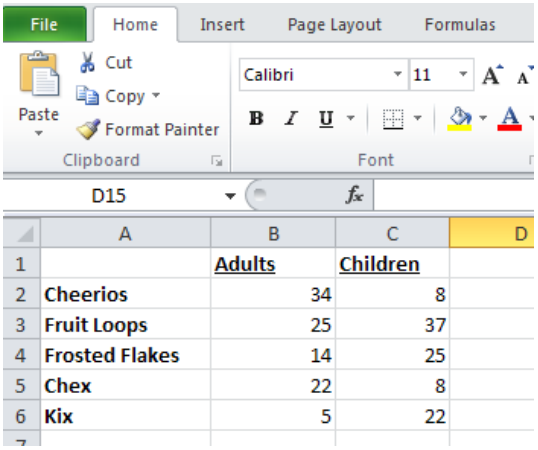
Lecture 6
Charts and Graphs in Excel

Charts and graphs are used to make information clearer and easier to understand. *A good picture is worth a thousand numbers.* The most common place for people to see charts and graphs is in the news. News publishers use graphics all the time to show comparisons and explain important trends for things such as weather, gas prices, crime rate, or who is winning an election and by how much. Charts and graphs are also critical to engineers, scientists and financial analysts who use them to help visualize large amounts of information, make better decisions, and communicate their results to other people.

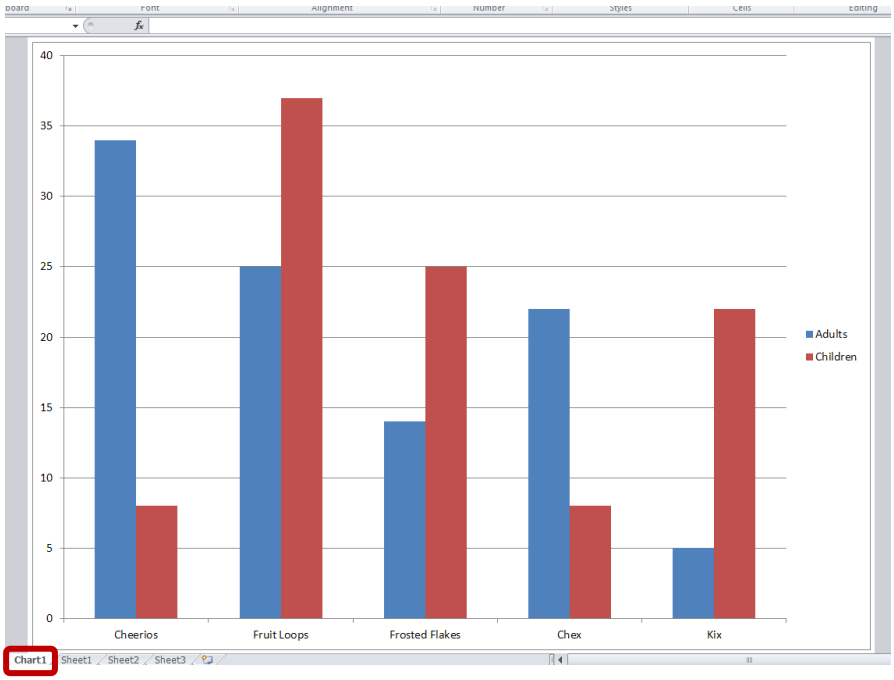
Creating a Chart

1. To create a basic chart in Excel that you can modify and format later, start by entering the data for the chart on a worksheet. It is important to include titles in the datasheet so that Excel can create legends and labels for the chart.

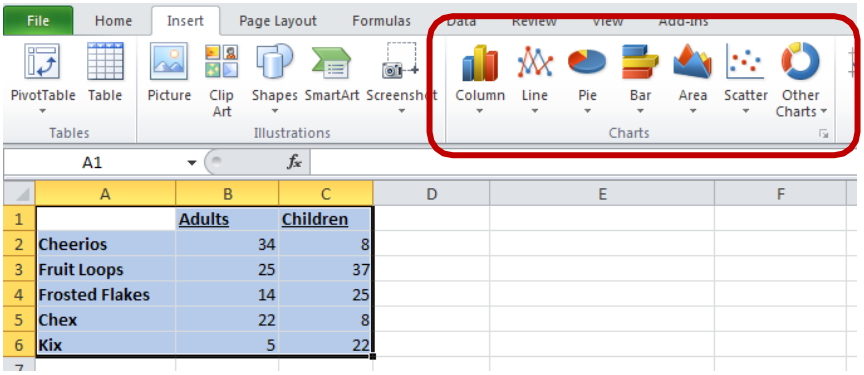


	A	B	C	D
1		Adults	Children	
2	Cheerios	34	8	
3	Fruit Loops	25	37	
4	Frosted Flakes	14	25	
5	Chex	22	8	
6	Kix	5	22	

