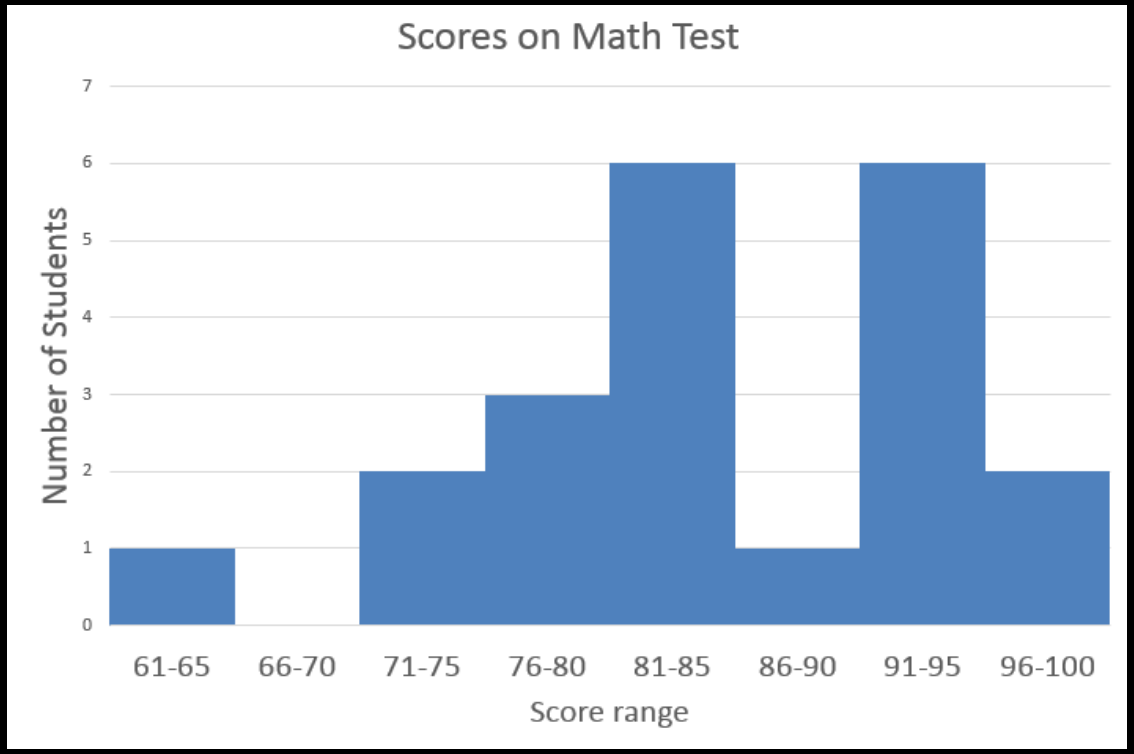
Making Histograms



Resources for
Excel and Google Sheets

Definitions

- A **frequency distribution** is a table that displays the **frequency** of various outcomes in a sample
- A **histogram** is a graph of a frequency distribution.

You need this language if you are looking at Excel help or most online resources around histograms.

Histograms and the Language of Statistics

Bins	Frequency
61-65	1
66-70	0
71-75	2
76-80	3
81-85	6
86-90	1
91-95	6
96-100	2

"Frequency distribution"

Key Points About Histograms

- They show you how data are distributed
- They rely on “binned” data
- Histogram bars touch each other: In bar graphs, bars are separated.

How to Make a Histogram

General approach, whether using Excel or Google Sheets:

1. Make a frequency table
2. Use the bar graph function to create the histogram

Step 1

Make a Frequency Table

Making a Frequency Table in Excel

- Two ways using Excel functions:
  - COUNTIFS
  - FREQUENCY
- You can also make the table directly using the "Histogram tool of the Data Analysis" add-in (found under the DATA tab).

Different Excel Approaches

Pros and Cons

Approach	Pros	Cons
COUNTIFS	• Intuitive • Frequency table updates as data change (*if* they ever change)	Requires fiddly editing of formulas
FREQUENCY function	• Quick and efficient to set up • Table updates as data change	Requires unfamiliar keystroke combinations because it is a so-called array formula
Data Analysis add-in	Quick and efficient to use	• Table is static: Once created, it does not change if the underlying data do. • Requires that the Data Analysis add-in be installed

Making a Frequency Table in Google Sheets

- Use the COUNTIF function

Step 2

Make the Graph

Making the Graph

- This is for Excel, but the same steps apply in Google Sheets
- Excel does not have a histogram chart type! Therefore,…
- We will make a column chart do the job.

