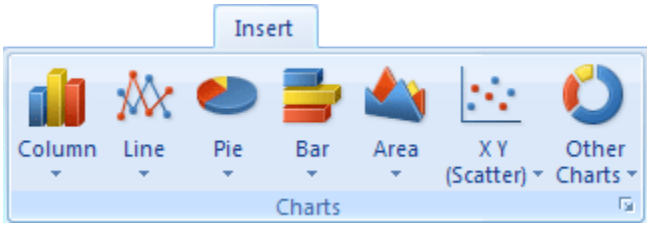


To start making your chart, highlight the BBC1 programs, and the viewing figures. If you have just finished the sorting section, this data should still be highlighted, and look like this:

3	BBC 1	
4		Millions
5	Casualty	8.82
6	Antiques Roadshow	7.68
7	Changing Rooms	7.38
8	DIY SOS	7.20
9	Lenny Henry	7.03
10	Holby City	6.99
11	Ground Force	6.71
12	Vicar of Dibley	6.34
13	Ready Steady Cook	6.33
14	National Lottery	6.27
15		

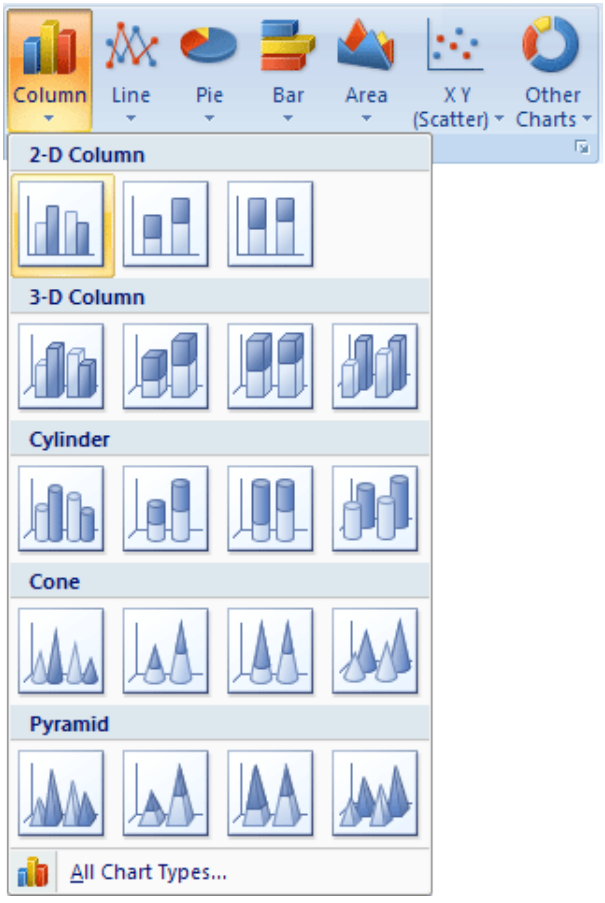
With your programs and the viewing figures highlighted, do this:

- From the tabs on the Excel Ribbon, click on **Insert**
- Locate the **Charts** panel. It looks like this in Excel 2007:

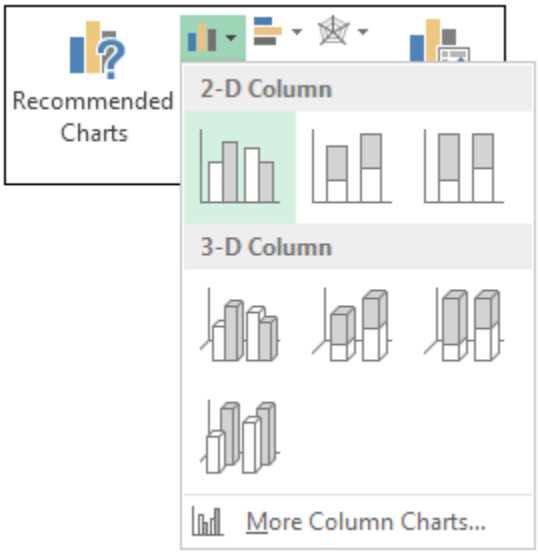


In later versions of Excel, the Charts panel looks like this:

For this first one, we'll create a Column Chart. So, in Excel 2007, click the down arrow on the **Column** item of the Chart Panel. You'll see a list of available charts to choose from. Select the first one, the chart highlighted below (2D Column):

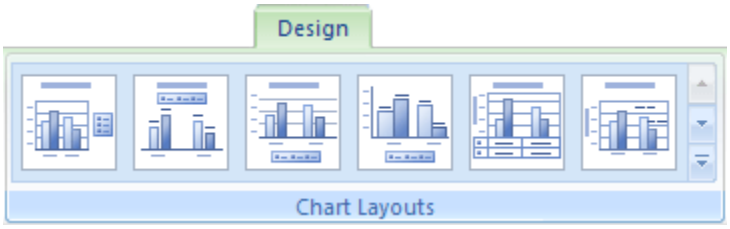


The Column drop down list in later versions of Excel looks like this:

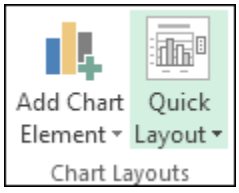


When you make your selection, a new chart appears on the same spreadsheet that you have open. The chart should look the same as the one at the top if this page.

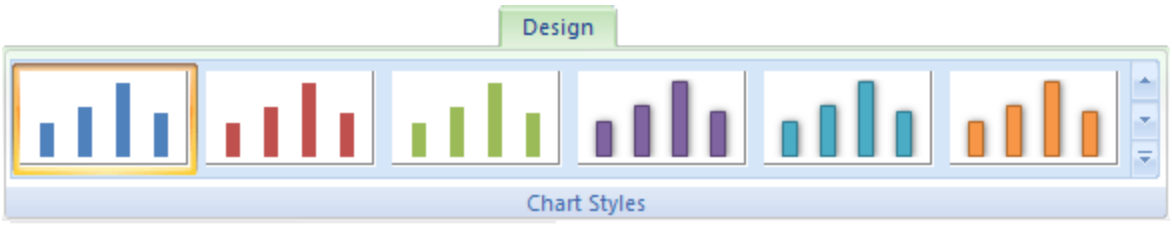
But notice that the Excel Ribbon has changed. The design menu is selected, along with options for Chart Layouts:



In Excel 2013 to 2016, you'll see these layouts on the left, in the **Chart Layouts** panel, under **Quick Layouts**:



Also on the Design Ribbon, you'll see options for Chart styles:



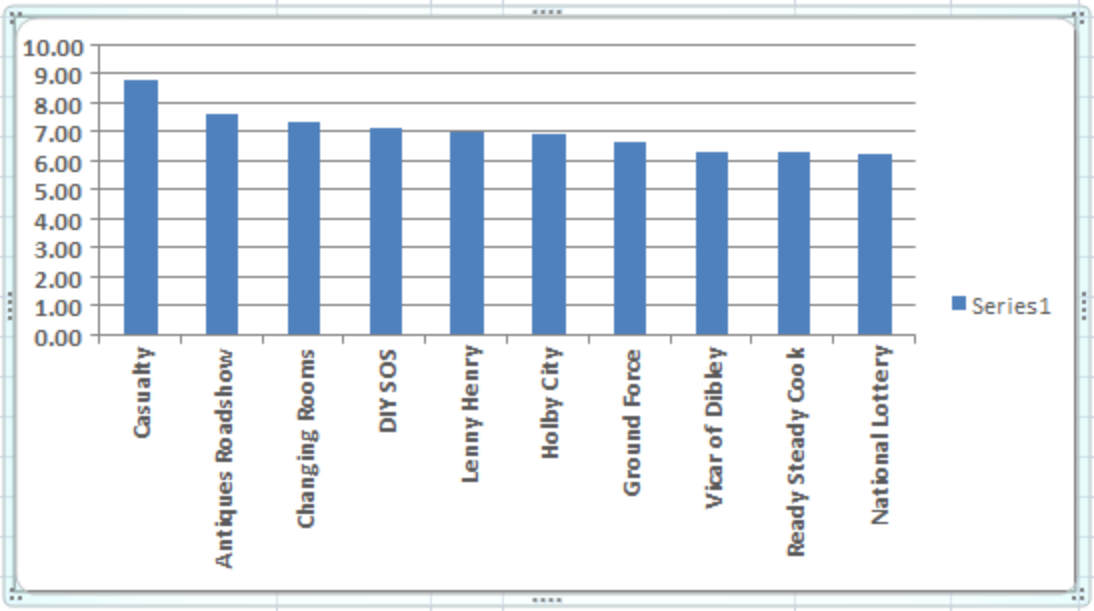
You'll see how to use these later. For now, your chart may be covering your viewing figures. In the next part, we'll see how to move and resize a chart.

2.3 Move and Resize your Chart

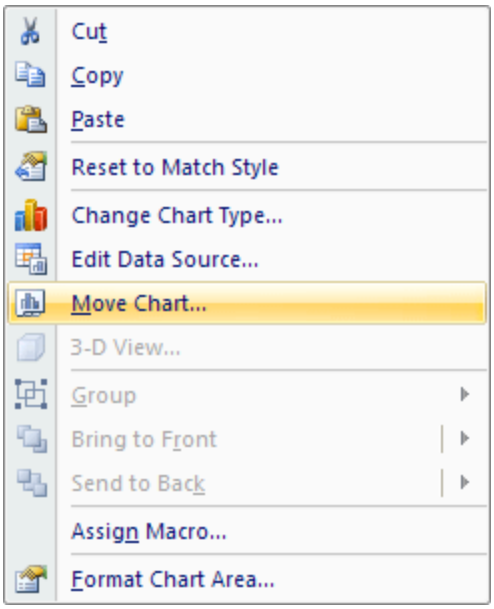
In the image below, our chart is overlapping the ITV data. To move it, hold your mouse over the chart until your cursor changes shape: (We found that the best place for your mouse is over the dots in Excel 2007, as we had problems moving a chart when the cursor was anywhere else! Moving charts in later versions of Excel is easier.)

Press and hold down the mouse button when your cursor looks like the one in the image above, and then drag your chart to a new location. In the image below, we've placed the chart below the data.

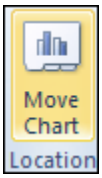
	BBC 1		ITV	
		Millions		Millions
5	Casualty	8.82	Who...Millionare	10.99
6	Antiques Roadshow	7.68	Heartbeat	10.22
7	Changing Rooms	7.38	Bad Girls	7.42
8	DIY SOS	7.20	The Bill	6.54
9	Lenny Henry	7.03	The Vice	6.37
10	Holby City	6.99	Blind Date	6.31
11	Ground Force	6.71	Stars in their Eyes	6.26
12	Vicar of Dibley	6.34	Footballer's Wives	6.17
13	Ready Steady Cook	6.33	Champions League	6.09
14	National Lottery	6.27	Inspector Morse	5.81



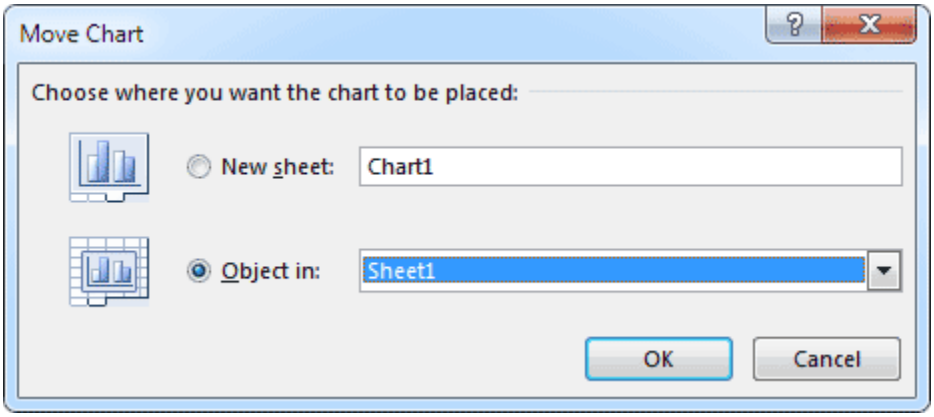
You can also place your chart in a different worksheet. To do this in Excel 2007, right click anywhere on your chart. From the menu, select **Move Chart**:



In Excel 2010 to 2016 there is a **Location** panel to the right of **Chart Styles**. Click the **Move Chart** item:



In all versions, you'll then get a dialogue box popping up:



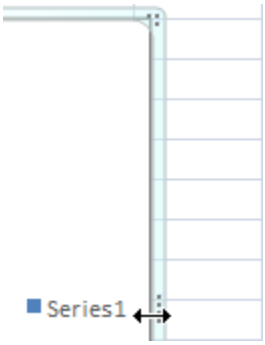
If you want your chart in a new worksheet, select the first option. Then delete the text "Chart1" from the textbox, and then type a name of your own.

If you look along the bottom of Excel, you'll see Sheet1, Sheet2, and Sheet3. Your data is in Sheet1. If you click the drop-down list to the right of **Object in** on the dialogue box

above, you'll see the other worksheets you have open. You can select one from the list and click OK. But for this first chart, leave it in Sheet1.

How to Resize an Excel Chart

You can resize a chart, and any elements on it, by moving your mouse over the sizing handles. For the chart itself, the sizing handles are the dots around the edges of the chart in Excel 2007:

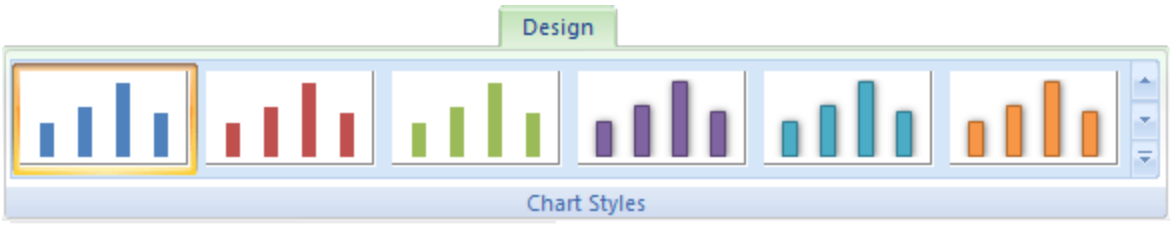


In later versions, the sizing handles are white squares:

When your mouse changes shape to a double-headed arrow, hold down your left mouse button. Then drag to a new location. You can resize using the corners, or the edges.

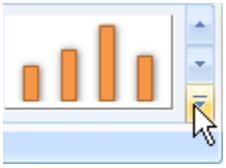
2.4 Chart Styles and Layouts

You can easily change the Style of your chart. If you can't see the Styles, click anywhere on your chart to select it, and you should see the Ribbon change. The Styles will look like this in Excel 2007:

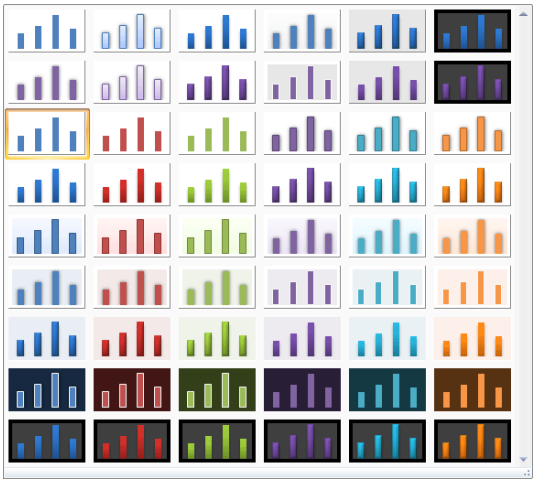


In newer versions of Excel, your Chart Styles will look like this:

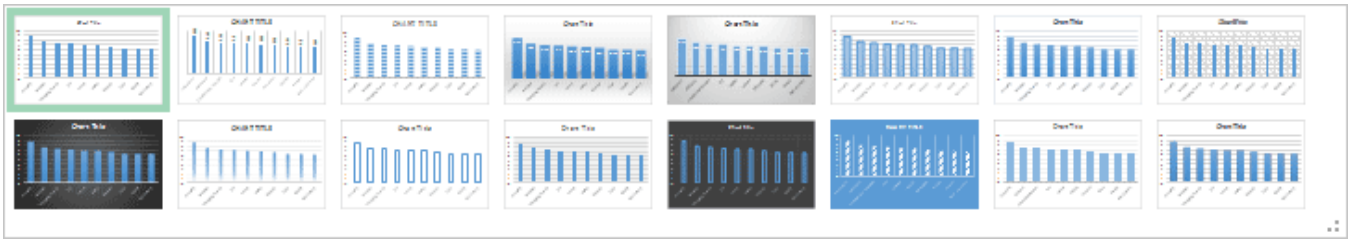
Click on any chart style, and your chart will change. To see more styles, click the arrows to the right of the Chart Styles panel:



You'll then see a drop-down sheet of new styles (Excel 2007):



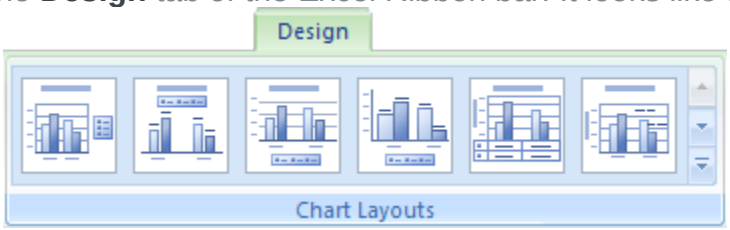
And here's the Styles in Excel 2013 to 2016:



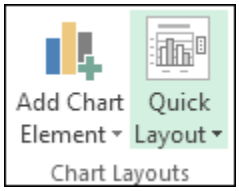
Work your way through the Styles, and click on each one in turn. Watch what happens to your chart when you select a style.

Chart Layouts

You can also change the layout of your chart in the same way. Locate the **Chart Layout** panel on the **Design** tab of the Excel Ribbon bar. It looks like this in Excel 2007:

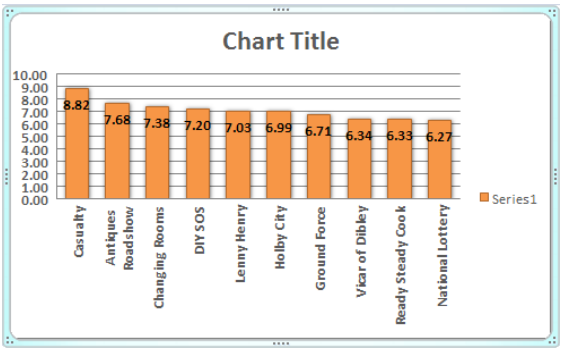


In newer versions of Excel, you may have to click the **Quick Layout** option on the **Chart Layouts** panel:



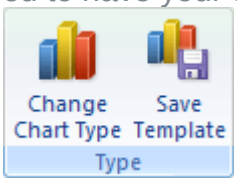
Click the down arrow to the right of the Chart Layouts panel to see the available layouts you can choose from:

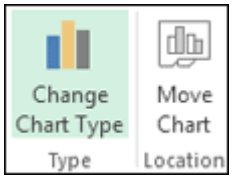
Again, click on each one in turn and see what happens to your chart. In the image below, we've gone for Layout 10:



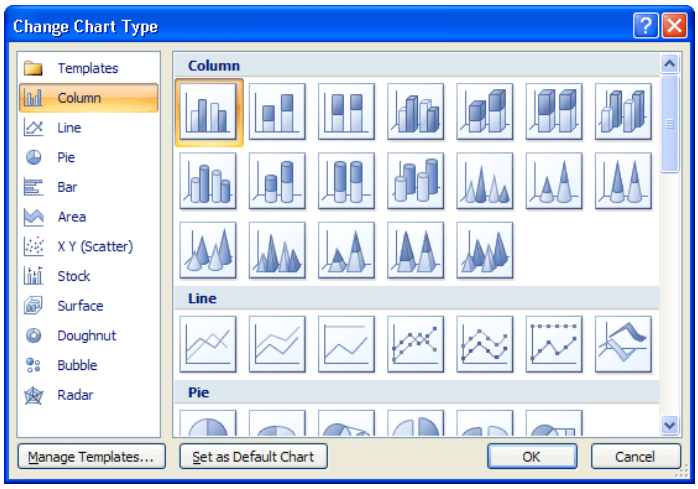
Changing the Chart Type - 2D Bar Charts

You can change the type of chart, as well. Instead of having a 2D column chart, as above, you can have a 2D bar chart. To change the chart type, locate the **Type** panel on the Excel Ribbon bar (you need to have your chart selected to see it):

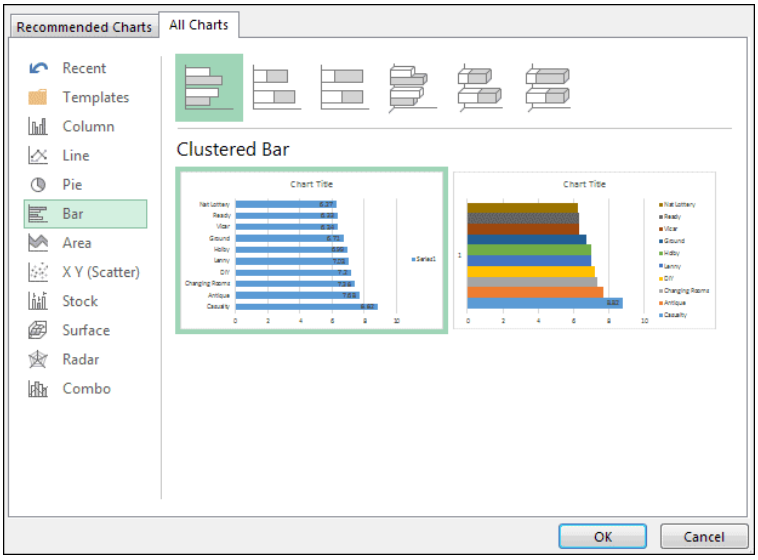




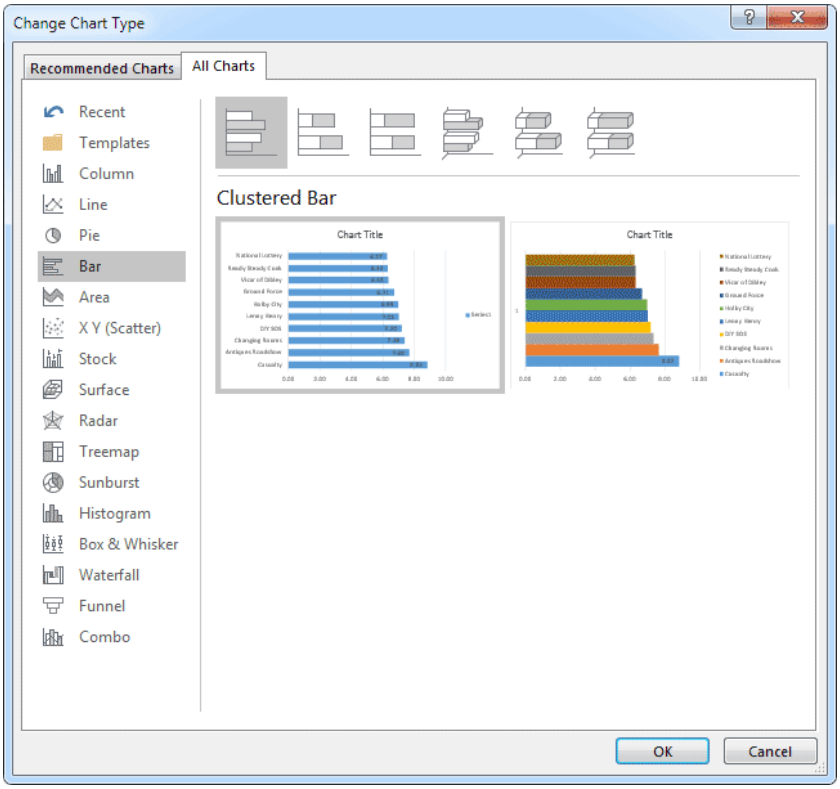
Then click **Change Chart Type**. You'll see a dialogue box appear. This one is from Excel 2007:



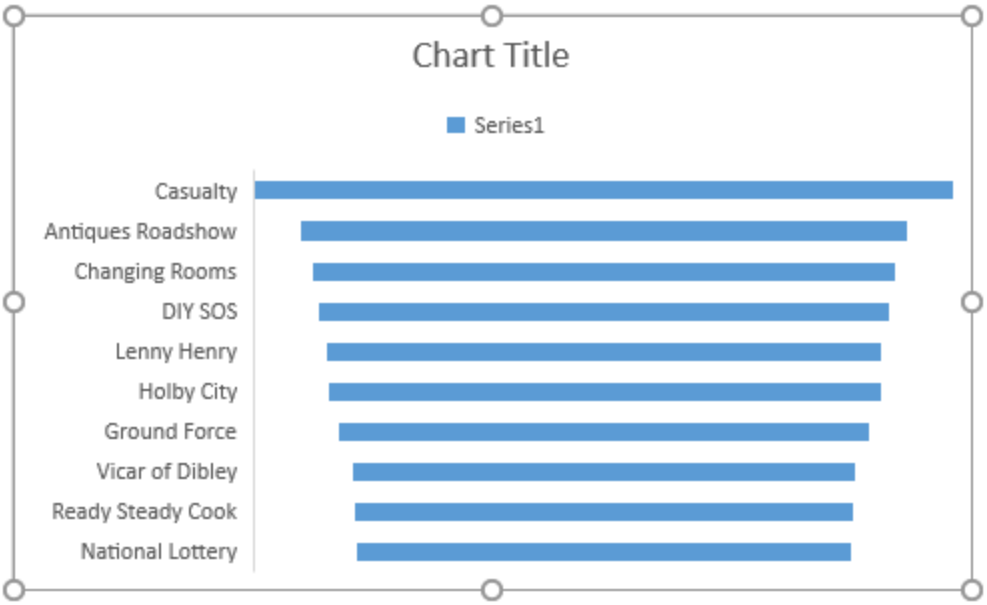
The dialogue box looks slightly different in Excel 2013:



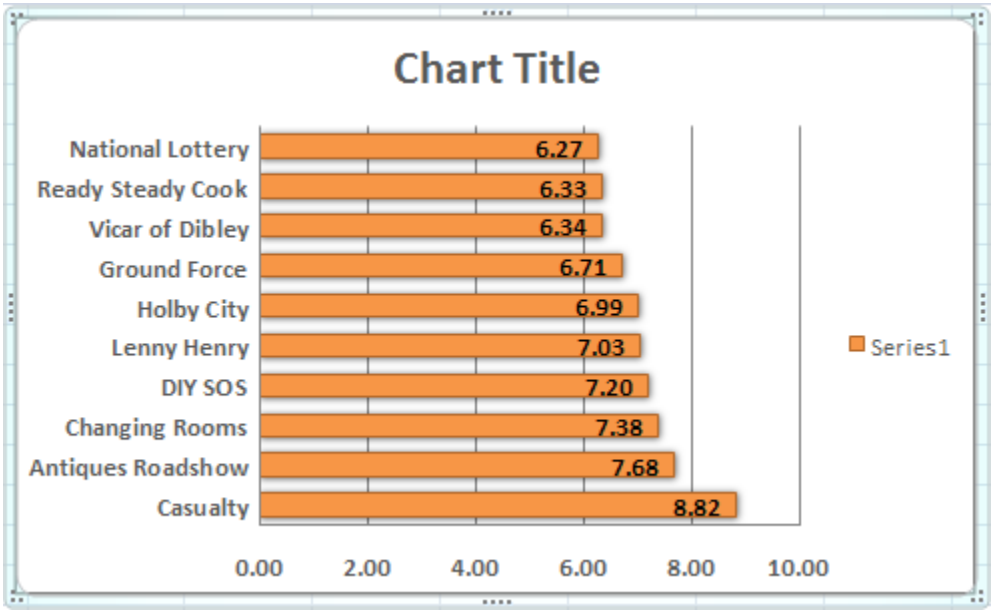
Excel 2016 has some new chart types:



In the image above, Microsoft have added six new charts: Treemap, Sunburst, Histogram, Box and Whisker, Waterfall, and Funnel. If you have this version of Excel, click each one in turn to see what they look like. For example, here's the what the Funnel chart looks like:



But select **Bar** from the list on the left of the dialogue box, and click on the first Bar chart (Clustered Bar). Click OK to see your chart change:



You can experiment with the types of chart in the dialogue box. But reset it to Bar chart, as above.

2.5 Chart Titles and Series Titles

Once you have your chart in place, there are plenty of formatting options in Excel. In the chart above, for example, the title says, "Chart Title". And there's a not terribly descriptive orange square that says "Series 1" (your bars may be blue). We'll see how to change that

in a moment. But first, the Chart Title. (If you don't have a title in Excel 2010, select the first layout in the **Chart Layouts** panel.)

How to Change the Chart Title

To change the title of your chart, click on the title to select it:

The circles surrounding the title tell you that it is selected. Once the title is selected, click on the letter "C" of Chart. Hold your left mouse button down and highlight the two words, as in the image below:

Once your title is highlighted, you can change it by simply typing a new one:

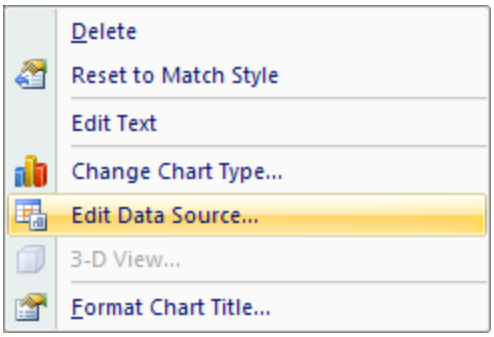
While the title is highlighted, you can select a different font and font size, if you want (on the Home panel in the Excel Ribbon at the top.)

To deselect the title, click anywhere outside of it.

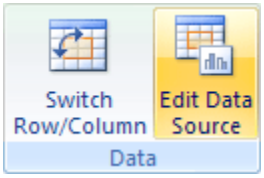
Formatting a Series Title

To change the **Series 1** text on the Chart heading to something more descriptive, select the title as you did above:

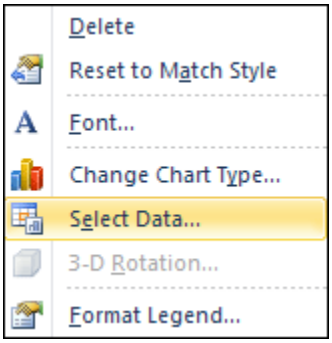
Make sure the circles are there, and then right click. You should see the following menu appear in Excel 2007:



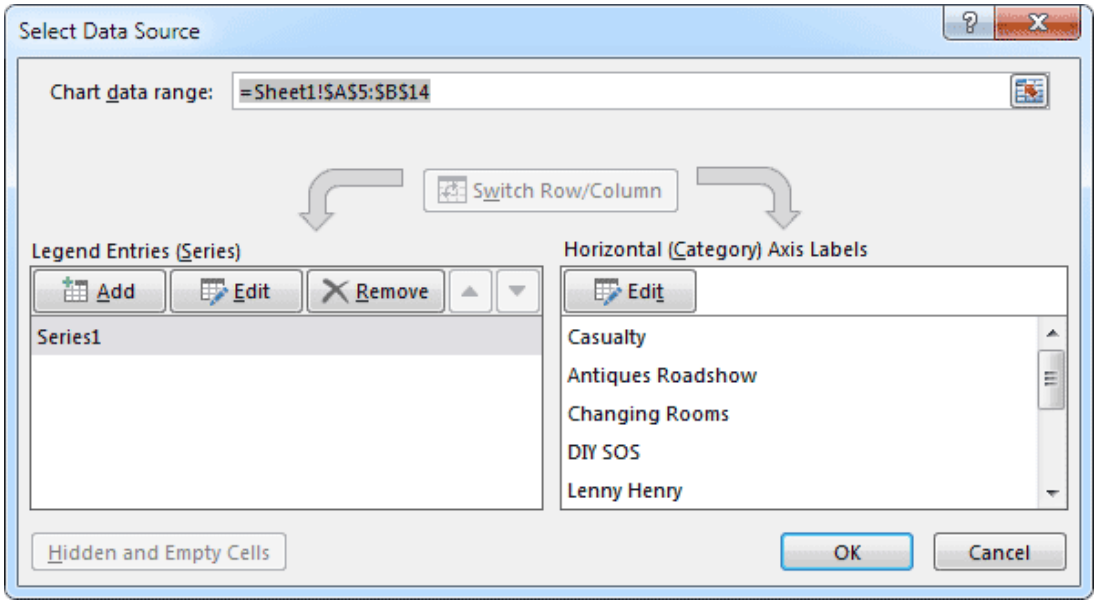
Click on "Edit data source". Alternatively, click the **Edit data source** item on the **Data** panel on the Excel 2007 Ribbon:



For Excel 2010 and 2016 users, your menu looks like this:

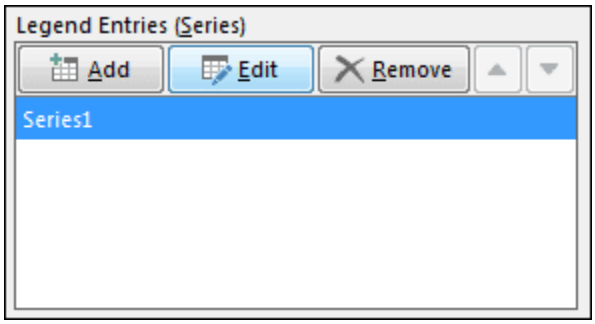


The item to click on the menu above will say **Select Data** instead of **Edit Data Source**. In both versions you should then see the following dialogue box appear.

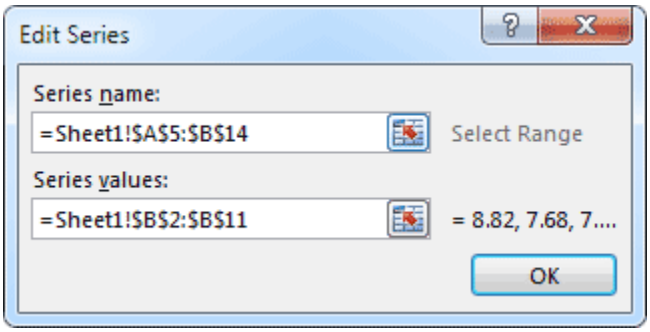


The **Chart Data Range** at the top of the dialogue box is highlighting the cells A5 to B14. This is the data we selected for the chart. Below this there is an area for **Legend Entries (Series)** and **Horizontal Axis Labels**. We'll see more of these later. For now, though, we just want to change Series 1 into something more descriptive.