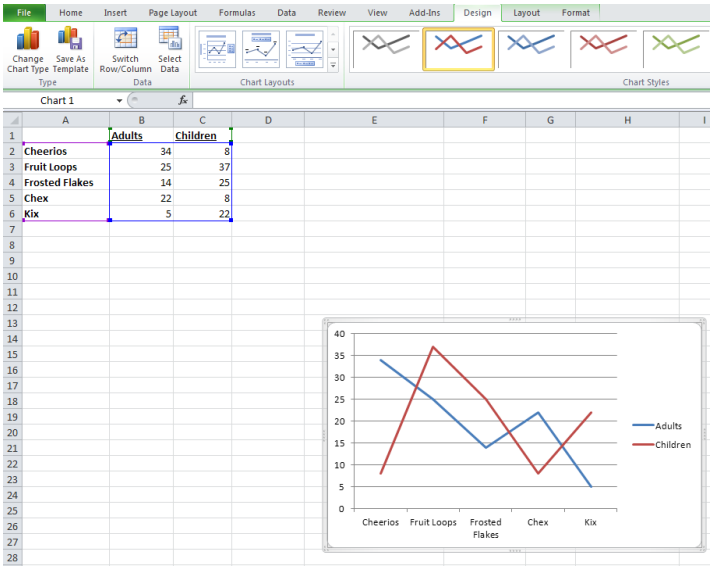
2. Then simply select that data (including titles) and press **F11**. This creates an instant column chart in a new tab, which can be customized to meet your needs.


40
35
30
25
20
15
10
5
0
Cheerios
Fruit Loops
Frosted Flakes
Chex
Kix
Adults
Children
Chart1
Sheet1
Sheet2
Sheet3

3. Or, instead of pressing F11, go to the **Insert** tab and select the type of chart you would like to create.



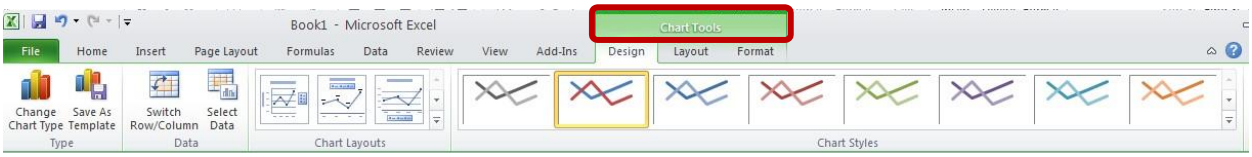
4. This creates a chart embedded in the datasheet.



Formatting a Chart

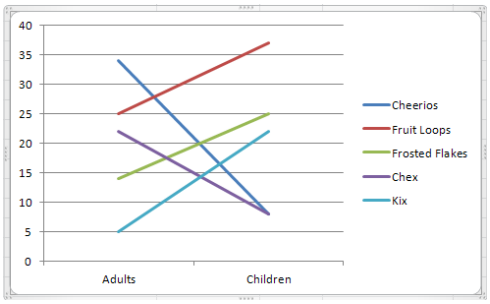
Once a chart has been created, there are a multitude of formatting options that can be applied.

1. Select the chart. This activates the **Chart Tools** on the Ribbon.



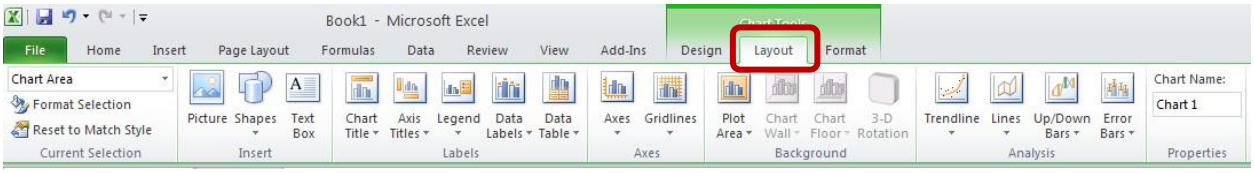
2. Use the features available on the **Design** tab to:
    a. Change the chart type.
    b. Swap the rows and columns or adjust what data is charted. For example, switching the columns and rows changes the look of the chart, even though the

raw data has not changed:



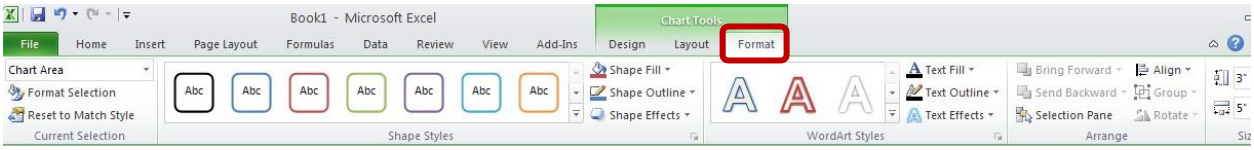
c. Apply a Chart Style.
d. Move the chart (from the datasheet to its own tab or vice versa).

3. Use the features available on the **Layout** tab to:



a. Insert a picture, shape, or text box.
b. Adjust the labels, including moving the legend, editing titles, and adding data labels (like values).
c. Adjust the axes and gridlines (for example, showing numbers on the axis in millions or adding or removing gridlines).
d. Format the background.
e. Add trendlines to forecast future data or error bars to show potential error amounts.