Follow me…

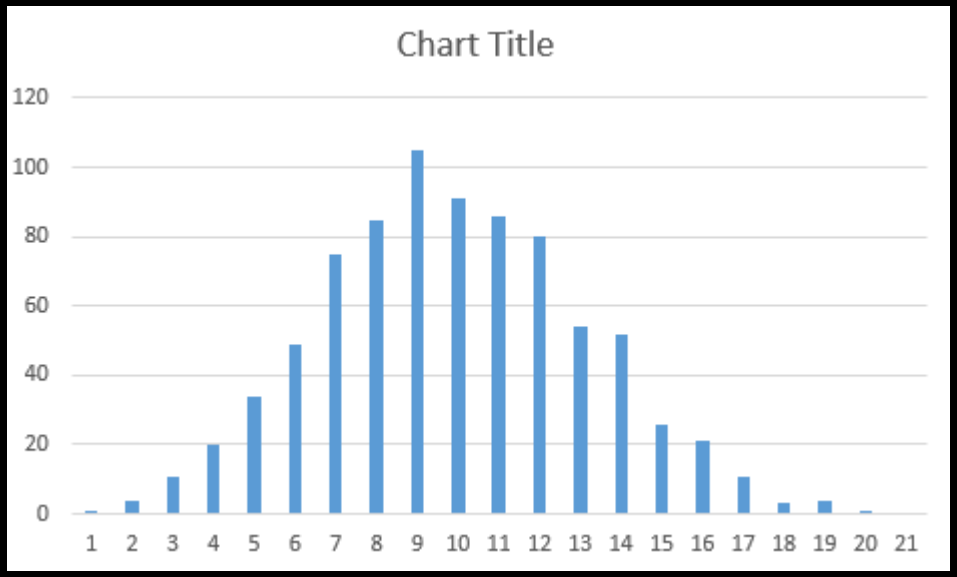
Frequency Table Used for this Example

Bins	Rdg13
400	1
405	4
410	11
415	20
420	34
425	49
430	75
435	85
440	105
445	91
450	86
455	80
460	54
465	52
470	26
475	21
480	11
485	3
490	4
495	1
500	0

Create the Column Chart

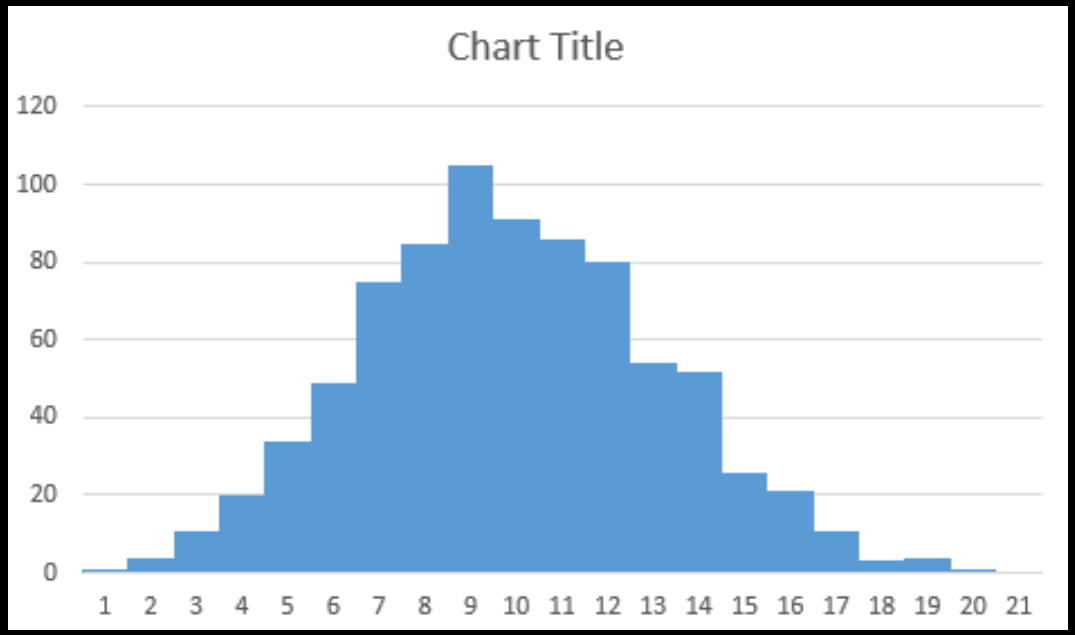
1. Select the desired column in the frequency chart.
2. Insert a column chart using the INSERT ribbon.