So, click on Series 1 to highlight it. Then click the Edit button, as in the image below:



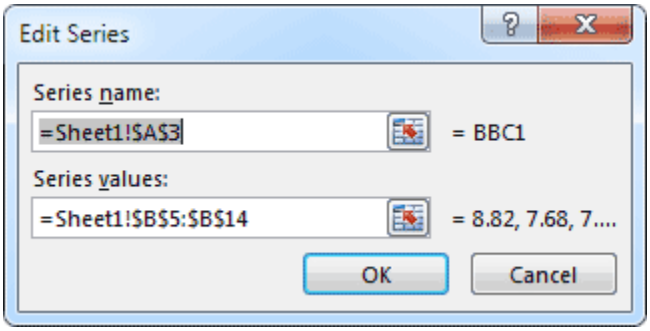
When you click the **Edit** button, you'll see a new dialogue box appear - **Edit Series**. It should look like this:



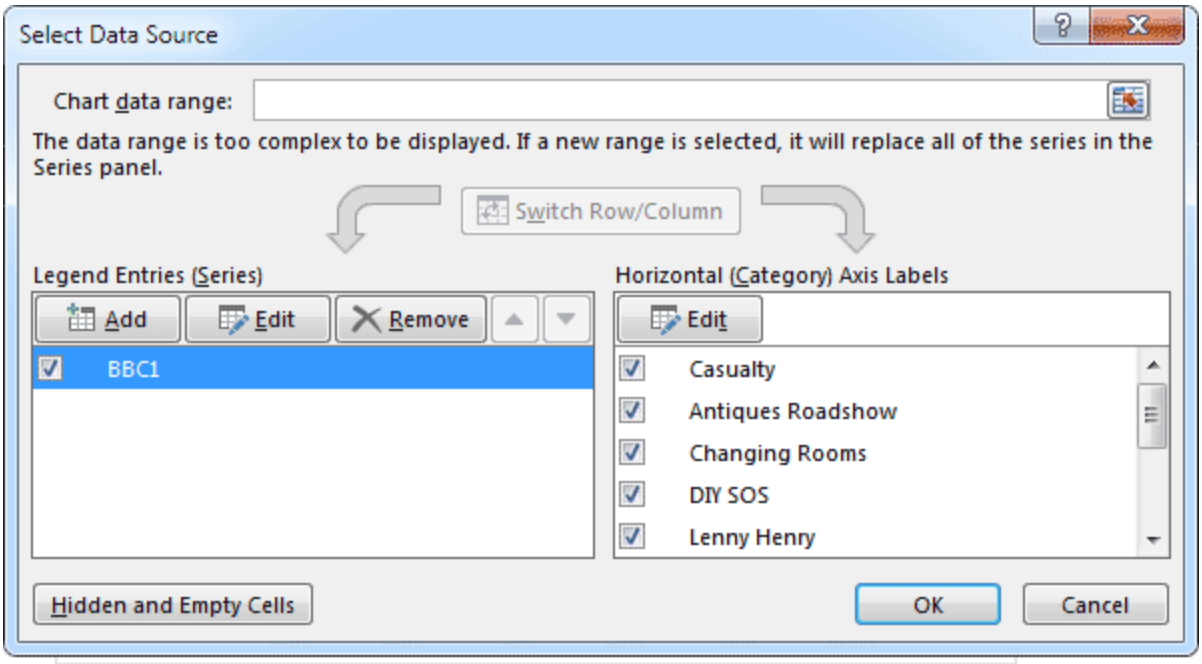
Notice the cells being referenced in the **Series name** area. They are cells A5 to B14. These same cells are also highlighted on the spreadsheet:

2		
3	BBC 1	
4		Millions
5	Casualty	8.82
6	Antiques Roadshow	7.68
7	Changing Rooms	7.38
8	DIY SOS	7.20
9	Lenny Henry	7.03
10	Holby City	6.99
11	Ground Force	6.71
12	Vicar of Dibley	6.34
13	Ready Steady Cook	6.33
14	National Lottery	6.27
15		
16		

Click on the BBC title instead, the one on Row 3 above. Your Edit Series dialogue box will have changed. The Series Name area will now say A3 (amongst all those dollars):



Click OK to get back to your **Edit Data Source** dialogue box. The Series legend will now say BBC:



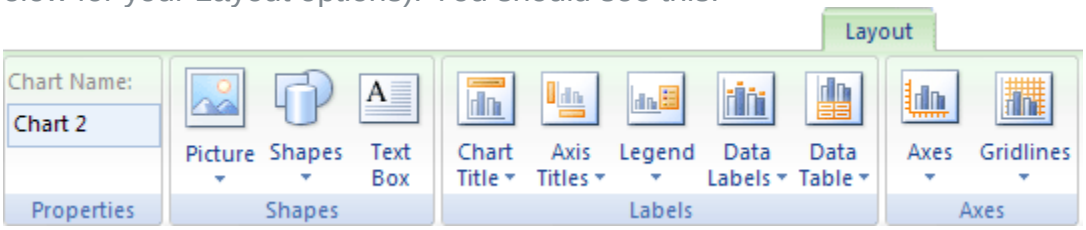
Click OK to return to your spreadsheet. But look what's happened to the chart. The **Series 1** has gone. Next to the orange square, we now have BBC 1:

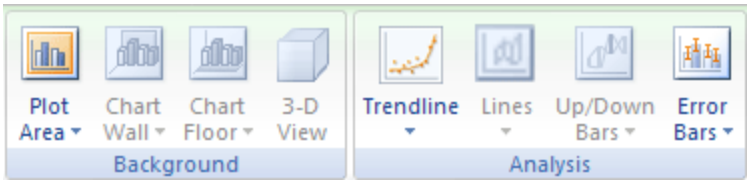
We'll meet these boxes again when we create a chart from scratch. For now, let's see some more formatting option you can do with an Excel chart.

2.6 Chart Layout Panel in Excel

In the previous part of this lesson on charts, you saw how to format a chart with various dialogue boxes.

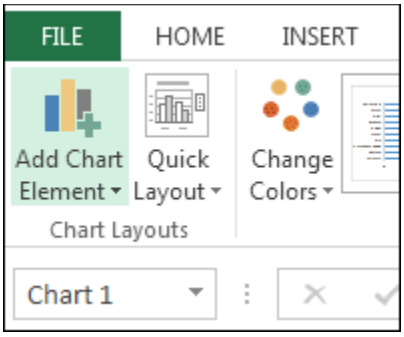
You can also format your charts using the menu items on the Excel Ribbon bar, at the top of the screen. With your chart selected, click the **Layout** menu (Not Excel 2013 to 2016. See below for your Layout options). You should see this:



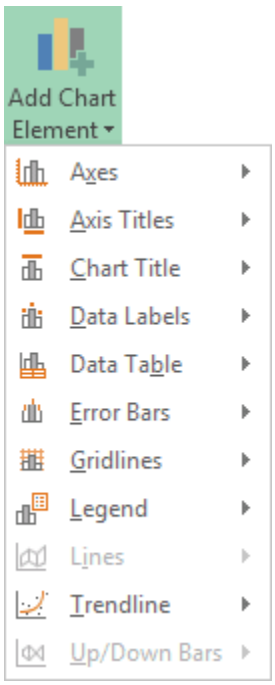


The Layout menu is a bit big for this page, so we've split it in two. But the chart Layout panel is split into many different sections (six in our version), and allows you to change the information in the chart.

For Excel 2013 to 2016 users, your Layout options are on the Design tab still, on the far left, just under the File menu:

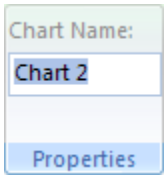


Click Add Chart Element to see the following drop-down list:



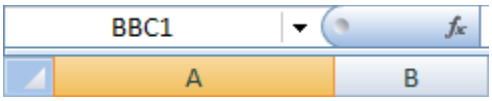
For all versions of Excel, The first thing you may want to do is to give your chart a name.

To change the name of your chart in Excel versions 2007 and 2010, locate the **Properties** panel on the Layout menu:

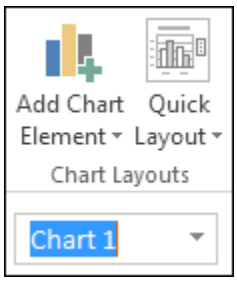


Highlight the default name in the textbox and type a new one:

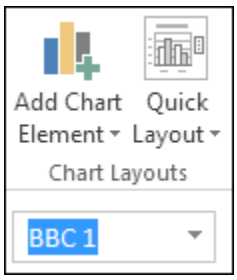
If you now click away from your chart, and then click back on it, you'll notice the name of the chart change:



For Excel 2013 to 2016 users, locate the Name box just below Chart Layouts:

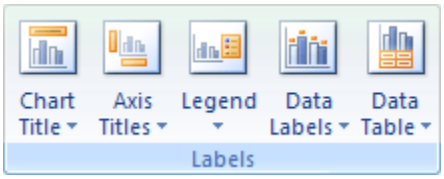


Highlight the default Chart 1. Type a new name (BBC 1) and press enter:

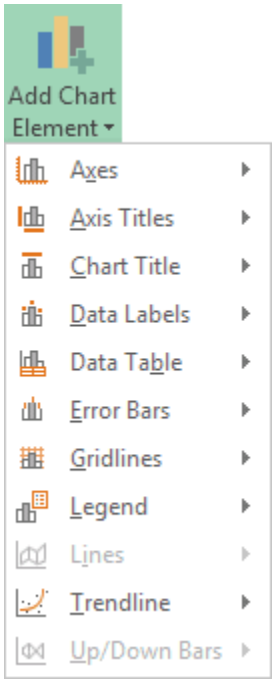


The Labels Panel in Excel 2007/2010

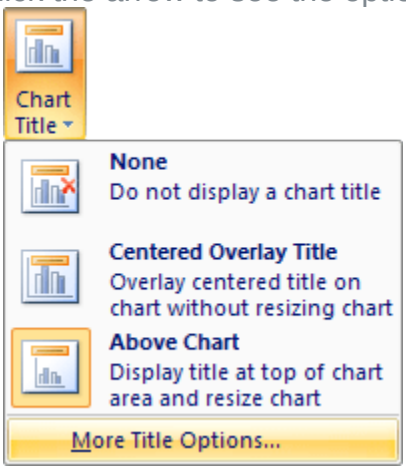
The **Labels** panel on the Layout menu lets you format the titles and legends on your chart. Here it is:

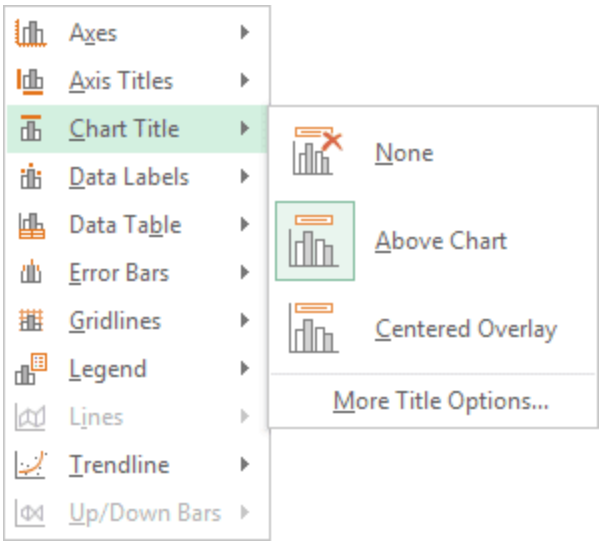


Or this for Excel 2013 to 2016 users:

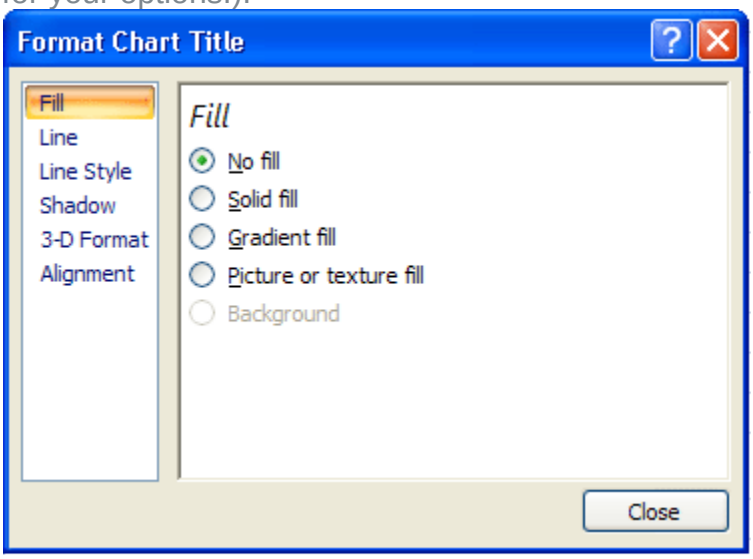


The first one is **Chart Title**. Click the arrow to see the options:





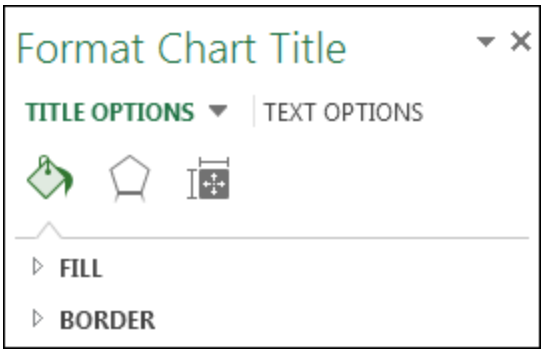
Click each item on the menu in turn to see what they do. Then click **More Title Options**. The following dialogue box will appear (Excel 2010 has more options. Excel 2013to 2016 users, see below for your options.):



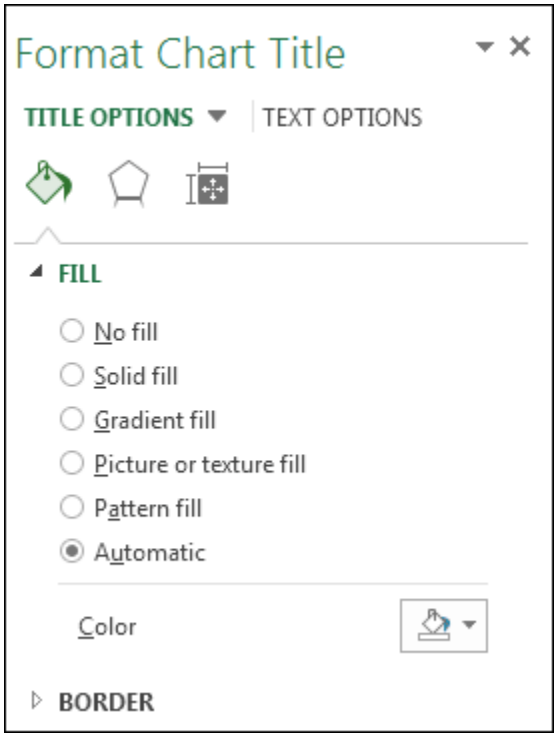
As you can see, there are options to change the Fill, Line, Line Style, Shadow, 3-D format, and Alignment. Play around with the options on the dialogue box to see what they do. The only thing you're changing here is the Chart Tile. Click Close when you're done. If you don't like what you see, click the undo arrow at the top of Excel.

Formatting Chart Titles in Excel 2013 to 2016

Excel 2013 and 2016 users won't see a dialogue box. Instead, you'll see a panel appear on the right of the screen. This one:

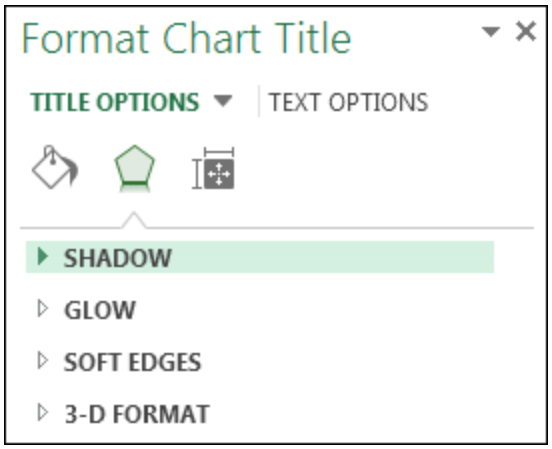


Click an arrow to see further options. Here are the options for Fill:

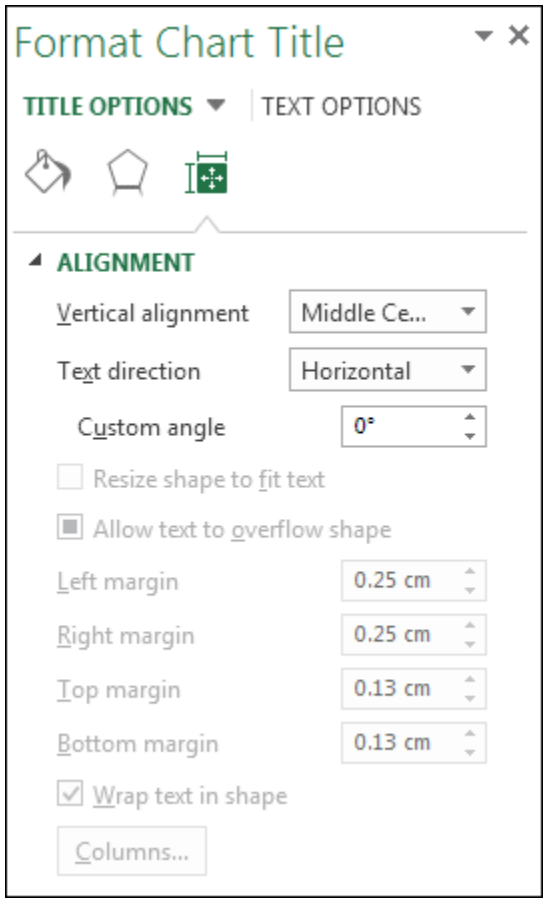


You can also click the icons at the top. There are three of them: a paint bucket, an Hexagon, and a resize symbol.

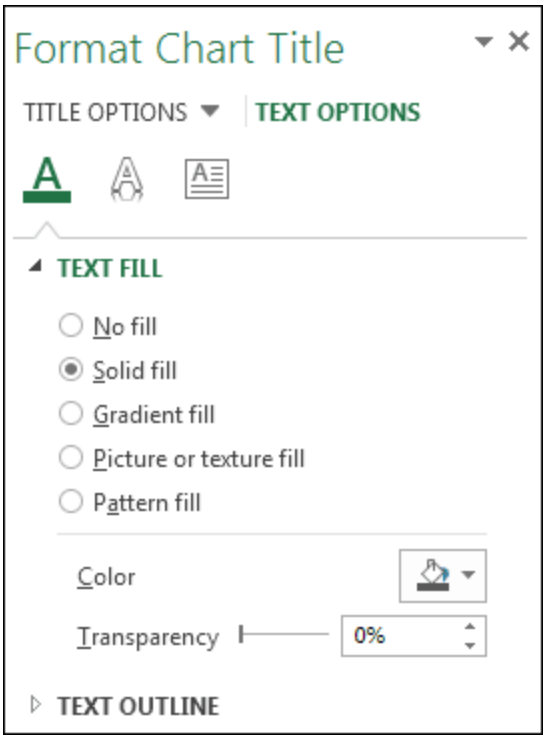
Click the Hexagon and you'll see these options:



Click the Resize symbol and the options will change to these:



As well as the three symbols, you can click the Text Options, just to the right of Title Options at the top. You'll then see even more options, this time to change the text itself:

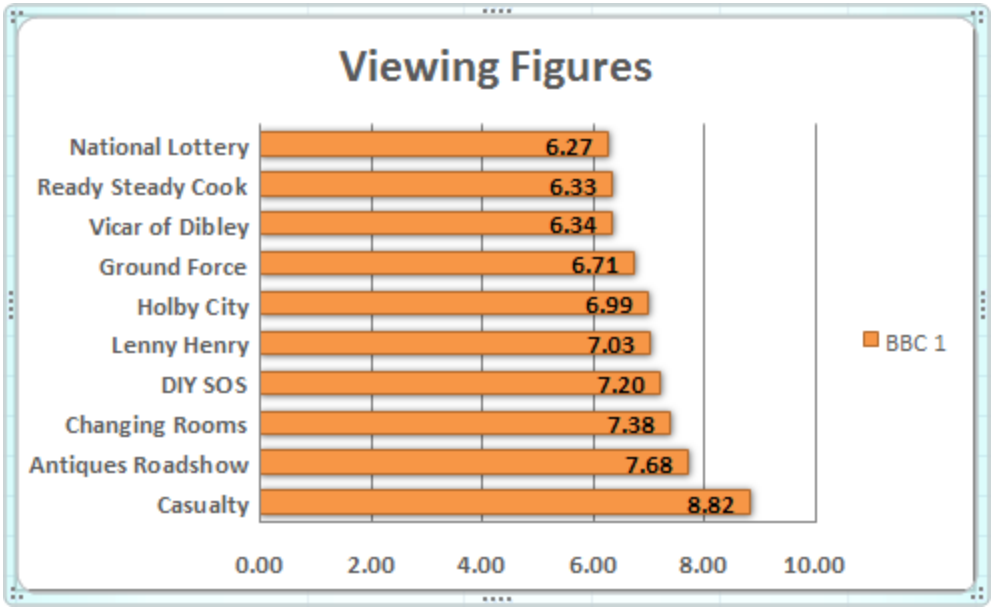


Play around with all and see how they work.

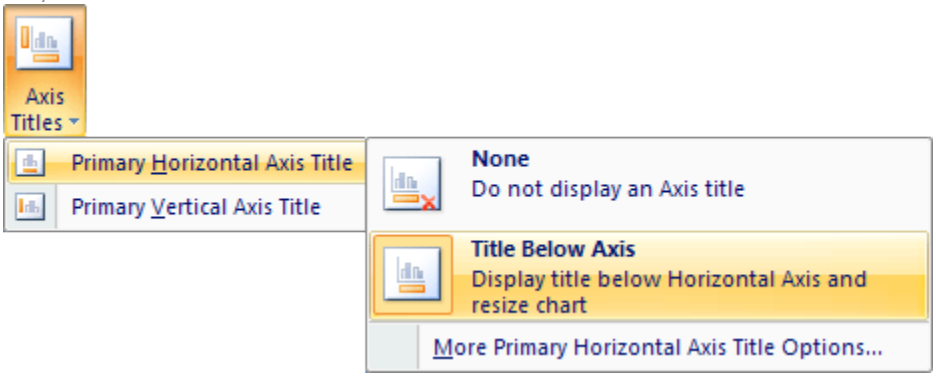
Change the Axis Title in Excel 2007/2010

The next item on the **Labels** panel is the **Axis Title**. Click the down arrow to see the options:

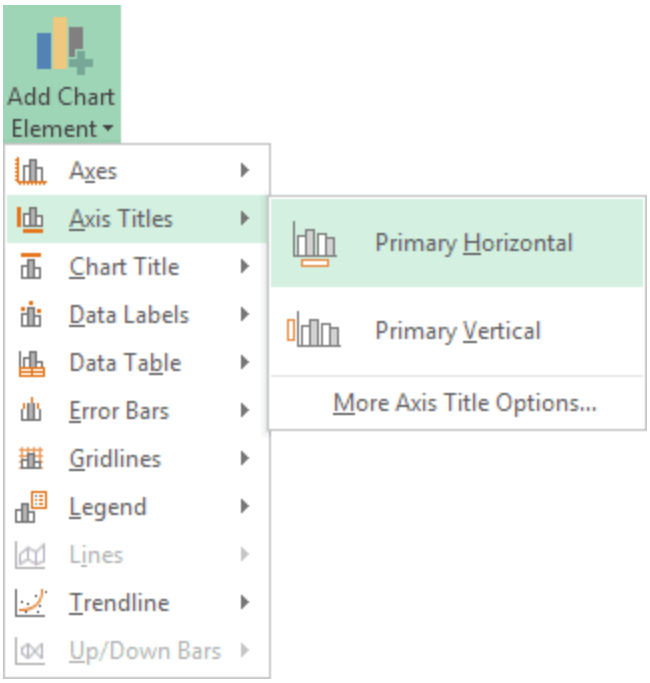
At the moment, our chart has no Axis Title. It just has numbers running across the bottom. Someone looking at the chart won't know what the numbers represent. Here's what our Chart looks like at the moment:



To add an Axis title in Excel 2007 and 2010, click on **Primary Horizontal Axis Title**. From the sub menu, click **Title Below Axis**.



In Excel 2013 and 2016, select **Primary Horizontal** on the **Axis Titles** menu of **Add Chart Elements**:



When you click **Title Below Axis** or **Primary Horizontal**, a new title will be added to the chart:

Highlight the default text, and type your own:

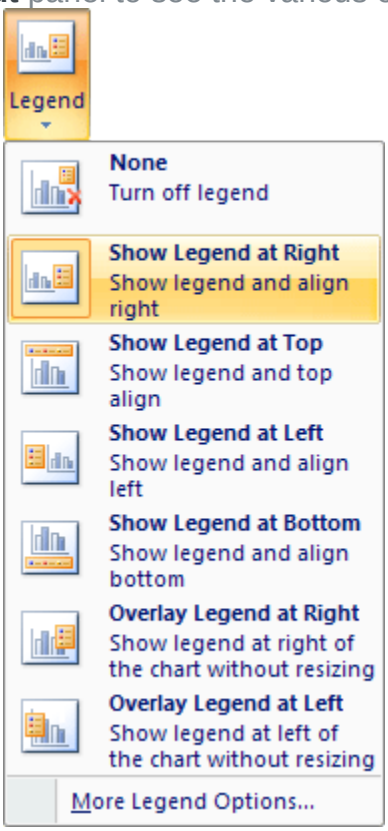
Click away from the chart to see what it looks like:

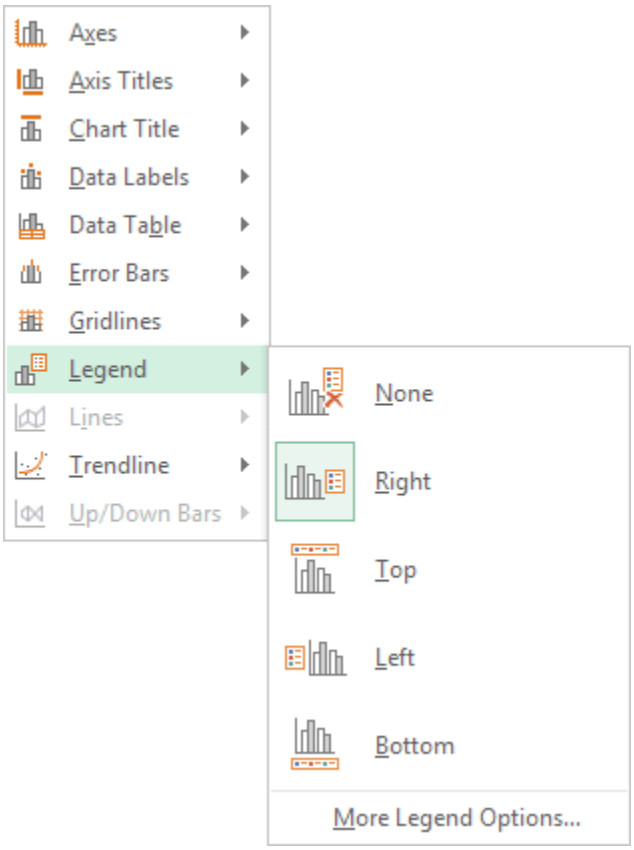
We now have some explanation for what the numbers represent. You can add a Vertical Axis, as well. Click on **Primary Vertical Axis** Title and see how it works.

Chart Legend

The Chart's Legend is this one:

At the moment, our Legend is on the right of the chart. But you can move this. Click the **Legend** item on the **Layout** panel to see the various options:

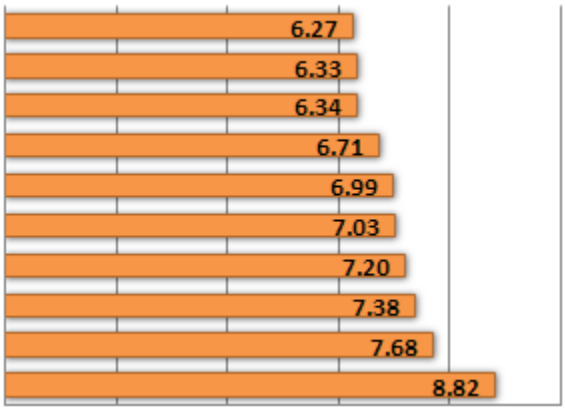




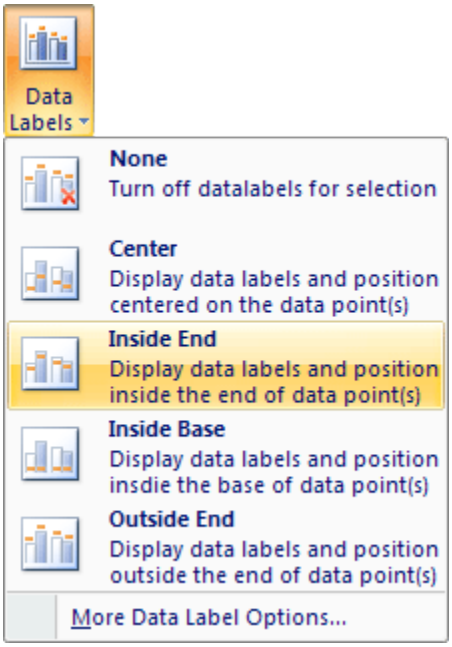
Click an option on the menu and watch what happens to your Legend. You should see it move around your chart.

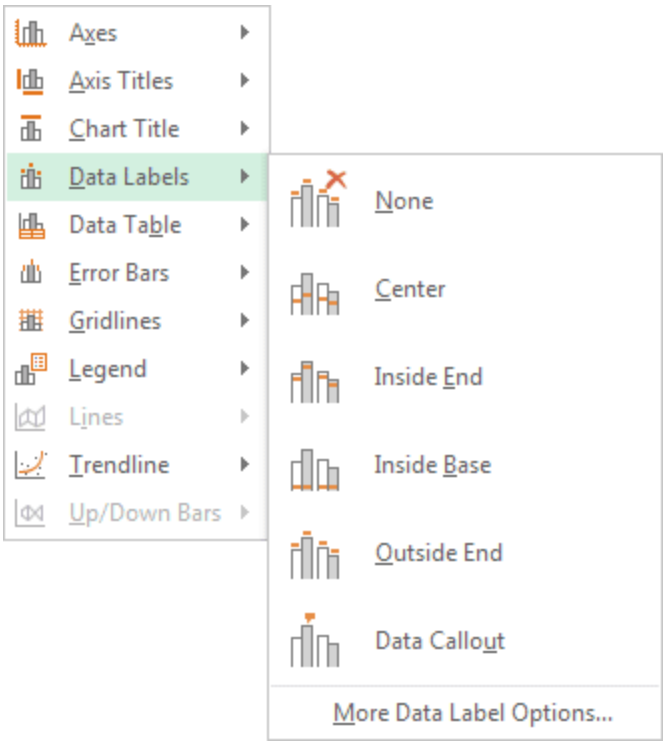
Adding Data Labels to an Excel Chart

A Data Label is information overlaid on the chart bars. In our chart below, we have numbers overlaid on the orange bars:

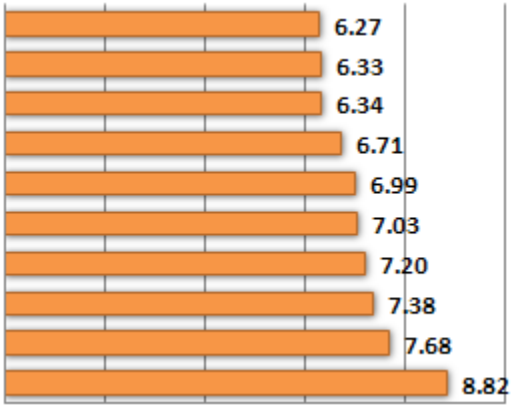


You can format these Data Labels. Click the **Data Labels** item on the **Labels** panel to see the following options:

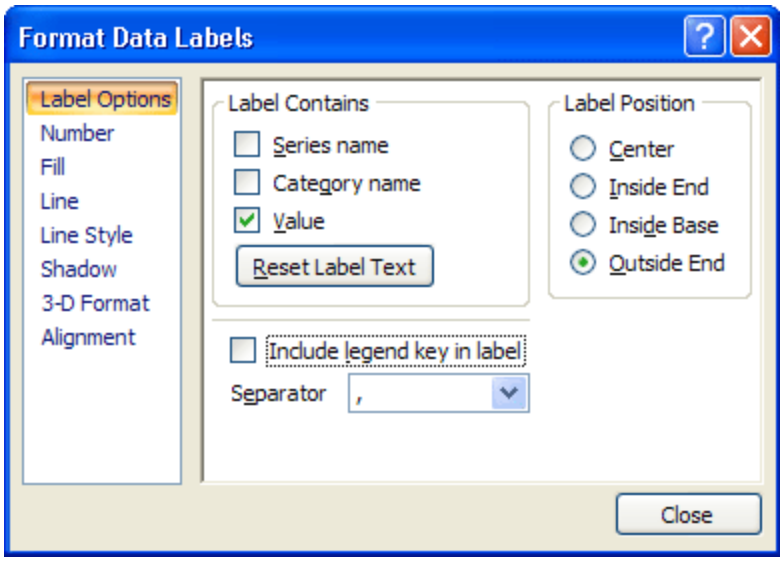




The one wat we have at the moment is **Inside Edge**. Click on **Outside End** and your Data Labels will look like this:



You can also see the options if you click **More Data Label Options** from the menu. You'll then see this dialogue box (In Excel 2013 and 2016, again, you won't see a dialogue box. Instead, you'll see the Format panel appear on the right of your screen. The same options as below will be available, however.):

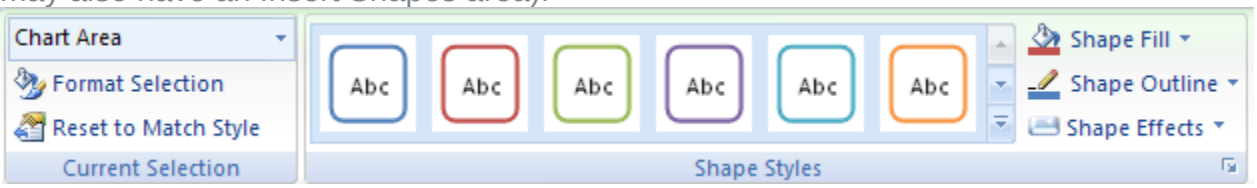


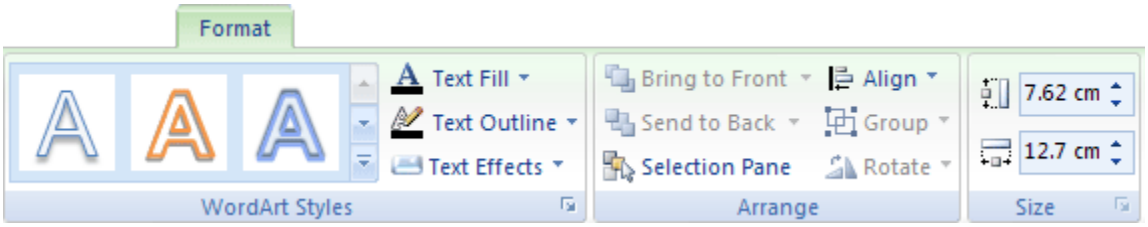
Again, play around with the options to see what they do. The first two, Label Options and Number, are the ones you'll probably use most often.