4. Use the features available on the **Format** tab to:

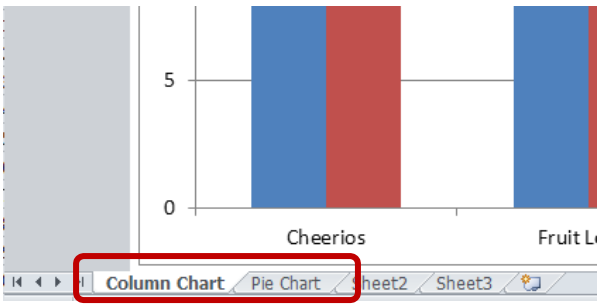


a. Apply a style, fill, outline, or effect. (For example, to change the color of the bars.)
b. Apply and format WordArt.
c. Use the dropdown list in the **Current Selection** group to quickly adjust which area of the chart you want to format.

Working with Charts

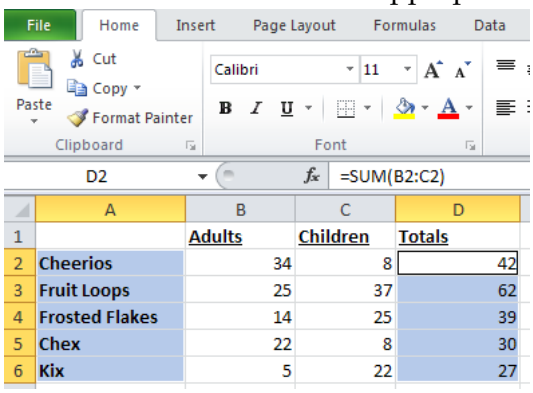
1. Keep in mind that as data changes in the worksheet, the chart will automatically update.

2. You may want to name the tabs at the bottom of the workbook to ease in navigation.

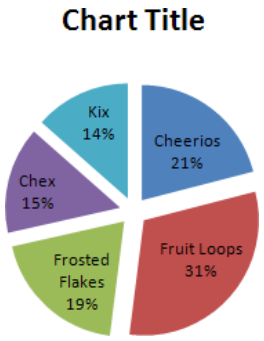


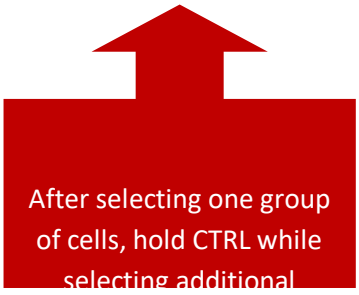
   a. To rename a tab, **double-click** its name.
   b. Or **right-click** and choose **Rename**.
   c. You can also **right-click** and choose **Tab Color** to change the color of the tabs.

3. There may be times when you want to chart summary data rather than individual instances. For example, you may want to chart total expenditures for each quarter as opposed to each monthly expenditure.
   a. Use formulas to create the summary data.
   b. Use the CTRL button on the keyboard to select non-adjacent data. Remember to select titles so that Excel can appropriately label the chart.



	A	B	C	D
1		Adults	Children	Totals
2	Cheerios	34	8	42
3	Fruit Loops	25	37	62
4	Frosted Flakes	14	25	39
5	Chex	22	8	30
6	Kix	5	22	27

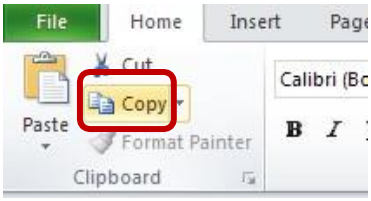




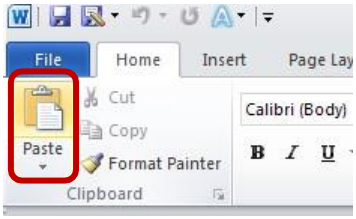
Adding Excel Charts to Word or PowerPoint

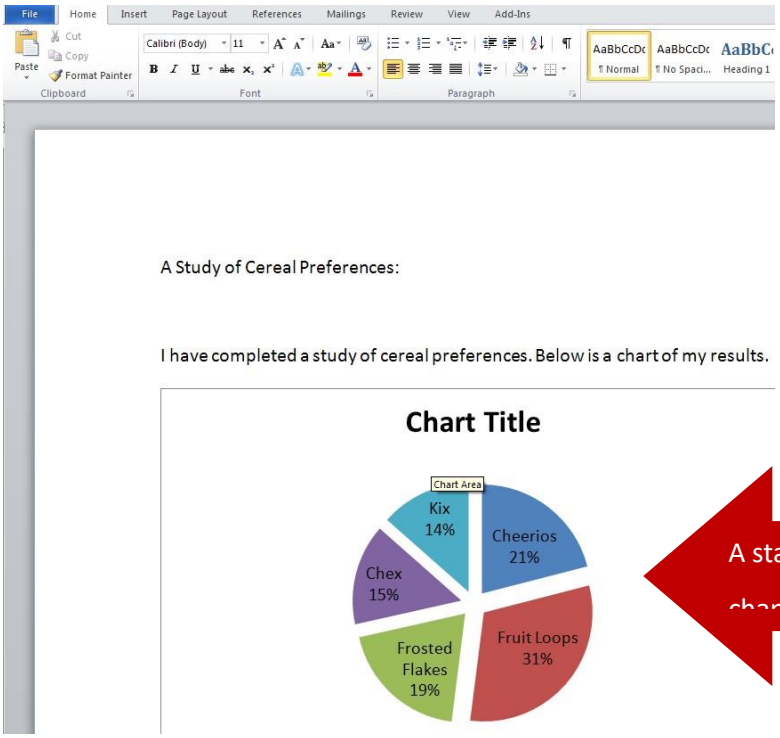
Now that you have created the charts in Excel, you may want to add them to a Word document or PowerPoint presentation. There are two options – inserting a static copy of the chart or inserting a linked copy of the chart. A static copy does not change; it will NOT be updated if the chart is updated in Excel. A linked copy will update if the chart is updated in Excel.