Yields the following:



Adjust the Bar Widths

1. Right-click in one of the columns and select *Format Data Series.*
2. Under *Series Options,* change the *series overlap* and *gap width* to zero.

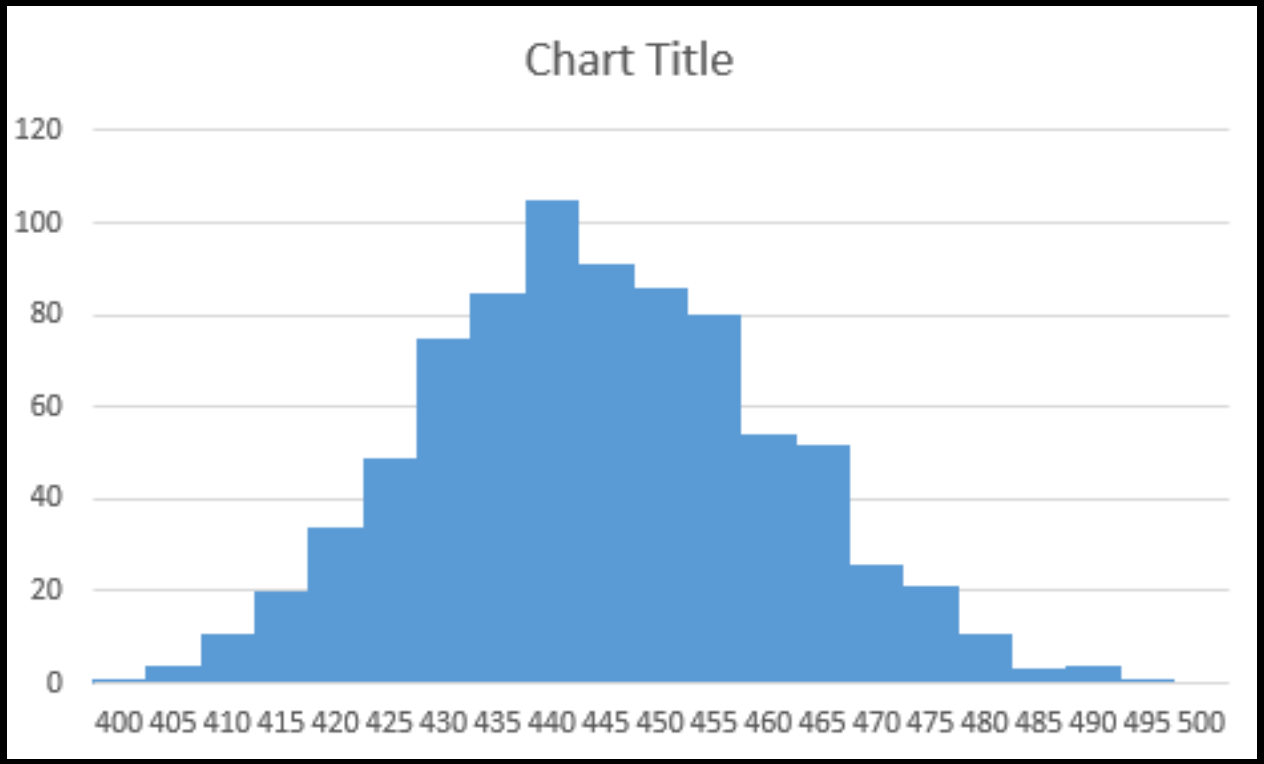


Add the Bin Labels

1. Click inside the chart area (but not on a bar) and select *Select data.*
2. Click *Edit* under *Horizontal (Category) Axis Labels.*
3. Select the range of cells holding the bin labels.
4. Click OK to get out of that screen.