2.7 The Format Chart Panel

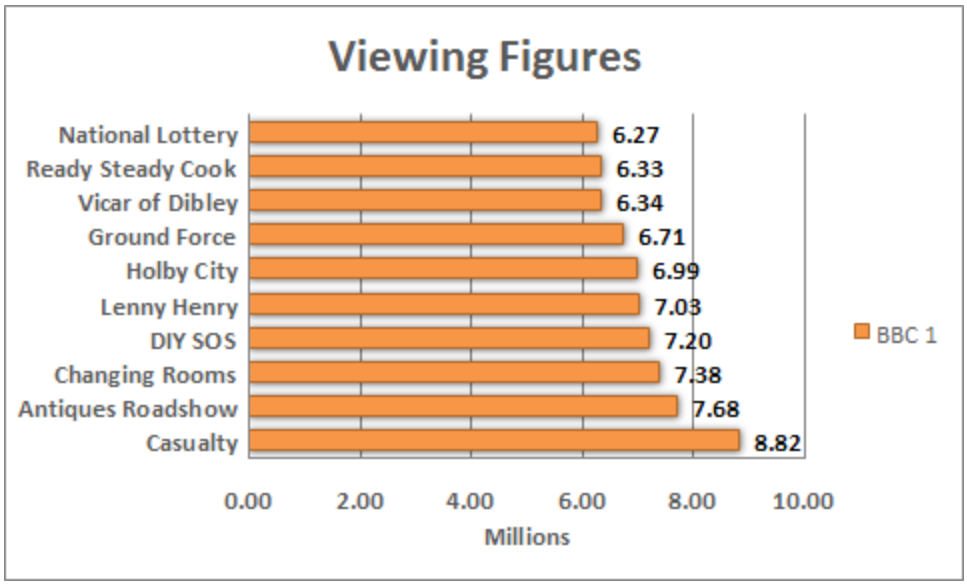
The **Format** panels allow you to create some great looking charts with just a few mouse clicks.

Click on your chart to select it, and then click the **Format** menu at the top of the Excel Ribbon. You should see this long menu, split in two here (In newer versions of Excel, you may also have an Insert Shapes area):

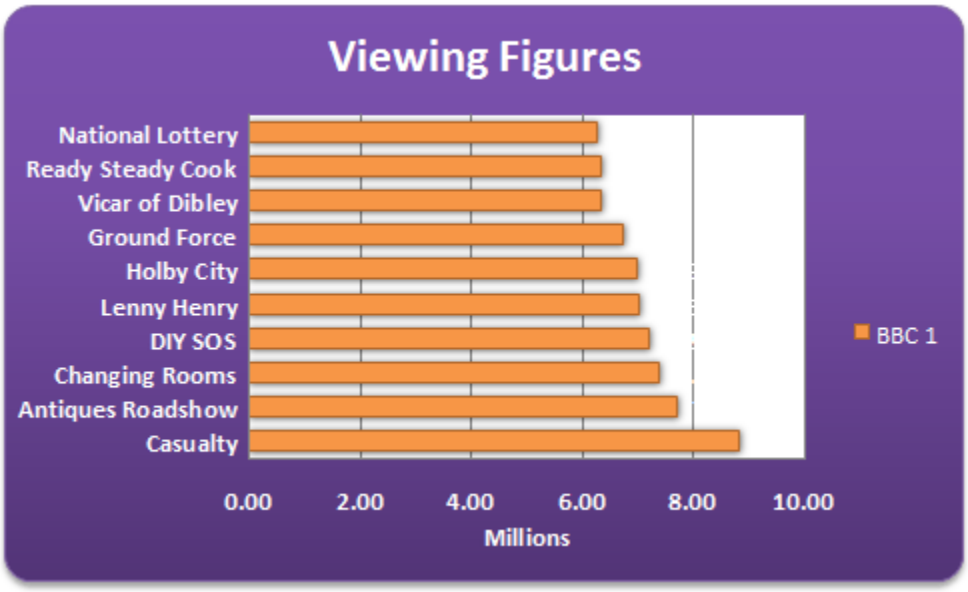




Using the various **Format Panels** on the Excel Ribbon, we'll format our chart from this:

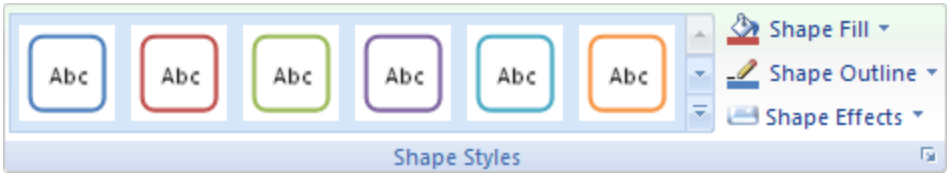


To this:

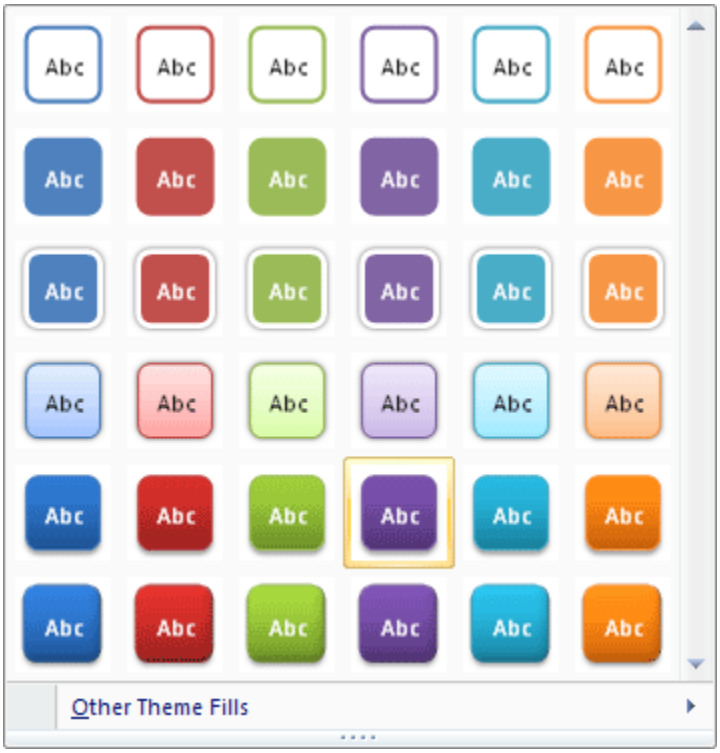


OK, it may look a bit gaudy! But at least it's lively. You can create a chart like this quite easily:

- First, click on your chart to highlight it
- Click the **Format** menu on the Excel Ribbon
- Locate the **Shape Styles** panel:



Click the down arrow on the right of the panel to see the available styles (there might not be so many styles in Excel 2013, so you may have to select a different color):

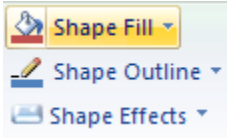


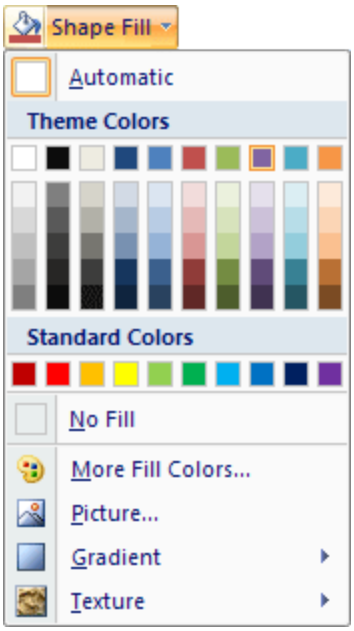
When you move your mouse over a style, your chart will change automatically. But you won't be able to see the full effect until you click away from the chart. We went for Style 28, the one that's highlighted in the image above. You get the rounded corners, the drop shadow and the color fill.

Create your own Chart Style in Excel

You can create all that yourself, though. If you want to create your own style, try the following:

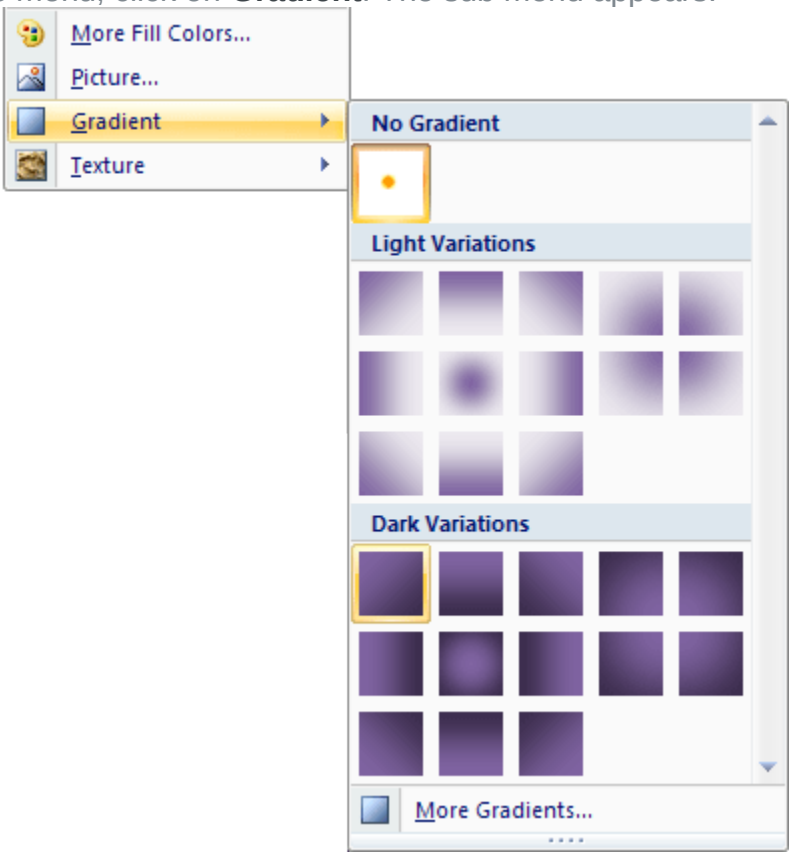
Fill your chart with a color by clicking the down arrow on **Shape Fill** on the Shape Styles panel:





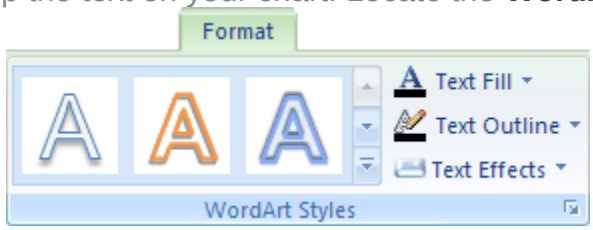
Select a color from the list. Or click "More Fill Colors". Once your chart has a color, you can liven it up a bit.

Still on the same menu, click on **Gradient**. The sub menu appears:

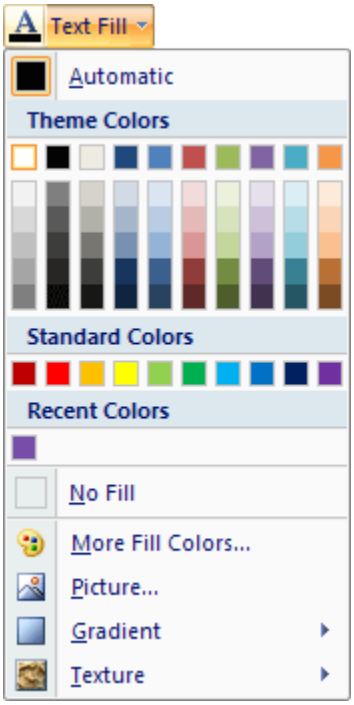


We went for one of the Dark Variations.

Next, you can spruce up the text on your chart. Locate the **WordArt Styles** panel:

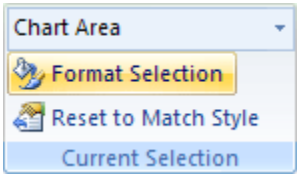


Click the **Text Fill** button to see the available colours:

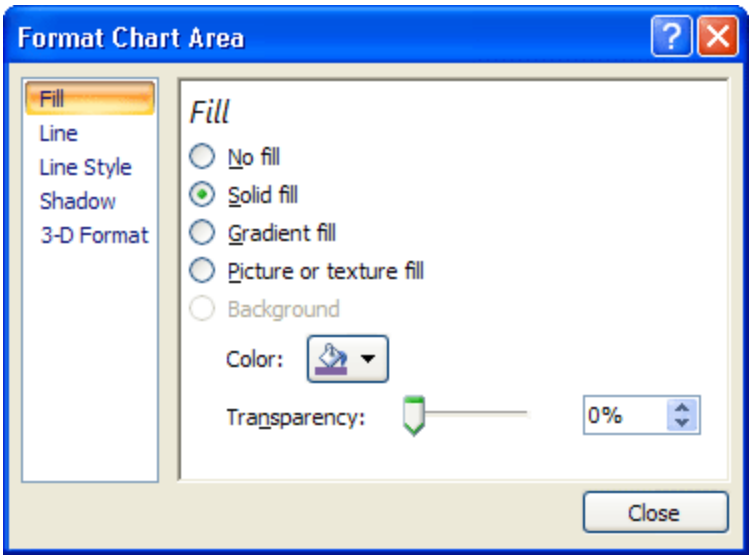


Once you have the chart background and text formatted the way you want it, you can add some rounded corners, and a bit of drop shadow. You can apply both of those from the Format Chart Area dialogue box. Here's how.

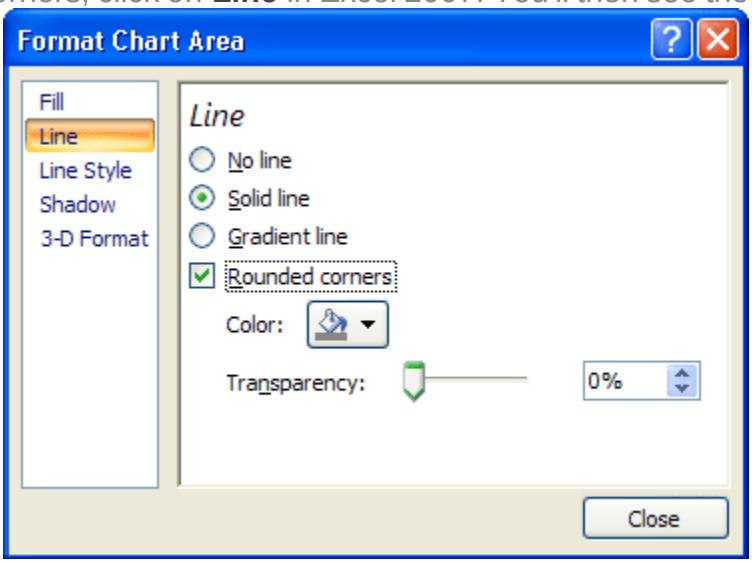
To bring up the Format Chart Area dialogue box, click the **Format Selection** button on the **Current Selection** panel:



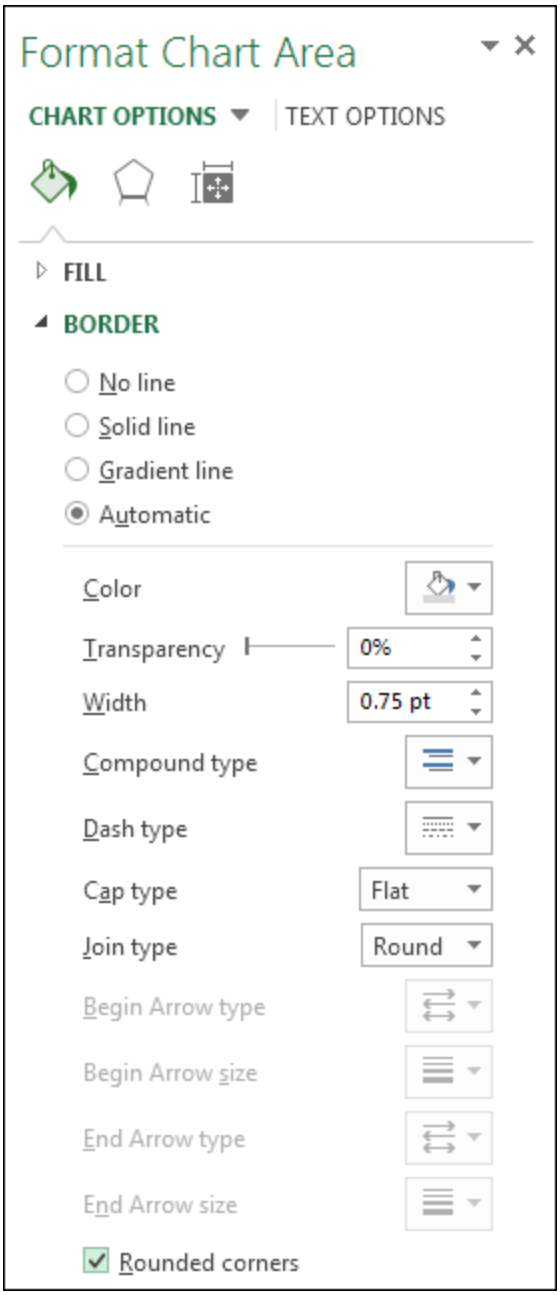
You'll then see the following dialogue box appear (If you're using Excel 2013 and 2016, you'll see a panel appear on the right of your screen instead of a dialogue box):



To get rounded corners, click on **Line** in Excel 2007. You'll then see the following options:

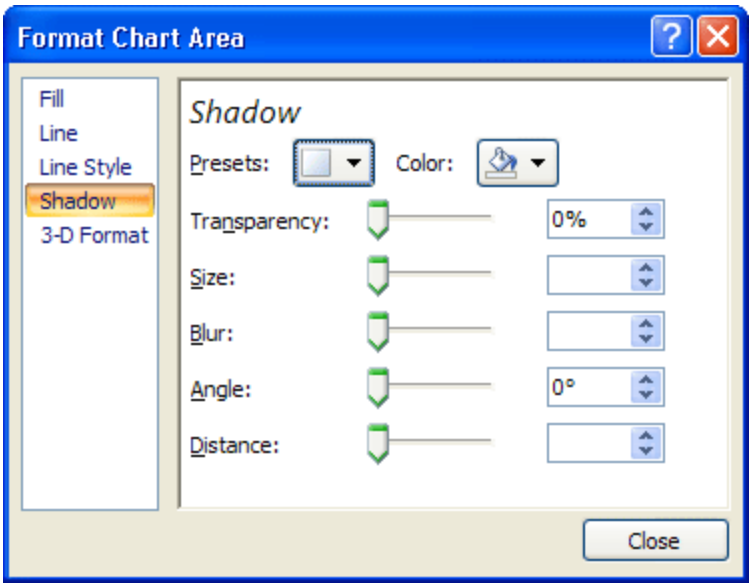


In Excel 2010, you'll have a **Border Styles** menu on the left. Click that to see the Rounded Corners option. For Excel 2013 and 2016, click the **Border** category to expand it. The Rounded Corners options is at the bottom:

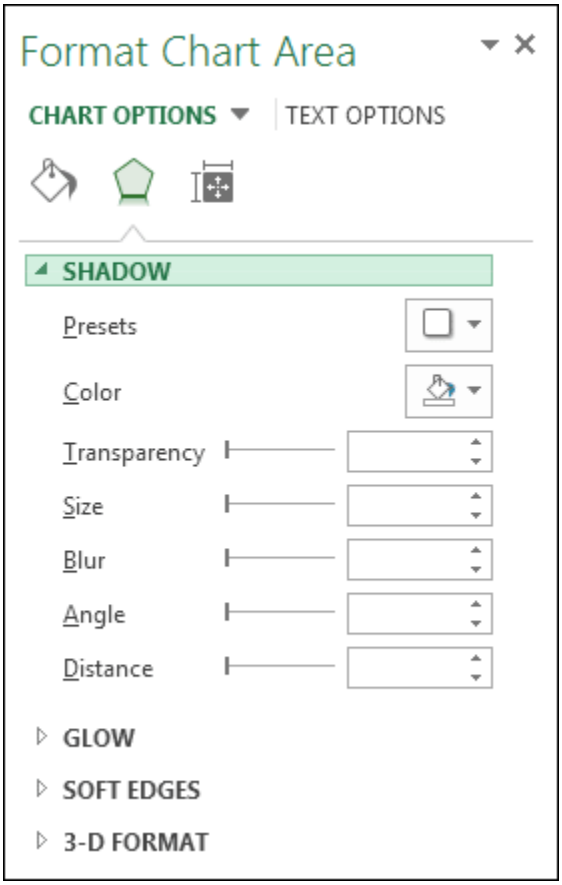


Put a tick in the box for Rounded Corners.

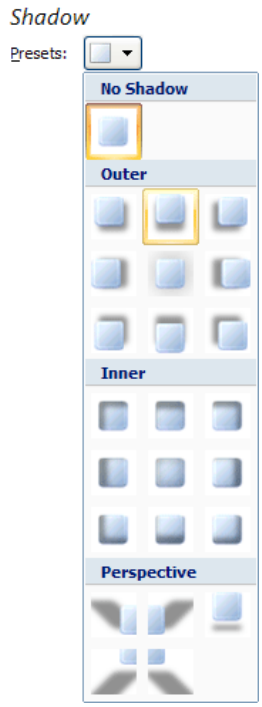
To get a Shadow for your chart, click the Shadow option on the left of your dialogue box. The options will change to these:



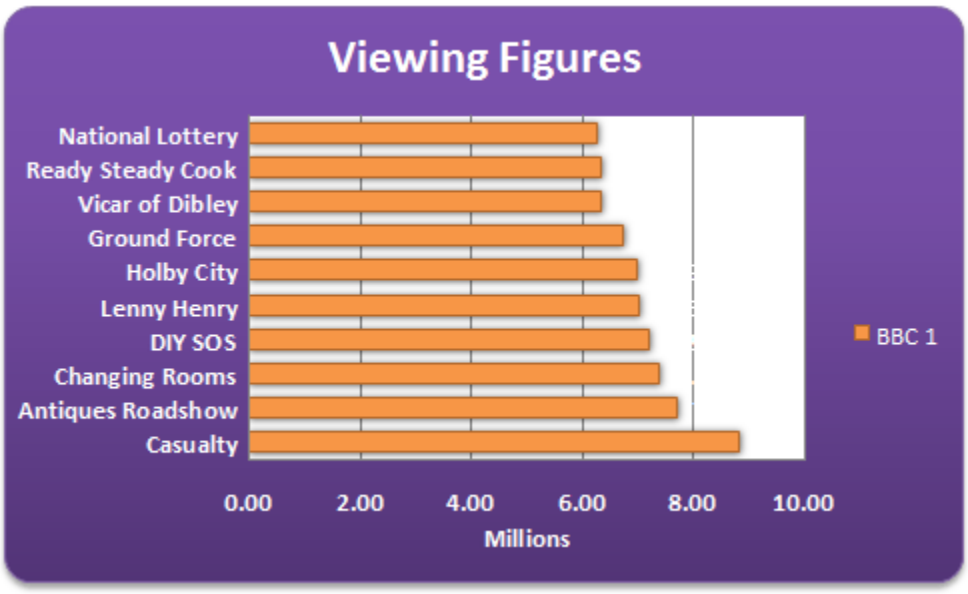
For Excel 2013 and 2016 users, click the Hexagon symbol at the top, just to the right of the paint bucket:



Click the Presets button to see a list of pre-made shadows:



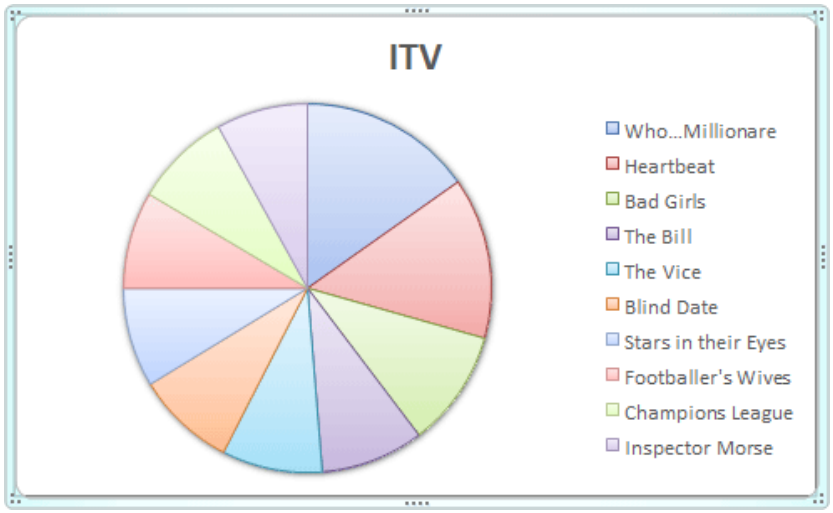
Select the one you like. Then click Close on the dialogue box. Your chart will then have rounded corners and a drop shadow.



OK, you should now a very smart chart. Playing around with the various options on the Format Chart Area dialogue box can really bring an Excel chart to life!

8 Create a Pie Chart in Excel

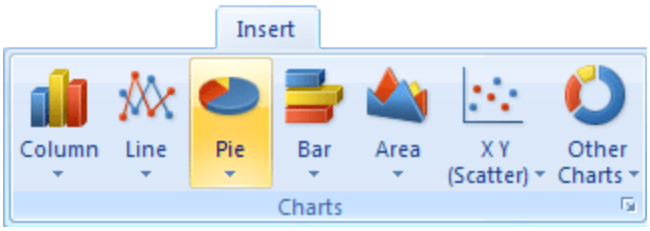
Pie charts are quite easy to create in Excel. In case you're not sure what a Pie Chart is, here's the basic one you'll be creating. Later, you'll add some formatting to this:



To make a start, you need to highlight some data. If you've been following along with the previous tutorials, then you'll have some viewing figures data. You've created a 2D chart with the BBC data. This time we'll use the ITV data. If you don't have this data, create the following simple spreadsheet. The cells to use are D4 to E14:

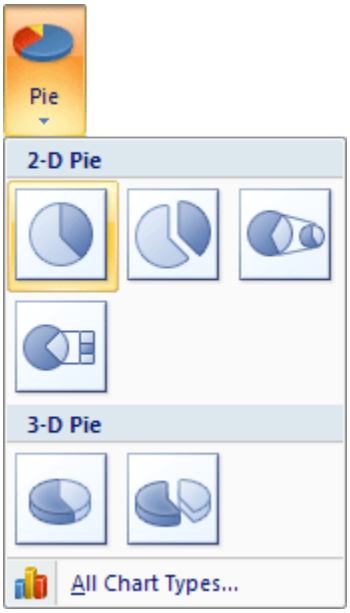
	ITV
Who...Millionare	10.99
Heartbeat	10.22
Bad Girls	7.42
The Bill	6.54
The Vice	6.37
Blind Date	6.31
Stars in their Eyes	6.26
Footballer's Wives	6.17
Champions League	6.09
Inspector Morse	5.81

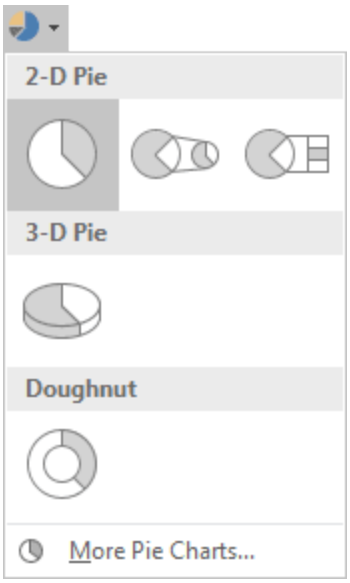
- Click inside cell E4 and change "Millions" to ITV, if you already have the data from a previous lesson
- Highlight the cells D4 to E14
- Click the **Insert** menu at the top of Excel
- Locate the **Chart** panel, and the **Pie** item:



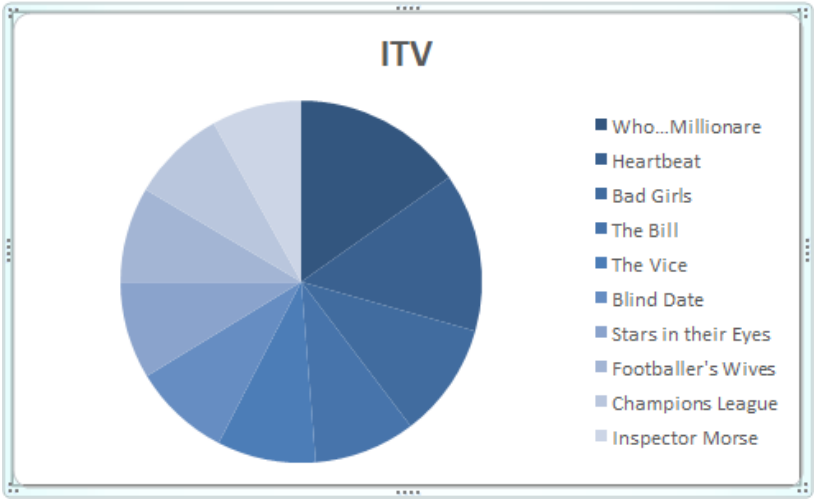
In Excel 2013 and 2016, the Pie chart is harder to spot. But it's highlighted in green in the image below:

Click the down arrow and select the first Pie chart:

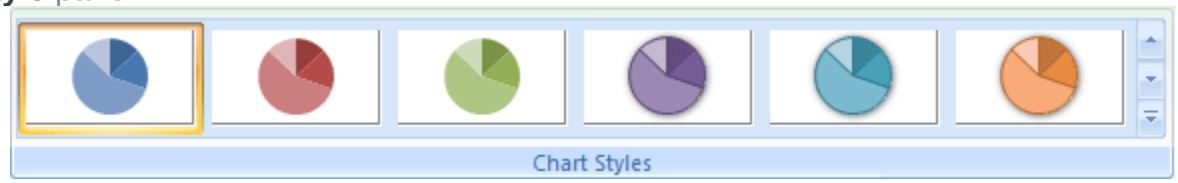




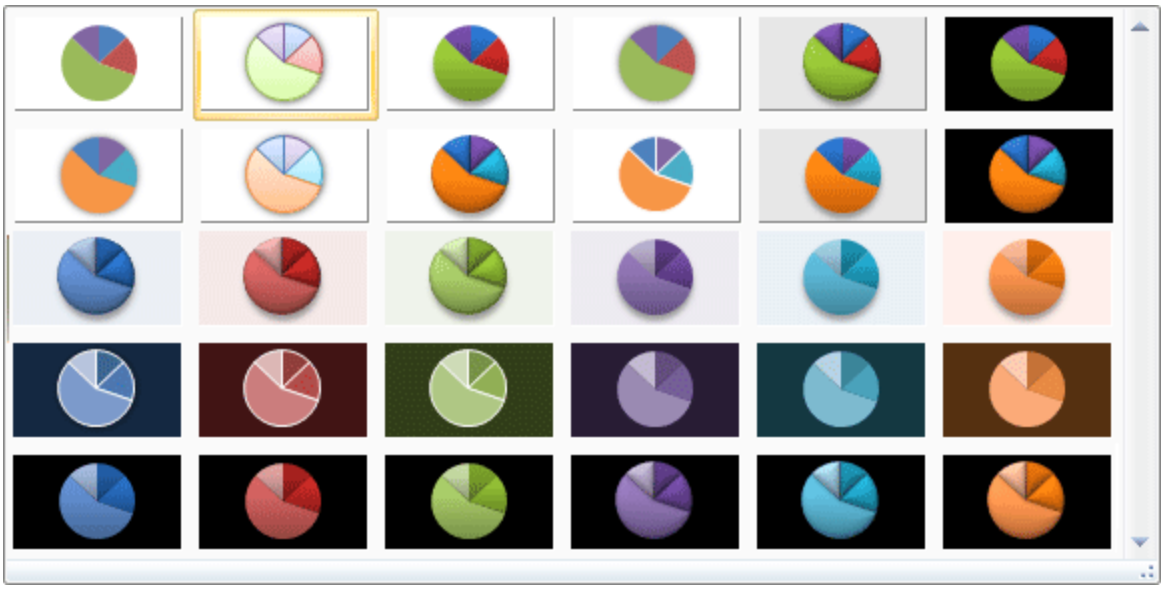
- A new Pie chart is inserted
- Move your new pie chart by dragging it to a new location
- Notice how all the segments of the pie chart are the same colour in Excel 2007:



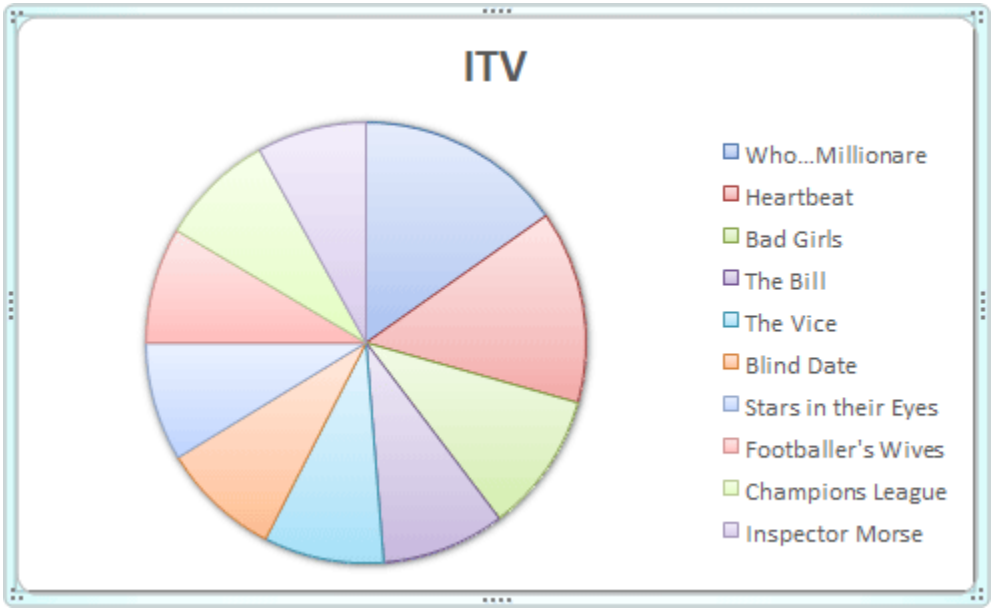
To get assorted colors, make sure that your chart is selected and locate the **Chart Style** panel:



Click the down arrow to the right of the Chart Style panel to reveal the available styles :



We've gone for the second one, Style two. If you haven't got this style, select a similar one, such as style 4 in Excel 2013 and Excel 2016. The chart will then look like this (your labels may well be at the bottom, though, depending on which version of Excel you have):



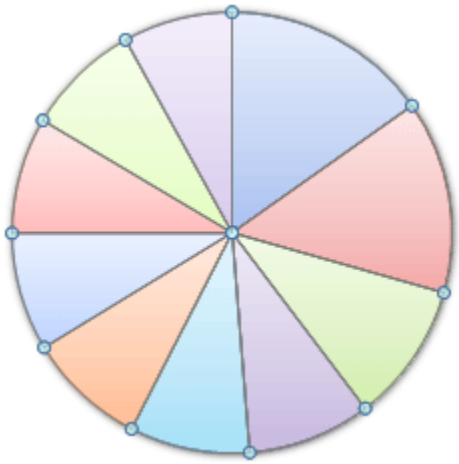
But it looks pretty good for just a few mouse clicks! We can still do a bit more to it, though. In the next part, you'll see how to add the viewing figures to the pie chart segments.