1. Select the chart in Excel.
2. From the **Home** tab, select **Copy**.

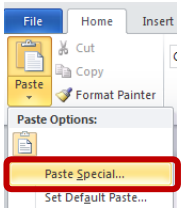


3. Open the document or presentation in which you want to insert the chart.
4. Place the cursor in the desired location.
5. To insert a static copy of the chart, select **Paste** from the **Home** tab.

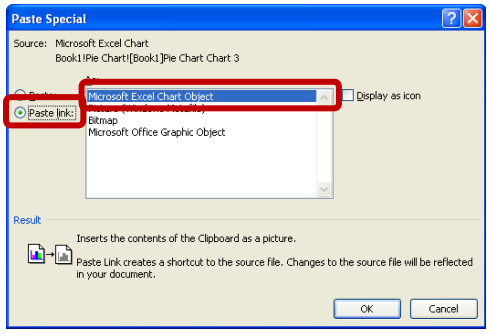




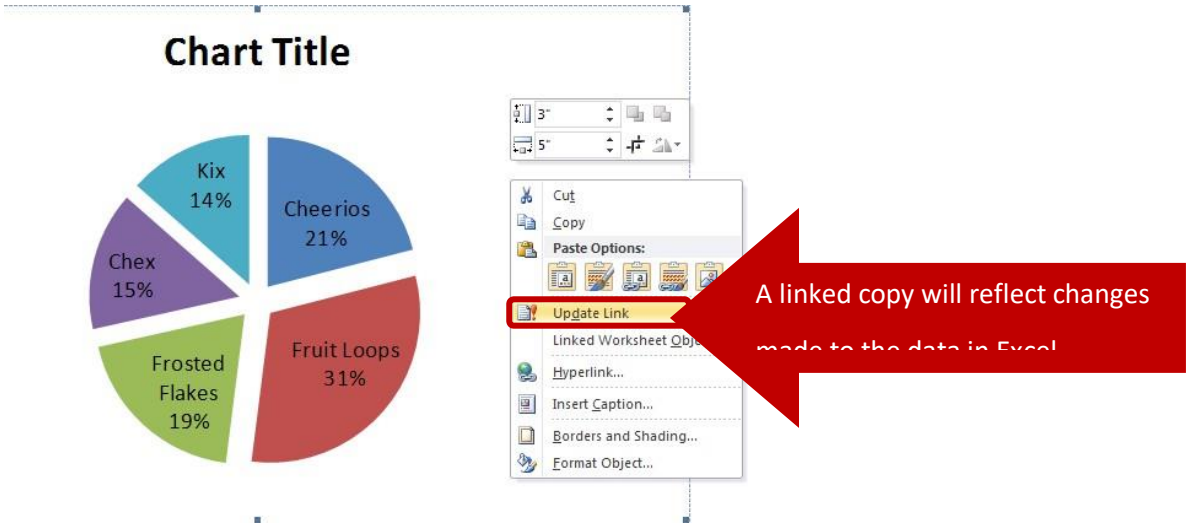
6. To insert a linked copy of the chart, click the **dropdown arrow underneath the Paste button** and choose **Paste Special**.



   a. Select **Microsoft Office Excel Chart Object**.
   b. Select **Paste Link**.
   c. Click **OK**.



   d. The chart in the document or presentation will update as the chart is updated in Excel. **Right-click** on the chart and choose **Update Link** to force the application to check for updates.

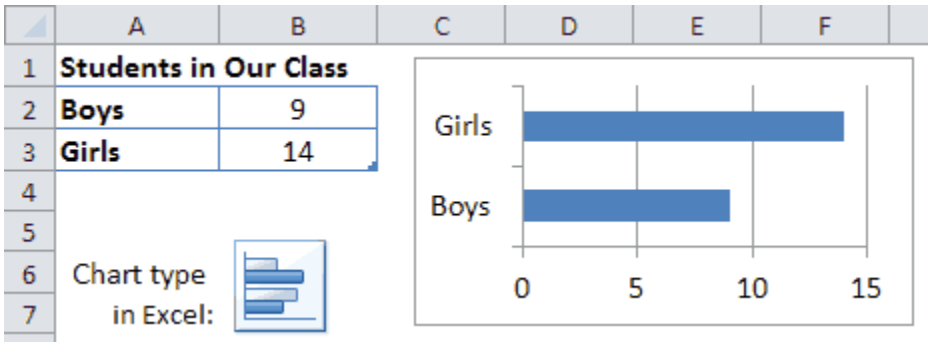


   e. Note: To ensure that the entire chart is seen when pasted, before you click the Copy button in Excel, go to the **View** tab, and click the **100%** button to set the Zoom level to 100%.

