

# Graphs

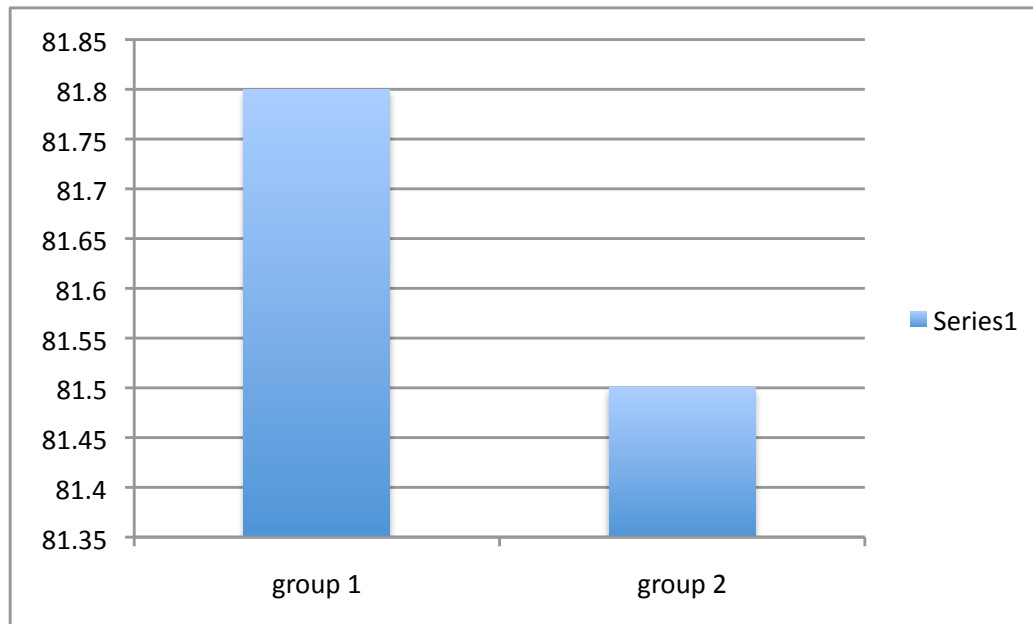
**Types of Graphs**

**Histograms**

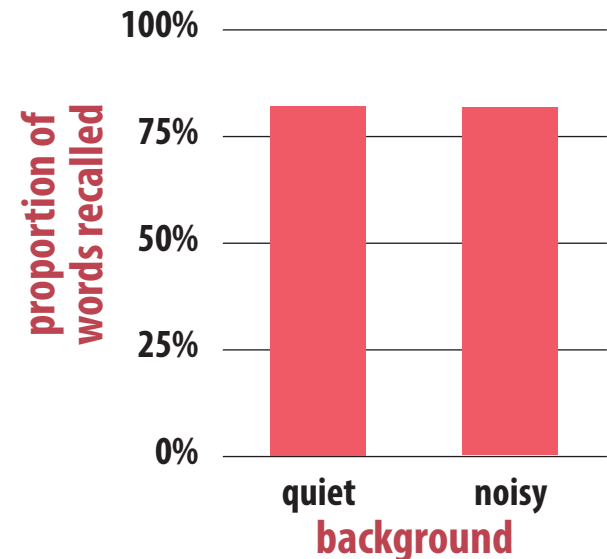
# The Purpose of a Graph

The purpose of a graph is to make results clear at a glance. Avoiding common pitfalls, such as those done by default in Microsoft Excel (shown below on the left), can help achieve this goal.

Problem with default Excel graph	Consequence
no x-axis label; untitled categories	not known what is being compared
no y-axis label or title	not known what is being measured
y-axis doesn't have appropriate range	misleading comparison
inconsistent decimal places	distracting, unprofessional
"Series1"	confusing because it is meaningless