2.9 Add Labels to a Pie Chart

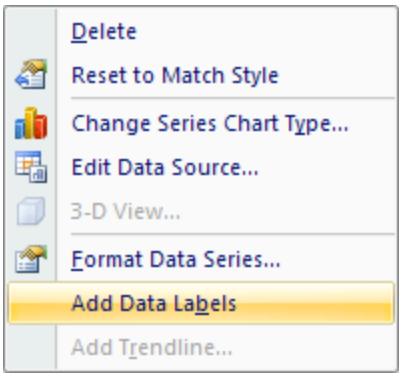
At the moment, though, there's no information about what each segment represents. We're going to add the numbers from our ITV viewing figures. These ones:

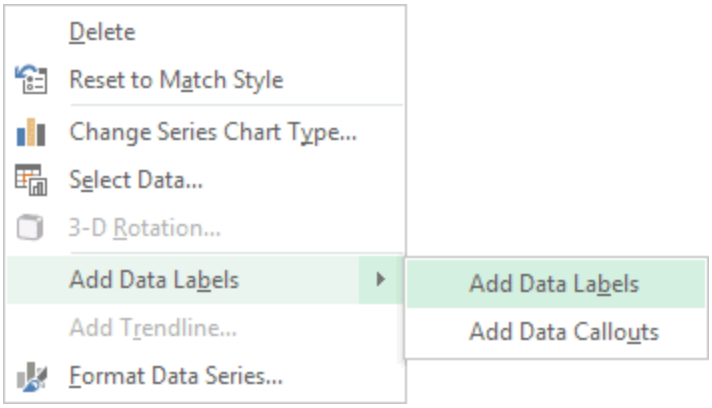
	ITV
Who...Millionare	10.99
Heartbeat	10.22
Bad Girls	7.42
The Bill	6.54
The Vice	6.37
Blind Date	6.31
Stars in their Eyes	6.26
Footballer's Wives	6.17
Champions League	6.09
Inspector Morse	5.81

To add the numbers from our E column (the viewing figures), left click on the pie chart itself to select it:

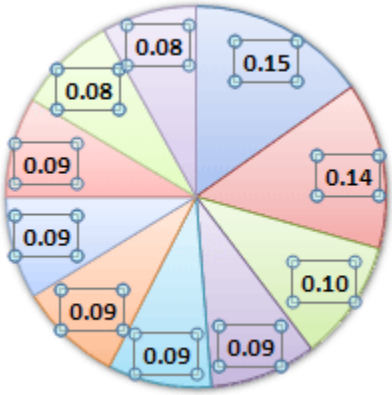


The chart is selected when you can see all those blue circles surrounding it. Now right click the chart. You should get the following menu:

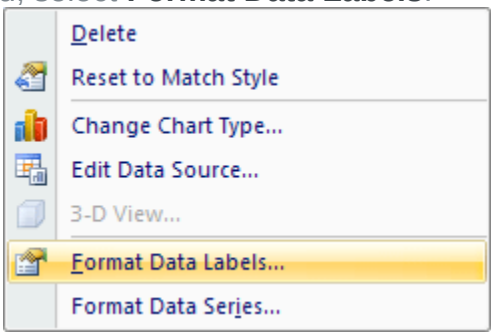




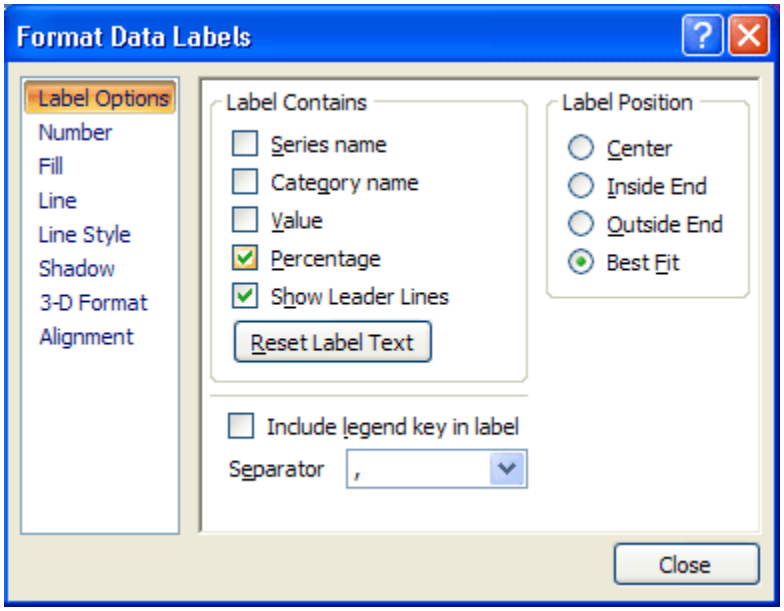
From the menu, select **Add Data Labels**. New data labels will then appear on your chart:



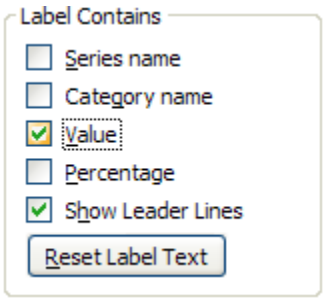
The values are in percentages in Excel 2007, however. To change this, right click your chart again. From the menu, select **Format Data Labels**:



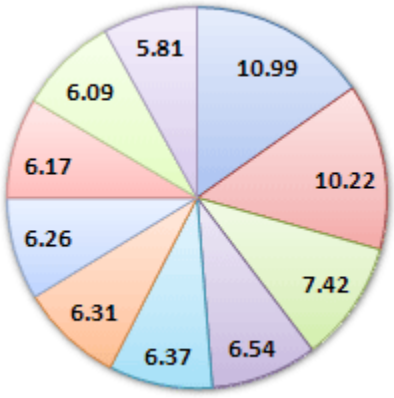
When you click Format Data Labels, you should get a dialogue box. This one:



If there's a tick in Percentage, untick this and select Value:

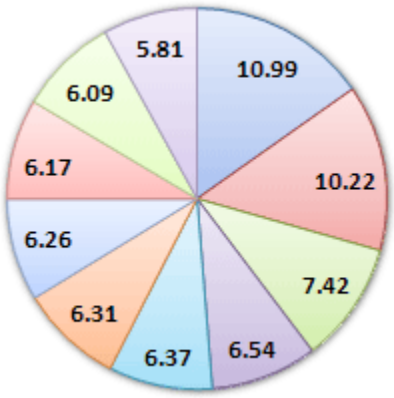


Your chart will then have the correct numbers:



Overall, the chart looks OK. But we can add some formatting to it. in the next part, you'll see how to format each individual segment of the Pie Chart. We'll change the color of one segment, and separate it.

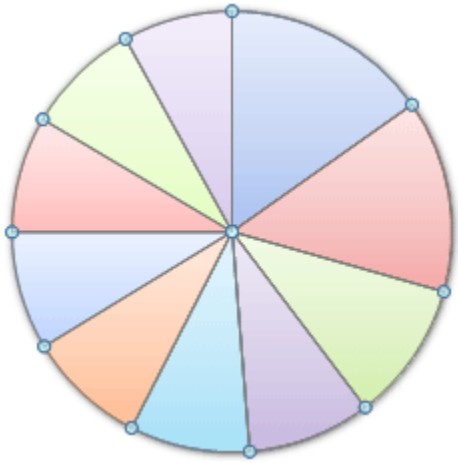
2.10 Format Pie Chart Segments



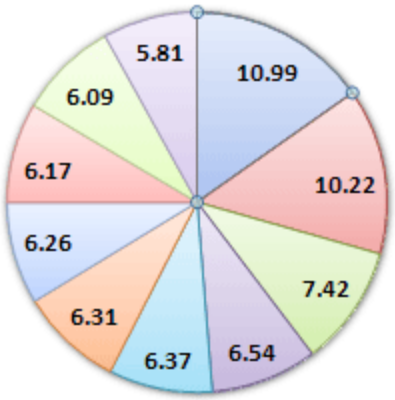
You can change the color of each slice of your pie chart, and even move a slice. Let's change the colors first.

Change the Color of a Pie Chart Segment

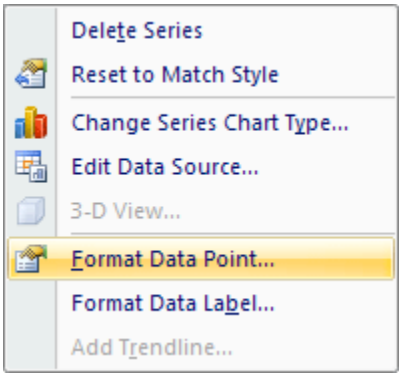
Left click on the pie chart itself to select it:



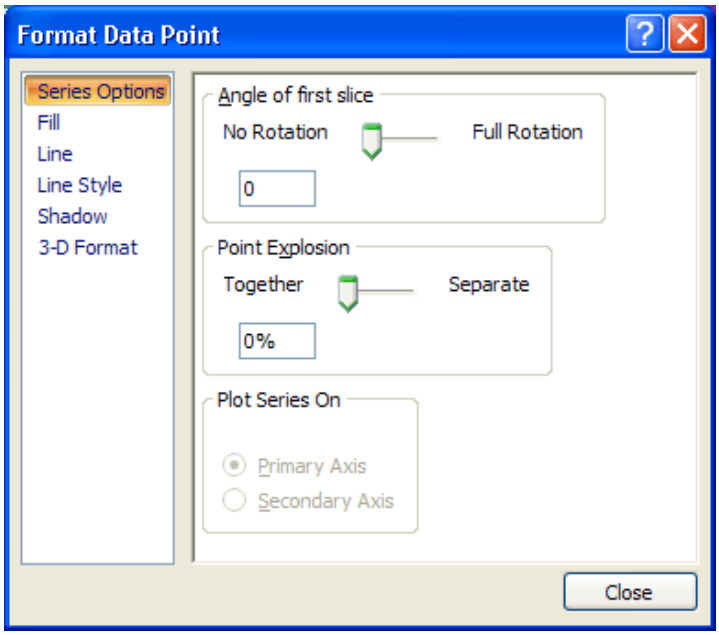
It is selected when you can see those round handles. Now left click on one of the segments to select just that individual slice. It's a little bit tricky, but if you do it right your pie chart should look like this:



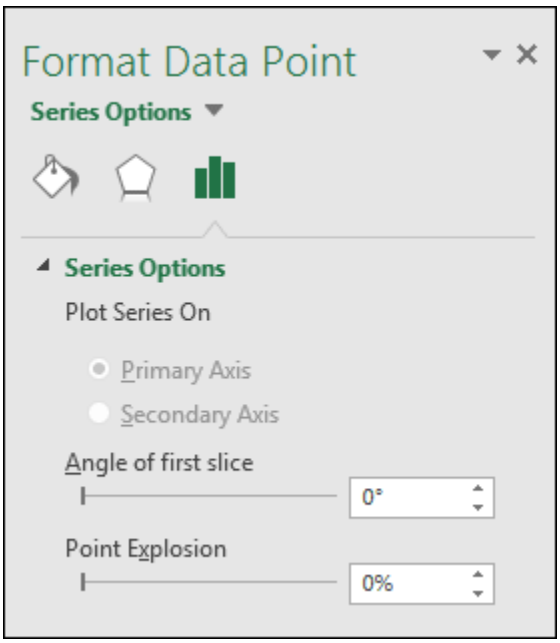
In the image above, only the 10.99 segment is selected. You should see round circles surrounding just that segment. Now right click your segment and, from the menu that appears, select **Format Data Point**:



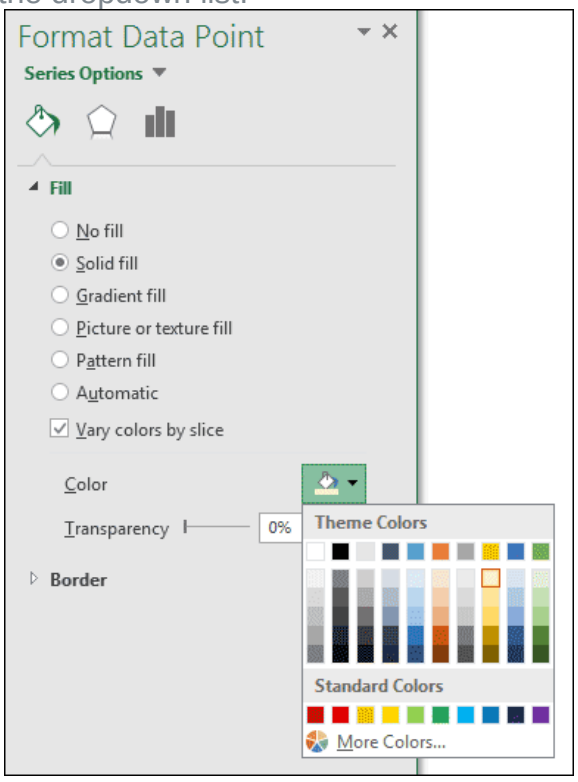
You should see the following dialogue box appears in Excel 2007:



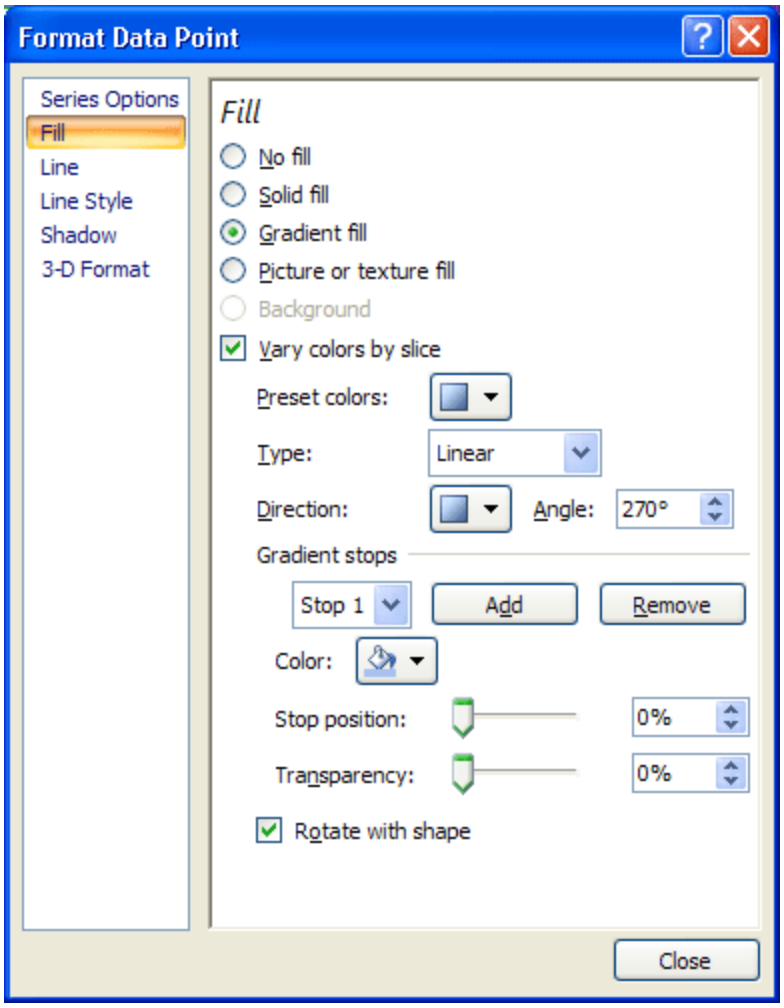
You'll see a panel appear on the right of your screen in Excel 2013 and 2016.



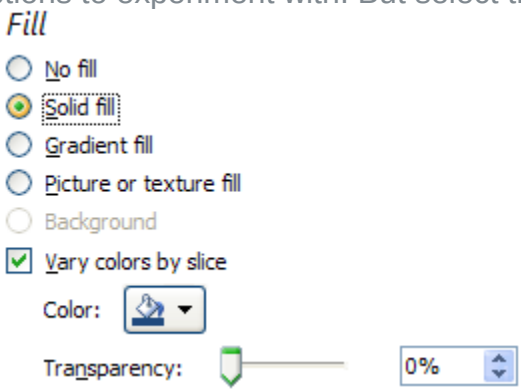
Click the paint bucket icon at the top, then click to expand the Fill option. Select **Solid fill**, and select a color from the dropdown list:



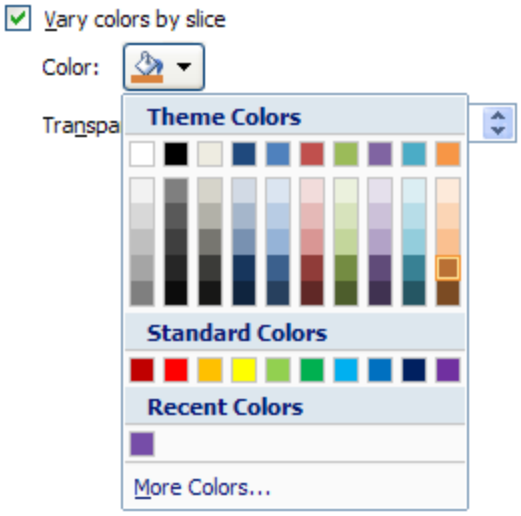
In Excel 2007, click on **Fill** from the options on the left. The dialogue box changes to this:



There are quite a lot of options to experiment with. But select the **Solid Fill** option:



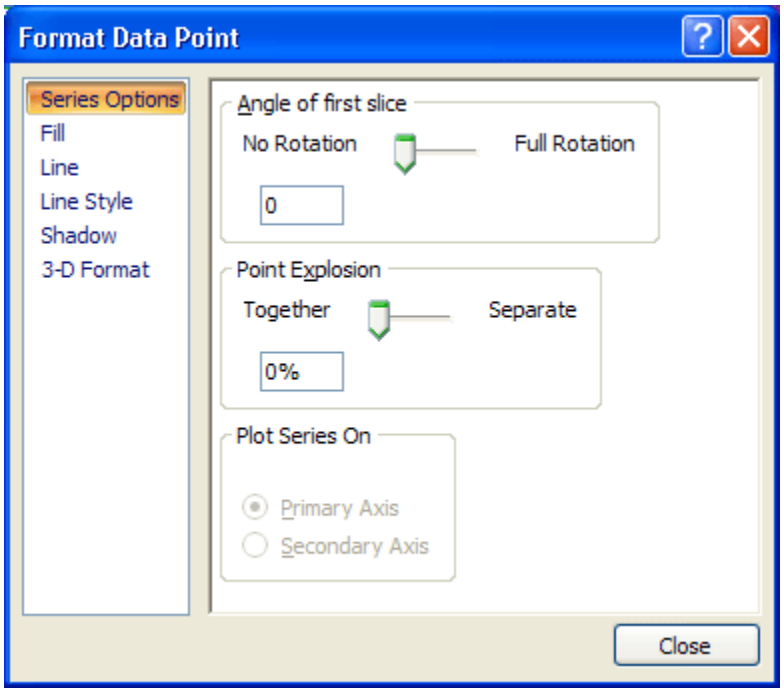
Now click the color picker, and choose a new color for the segment:



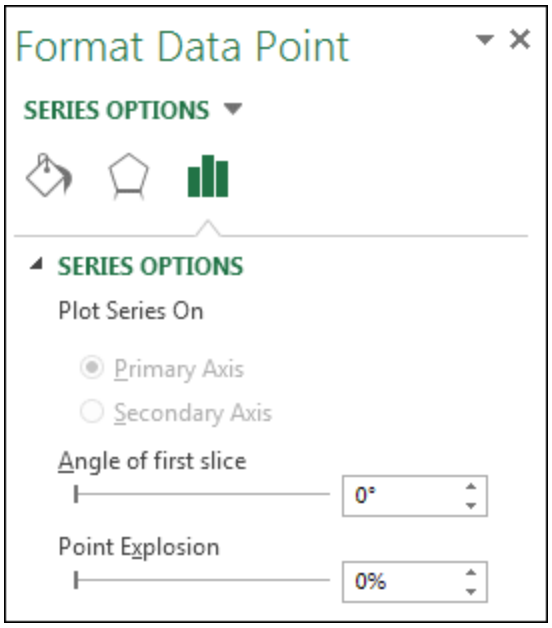
We've gone for a dark orange color, but select any color you like.

Move a Pie Chart Segment in Excel

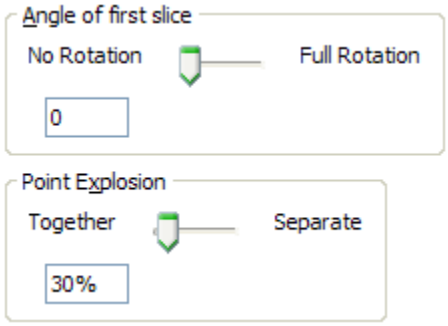
To move the slice that you've just colored, click back on **Series Options** from the options on the left:



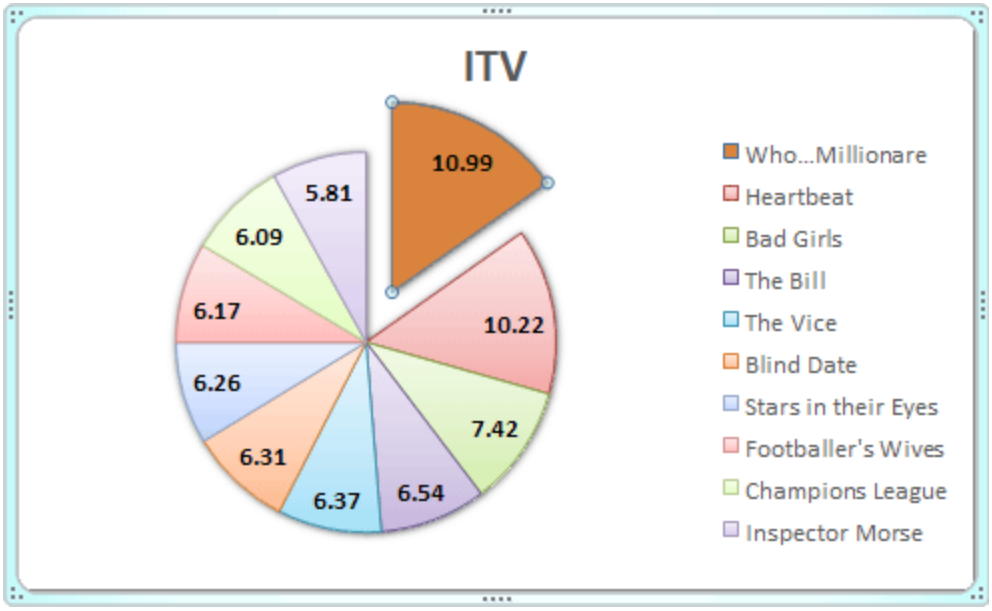
In Excel 2013 and 2016, click the three bars icon:



Set the Point Explosion slider to about 30%



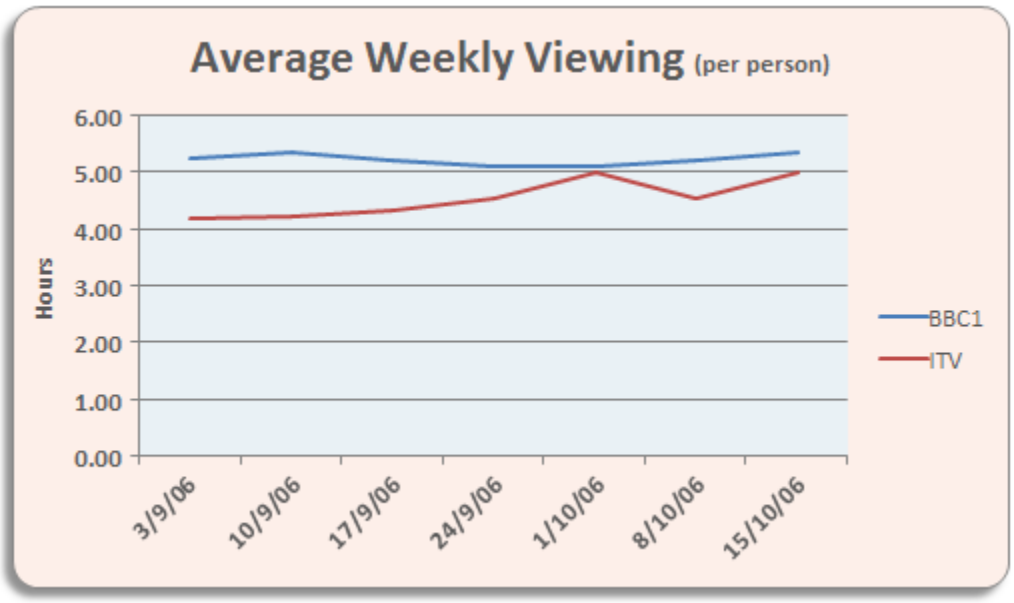
Now click the Close button. Your chart should look something like this one:



Change the rest of the slices in exactly the same way. You can format the rest of the chart exactly like you did for the Bar chart. But it looks quite impressive as it is!

2.11 Create a 2D Line Chart in Excel

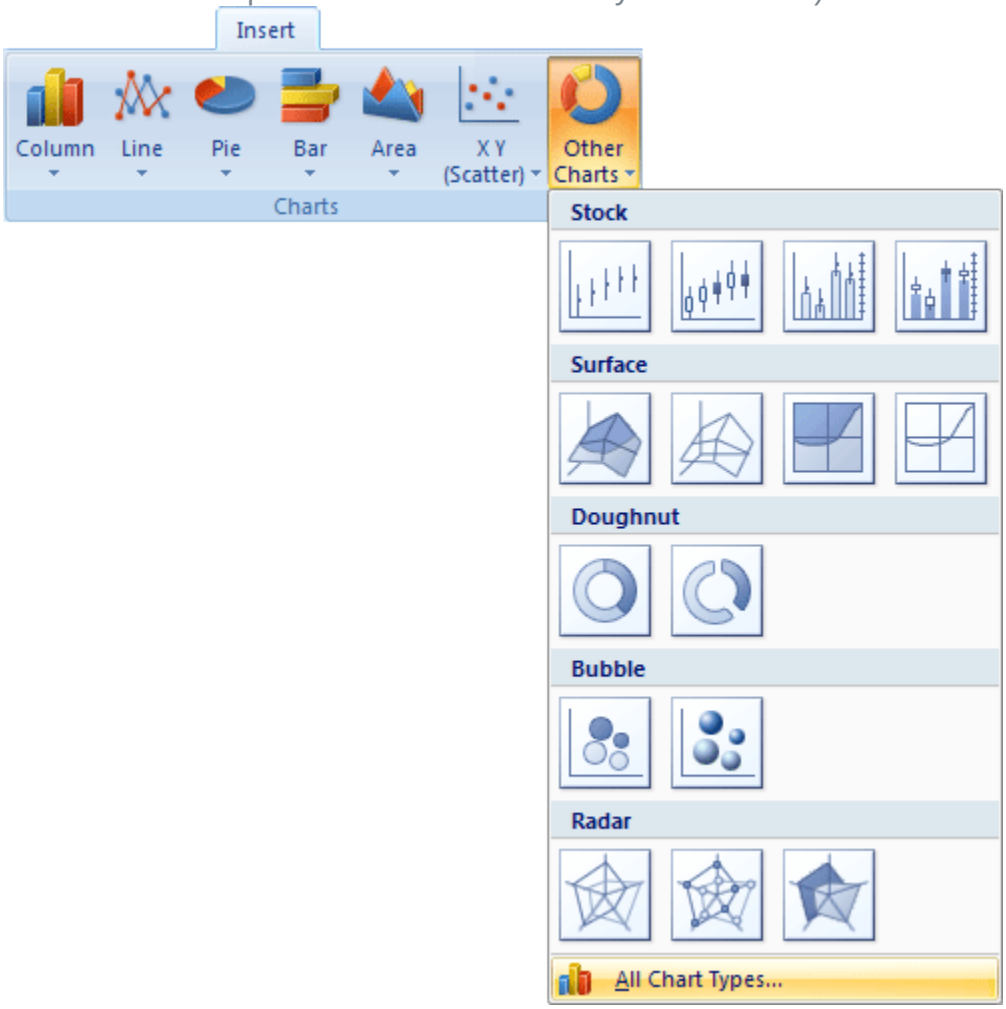
For this last chart, we'll compare the viewing figures of BBC1 and ITV. A line chart is better for this type of data. The chart we'll create looks like this:



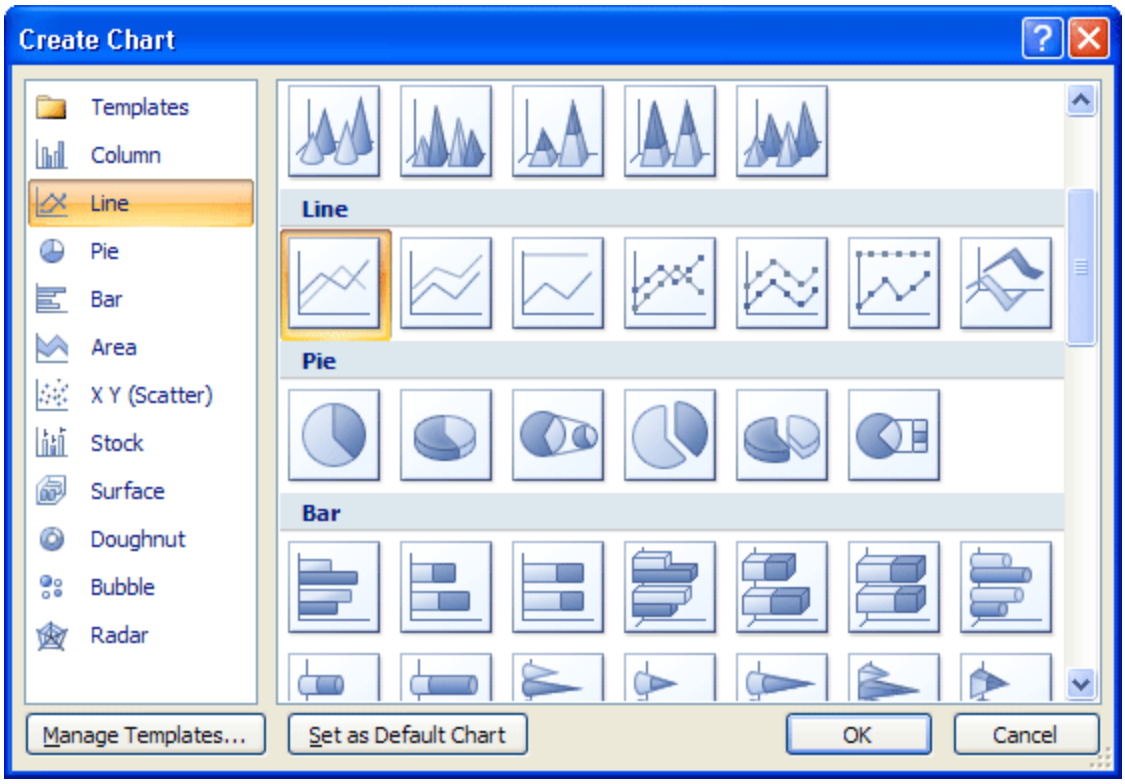
We're comparing how many hours per week a person watches BBC1 with how many hours they watch ITV. You'll need some data, of course. Start a new spreadsheet and enter the same data as below:

	A	B	C	D	E	F	G	H
1	Average Weekly Viewing (Hours/Mins per person (03/03/16 to 15/04/16)							
2								
3		03/03/2016	10/03/2016	17/03/2016	24/03/2016	01/04/2016	08/04/2016	15/04/201
4	BBC	5.27	5.37	5.23	5.13	5.12	5.21	5.
5	ITV	4.19	4.23	4.33	4.54	5.00	4.57	5.
6								

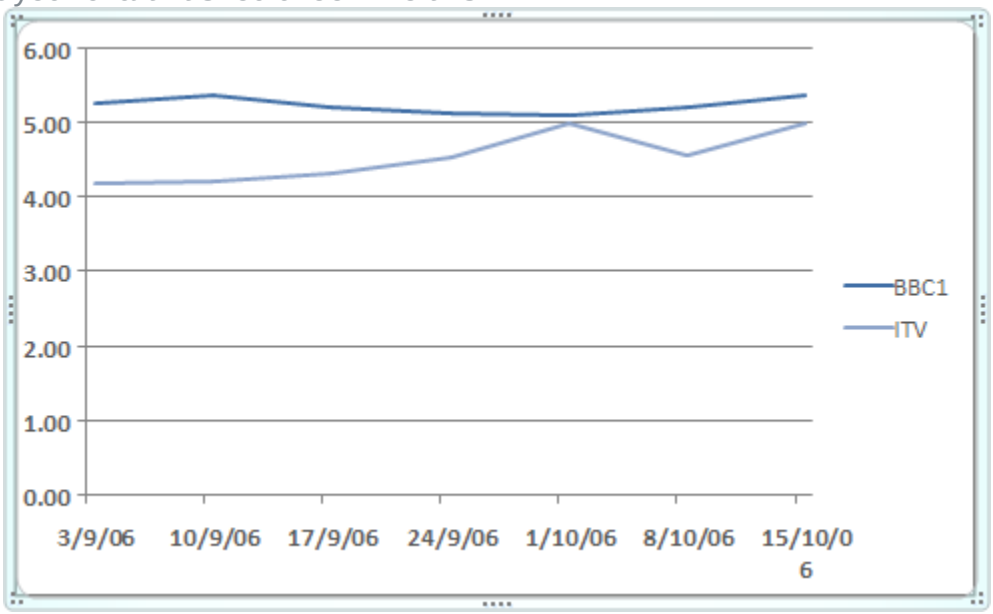
Once you have your spreadsheet data, highlight the cells A3 to H5. Now click **Insert** from the Ribbon bar in Excel 2007 and 2010. Locate the **Charts** panel, and click on **Other Charts**. From the menu, select **All Chart Types** (In Excel 2013 and 2016, there is no Other Charts option. See below for what you should do):



When you click **All Chart Types**, you'll get a dialogue box popping up:

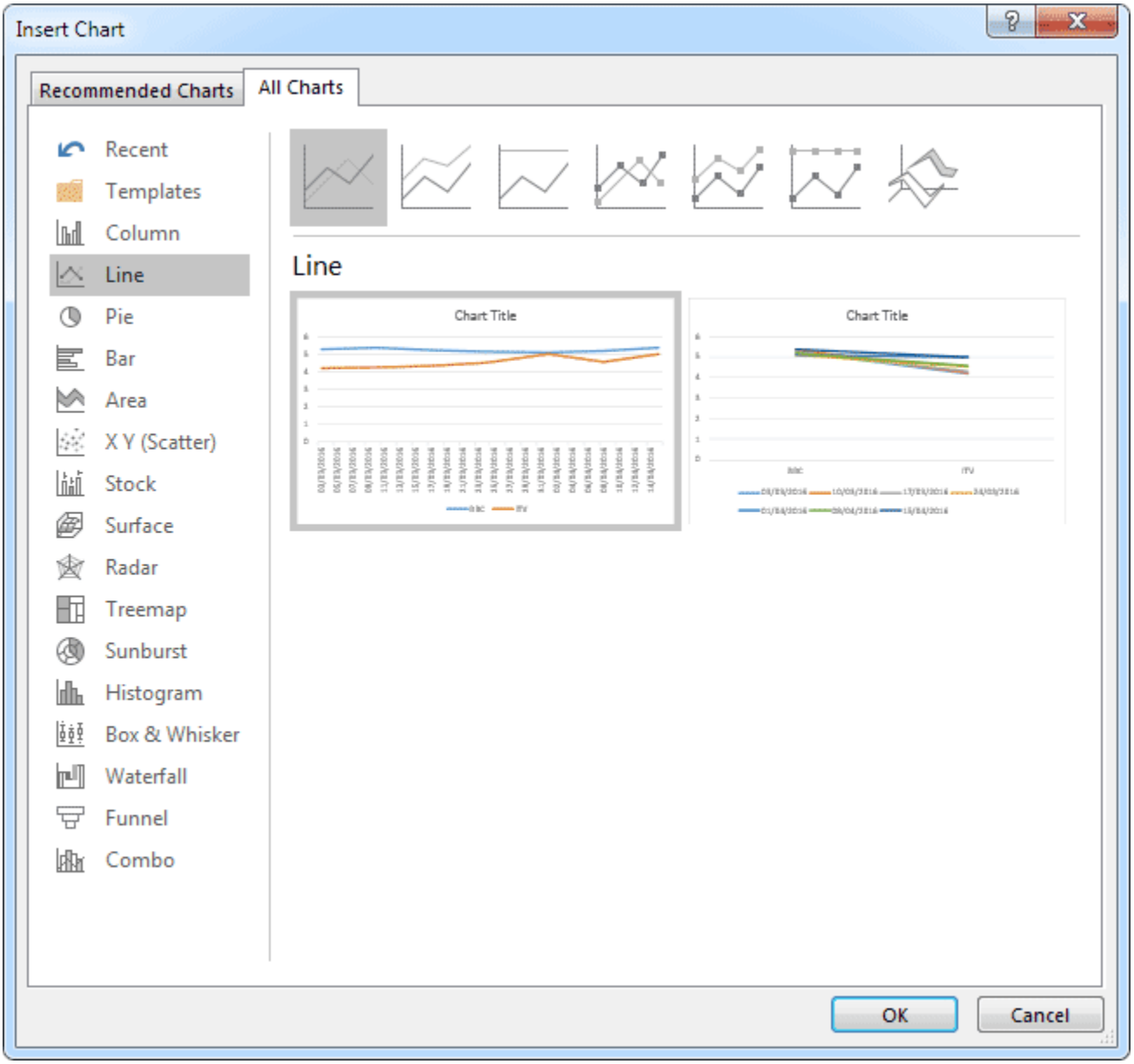


From the dialogue box, the left hand side shows all the chart templates. Click on **Line**. Select the first Line chart, the one highlighted in the image above. Click OK and Excel will insert your chart. It should look like this:

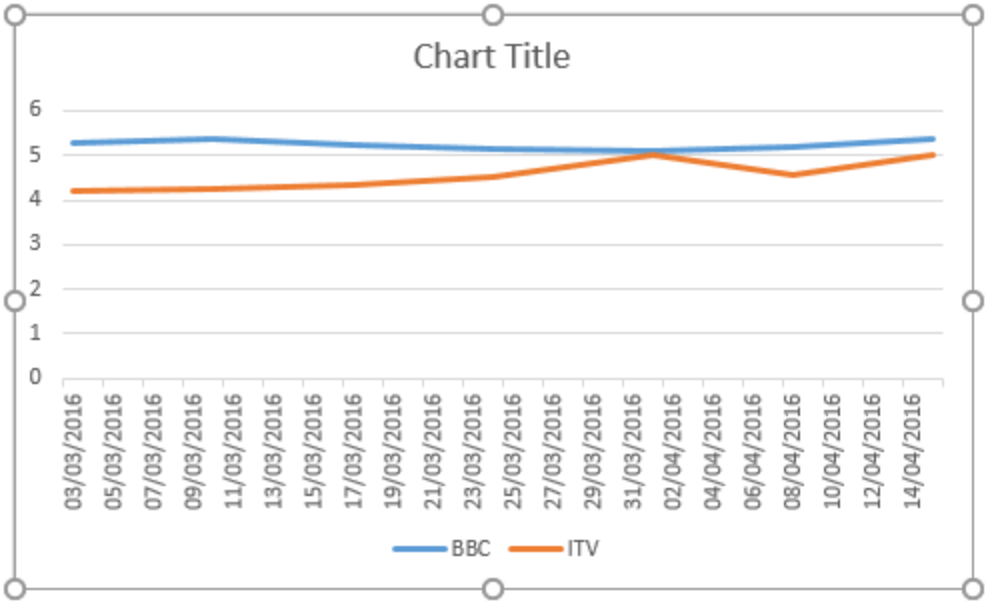


In Excel 2013 and 2016, click the **Recommended Charts** item instead of Other Charts:

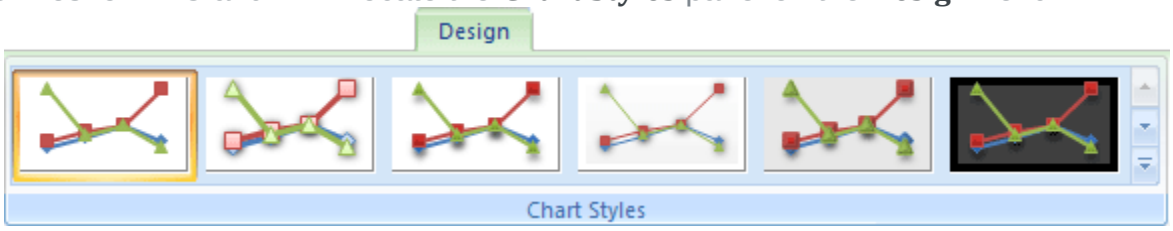
You'll then see a dialogue box appear. Click on All Charts:



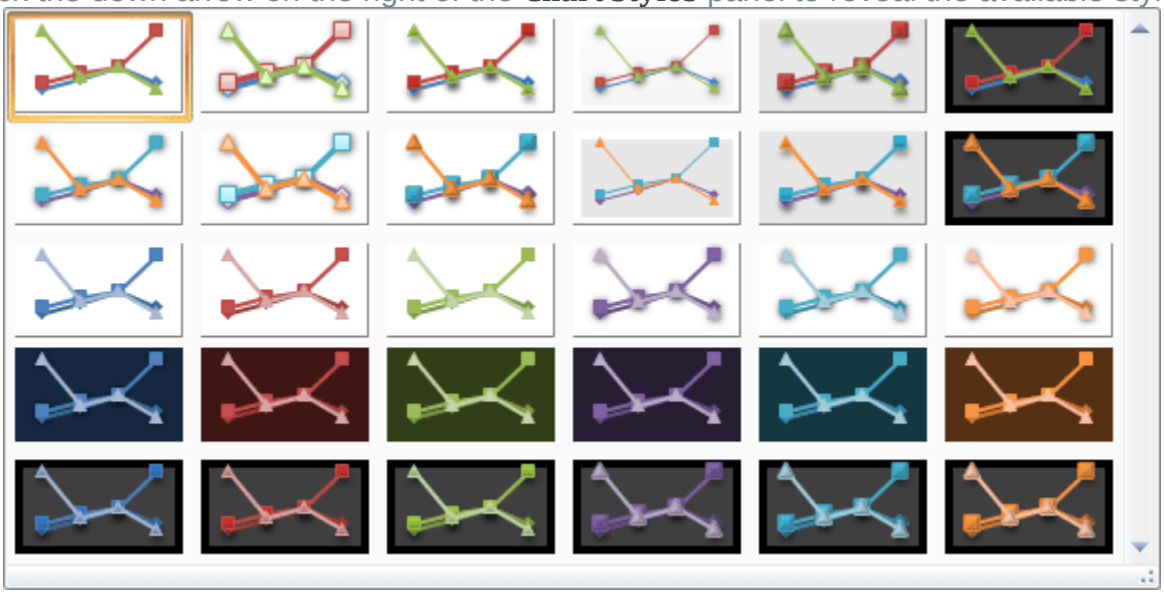
Select Line from the list on the left to see all the available line charts (2016 users will have more charts on the list). Select the first one. Your charts will then look like this:



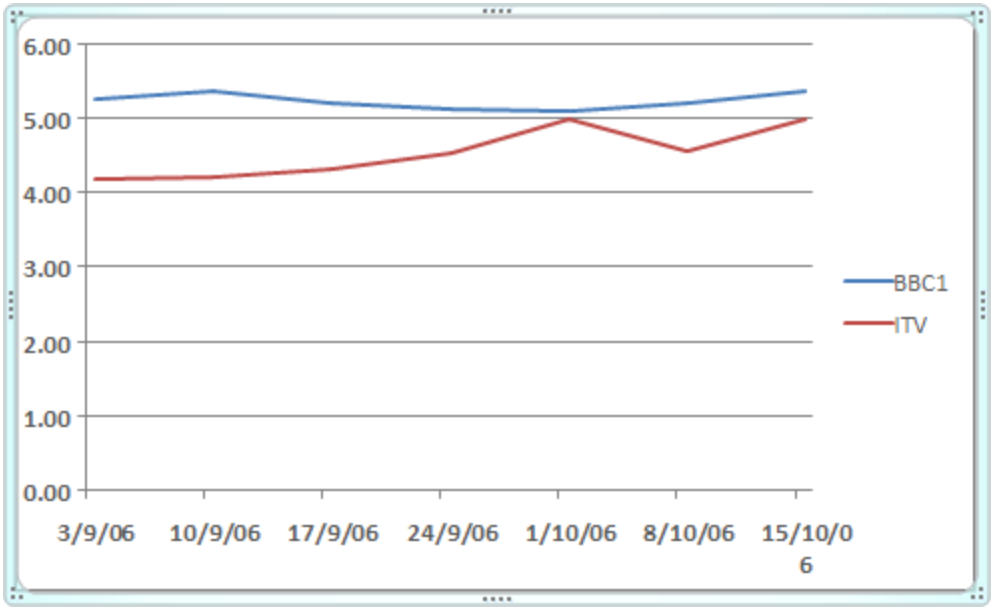
For all users, the chart looks a bit plain, at the moment. You can change the colour of the lines for BBC and ITV. Locate the **Chart Styles** panel on the **Design**menu:



Click the down arrow on the right of the **Chart Styles** panel to reveal the available styles:

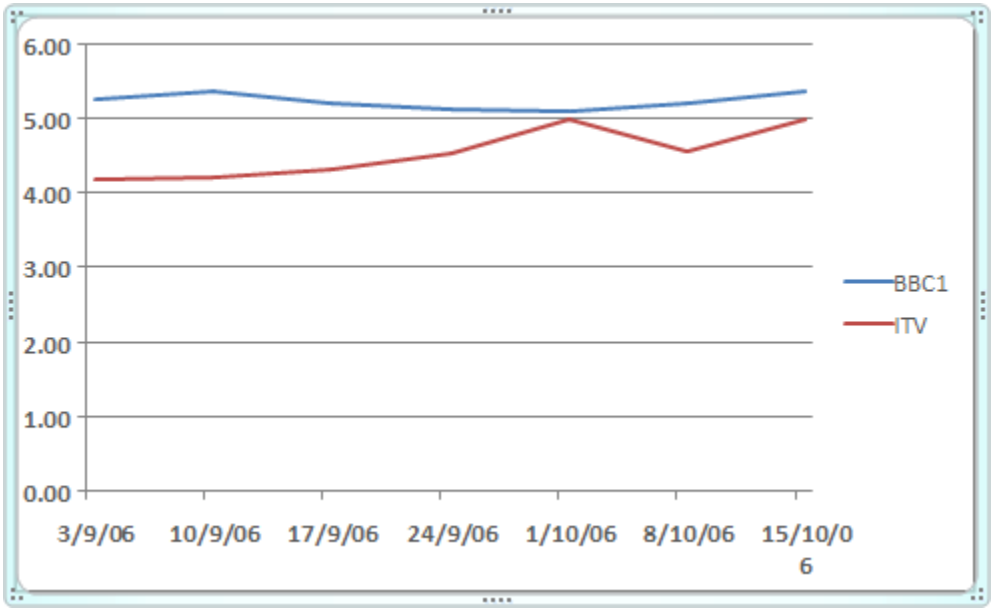


We've gone for the first one, top left. When you select a style, your chart will change:

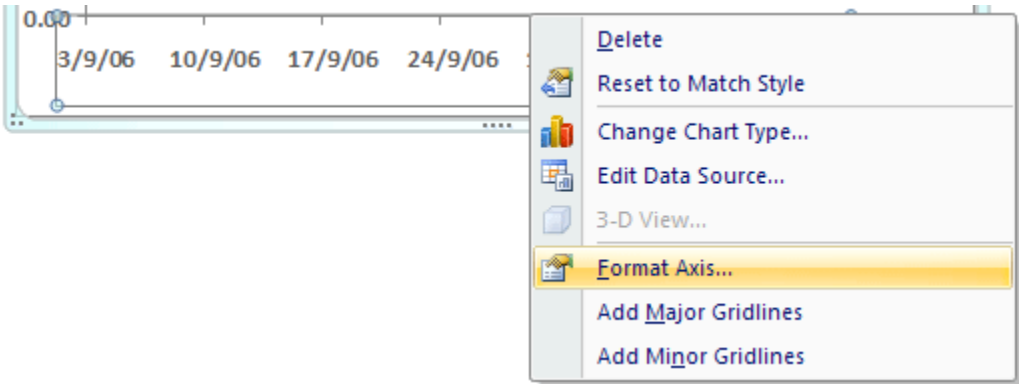


The lines are more distinct now. The dates at the bottom don't look too impressive, though! In the next part, you'll see how to format the dates on the bottom Axis.

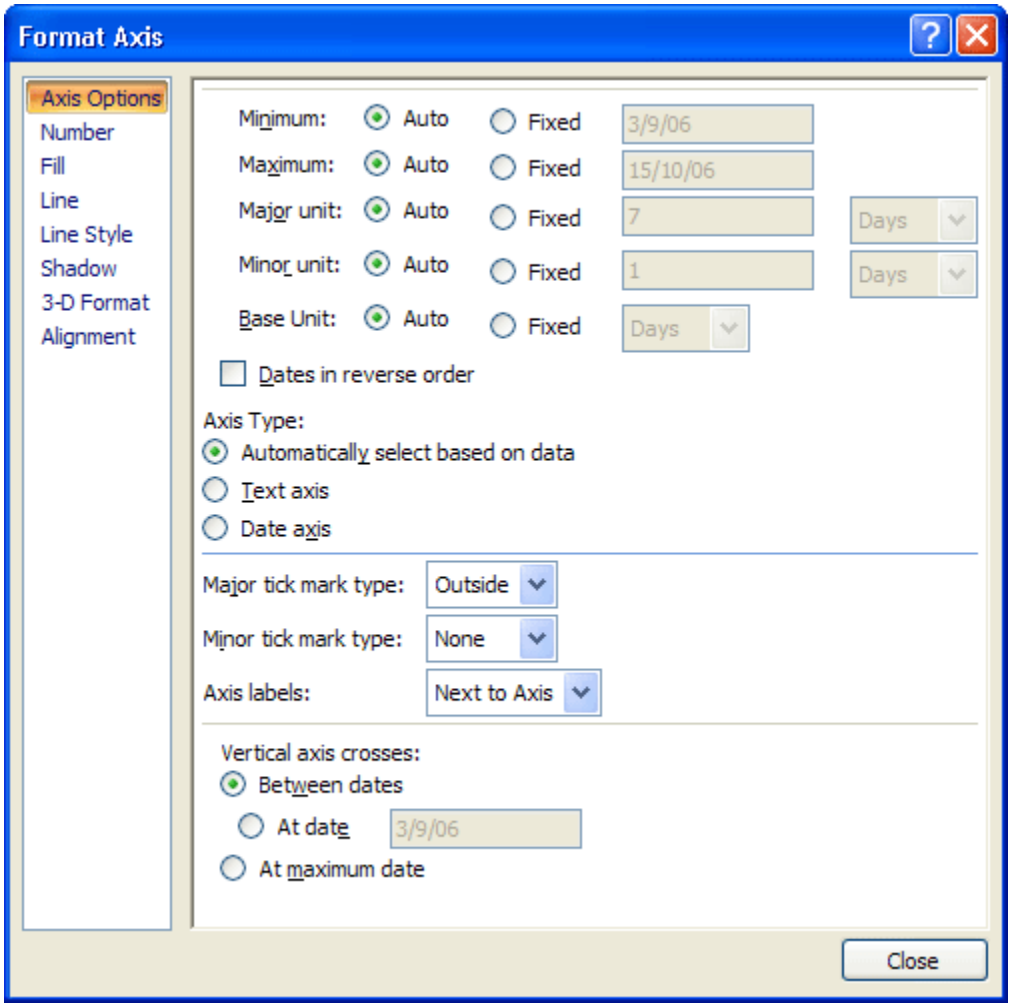
2.12 Format your Axis Titles



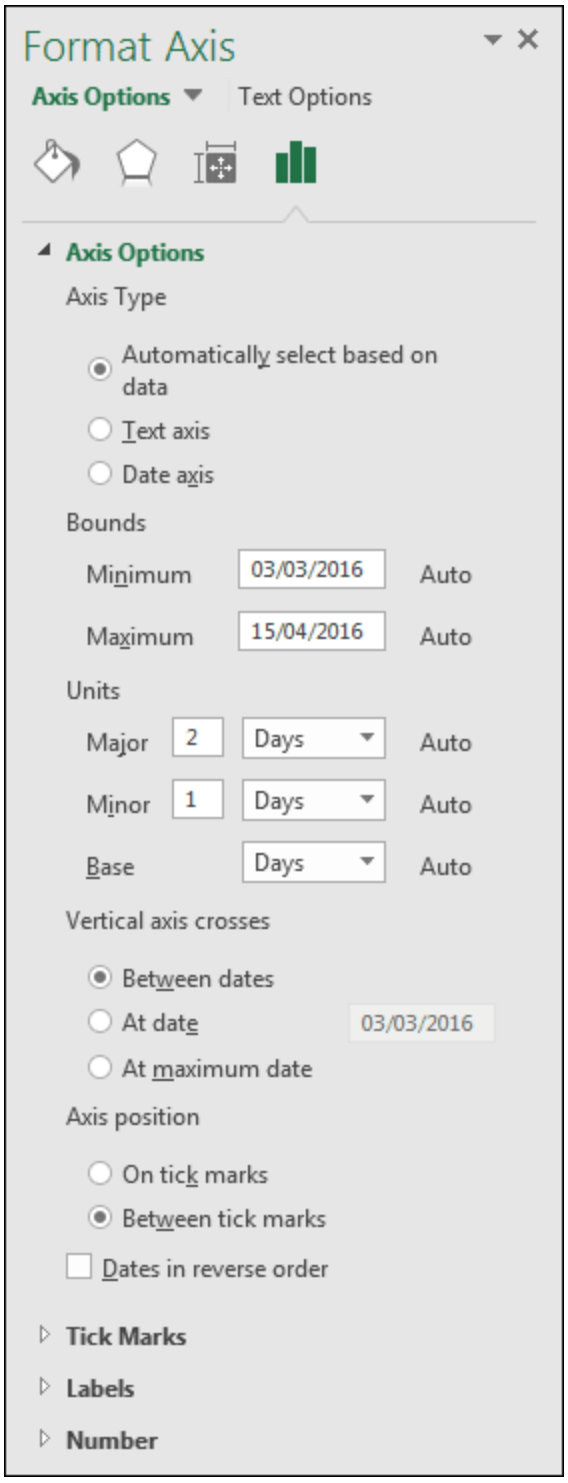
To format the dates on the bottom Axis, click on them with your left mouse button. With the dates Axis selected, right click. You should see this menu:



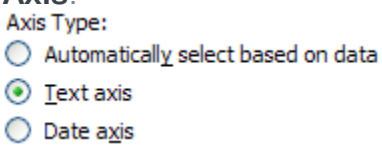
Select **Format Axis** from the menu, and you'll see the following dialogue box appear in Excel 2007 and 2010:



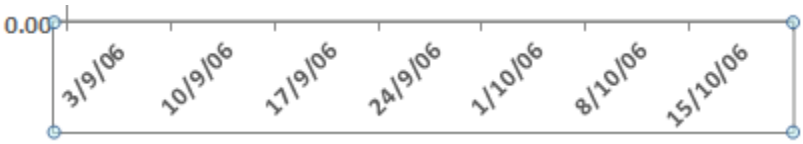
Excel 2013 and 2016 users will see a panel appear on the right of the screen, instead of a dialogue box:



Under **Axis Type**, select **Text Axis**:

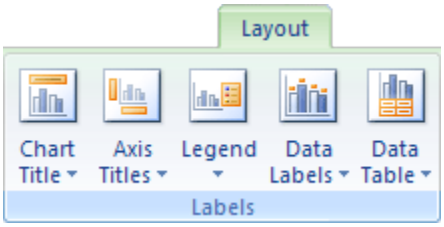


Your dates should end up in the middle. (Our version of Excel was a little buggy. We had to click Date axis, then click back on Text axis to get the dates in the middle.)

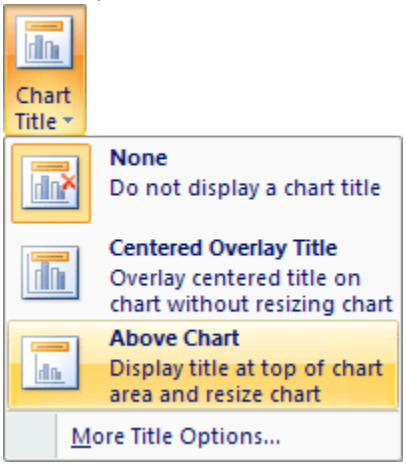


Adding an Axis Title

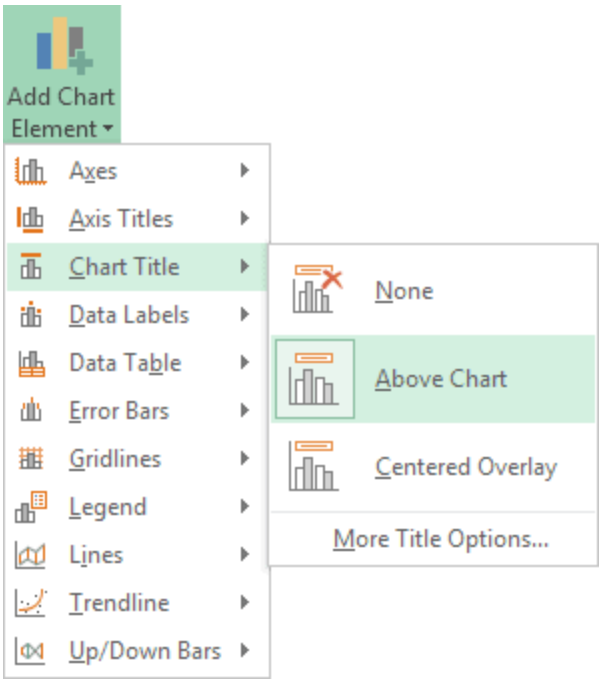
To add an Axis label at the top of your chart, if you have Excel 2007 or Excel 2010, click the **Layout** menu at the top of Excel. Then locate the **Labels** panel:



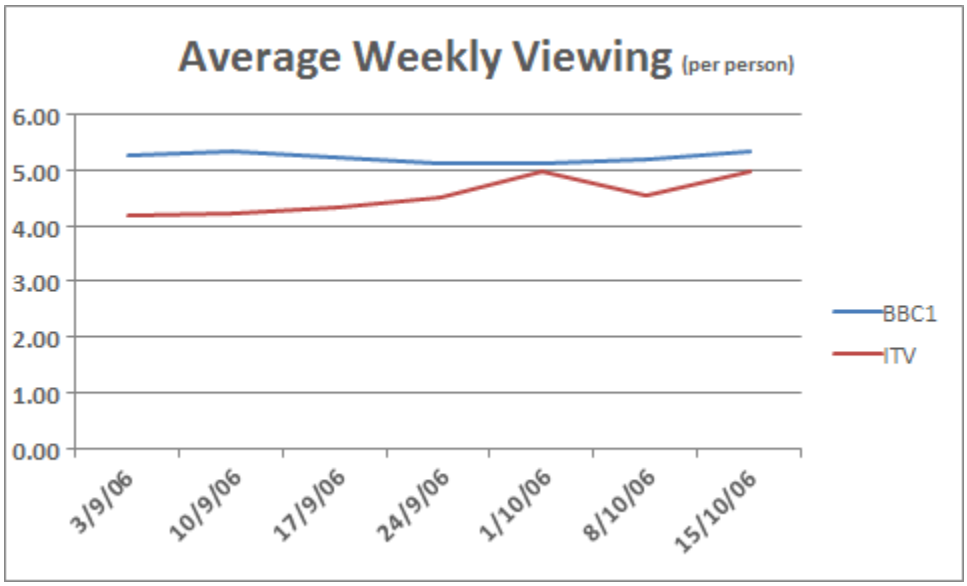
Click on **Chart Title**. From the menu, select **Above Chart**:



If you have Excel 2013 and 2016, however, stay on the **Design** Ribbon and locate the **Chart Layouts** panel on the left, just under the File menu. Click **Add Chart Element**, then **Chart Title > Above** Chart:



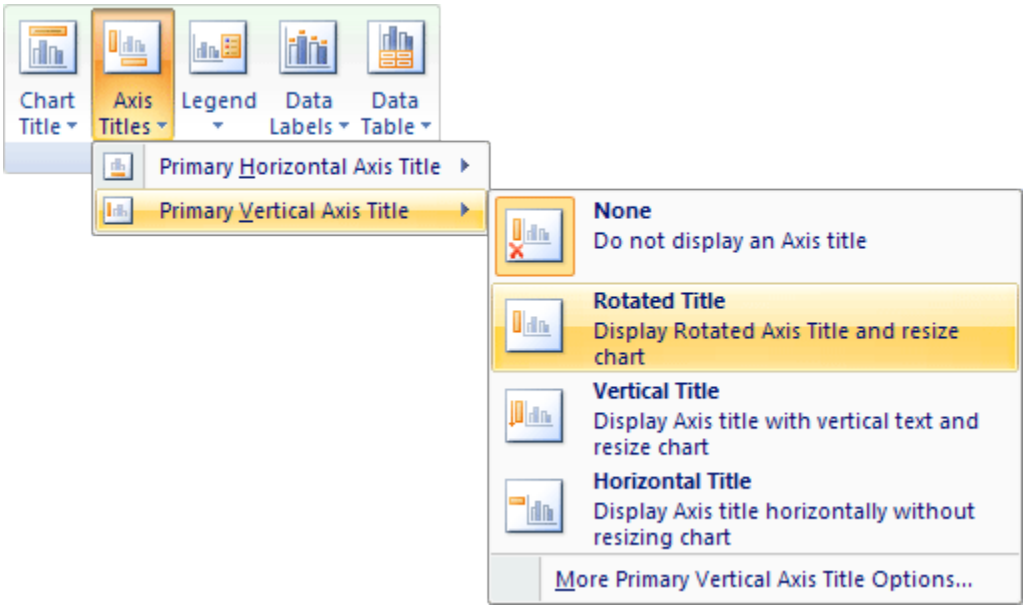
You will then see a default title appear at the top of the chart. Highlight the text, and type a title of your own:

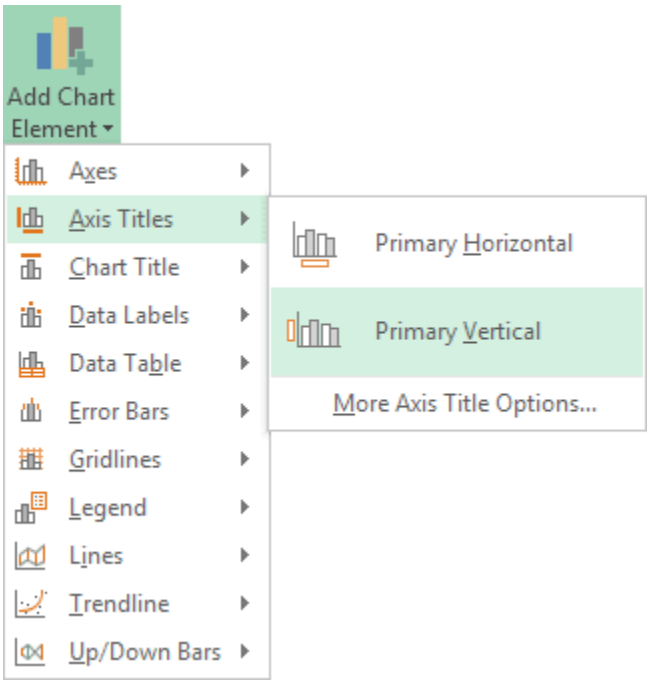


Add a Left Axis

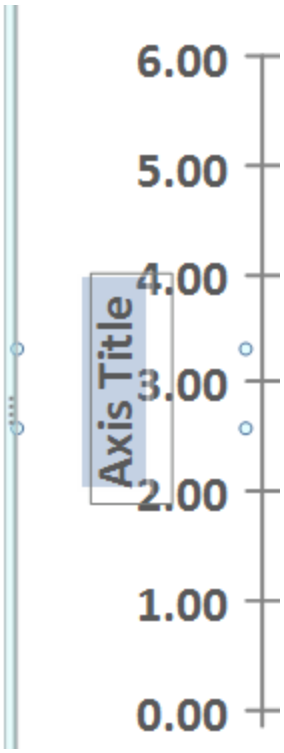
We now need to add an Axis for the numbers running up the left of the chart. The numbers are the hours per week that people watch each channel - 0 to 6.

From the Labels menu still, select **Axis Titles > Primary Vertical Axis Title > Rotated Title**:

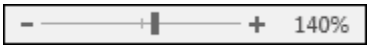




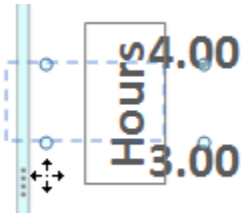
(Excel 2013 and 2016 users won't have **Rotated Title** option - the title will roate by itself.) This will add a title like the following one:



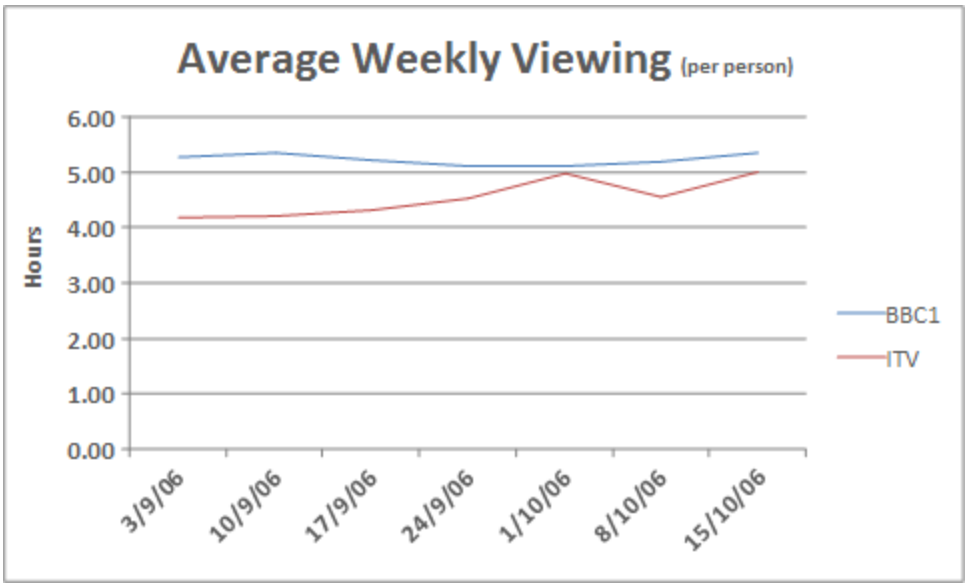
Highlight the default title and type **Hours**. You can move the title to the left by clicking and dragging. This is a little tricky, though! Use the Zoom tool at the bottom of Excel to zoom in on your target:



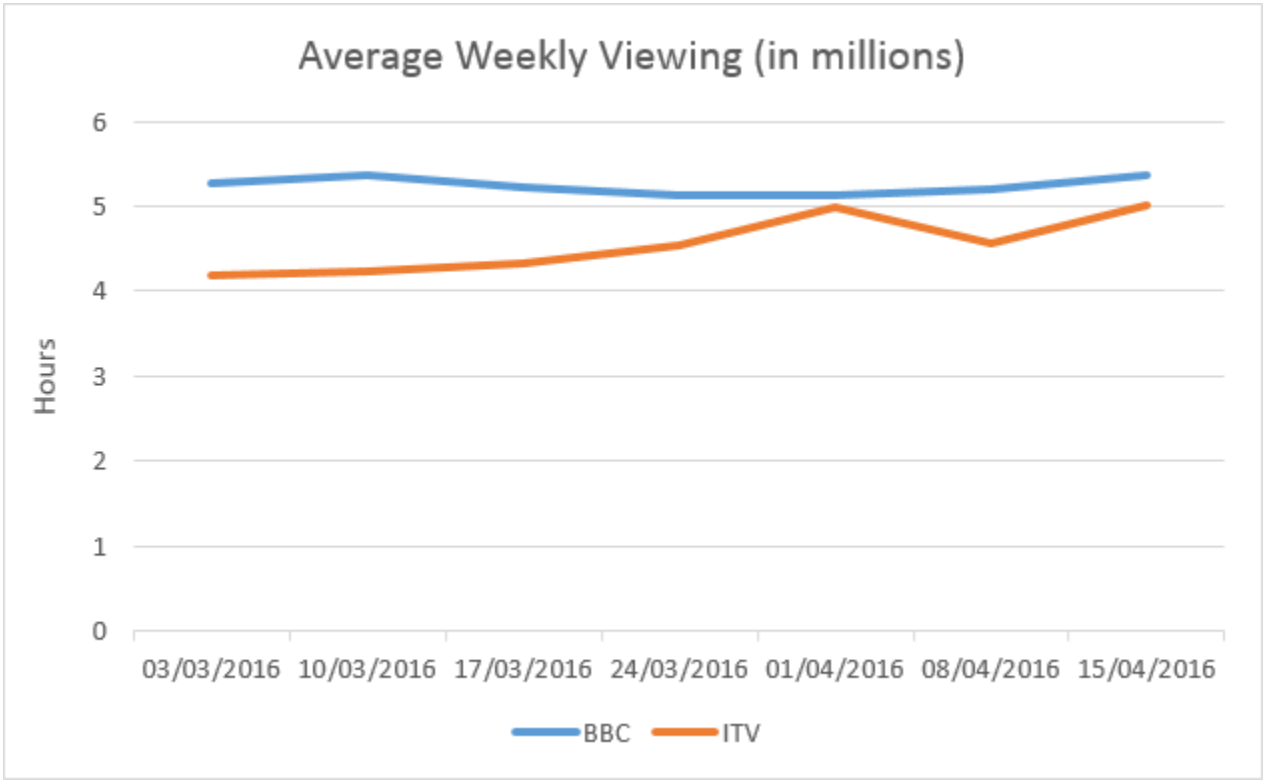
Move the Axis in to position:



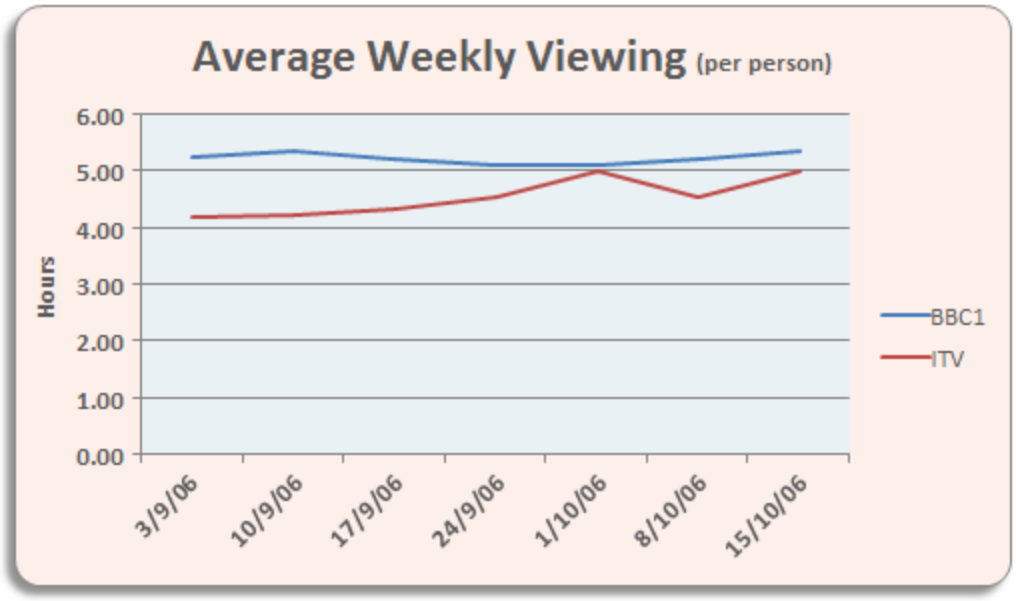
When you're done, your chart should now look like this one:



Or this:



Spruce it up a bit by adding a bit of fill color, rounded edges, and shadow



And that's it for line charts. If you've been following along from the beginning, you should now have some impressive Excel chart skills.