Common types of graphs and charts

Bar Graph

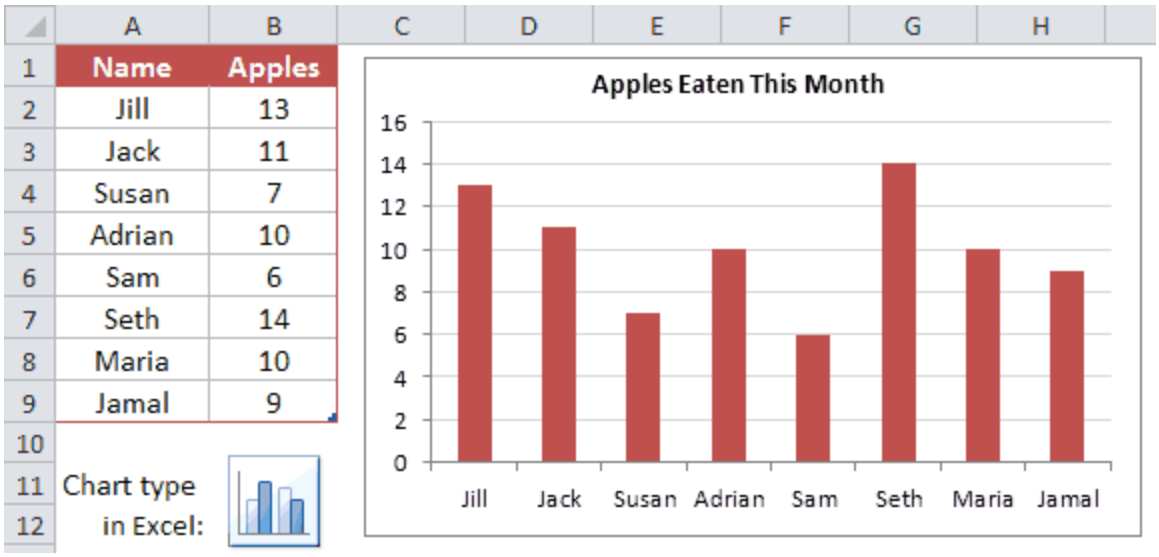
A bar graph is a graph that shows you information about two or more **discrete objects, events, locations, groups of people, etc**. You can use the bar graph to make comparisons. For example, if you count the number of students in your class who are girls and the number who are boys, you could make a bar graph to compare the totals. One bar would represent the number of boys, and another bar would represent the number of girls.



Example of a bar graph created with Excel.

Column Chart

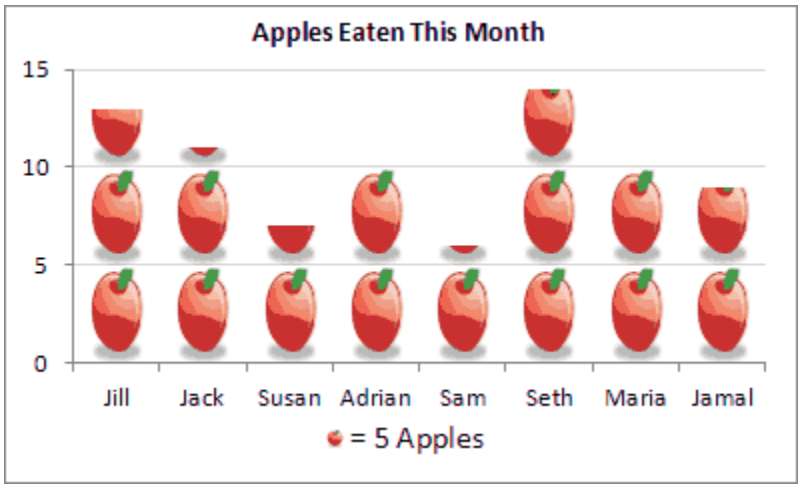
A column chart in Excel is just a bar graph where the bars are displayed as columns. Instead of the labels or categories listed on the left, they are listed on the bottom. The example below shows how you can set up the data table for creating a column chart showing the number of apples eaten in a particular month.



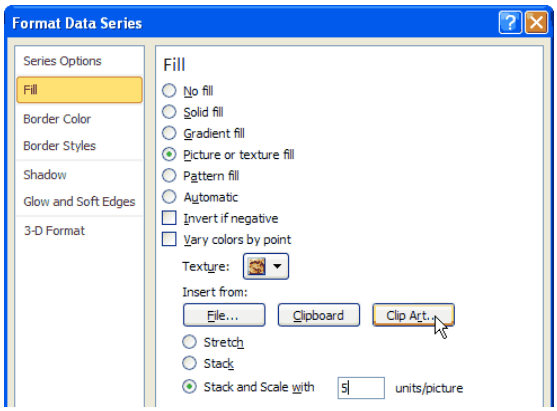
Example of a column chart created using Excel

Pictograph

A pictograph shows data using a series of pictures, where a picture represents a number. The example below takes the same data used for the column chart but uses pictures of apples, where one complete picture represents 5 apples eaten. Pictographs can be a fun way to display information, and they are easy to create in Excel. You first create a bar graph or column chart and then you edit the fill options for the bars or columns.