## Effect of Noise on Recall

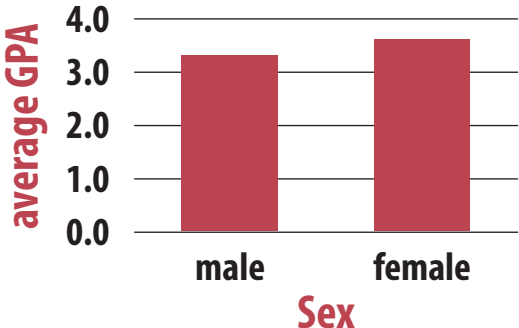
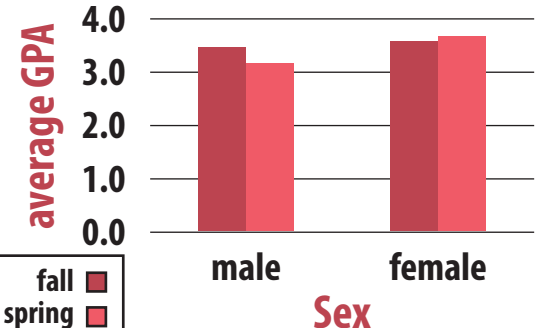
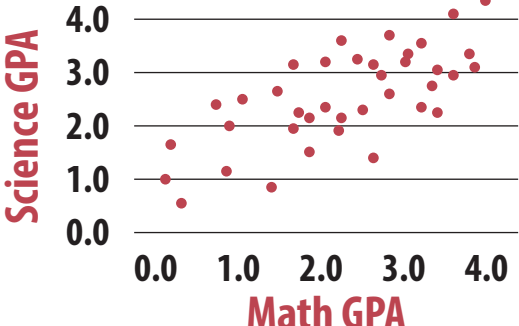
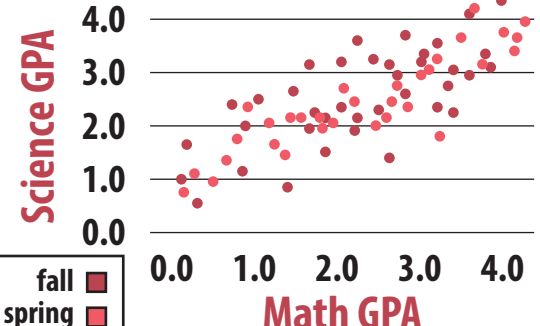
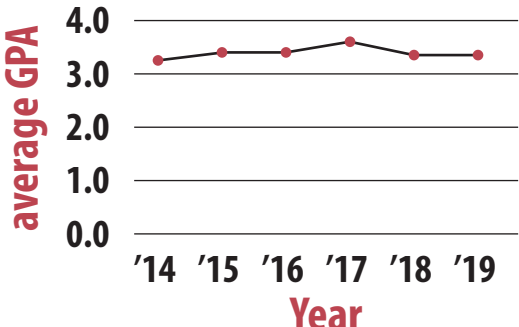
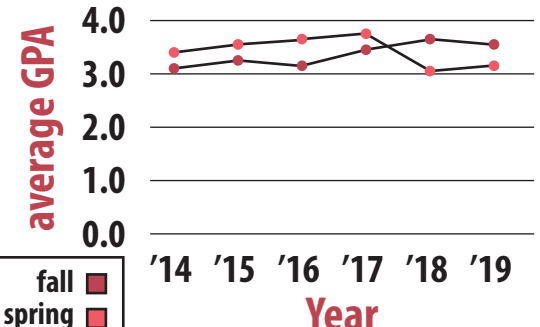


# Types of Graphs

Graph	Description	Purpose	When to use
<b>Bar Graph</b>	one bar for each category	to compare averages, totals, or frequencies of categories	The independent variable is categorical, such as car brand.
<b>Scatter Plot</b>	one dot for each data point	to show the correlation between two numerical variables	Each participant provides two numerical values, such as height and weight.
<b>Time Series Plot</b>	one dot for each point in time, connected with line segments	to show a trend over time	The independent variable is time on a timeline, such as year, and the dependent variable is numerical, such as rainfall.

When there are two independent variables, one can be established on the  $x$ -axis normally and the second can be established by different colors labeled in a legend.

# Graph Examples

Graph	One independent variable	Two independent variables
<h2>Bar Graph</h2>	 <p>average GPA</p> <p>male female</p> <p>Sex</p>	 <p>average GPA</p> <p>male female</p> <p>Sex</p> <p>fall spring</p>
<h2>Scatter Plot</h2>	 <p>Science GPA</p> <p>Math GPA</p>	 <p>Science GPA</p> <p>Math GPA</p> <p>fall spring</p>
<h2>Time Series Plot</h2>	 <p>average GPA</p> <p>'14 '15 '16 '17 '18 '19</p> <p>Year</p>	 <p>average GPA</p> <p>'14 '15 '16 '17 '18 '19</p> <p>Year</p> <p>fall spring</p>

# Histograms and Distributions

A discrete **distribution** states each possible category and how common it is.

A **histogram** is a type of bar graph in which the x-axis is a numerical scale and the y-axis shows the **frequency** (quantity) or **relative frequency** (proportion) of data in each category.

Distribution	Description	Histogram Example
<b>Uniform</b>	Each category is equally common.	<p><b>6-Sided Die Rolls</b></p>
<b>Bimodal</b>	The two most common categories are not next to each other.	<p><b>Starbucks Drink Prices</b></p>
<b>Approximately Normal</b>	The distribution is approximately mound-shaped and symmetrical.	<p><b>Scores on Physics Test</b></p>
<b>Skewed</b>	The distribution has one or a few data far out on one specific side.	<p><b>Home Prices (\$100,000s)</b></p>