In the next part, we'll take a look at how to predict future values with Excel charts.

2.13 Predict the future with a Trendline Chart

Excel can help you make predictions about future values, or help you spot a linear trend. What we'll do in this section is set up something called a Trendline. We'll use an X, Y Scatter chart for this. We'll take a look at future income predictions based on what was earned in previous years. If you're a bit confused, don't worry: it will all become clear as we go along.

Type the following headings into cells A1 to C1:

Year
Years since 2006
Income

Format the cells, if you prefer. Your spreadsheet will then look like this:

	A	B	C
1	Year	Years since 2006	Income
2			
3			

Enter the years 2006 to 2019 into cells A2 to A15:

	A	B	C
1	Year	Years since 2006	Income
2	2006		
3	2007		
4	2008		
5	2009		
6	2010		
7	2011		
8	2012		
9	2013		
10	2014		
11	2015		
12	2016		
13	2017		
14	2018		
15	2019		
16			

As an X axis for our chart, we can have the years since 2006. These values will be used in a later formula. In Cells B2 to B15 enter the values 0 to 13:

	A	B	C
1	Year	Years since 2006	Income
2	2006	0	
3	2007	1	
4	2008	2	
5	2009	3	
6	2010	4	
7	2011	5	
8	2012	6	
9	2013	7	
10	2014	8	
11	2015	9	
12	2016	10	
13	2017	11	
14	2018	12	
15	2019	13	
16			

We now need some income values for the years 2006 to 2013. This is income that has actually been earned, rather than income that might be earned in the future. We'll then use this hard data to predict future values. Enter some income values, then, into cells C2 to C9. We made up the following values:

	A	B	C
1	Year	Years since 2006	Income
2	2006	0	12300
3	2007	1	15300
4	2008	2	14250
5	2009	3	15900
6	2010	4	16700
7	2011	5	16300
8	2012	6	17100
9	2013	7	16800
10	2014	8	
11	2015	9	
12	2016	10	
13	2017	11	
14	2018	12	
15	2019	13	
16			

We're now ready to insert an X, Y Scatter chart.

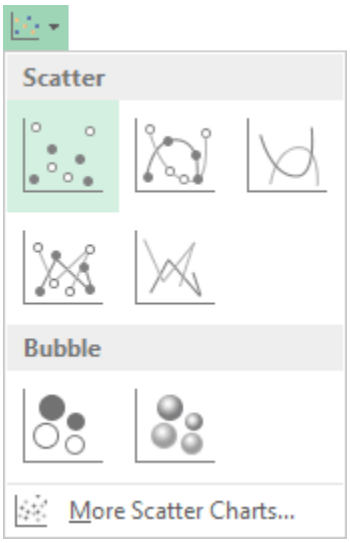
Highlight the cells B1 to C9:

	A	B	C
1	Year	Years since 2006	Income
2	2006	0	12300
3	2007	1	15300
4	2008	2	14250
5	2009	3	15900
6	2010	4	16700
7	2011	5	16300
8	2012	6	17100
9	2013	7	16800
10	2014	8	
11	2015	9	
12	2016	10	
13	2017	11	
14	2018	12	
15	2019	13	
16			

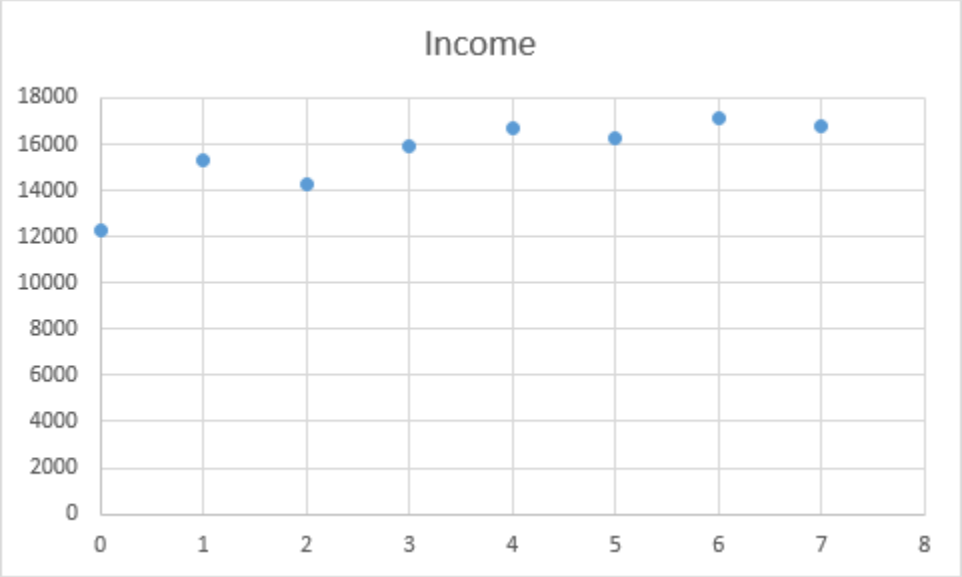
This will be the data for our chart.

From the top of Excel, click on the **Insert** ribbon. From the **Charts** panel, locate and click on the Scatter charter icon. The icon looks like this:

Select the first item to get a chart with just dots:



(If you can't see the icon above, click on **Recommended Charts**. Switch to the **All Charts** tab, then select **X Y Scatter**).
A new chart will then appear on your spreadsheet. It should look like this:

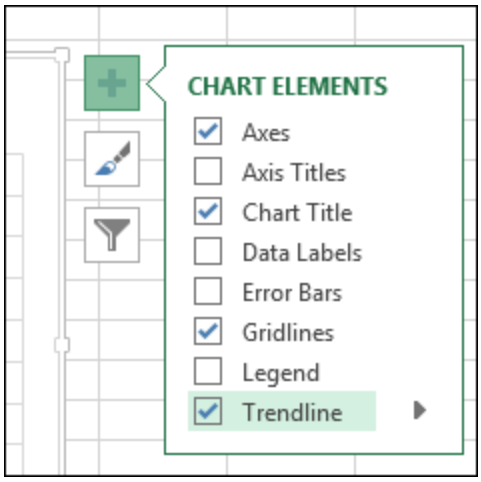


The figures along the bottom, the X Axis, are our years since 2006. The figures on the Y Axis are our income values. The first dot, the one on the far left, tells us that we made just over 12000 at Year 0, (Year 0 is 2006). At Year 1 (2007) we made just under 16000. At Year 2 (2008) we made just over 14000, and so on.

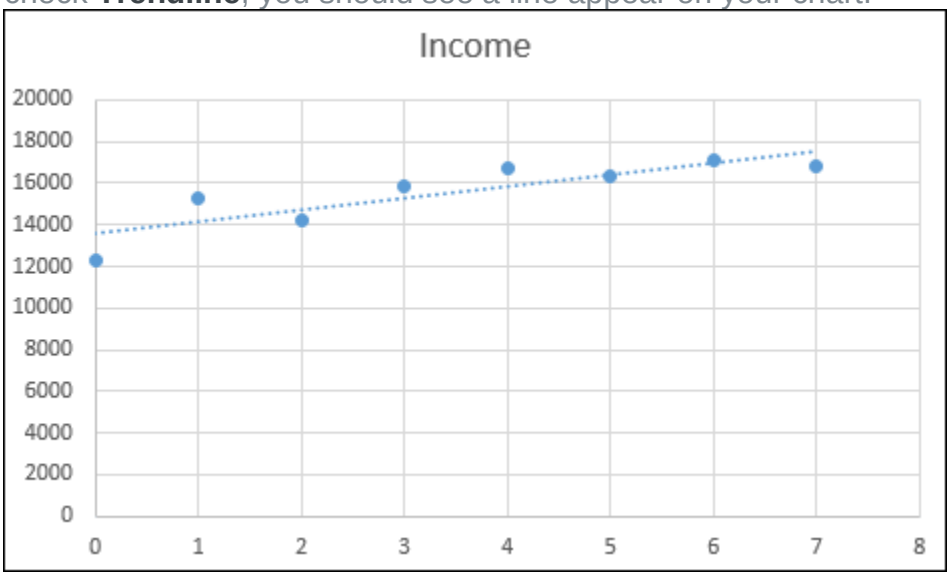
All these dots seem to form a loose line going up from the left. You could add a line yourself using the Shapes item on the Illustrations panel. What you'll then have done is to create a linear regression.

Rather than add the line ourselves, however, Excel can add the line for us. Not only that, it can give us the formula it used to create the line. We can use that formula to predict future incomes.

Click on your chart to highlight it. You should see three icons appear on the right, in Excel 2013 and 2016. (See below for Excel 2007 and Excel 2010.) Click on the Plus symbol, and put a check in the box for **Trendline**:

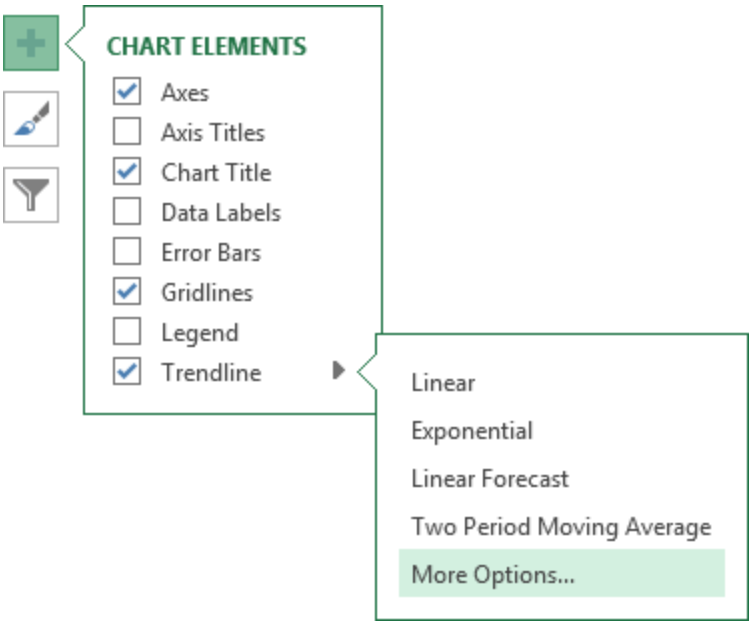


When you check **Trendline**, you should see a line appear on your chart:



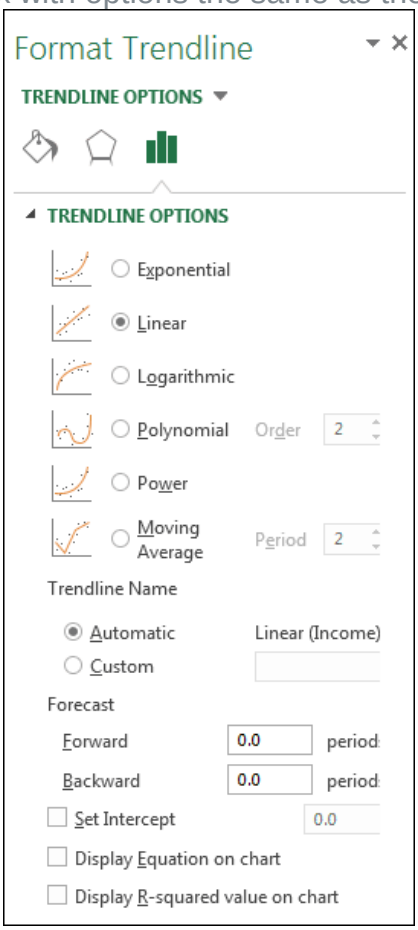
To get the line in Excel 2007 and 2010, select your chart then click on the **Layout** tab. From the **Analysis** panel, click the **Trendline** option. From the Trendline menu, select **Linear Trendline**.
The line represents Excel's best fit for a linear regression. It's trying to put as many as the dots as it can as close to the line as possible.

To see the equation Excel used, click on the Plus symbol again (Excel 2013 and Excel 2016). Then click on the arrow to the right of Trendline. A new menu appears.
Select **More Options** at the bottom:



You should see a panel open on the right of Excel, like the one in the next image.

For Excel 2007 and 2010 users, Click the **Layout** tab again. Then click the **Trendline** on the **Analysis** panel. From the Trendline menu this time, select **More Trendline Options**. You'll then see a dialogue box with options the same as the ones in the image below.



The Trendline option we've chosen is **Linear**. Have a look at the bottom, and check the box next to **Display Equation on chart**.
When you check the box, you should the following equation appear on your chart:

y = 564.88x + 13604

This is something called the Slope-Intercept Equation. If you remember you Math lessons from school, the equation is usually written like this (the "b" at the end may be a different letter, depending on where in the world you were taught Math):

y = mx + b

In this formula, the letter "m" is the slope (gradient) of the line, and the letter "b" is the first value on the y axis. The x is a value on the X-Axis. Once you have the slope of the line, a value for the X-Axis, and the starting point of the line, you can extend the line, and work out other values on it. This will be the letter "y" in the equation.

Excel has already worked out two values for us, the "m" and the "b". The "m" (the slope) is 564.88 and the "b" is an income value of 13604.

To work out the y values we just need an "x". The "x" for us will be those "Years since 2006" in our B column.

Click inside cell C10 on your spreadsheet, then. Enter the following:

=564.88 * B10 + 13604

Press the enter key and you should find that Excel comes up with a value of 18123.04. This is the predicated income for the year 2014. Use Autofill for the cells B11 to B15. The rest of the predicted values will then be filled in:

	A	B	C
1	Year	Years since 2006	Income
2	2006	0	12300
3	2007	1	15300
4	2008	2	14250
5	2009	3	15900
6	2010	4	16700
7	2011	5	16300
8	2012	6	17100
9	2013	7	16800
10	2014	8	18123.04
11	2015	9	18687.92
12	2016	10	19252.8
13	2017	11	19817.68
14	2018	12	20382.56
15	2019	13	20947.44
16			

So, Excel is predicting we'll earn 18123.04 in 2014. By 2019, it's predicting we'll earn 20947.44.

2.14 Sparkline Charts

A8

	A	B	C	D	E
1		Student Exam Scores			
2	Lisa	Alice	Imran	John	
3	55	88	82	68	
4	59	75	90	62	
5	63	50	71	54	
6	64	83	75	50	
7	76	45	80	45	
8					
9					

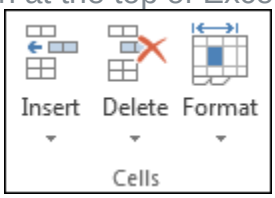
The graph in the cell A8 shows the scores that Lisa achieved in her tests. You can quickly see that Lisa's scores are going up all the time, with no dips.

To add Sparklines to your own spreadsheets, start with some data. (You need more than one value, otherwise you'll just have a dot.) In a new Excel spreadsheet, type the following exam scores:

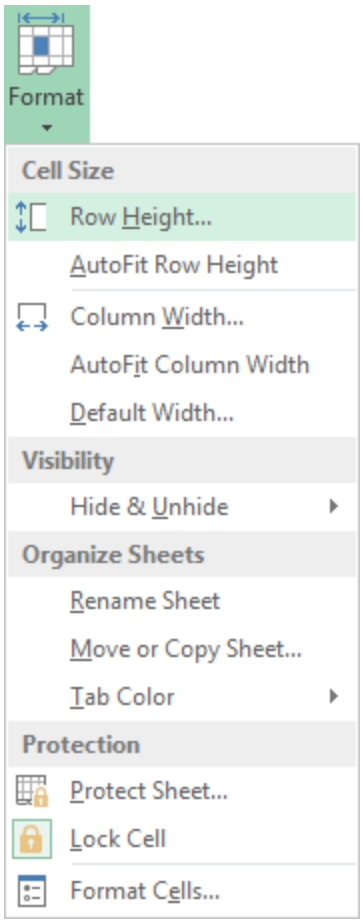
	A	B	C	D	E
1		**Student Exam Scores**			
2	**Lisa**	**Alice**	**Imran**	**John**	
3	55	88	82	68	
4	59	75	90	62	
5	63	50	71	54	
6	64	83	75	50	
7	76	45	80	45	
8					
9					

Change the height of row 8 to create more room for the Sparklines. To do this, you can simply move your mouse to just below the number 8 on the left of Excel. When your mouse pointer changes shape, hold down the left mouse button. Keep it held down and drag to a new height.

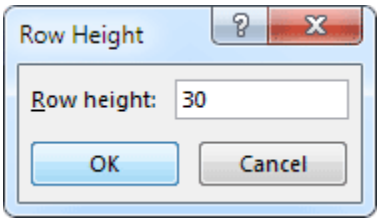
If you want an exact value for the height, click inside of any cell on row 8. Locate the **Cells** panel on the **Home** ribbon at the top of Excel:



From the Cells panel, click on **Format**. From the Format menu, select **Row Height**:



When you select Row Height, you'll see a small dialogue box appear. Type in a new value for the height and click OK:

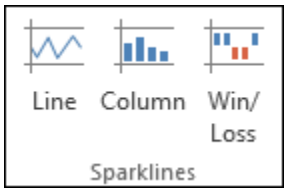


Row 8 on your spreadsheet should now look like this:

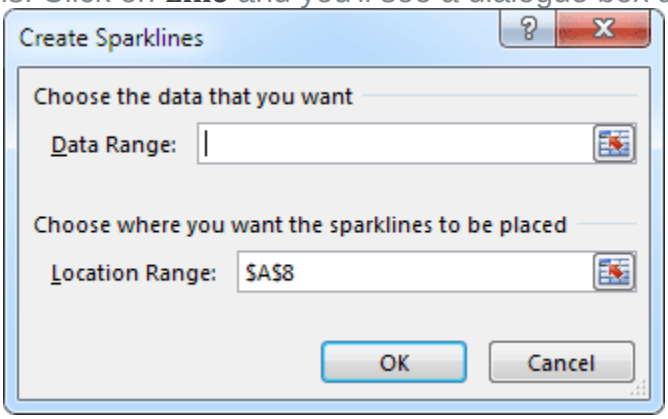
	A	B	C	D	E
1		Student Exam Scores			
2	Lisa	Alice	Imran	John	
3	55	88	82	68	
4	59	75	90	62	
5	63	50	71	54	
6	64	83	75	50	
7	76	45	80	45	
8					
9					

Adding a Sparkline to a Spreadsheet Cell

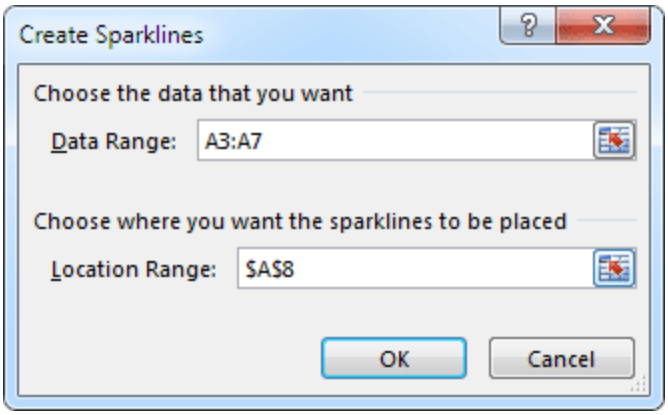
To add a Sparkline, click inside of cell A8. Now select the Insert ribbon from the top of Excel. From the Insert ribbon, locate the Sparklines panel:



You can see that there are three options: Line, Column, and Win/Loss. The first two are the most used options. Click on **Line** and you'll see a dialogue box appear. This one:

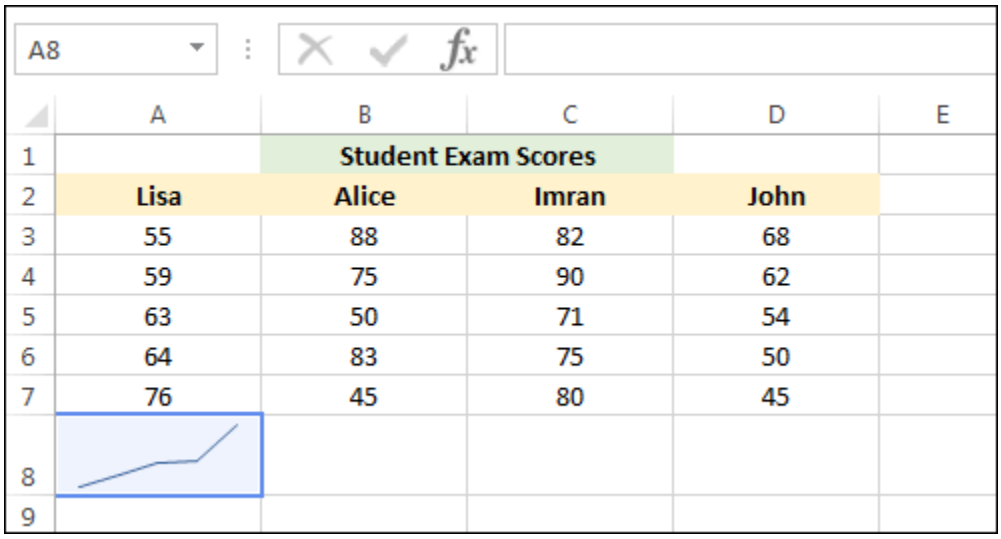


The first text box is where you specify your Data Range. Click inside this box and enter A1:A7. For the second text box, Location Range, you specify where on your spreadsheet you want your Sparkline to appear. We want the Sparkline to appear in cell A8. The dollar signs before the A and 8 mean it will be an Absolute cell reference, as opposed to a Relative cell reference. If you leave the Location Range box blank then your Sparkline will appear in the currently selected cell.
Your Create Sparklines dialogue box should look like this:

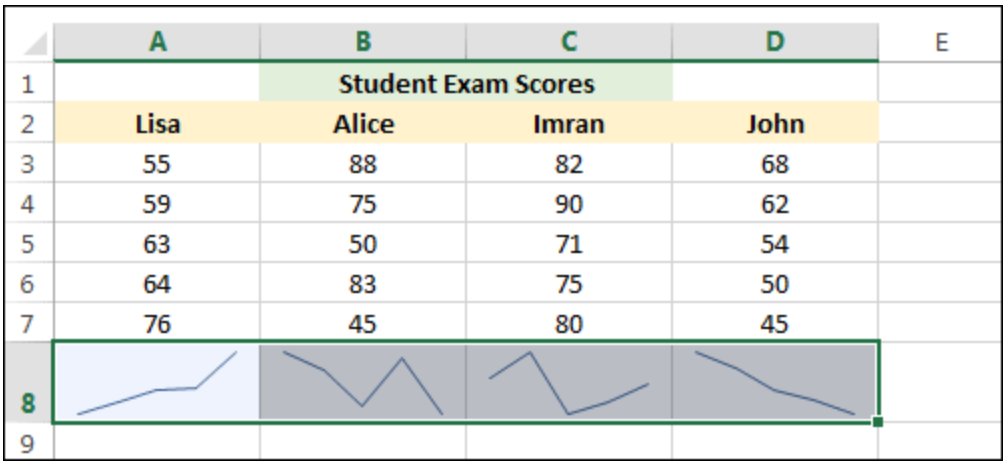


Don't worry if your Location Range text box is blank, though. As long as your Data Range box is filled in you can click OK.

When you do click OK, your A8 cell will look like this:



You can use AutoFill for the other exam scores. Move your mouse pointer to the bottom right of cell A8 until the pointer turns into a black cross. Hold down your left mouse button. Keep it held down and drag to cell D8. You should see all four cells fill with Sparkline charts:



	A	B	C	D	E
1		Student Exam Scores			
2	Lisa	Alice	Imran	John	
3	55	88	82	68	
4	59	75	90	62	
5	63	50	71	54	
6	64	83	75	50	
7	76	45	80	45	
8					
9					

Functions

If you're trying to work out an average, you're trying to calculate what the most common value is. For example, if a class of eight students took exams, you may want to know what the average exam score was. In other words, what result most students can expect to get. In order to calculate an average, you'd add up all eight exam scores and divide by how many students took the exam. So, if the total for all eight students was 400, dividing by 8 would get you 50 as the average grade. If any students were below the average, you can tell at a glance.

In Excel, there is an easy way to calculate the average of some numbers - just use the inbuilt Average function.

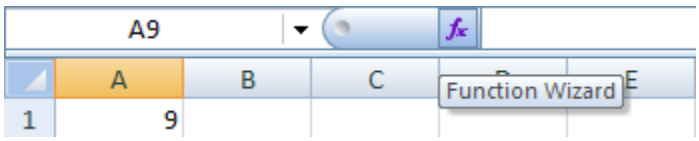
Start a new spreadsheet and enter the following exams scores in cells A1 to A8, as in the image below:

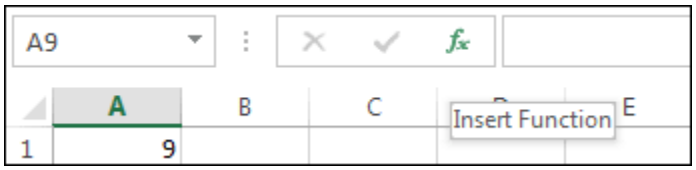
	A	B	C
1	9		
2	7		
3	6		
4	7		
5	8		
6	4		
7	3		
8	9		
9			

Click in cell A9, and we'll see how to use the Average function in Excel 2007. There are two ways we can do this. Try method 1 first.

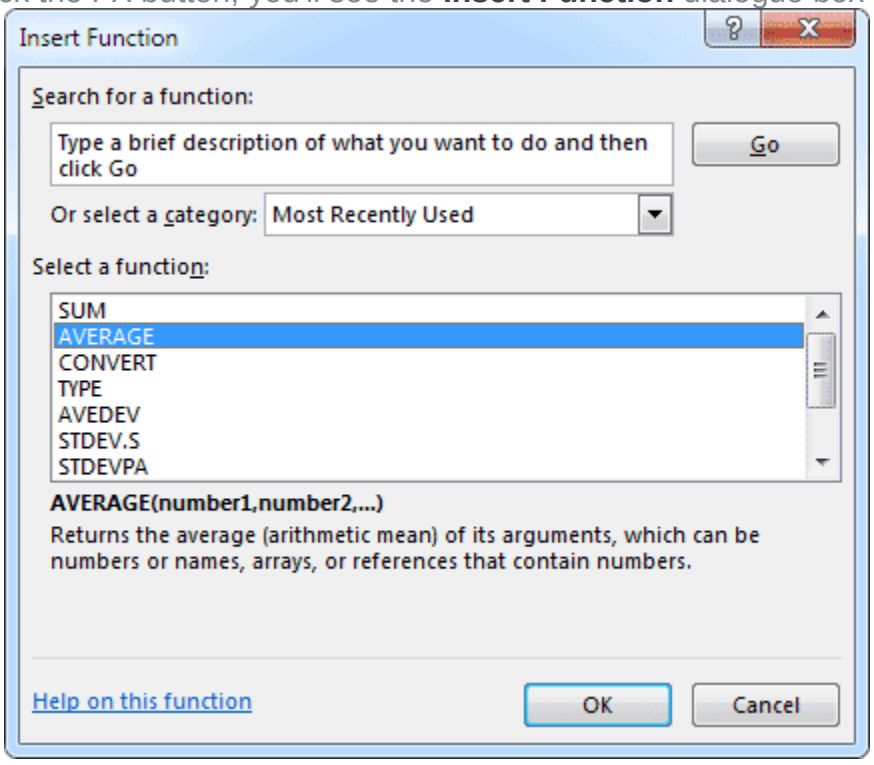
Method 1

Next to the formula bar, you'll see an FX button. This is the Formula Wizard:



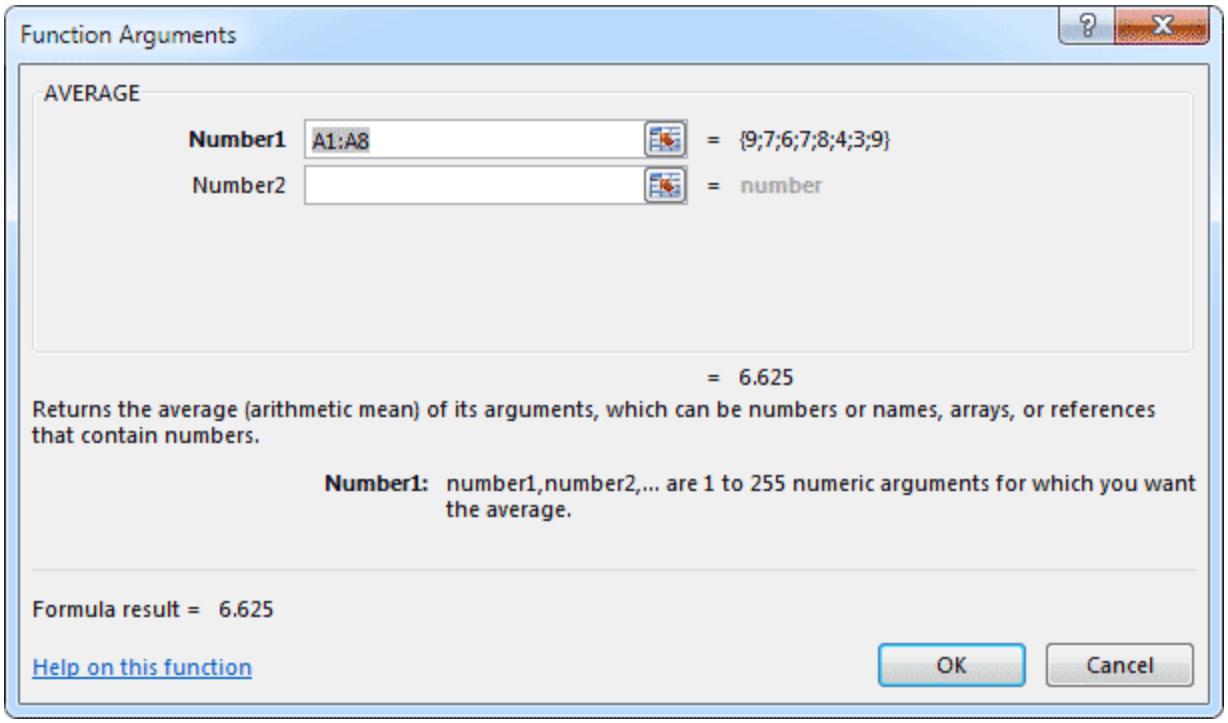


When you click the FX button, you'll see the **Insert Function** dialogue box appear:



The Insert Function dialogue box shows a list functions. These are the just the common ones. To see more functions, click the drop-down list to the right of Select a category. The one we want is displayed under Select a function, though - Average. Click on this, and then click OK.

When you click OK, another dialogue box appears. On this dialogue box, you select the data that you want to include in your function:



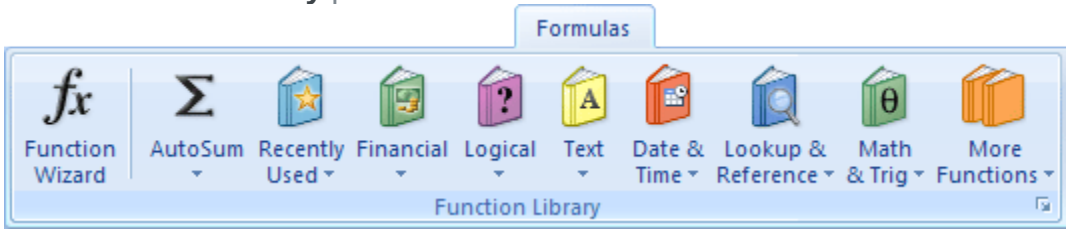
If you look in the Number1 box, you'll see Excel has guessed which cells we want to use for our Average function - A1:A8. It evens gives the answer to the Function - 6.625.

Click OK to insert the function.

Method 2

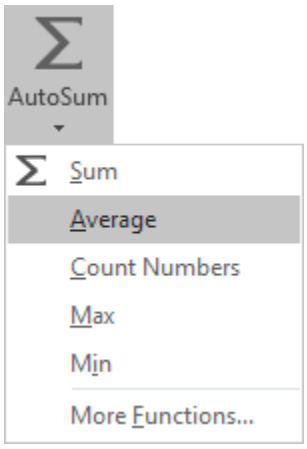
The second way to enter a Function in Excel is through the panels on the Ribbon. Try this:

- Click inside cell B9 on your spreadsheet. This is where we'll place the Average for the cells A1 to A8.
- Click the **Formulas** menu at the top of Excel
- Locate the **Function Library** panel. Here it is in Excel 2007



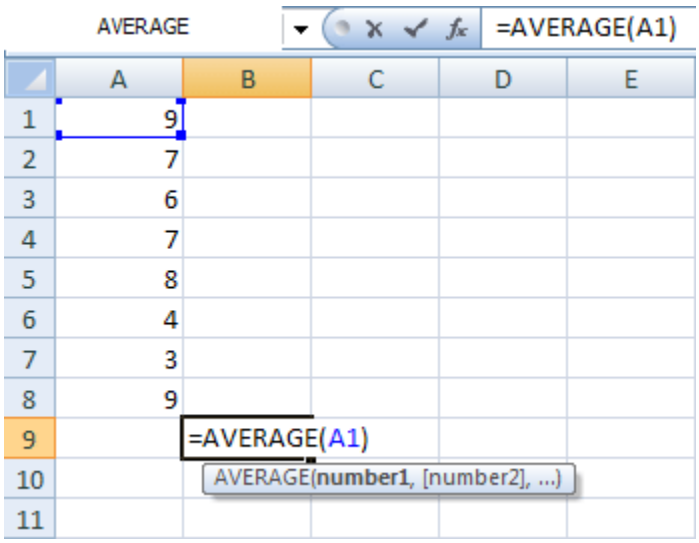
And here it is in later versions:

As you can see, in Excel functions are split into categories. The Average function is in a few places. The easiest way to use Average is with AutoSum. Click the down arrow on AutoSum to see the following:

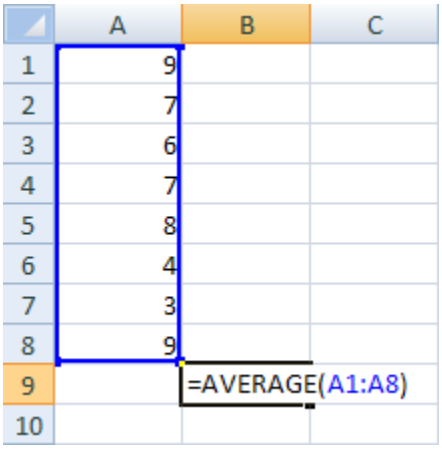


Now click Average from the menu. Because the answer is going in cell B9, Excel doesn't know which cells you want to use in the function, so it can't give you a quick answer. AutoSum is good when the data is in the same row or column. But when it's not, you must tell it what to calculate.