Example of a Pictograph created with Excel



Fill Settings for Creating a Pictograph
Click to Enlarge

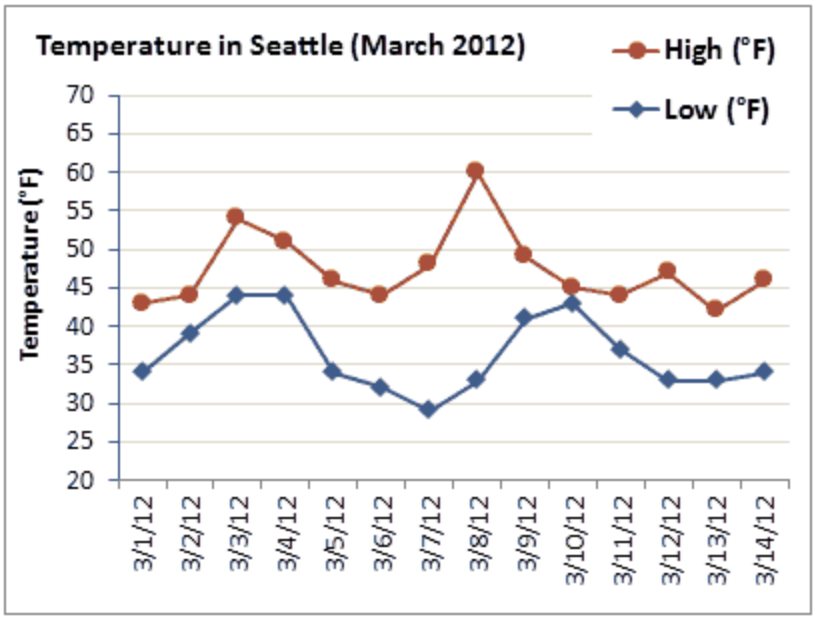
Pictures can say a lot more than numbers. But, it is very important that we don't misrepresent information by the way that we use images and graphics. For example, it would be very confusing if the pictograph above used images of oranges instead of apples to represent the number of apples eaten. We must think about whether the **sizes**, **shapes** and **colors** of graphics are helping to make information more clear and helping to increase understanding.

Line Graph

A line graph is great for showing **continuous change over time**. For example, you could use a line graph to watch the changes in temperature in the month of March. If it is hotter one day than on the day before, the line will go up. If it is cooler, it will go down. By analyzing the line graph, you can get a better idea of the changes that took place as time went on. You can also easily determine when the value you are graphing was highest or when it was lowest. Including 2 lines on the same graph lets you visualize comparisons, such as the difference between the High and Low temperatures for each day.

	A	B	C
1	Temperature Data for Seattle		
2	Date	High (°F)	Low (°F)
3	3/1/12	43	34
4	3/2/12	44	39
5	3/3/12	54	44
6	3/4/12	51	44
7	3/5/12	46	34
8	3/6/12	44	32
9	3/7/12	48	29
10	3/8/12	60	33
11	3/9/12	49	41
12	3/10/12	45	43
13	3/11/12	44	37
14	3/12/12	47	33
15	3/13/12	42	33
16	3/14/12	46	34

Chart type in Excel:



Example of a line graph in Excel
Data Source: http://www.beautifulseattle.com/mthsum.asp

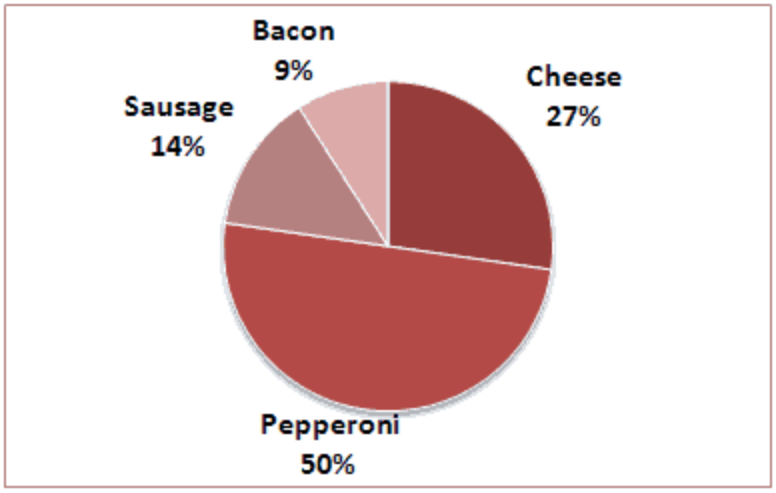
You can create a line graph from the same data table as a bar graph, and vice versa. But, what you decide to use should largely depend upon whether you are showing how something changes over time (line graph) or showing comparisons between discrete things (bar graph).

It is important to be aware of color choices when using graphs. People often associate meanings with different colors, such as red for hot and blue for cold, so in the example above it could be confusing if the colors of the lines were switched. It makes more sense for red to be used for the High temperature and blue to be used for the Low temperature.

Pie Charts

A pie chart is a circular graph where the pieces of the pie are used to represent a **percentage of a whole**. For example, if you took a survey of the students in your class and asked them each about their favorite pizza, you could use the results to make a pie chart that would show what toppings earned the most votes. In this case, each triangle would represent a different topping. The triangle with the largest area would represent the topping that got the most votes, while the toppings that got the least votes would be represented by smaller triangles.

	A	B
1	Favorite Pizza Topping	
2	Topping	Votes
3	Cheese	6
4	Pepperoni	11
5	Sausage	3
6	Bacon	2

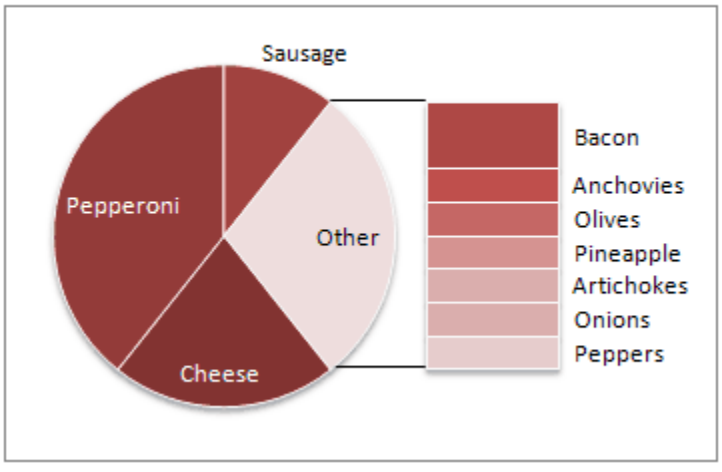


Example of a pie chart in Excel

In the example above, it is pretty easy to see that Pepperoni was the favorite. It is also easy to see that Pepperoni received the same amount of votes as all of the others combined. That would not be as easy to see if you were just staring at the numbers in the table. One problem with a pie chart is that it can take up a lot of space to show only a little bit of information.

Another major problem with pie charts is making comparisons between a lot of different things, and especially when you have a lot of little slices. To help with that, Excel provides a "Bar of Pie" graph that breaks out some of the pieces into a separate stacked bar graph like in the example below.

	A	B
1	Favorite Pizza Toppings	
2	Topping	Votes
3	Cheese	6
4	Pepperoni	11
5	Sausage	3
6	Bacon	2
7	Anchovies	1
8	Olives	1
9	Pineapple	1
10	Artichokes	1
11	Onions	1
12	Peppers	1



Example of a "bar of pie" graph in Excel

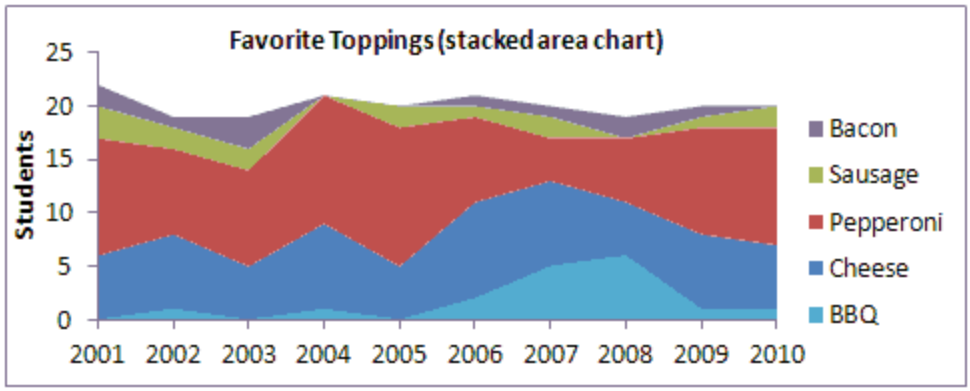
People already have a hard time comparing sizes of areas when they are fairly close in size. But, it is even harder when the areas are different shapes. If you tried to compare Sausage and Bacon in the above example (without using the data table), you could end up coming to an incorrect conclusion. Can you tell why? Is the Sausage slice larger or smaller than the Bacon? Without the numbers to help you, you probably couldn't tell for sure. In fact, the Sausage received 3 votes and the Bacon only received 2. It turns out that the sizes of the rectangles can only be compared within the stacked bar chart. The size of the rectangles cannot be compared to the size of the pie slices - not only because of the difficulty between comparing rectangles and pie slices, but also because the total area of the stacked bar chart is not the same as the total area of the "Other" slice from which it was taken.

Area Charts

An area chart or area graph combines some of the characteristics of line graphs with the characteristics of bar graphs. It looks like a line graph with shading underneath the line. Sometimes, the shading can help add meaning to a line graph. For example, if a line graph represented the height of water in a reservoir over time, shading the area under the line could make the line graph look like actual water rising and falling.