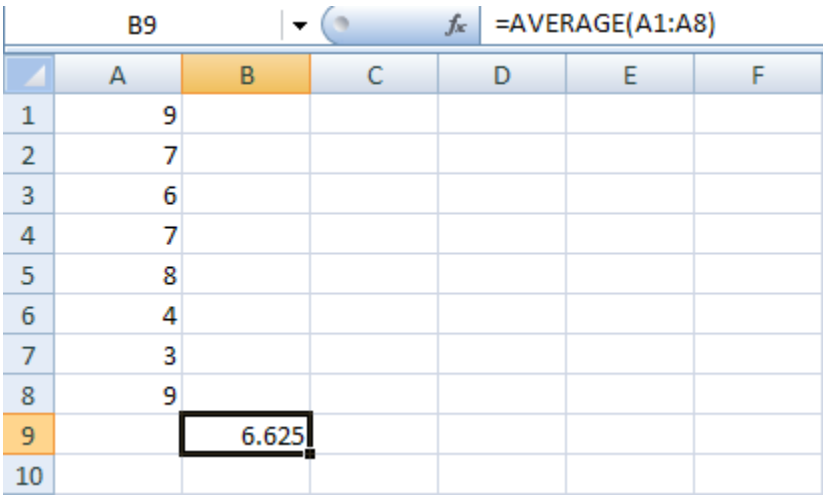
So, click inside cell A1 and you'll see the cell selected



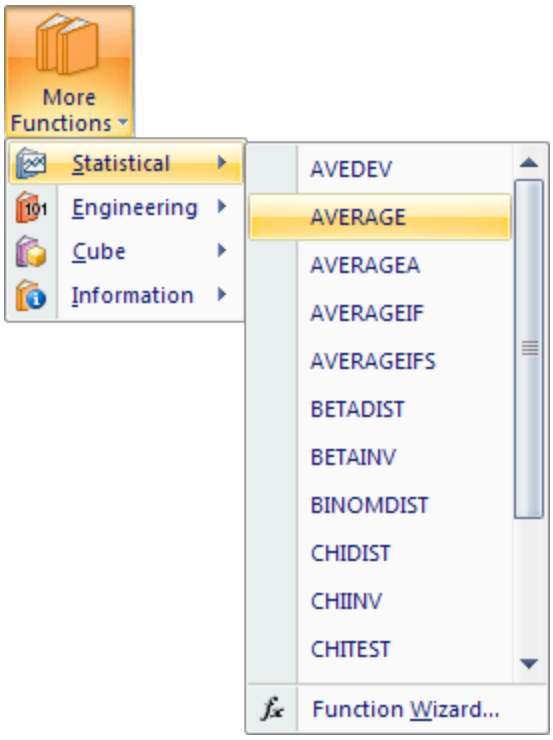
Hold down your left mouse button over the bottom right blue square, and drag to cell A8:



Excel fills in the cells for your function. Let go of the left mouse button, and then press the Enter key on your keyboard. The correct answer is place in cell B9:



You can also find the Average function on the More Functions menu. Click Statistical, and you'll see it there:



Of course, once you know the correct function, you could simply type it all out in the Formula bar yourself!

Try this exercise.

Exercise
You start your own online business and find that sales for the first week are these:
Monday Rs. 120.45
Tuesday Rs. 187.43
Wednesday Rs. 106.87
Thursday Rs. 143.69
Friday Rs. 117.52
Saturday Rs. 87.93
Sunday Rs. 92.12
Use a function to work out how much you earned, on average, each day.

There are a number of different reasons why you would want a Date or Time function in a spreadsheet: If you're running your own company, you might want to record when an order was received and when it was processed. You could then calculate the difference between the two, so that you check how fast the orders were being processed. We'll do that now.

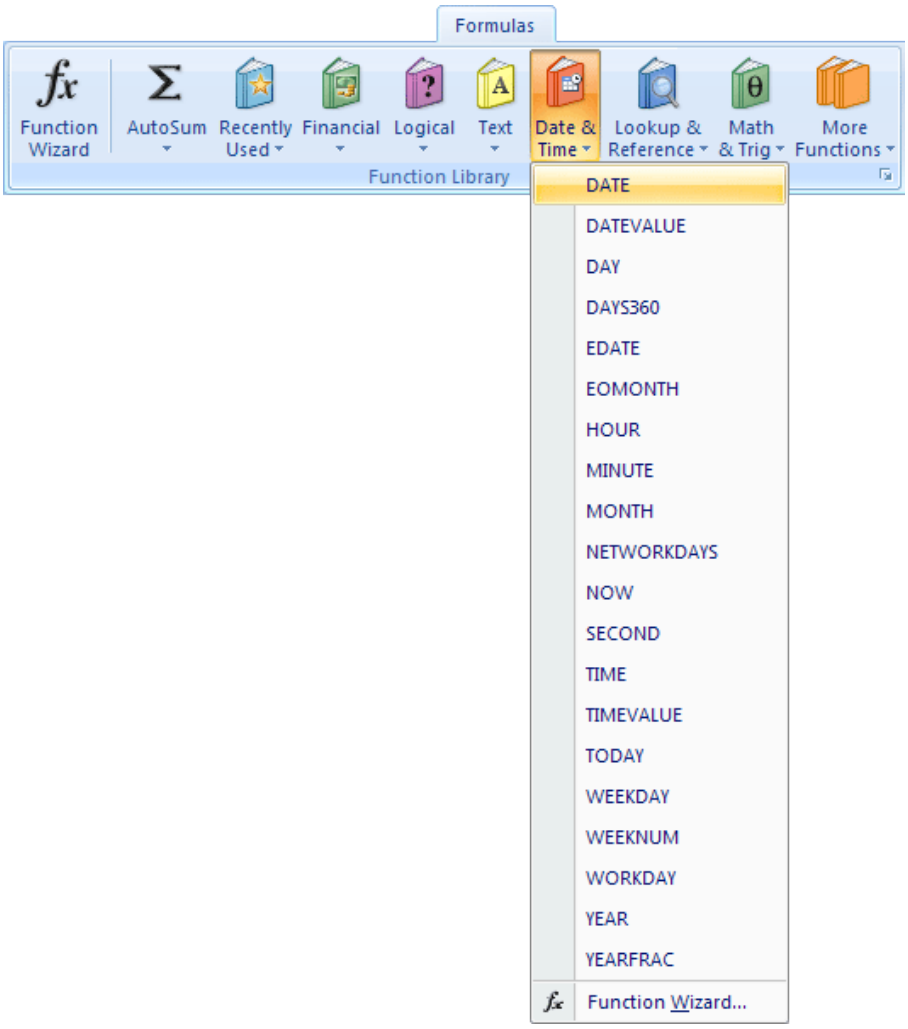
The Excel Date Function

As an example of how to use date functions in Excel, we'll construct as simple spreadsheets for an order form. We'll enter the date an order was taken, the date the

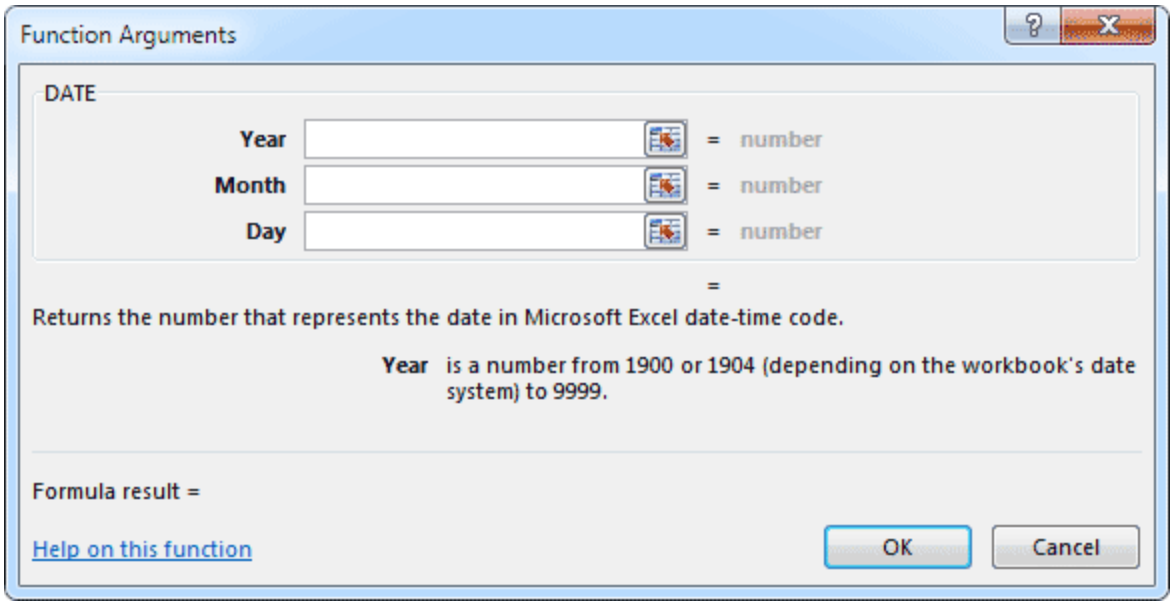
order was sent, and how long it took to be processed. So, to make a start, create the spreadsheet below:

	A	B	C	D
1	Date Order Taken	Date Order Sent	Time Taken	
2				
3				
4				
5				

Click inside cell A2, and we'll enter a date. To enter a date, Click on the **Formulas** menu at the top of Excel. Then locate the **Function Library** panel. From the Function Library panel, click on **Date & Time**:

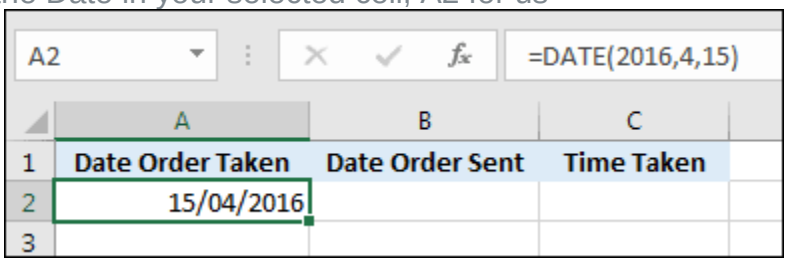


As you can see, there's quite a lot of Date and Time functions! Click on **Date** from the menu, and you'll get the following dialogue box:



You're now being asked to enter a full date.

- In the Year box, enter 2016
- In the Month box, enter the number 4
- In the Day box, enter the number 15
- Click the OK button
- Excel will enter the Date in your selected cell, A2 for us

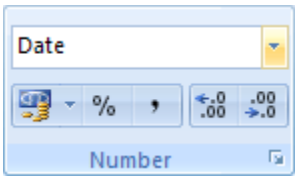


Notice the DATE Function in the Formula bar:

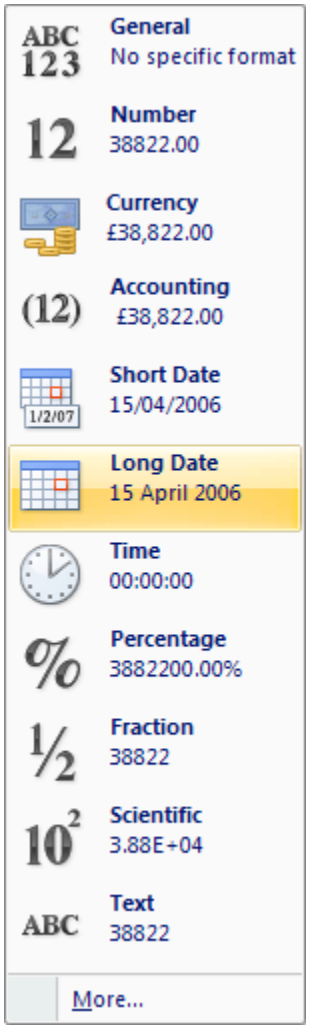
=DATE(2016, 4, 15)

Between the round brackets of DATE, the Year comes first, then the Month, then the Day.

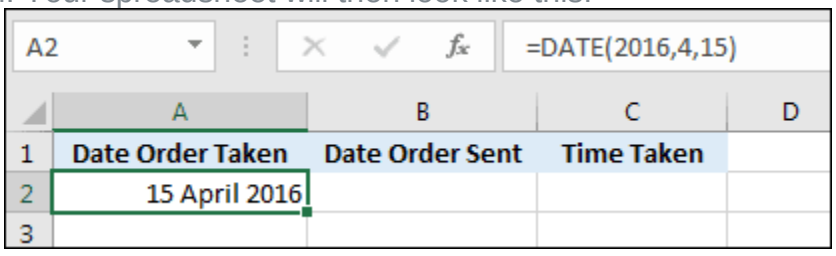
If you want to format your date as say Monday 15th of April, then you need to click on the **Home** tab from the Ribbon at the top of Excel. Locate the **Nmumber** panel, and you'll see Date already displayed:



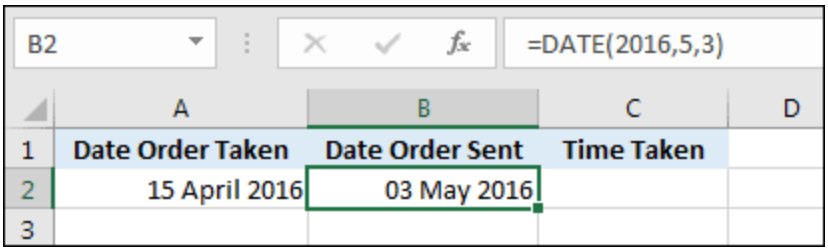
Click the down arrow to see more options:



Click the **Long Date** item. Or click on **More** at the bottom to see some more Date formats to choose from. Your spreadsheet will then look like this:



In cell B2, under your Date Order Sent heading, enter another Date Function. This time, have the date read May 3, 2016:

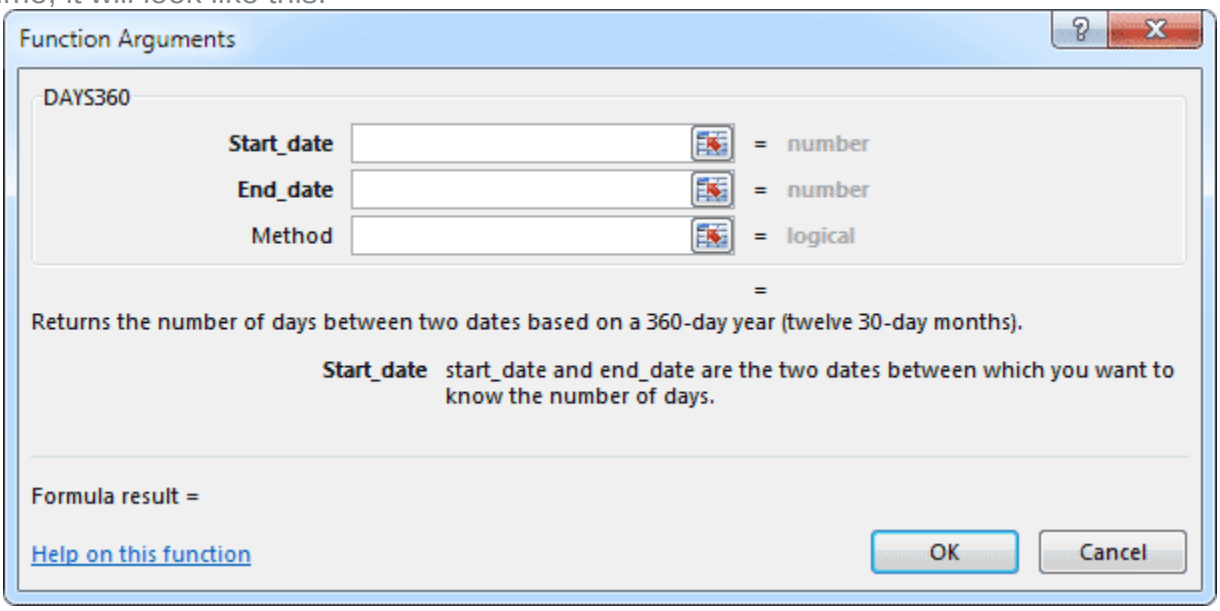


In cell C2, under Time Taken, we'll work out how many days the order took to be sent out.

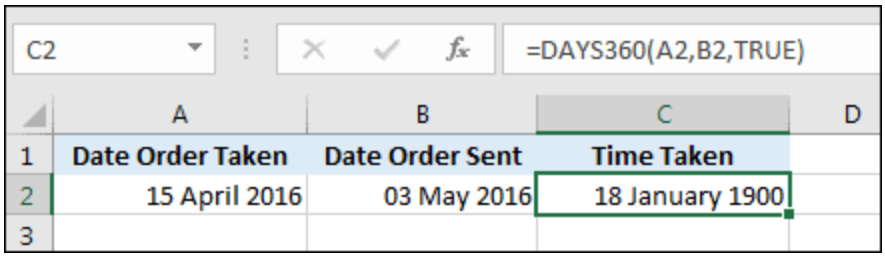
The Days360 Function in Excel

When you want to work out how many days there are between two dates, the function to use is Days360(). We want to work out how many days there are between the 15th of April 2016 and the 3rd of May 2016. So, click inside cell C2 and do the following:

Click on the **Formulas** tab at the top of Excel. Then locate the **Function Library** panel. From the Function Library panel, click on **Date & Time**. From the menu, click on **Days360()**. You should see the Function Arguments dialogue box appear again. This time, it will look like this:

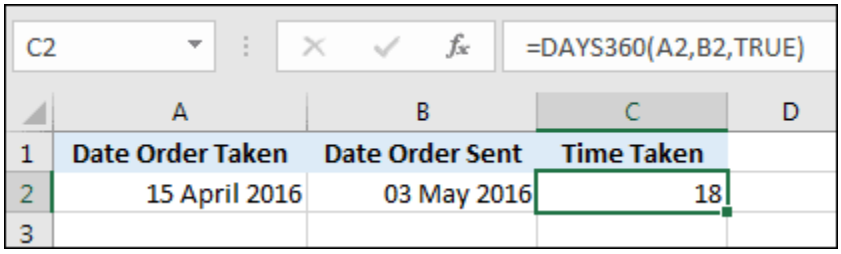


The Days360 function needs a start date and an end date. You can enter your cell references here. So, in the **Start_date** box, enter A2. In the **End_Date** box, enter B2. If you enter the word True in the **Method** box, Excel will calculate using the European date system. Click OK, to return to your spreadsheet and you might see this:



(If your C2 cell has a lot of #### symbols in it, it means that your column is not wide enough. Widen the C column and they'll go away!)

The answer we got was January 18th, 1900! The reason for such a bizarre answer is that we've formatted the C2 cell as a date. But the answer to the Days360 function is not a date - it's a number. If you have the same strange answer, then format your C2 as a number. Your spreadsheet will then look like ours below:



So, the difference between the two dates is 18 days.

Entering dates can be straightforward, like cells A2 and B2. But performing calculations with dates can be slightly more complex. To get you some more practice, here's an exercise.

Exercise

Use a Days360 function to work out how many days are left before your next birthday. Instead of typing out the current date in say cell A2, you can use this inbuilt function:

=Now( )

The Now function doesn't need anything between the round brackets. Once you have today's date, you can enter your birthday in say cell B2.

In the next part, we'll look at how to handle Time functions in Excel.

Time Function

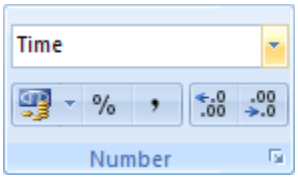
There are many ways to enter the current time in an Excel spreadsheet. Try this:

- Click inside a blank cell on your spreadsheet
- Click into the Formula Bar at the top
- Type the following inbuilt function:

= Now( )

Hit the enter key, and you'll get the current date and time. If you only want the time, you can format the cell to get rid of the date part:

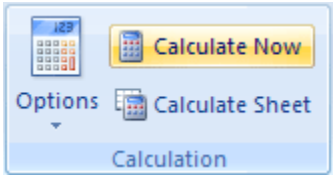
- Click on the cell that contains your Now() function
- From the Excel menu bar, click on **Home**
- Locate the **Number** panel, and you may see Time already set (it might say **Custom** in newer versions of Excel):

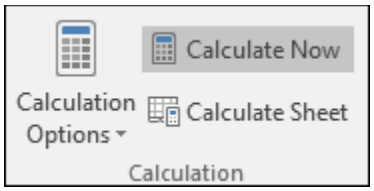


- Click the down arrow to see menu options
- From the menu, click on **Time**
- Click on **More** to see more Time options

Excel doesn't update the Time function every second, so it's not like a normal clock. But you can update the Now function to get the correct time. (Well, it's correct if your system clock is correct!)

The easiest way to update the Time in Excel is to click inside the cell that holds your Time formula. Then, from the Formulas menu, locate the Calculation panel.





Click the "Calculate Now" button, and Excel will update the time.

Excel also updates the time when you enter another calculation elsewhere in the spreadsheet. For example, click in any other cell on your spreadsheet. Now enter a simple formula like = 2 + 2. When you press the Enter key on your keyboard, Excel will update your time function as well.

Financial Functions

The Main financial function we're going to explore is called PMT( ). You use this function when you want to calculate things like the monthly payment amounts on a loan, or how much per month a mortgage will cost you. We'll use it to work out how much per month a loan will cost us. Here's what we'll do.

We've decided to take out a loan of ten thousand pounds from our friendly banker. We're going to be paying it back over 5 years. The question is, how much per month is this going to cost us?

The PMT() Function in Excel

The PMT() function expects certain values in between its two round brackets. The values that go in round brackets are known as arguments. The arguments for the PMT() function are these:

PMT(rate, nper, pv, fv, type**)**

Only the first three are needed, and you can miss the final two out, if you like.

We'll work out our monthly loan costs with the help of the PMT() function. First, create a new spreadsheet like the one below:

	A	B	C	D	E	F
1	Loan Amount	10000				
2						
3	Interest Rate	Num of Payments	Present Value	Monthly Amount	Total Paid Back	
4						
5						

If you look at cell B1 on the spreadsheet, you'll see a figure of Rs. 10, 000. This is the amount we want to borrow. The labels on Row 3 show what else we need: An interest rate, the number of payments we'll make over the 5 years, the present value of the loan, the amount we'll have to pay back each month, and the total amount paid back after 5 years. But we only need the first three for our PMT () function.

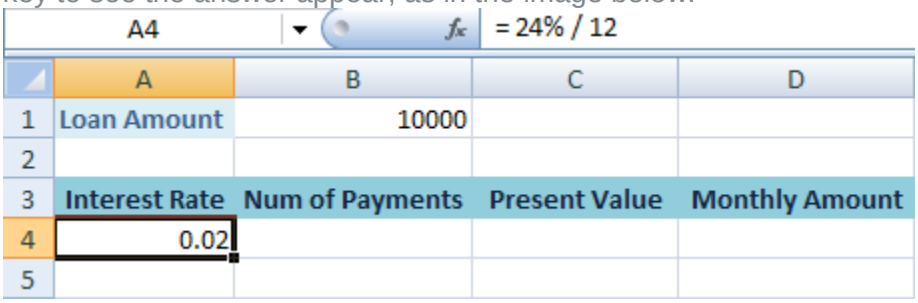
In cell A4, we'll need an interest rate. In cell B4 we'll need the number of payments, and in cell D4 we'll need the Present Value of the loan. First is interest rate.

Imagine that the interest rate given to us by the bank is 24 percent per year. For the PMT() function, we need to divide this figure by 12 (the number of months in a year) So try this:

- Click into cell A4 on your spreadsheet
- Enter the following formula:

= 24% / 12

- Hit the enter key to see the answer appear, as in the image below:



	A	B	C	D
1	Loan Amount	10000		
2				
3	Interest Rate	Num of Payments	Present Value	Monthly Amount
4	0.02			
5				

Now that we have an interest rate, the next thing we need for the PMT () function is how many payments there are in total. We must pay something back every month for 5 years. Which is a simple formula. So,

- Click into B4 on your spreadsheet and enter the following:

= 12 * 5

- Hit the enter key to see a figure of 60 as the answer.
  This figure of 60 is for the second argument of the PMT() function - the **nper**. This is just the number of payments.
  Now that you have a figure in cell A4 (**rate**), and a figure in cell B4 (**nper**), there's only one more to go - the Present Value (**pv**).
  The Present Value of a loan, also known as the Principal, is what the loan is worth at the present time. Since we haven't made any payments yet, this is just 10, 000 for us.

- Click into cell C4 on your spreadsheet and enter the following:

= B1

- Hit the enter key
- You'll see a figure of 10, 000 appear, and your spreadsheet should now look ours below:

	A	B	C	D	E
1	Loan Amount	10000			
2					
3	Interest Rate	Num of Payments	Present Value	Monthly Amount	Total Paid Back
4	0.02	60	10000		
5					
6					

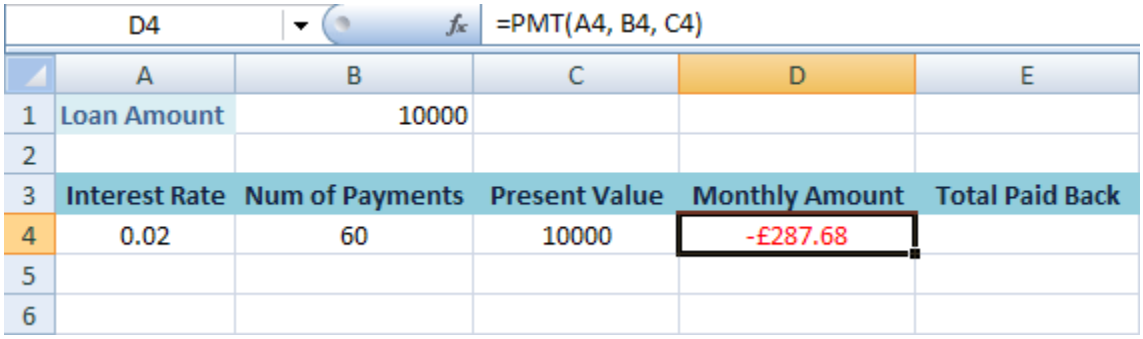
OK, we now have all the parts for our PMT () function: a rate (A4), an nper (B4), and a pv (C4). Try this:

- Click into cell D4 on your spreadsheet
- Enter the following function:

=PMT(A4, B4, C4)

Hit the enter key on your keyboard, and you'll see the monthly amount appear. The figure you should have is -Rs. 287.68. The reason there is a minus sign before the total is because it's a debt: what you owe to the bank.

But this is what your spreadsheet should look like:



	A	B	C	D	E
1	Loan Amount	10000			
2					
3	Interest Rate	Num of Payments	Present Value	Monthly Amount	Total Paid Back
4	0.02	60	10000	-£287.68	
5					
6					

The only thing left to do is see how much this loan will cost us at the end of 5 years. All you need to do here is multiply the monthly amount in cell D4 by the number of payments in cell B4. Enter your formula for this in cell E4, and you spreadsheet will look like ours below:

	A	B	C	D	E
1	Loan Amount	10000			
2					
3	Interest Rate	Num of Payments	Present Value	Monthly Amount	Total Paid Back
4	0.02	60	10000	-£287.68	-£17,260.78
5					

So, a ten thousand pounds loan, at the interest rate the bank is offering, means we'll have to pay back just over 17 thousand pounds over 5 years.

Tweaking the Values

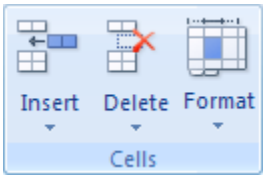
We can change the spreadsheet slightly to give us more control. For your figure in cell B4, the number of payments, you entered 12 * 5. This is 12 months multiplied by 5 years. But what if we wanted to pay the loan back over 10 years, or 15? How much will our monthly payments then be? And will be the final cost of the loan?

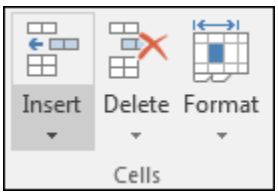
Also, the interest rate seems a bit high. What if we can get a better rate elsewhere?

By making a few changes to or spreadsheet, we can amend these values more easily. First, we'll need two new rows.

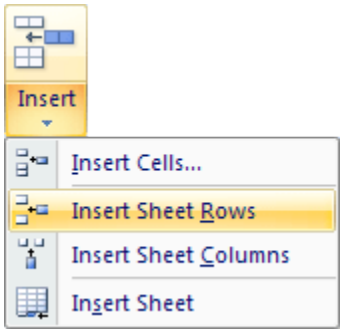
Inserting New Rows in Excel

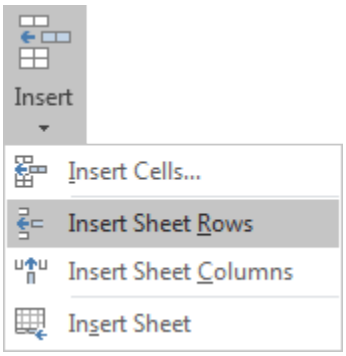
We need to insert new rows in our spreadsheet. To insert a new row, click into cell A2. Then click on the **Home** tab at the top of Excel. Locate the **Cells** panel, and click the **Insert** item:





From the Insert menu, click on **Insert Sheet Rows**:





Excel will insert a new row for you. Do this again to get two blank rows. Add two new labels, **Num of Years** and **Interest**. Your spreadsheet sheet will then look like this:

	A	B	C	D	E
1	Loan Amount	10000			
2	Num of Years				
3	Interest				
4					
5	Interest Rate	Num of Payments	Present Value	Monthly Amount	Total Paid Back
6	0.02	60	10000	-£287.68	-£17,260.78
7					

Adapting the PMT Formula

We can adapt the formulas we've entered so far, in order to make them more usable. As an example, we'll adapt the interest rate.

To get the interest rate for cell A4, we entered a formula:

= 24% / 12

Instead of having the interest rate in cell A4, however, we can place it at the top, in cell B3 on our new Row. We can then alter the interest rate by simply typing a new one in cell B3. To clear all that up, try the following:

- Click inside cell B3, which is the Interest cell in the image above
- Click inside the formula bar
- Type in = 24%
- Cell B3 should now read 24.00% (In Excel 2010 and 2013 you may have to format the cell to a **Percentage** value from the **Home** tab then the **Numer**item.)
To change the formula for your interest rate, click inside of cell A6. Change the formula from this:

= 24% / 12

to this:

= B3 / 12

Hit the enter key on your keyboard and nothing should change on your spreadsheet. But the difference is that you can enter a new interest rate in cell B3, and see how this effects the loan amounts. Try it out by typing 23% in cell B3:

B3 =23%

	A	B	C	D	E
1	Loan Amount	10000			
2	Num of Years				
3	Interest	23.00%			
4					
5	Interest Rate	Num of Payments	Present Value	Monthly Amount	Total Paid Back
6	0.019166667	60	10000	-£281.90	-£16,914.28
7					

As you can see, the interest rate has changed to a rather long figure. But notice the Monthly Amount - it has gone down to Rs. 281.90. The total amount we have to pay back has changed, too. Play around with the interest rate in cell B3, just to get a feel for how it works.

Exercise

In cell B6 of your spreadsheet, you have the following formula:

= 12 * 5

This calculates the number of months for the loan. Change this formula so that the number of years is coming from B2. Your finished spreadsheet should look like ours below:

B2 5

	A	B	C	D	E
1	Loan Amount	10000			
2	Num of Years	5			
3	Interest	24.00%			
4					
5	Interest Rate	Num of Payments	Present Value	Monthly Amount	Total Paid Back
6	0.02	60	10000	-£287.68	-£17,260.78
7					

If you play around with the values in cells B1, B2 and B3 you should be able quickly see the new loan repayments.

The Student Averages Project

Study the following spreadsheet:

	A	B	C	D	E	F	G	H	I	J	K
1		Steven	Mary	Ann	Raymond	Mark	Paul	Eliza	Kelly		Averages
2	Maths	76	89	43	48	51	76	87	56		
3	English	55	85	78	61	47	87	91	73		
4	Science	65	82	39	58	52	65	57	45		
5	History	45	91	56	72	49	56	78	56		
6	Geography	51	84	54	64	47	64	67	67		
7	Art	43	63	49	62	39	89	64	63		
8	Computer Studies	63	95	45	59	41	92	89	52		
9	French	35	91	65	26	28	51	92	56		
10											
11	Overall Average										
12											

The spreadsheet is the school exam marks of 8 students. A total of 8 subjects were taken. For this review, work out the Averages for all 8 subjects studied, which is in the K column above. Also, work out the Overall Averages for each student (row 11 above).

You can then use one of the methods for working out Averages that you have explored earlier. You're going to be needing your completed spreadsheet in the next section - so don't skip it!

Conditional Logic

1 The IF Function

The IF function can be quite useful in a spreadsheet. It is used when you want to test for more than one value. For example, has a bill been paid or not? If it has, you can deduct the amount from the money you have left to spend; if it hasn't, keep it on your debt list. Later, you'll see how to use the IF Function to grade student exam scores. If the student has above 80, award an A grade; if the student has below 30, award a fail grade. First, here's what an IF Function looks like:

IF(logical_test, value_if_true, value_if_false,)

The thing to note here is the three items between the round brackets of the word IF. These are the arguments that the IF function needs. Here's what they mean:

logical_test

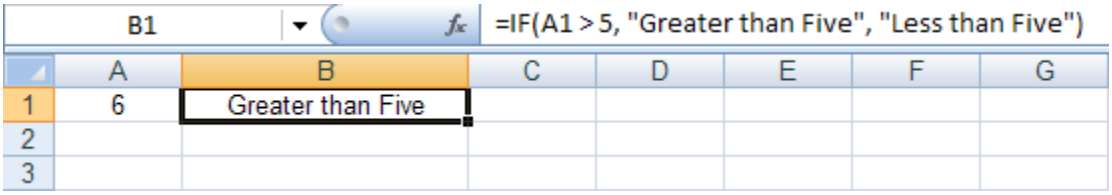
The first argument is what you want to test for. Is the number in the cell greater than 80, for example?

value_if_true
This is what you want to do if the answer to the first argument is YES. (Award an A grade, for example)
value_if_false
This is what you want to do if the answer to the first argument is NO. (Award a FAIL grade.)
If that's not terribly clear, an example may clear things up. Open a new spreadsheet, and do the following:

- Widen the B column a bit, as we'll be putting a message in cell B1
- Now click in cell A1 and type the number 6
- Type the following in the formula bar (The right angle bracket after A1 means "Greater Than".)

=IF(A1 > 5, "Greater than Five", "Less than Five")

Hit the enter key on your keyboard and your spreadsheet should look like ours below:



(Make sure you have all the commas and double quotes in the correct place, otherwise Excel will give you an error message. That right angle bracket (>) is known as a Conditional Operator. You'll meet some others shortly.)

But what we're saying in the IF function is this:

logical_test: Is the value in cell A1 greater than 5?
value_if_true: If the answer is Yes, display the text "Greater than Five"
value_if_false: If the answer is NO, display the text "Less than Five"

So your first tell Excel what you want to check the cell for, then what you want to do if the answer is YES, and finally what you want to do if the answer is NO. You separate each part with a comma.

Exercise Try this:

- **Click into cell A1**
- **Change the 6 into a 4**
- **Hit the enter key on your keyboard**

What happens?

Exercise
Now type the number 5 in cell A1. What happens now?

For the last exercise above, Excel should tell you that 5 is "Less than 5"! It does this because the answer to your logical test was NO. We were testing if the number in cell A1 was greater than 5. Since 5 is not greater than 5, the answer to the question is NO. We've told Excel to display a message of "Less than 5", if the answer was NO. In other words, we didn't tell Excel what to do if the value in cell A1 was the same as 5.

The solution to this is to use a different Conditional Operator. We used the Greater Than (>) operator. Here's some more:

< **Less Than**

>= **Greater than Or Equal To**

<= **Less than Or Equal To**

<> **Not Equal To**

For the second and third operators above, you type an angle bracket followed by the equals sign. There are no spaces between the two. For the final one, it's a left angle bracket followed by a right-angle bracket.

So, for our exercise, the symbol we should have used was the one for Greater than Or Equal To. Change
your IF function to this and try again:

=IF(A1 >= 5, "Greater than or Equal to Five", "Less than Five")

Exercise

Test the A1 cell to see if the value is less than or equal to 5. If it is, display a suitable message. If it's not, display the message "Greater than Five".

Complex If Functions

The If Functions you've just met are consider fairly simple ones. They can get really complex!

Consider our Student Exam problem. The spreadsheet we created to track our students looks like this, from an earlier section:

	A	B	C	D	E	F	G	H	I	J	K
1		Steven	Mary	Ann	Raymond	Mark	Paul	Eliza	Kelly		Averages
2	Maths	76	89	43	48	51	76	87	56		65.75
3	English	55	85	78	61	47	87	91	73		72.13
4	Science	65	82	39	58	52	65	57	45		57.88
5	History	45	91	56	72	49	56	78	56		62.88
6	Geography	51	84	54	64	47	64	67	67		62.25
7	Art	43	63	49	62	39	89	64	63		59.00
8	Computer Studies	63	95	45	59	41	92	89	52		67.00
9	French	35	91	65	26	28	51	92	56		55.50
10											
11	Overall Average	54.13	85.00	53.63	56.25	44.25	72.50	78.13	58.50		

However, we want to display the following grades as well:

A If the student scores 80 or above
B If the student scores 60 to 79
C If the student scores 45 to 59
D If the student scores 30 to 44
FAIL If the student scores below 30

With such a lot to check for, what will the IF Function look like? Here's one that works:

=IF(B2>=80, "A", IF(B2>=60, "B", IF(B2>=45, "C", IF(B2 >=30, "D", "Fail"))))

Quite long, isn't it? Look at the colours of the round brackets above, and see if you can match them up. What we're doing here is adding more IF Functions if the answer to the first question is NO. If it's YES, it will just display an "A".

But take a look at our Student Exam spreadsheet now:

B14 =IF(B2>=80, "A", IF(B2>=60, "B", IF(B2>=45, "C", IF(B2 >=30, "D", "Fail"))))

	A	B	C	D	E	F	G	H	I	J	K
1		Steven	Mary	Ann	Raymond	Mark	Paul	Eliza	Kelly		Averages
2	Maths	76	89	43	48	51	76	87	56		65.75
3	English	55	85	78	61	47	87	91	73		72.13
4	Science	65	82	39	58	52	65	57	45		57.88
5	History	45	91	56	72	49	56	78	56		62.88
6	Geography	51	84	54	64	47	64	67	67		62.25
7	Art	43	63	49	62	39	89	64	63		59.00
8	Computer Studies	63	95	45	59	41	92	89	52		67.00
9	French	35	91	65	26	28	51	92	56		55.50
10											
11	Overall Average	54.13	85.00	53.63	56.25	44.25	72.50	78.13	58.50		
12											
13		Steven	Mary	Ann	Raymond	Mark	Paul	Eliza	Kelly		
14	Maths	B	A	D	C	C	B	A	C		
15	English	C	A	B	B	C	A	A	B		
16	Science	B	A	D	C	C	B	C	C		
17	History	C	A	C	B	C	C	B	C		
18	Geography	C	A	C	B	C	B	B	B		
19	Art	D	B	C	B	D	A	B	B		
20	Computer Studies	B	A	C	C	D	A	A	C		
21	French	D	A	B	Fail	Fail	C	A	C		
22											

After the correct answer is displayed in cell B14 on the spreadsheet above, we used AutoFill for the rest!

Don't worry if that long IF statement is making your brain hurt - it is quite complicated.

In the next part, we'll look at using And and OR with IF Statements.

2 Conditional Formatting in Excel

You can use something called Conditional Formatting in your Excel spreadsheets. Conditional Formatting allows you to change the appearance of a cell, depending on certain conditions. What we'll do is to color the Overall Averages on our Student Exam spreadsheet, depending on the grade. Here's the spreadsheet we'll be working on.

	A	B	C	D	E	F	G	H	I
1		Steven	Mary	Ann	Raymond	Mark	Paul	Eliza	Kelly
2	Maths	76	89	43	48	51	76	87	56
3	English	55	85	78	61	47	87	91	73
4	Science	65	82	39	58	52	65	57	45
5	History	45	91	56	72	49	56	78	56
6	Geography	51	84	54	64	47	64	67	67
7	Art	43	63	49	62	39	89	64	63
8	Computer Studies	63	95	45	59	41	92	89	52
9	French	35	91	65	26	28	51	92	56
10									
11	Overall Average	54.13	85.00	53.63	56.25	44.25	72.50	78.13	58.50

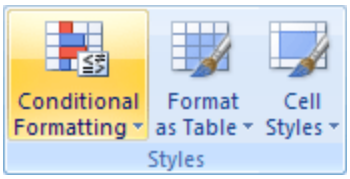
- Open up your Student Exam spreadsheet (You did complete it, didn't you?)
- Highlight the cells with Overall Grades, which should be cells B11 to I11

The Overall Averages range from 44 to 85. We'll color each grade, depending on a scale. An assorted color will apply to the following grades:

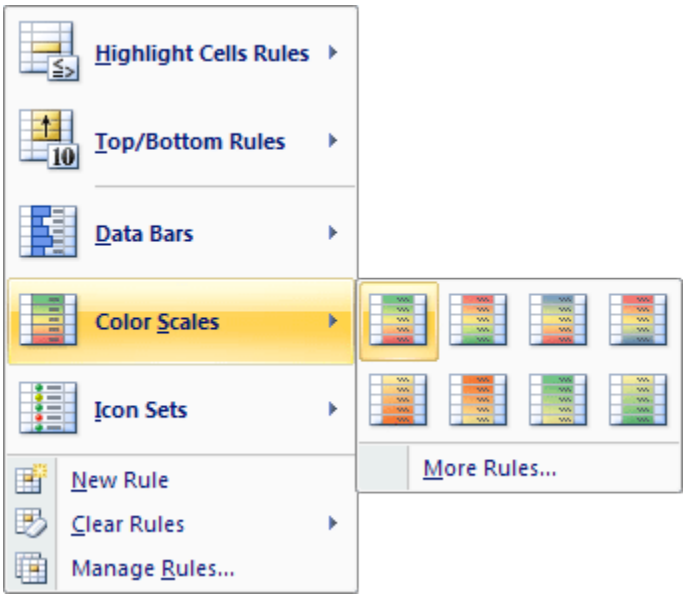
- **50 and below**
- **51 to 60**
- **61 to 70**
- **71 to 80**
- **81 and above**

So five different bands, and a color for each. To set the Conditional Formatting in Excel, do the following:

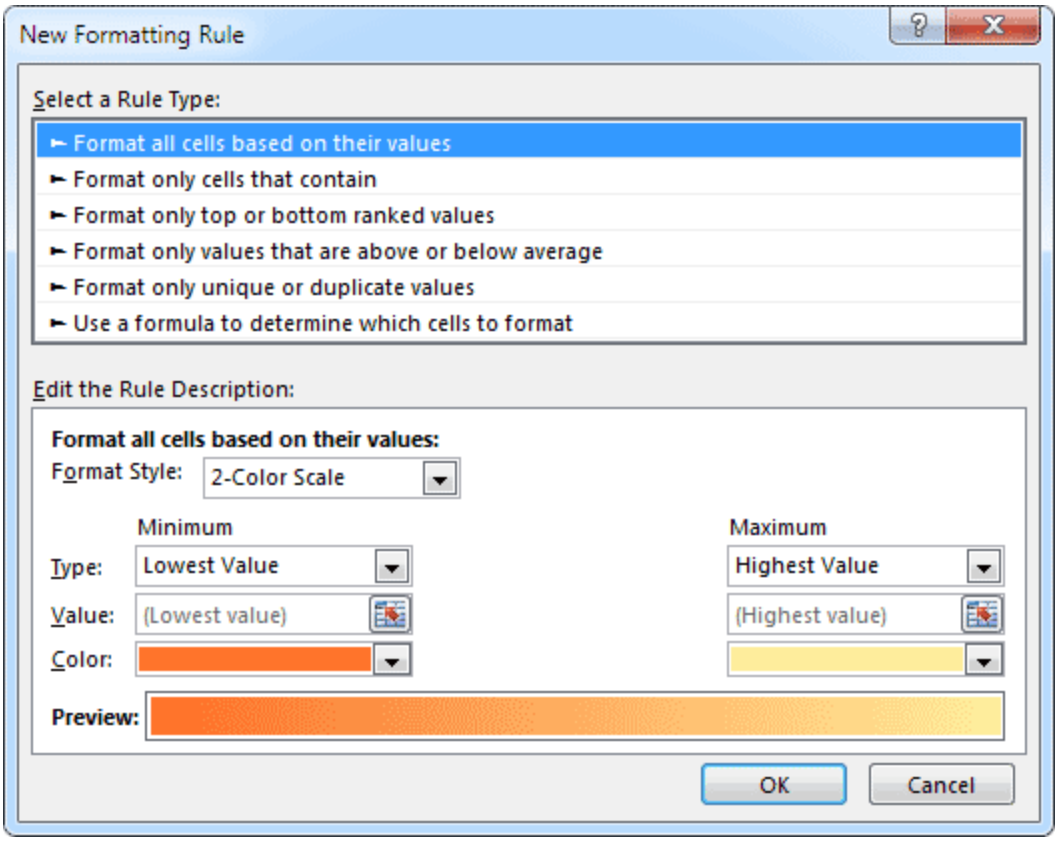
- **With your Overall Averages highlighted, click on the Home menu at the top of Excel**
- **on The Home ribbon, locate the Styles panel, and the Conditional Formatting item:**



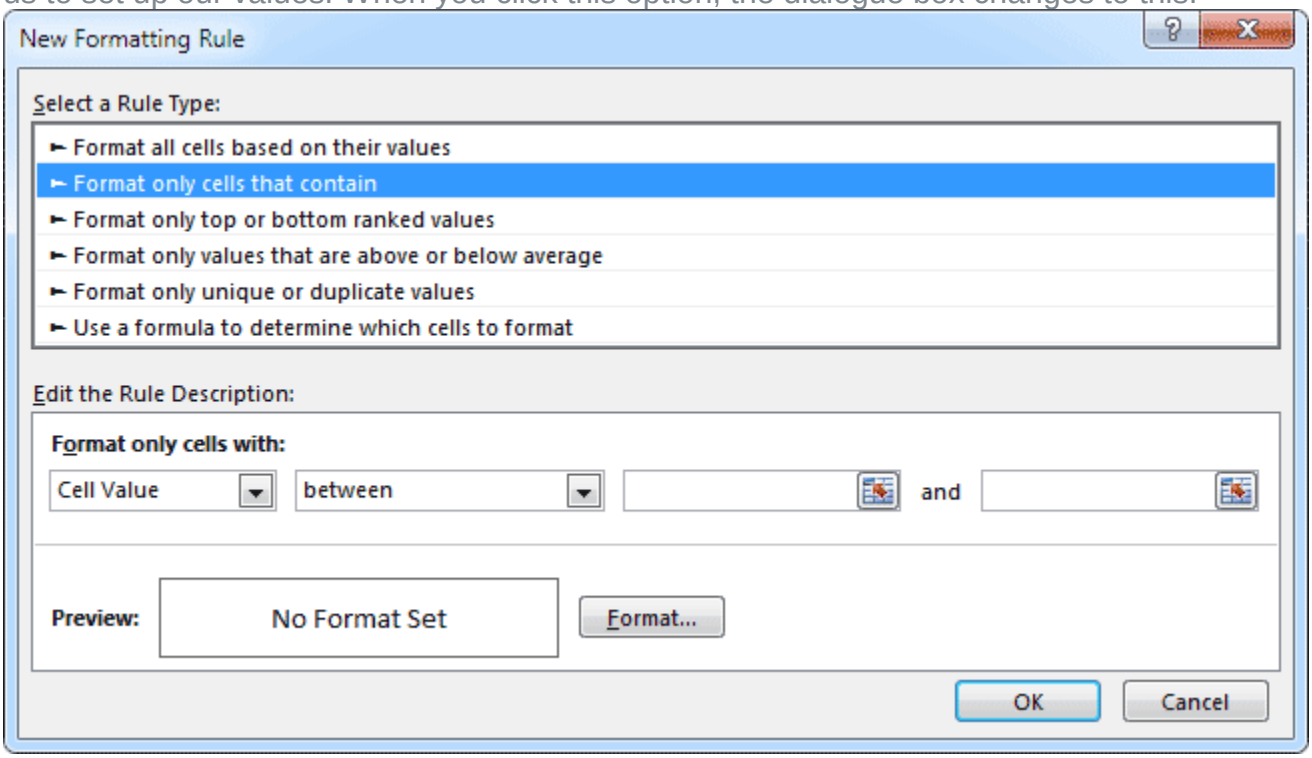
The Conditional Formatting menu gives you assorted options. The easiest one is the Color Scales option. Select one of these and Excel will color the cell backgrounds for you:



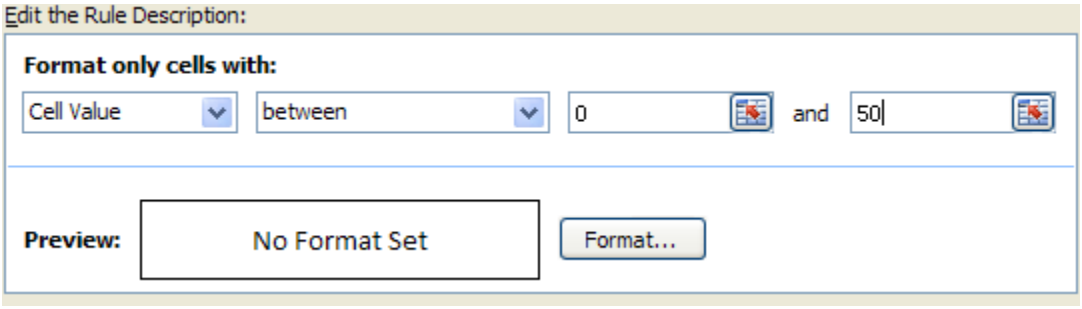
That's not quite what we're looking for, though. We'd like to choose our own values. So, click on **More Rules**, from the **Color Scales** submenu. You'll see the following rather complex dialogue box:



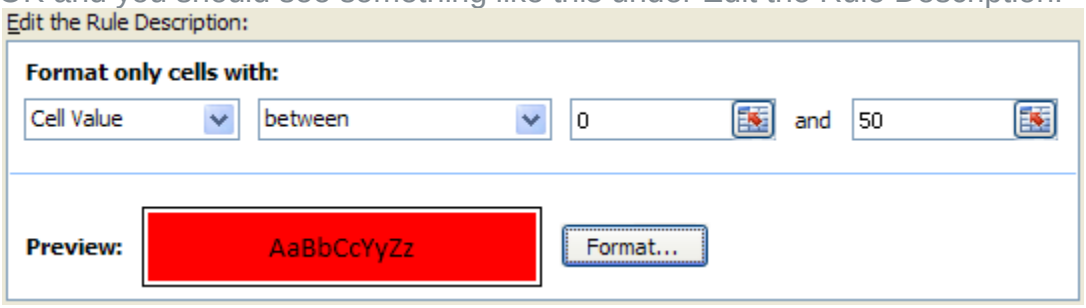
The one we want is the second option, **Format only cells that contain**. This will allow us to set up our values. When you click this option, the dialogue box changes to this:



The part we're interested in is the bottom part, under the heading **Edit the Rule Description**. It says **Cell Value** and **Between**, in the drop-down boxes. These are the ones we want. We only need to type a value for the two boxes that are currently blank in the image above. We can then click the **Format** button to choose a color.
So type 0 in the first box and 50 in the second one:

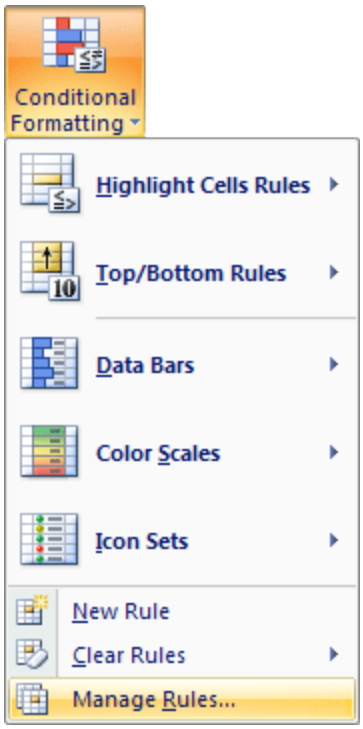


Then click the **Format** button. You'll get another dialogue box popping up. This is just the Format Cells one though. You've met this before. Click on the Fill tab and choose a colour. Click OK and you should see something like this under Edit the Rule Description:

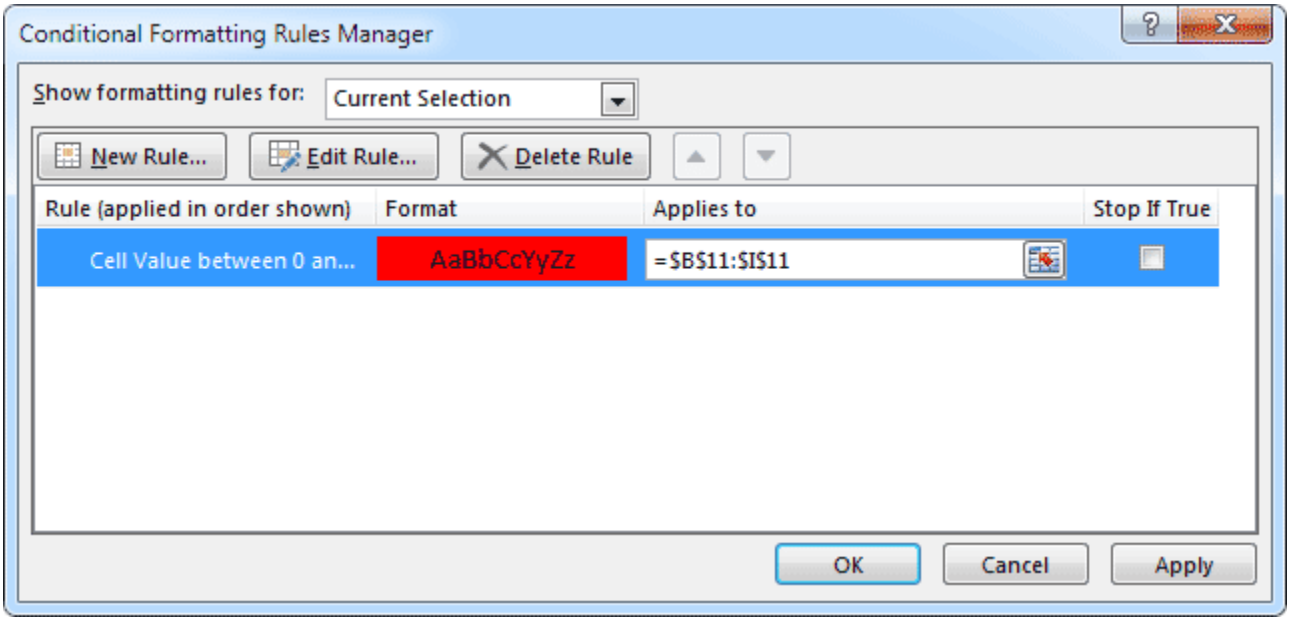


The Preview is showing the color we picked. So, we've said, "**If** the Cell Value is between 0 and 50 **then** color the cell Red".

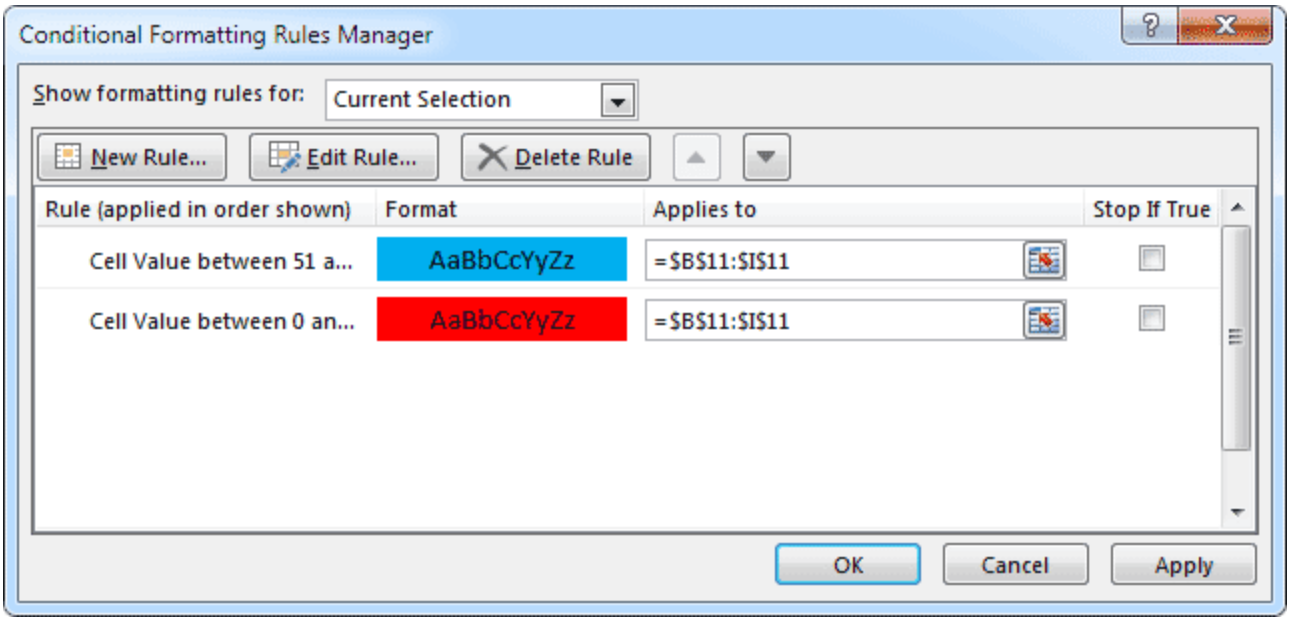
Click OK on this dialogue box to get back to Excel. You should find that one of the cells has turned red. To format the rest of the cells, click on Conditional Formatting on the Styles panel again. From the menu, click on **Manage Rules**:



You'll get yet another complex dialogue box popping up! This one:



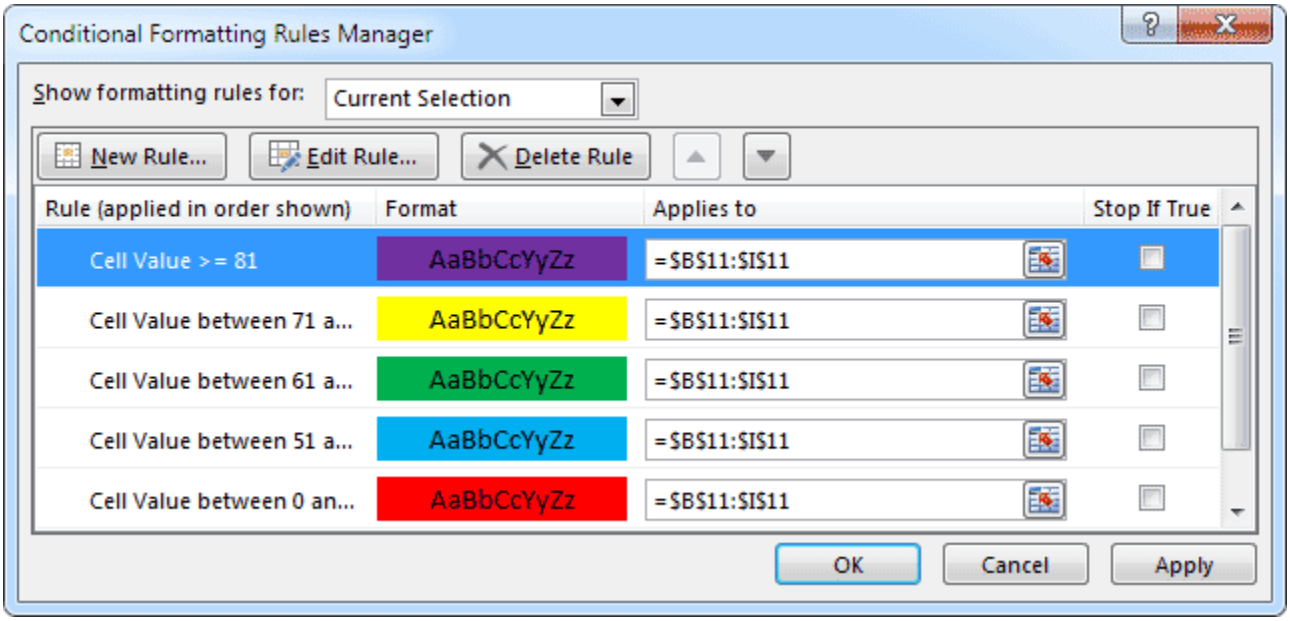
Our first rule is already there - Cell Value Between. The only thing we're doing here is adding New Rules, like the one we've just set up. Click the **New Rule** button then. You'll see the exact same dialogue boxes you used to set up the first rule. Set a new color for the next scores - 51 to 60. Choose a color, and keep clicking OK until you get back to the Rules Manager dialogue box. It should now look something like this one:



We now must color in our range. Do the rest of the scores, choosing a color for each. The scores are these, remember:

- **50 and below**
- **51 to 60**
- **61 to 70**
- **71 to 80**
- **81 and above**

When you've done them all, your dialogue box should have five colors:



The colors above are entirely arbitrary, and you don't have to select the same ones we did. The point is to have an assorted color for each range of scores. But click OK when you're done. Your Overall Averages will then look something like this:

	A	B	C	D	E	F	G	H	I
1		Steven	Mary	Ann	Raymond	Mark	Paul	Eliza	Kelly
2	Maths	76	89	43	48	51	76	87	56
3	English	55	85	78	61	47	87	91	73
4	Science	65	82	39	58	52	65	57	45
5	History	45	91	56	72	49	56	78	56
6	Geography	51	84	54	64	47	64	67	67
7	Art	43	63	49	62	39	89	64	63
8	Computer Studies	63	95	45	59	41	92	89	52
9	French	35	91	65	26	28	51	92	56
10									
11	Overall Average	54.13	85.00	53.63	56.25	44.25	72.50	78.13	58.50
12									

Formatting your spreadsheet in this way allows you to see at a glance relevant information. In the spreadsheet above, it's obvious who's failing - just look for the red cells!

3 CountIF

Another useful function that uses Conditional Logic is CountIF. This one is straightforward. As its name suggests, it counts things! But it counts things IF a condition is met. For example, keep a count of how many students have an A Grade.

To get you started with this function, we'll use our Student Grade spreadsheet and count how many students have a score of 70 or above. First, add the following label to your spreadsheet:

H	I	J	K	L
Eliza	Kelly		Num of Students Above 70	
87	56			
91	73			
57	45			
78	56			
67	67			
64	63			
89	52			
92	56			
78.13	58.5			

As you can see, we've put our new label at the start of the K column.

We can now use the CountIF function to see how many of the students scored 70 or above for a given subject.

The CountIF function looks like this:

COUNTIF(range, criteria)

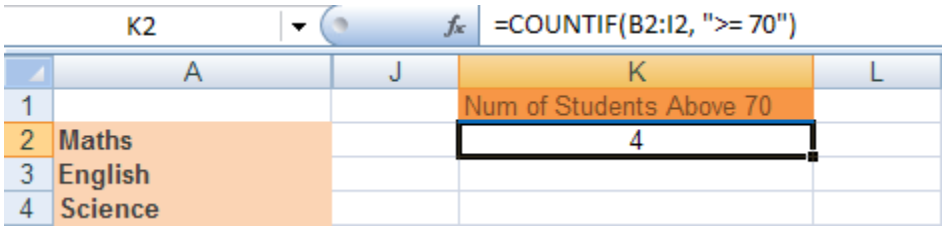
The function takes two arguments (the words in the round brackets). The first argument is range, and this means the range of cells you want Excel to count. Criteria means, "What do you want Excel to look for when it's counting?".

So click inside cell K2, and then click inside the formula bar at the top. Enter the following formula:

=CountIf(B2:I2, ">= 70")

The cells B2 to I2 contain the Math scores for all 8 students. It's these scores we want to count.

Press the enter key on your keyboard. Excel should give you an answer of 4:



(If you're wondering where the columns B to I have gone in the image above, we've hidden then for convenience sake!)

To do the rest of the scores, you can use AutoFill. You should then have a K column that looks like this:

	A	J	K	L
1			Num of Students Above 70	
2	Maths		4	
3	English		5	
4	Science		1	
5	History		3	
6	Geography		1	
7	Art		1	
8	Computer Studies		3	
9	French		2	
10				

By using CountIF, we can see at a glance which subject's students are doing well in, and which subjects they are struggling in.

Exercise Add a new label to the L column. In the cells L2 to L9, work out how many students got below 50 for a given subject. You should get the same results as in the image below:

	A	K	L	M
1		Num of Students Above 70	Num of Students Below 50	
2	Maths	4	2	
3	English	5	1	
4	Science	1	2	
5	History	3	2	
6	Geography	1	1	
7	Art	1	3	
8	Computer Studies	3	2	
9	French	2	3	
10				

In the next part, we'll look at a function like CountIF - SumIF.

4 SumIF

Another useful Excel function is SumIF. This function is like CountIf, except it adds one more argument:

SUMIF(range, criteria, sum_range)

Range and criteria are the same as with CountIF - the range of cells to search, and what you want Excel to look for. The Sum_Range is like range, but it searches a new range of cells. To clarify all that, here's what we'll use SumIF for. (Start a new spreadsheet for this.) Five people have ordered goods from us. Some have paid us, but some haven't. The five people are Elisa, Kelly, Steven, Euan, and Holly. We'll use SumIF to calculate how much in total has been paid to us, and how much is still owed.

So in Column A, enter the names:

	A	B	C	D
1	Customer			
2				
3	Elisa			
4	Kelly			
5	Steven			
6	Euan			
7	Holly			
8				

In Column B enter how much each person owes:

	A	B	C	D
1	Customer	Total Goods Ordered		
2				
3	Elisa	£120.00		
4	Kelly	£134.00		
5	Steven	£123.00		
6	Euan	£145.00		
7	Holly	£156.00		
8				

In Column C, enter TRUE or FALSE values. TRUE means they have paid up, and FALSE means they haven't:

	A	B	C	D
1	Customer	Total Goods Ordered	Has Paid	
2				
3	Elisa	£120.00	TRUE	
4	Kelly	£134.00	FALSE	
5	Steven	£123.00	FALSE	
6	Euan	£145.00	TRUE	
7	Holly	£156.00	FALSE	
8				

Add two more labels: Total Paid, and Still Owed. Your spreadsheet should look something like this one:

	A	B	C	D
1	Customer	Total Goods Ordered	Has Paid	
2				
3	Elisa	£120.00	TRUE	
4	Kelly	£134.00	FALSE	
5	Steven	£123.00	FALSE	
6	Euan	£145.00	TRUE	
7	Holly	£156.00	FALSE	
8				
9				
10	Total Paid			
11	Still Owed			
12				

In cells B10 and B11, we'll use a SumIF function to work out how much has been paid in, and how much is still owed. Here's the SumIF function again:

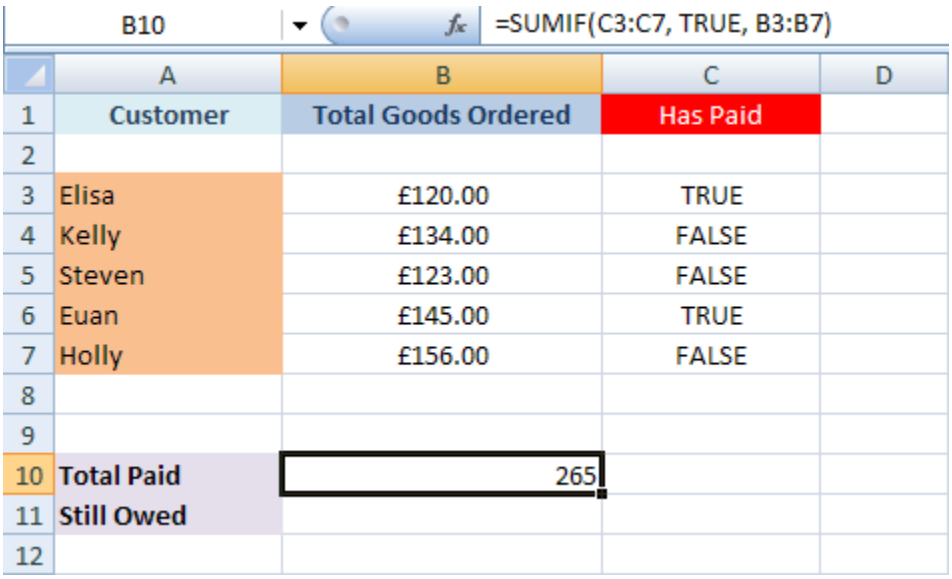
SUMIF(range, criteria, sum_range)

So, the range of cells that we want to check are the True and False values in the C column; the criteria is whether they have paid (True); and the Sum_Range is what we want to add up (in the B column).

In cell B10, then, enter the following formula:

=SUMIF(C3:C7, TRUE, B3:B7)

When you press the enter key, Excel should give you the answer:



	A	B	C	D
1	Customer	Total Goods Ordered	Has Paid	
2				
3	Elisa	£120.00	TRUE	
4	Kelly	£134.00	FALSE	
5	Steven	£123.00	FALSE	
6	Euan	£145.00	TRUE	
7	Holly	£156.00	FALSE	
8				
9				
10	Total Paid	265		
11	Still Owed			
12				

So, 265 is has been paid in. But we told SumIF to first check the values in the cells C3 to C7 (range). Then we said look for a value of TRUE (criteria). Finally, we wanted the values in the B column adding up, if a criteria of TRUE was indeed found (sum_range).

Exercise

Use SumIF to work out how much is still owed. Put your answer in cell B11.
We'll leave the subject of Conditional Logic.