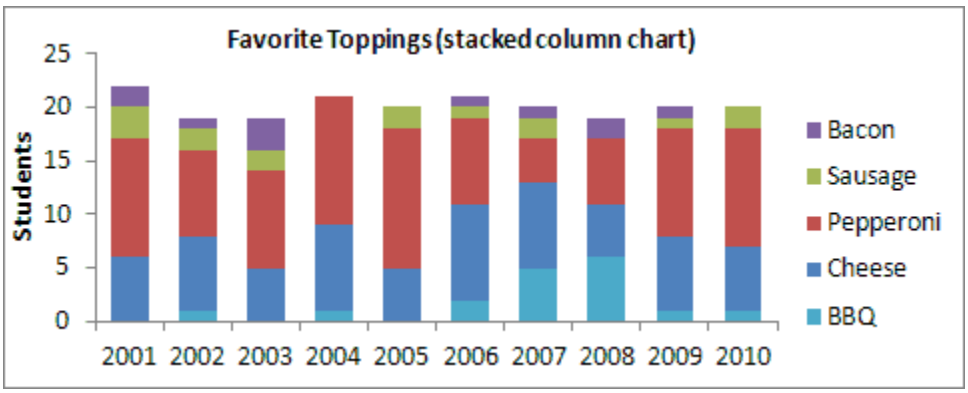
Stacked area charts and stacked column charts provide a way to compare differences or proportions over time or between different locations or groups of people. The height of each of the areas as well as the total height of all the areas may change over time. If you had a series of pie charts that compared the same items from month to month, all of that information could be displayed in a single area chart. For example, let's say that a teacher offered the same pizza topping survey to each of her classes over a period of 10 years. You can display that information as an area chart like the image below.

	A	B	C	D	E	F	G	H	I	J	K
1	Votes for Favorite Pizza Toppings in Ms. Anderson's 5th Grade Class										
2	Topping	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
3	Cheese	6	7	5	8	5	9	8	5	7	6
4	Pepperoni	11	8	9	12	13	8	4	6	10	11
5	Sausage	3	2	2	0	2	1	2	0	1	2
6	Bacon	2	1	3	0	0	1	1	2	1	0
7	BBQ	0	1	0	1	0	2	5	6	1	1



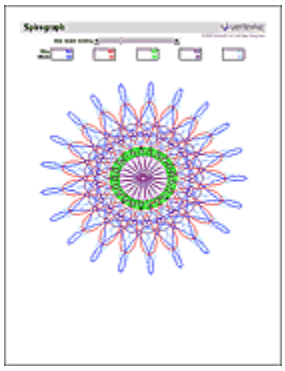
Example of a stacked area chart in Excel

This type of area chart is time-based (same survey offered year after year), but it's not truly continuous because the class stays the same throughout the entire year. So, this is a case where it might be more appropriate to show the graph as a stacked column chart (see below) which will depict the results as discrete events. Everything about the data table and the graph is pretty much the same. All you have to do is change the chart type.



Example of a stacked column chart in Excel

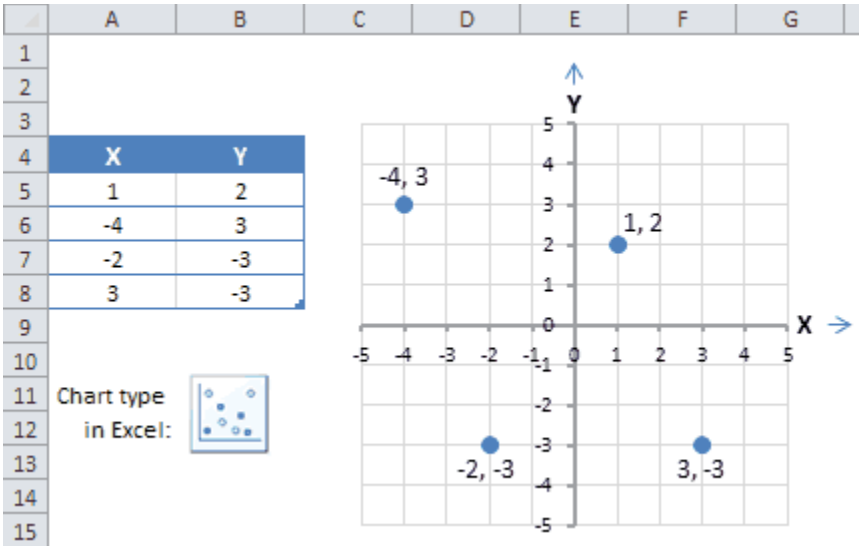
XY Graph (Scatter Plot)



Spirograph Template

An X-Y graph, also called a coordinate graph or scatter plot, is a graph that shows different ordered pairs on an X-Y axis (Cartesian coordinate system). X-Y graphs are used to look at and find patterns in sets of data and to plot mathematical formulas. The points on the graph may form a straight line or a curved line, and may be connected with a line. Unlike bar graphs and line graphs, the line in an X-Y graph can curve back on itself, forming complex patterns such as the spirograph shown on the right. In some cases, the points may not form a line at all. They might just be shown as a bunch of random dots scattered all over the place (thus the name).

To plot a point on graph paper, you first need to draw the coordinate system and then you simply find the point's x-coordinate, move straight up or down the line to its y-coordinate, and draw a point. To create a scatter plot in Excel, you first create a simple table with one column for listing the X-coordinates and a second column for the Y-coordinates, select the data table, then insert the scatter chart by choosing it from a menu.



Example of a scatter plot in Excel

Other Charts and Graphs

There are many other types of charts and graphs, as well as many other variations on the types listed above. But most of the more advanced types of graphs, charts, and plots require a more advanced knowledge of math, science, and statistics. Some of the names for these other types of charts (but definitely not all of them) are: surface plots and other 3-dimensional graphs, bubble charts, candlestick charts, radar plots, forest plots, glyph plots, histograms, stem-and-leaf plots, dot plots, biplots, box plots, gauge charts, control charts, geo charts, tree maps, combination charts, stepped area charts, dendrogram plots, and many others.