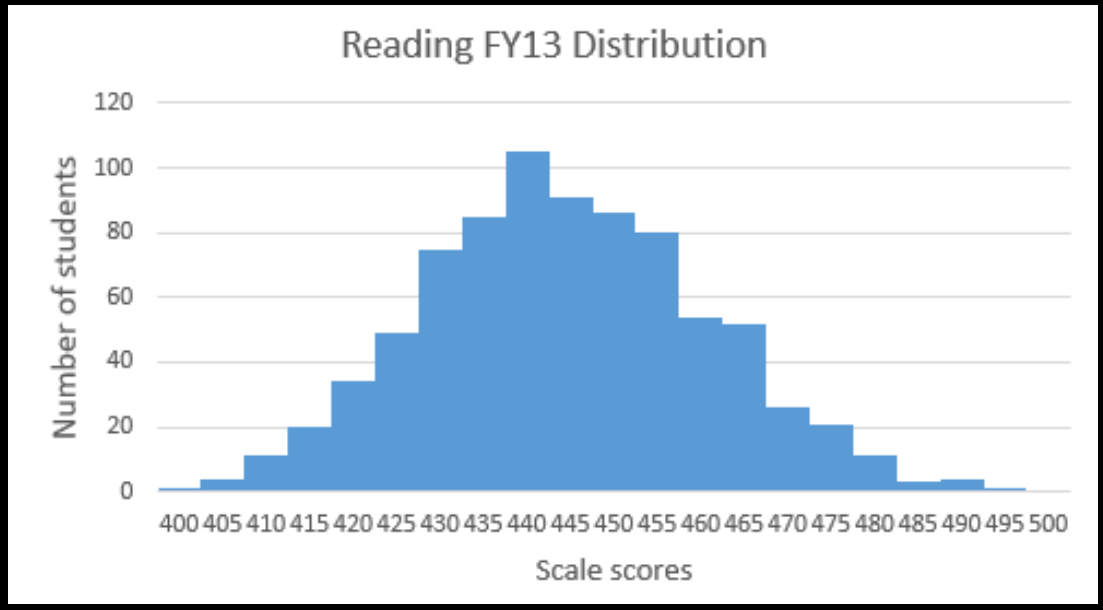
The graph now looks as follows:

Result of Prior Page's Steps



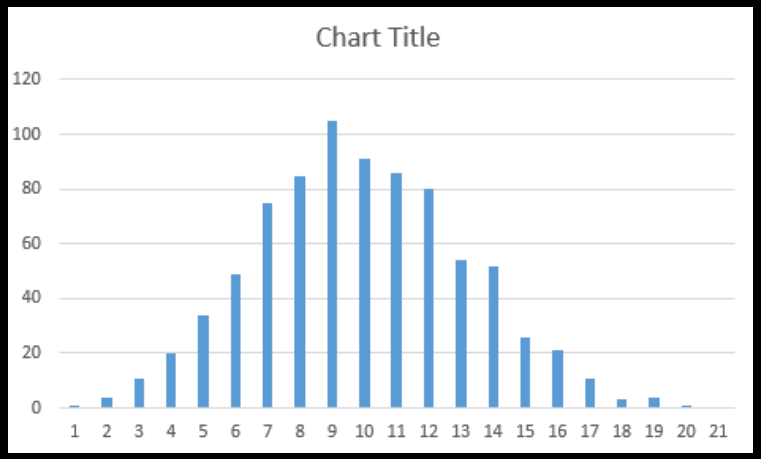
Finishing Touches

- ✓ Add horizontal and vertical axis titles
- ✓ Add a descriptive chart title
- ✓ Adjust the font size for each of the elements.
- ✓ Consider adding data labels so the counts appear atop each column
- ✓ Adjust length and width of the chart as necessary

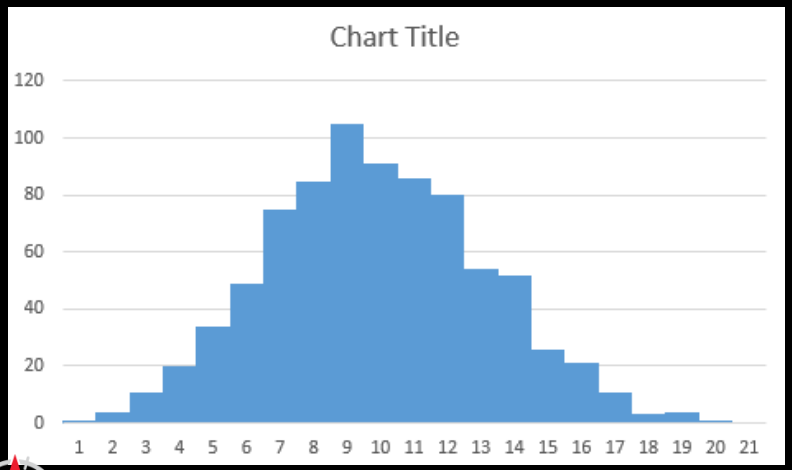


Evolution of a Graph

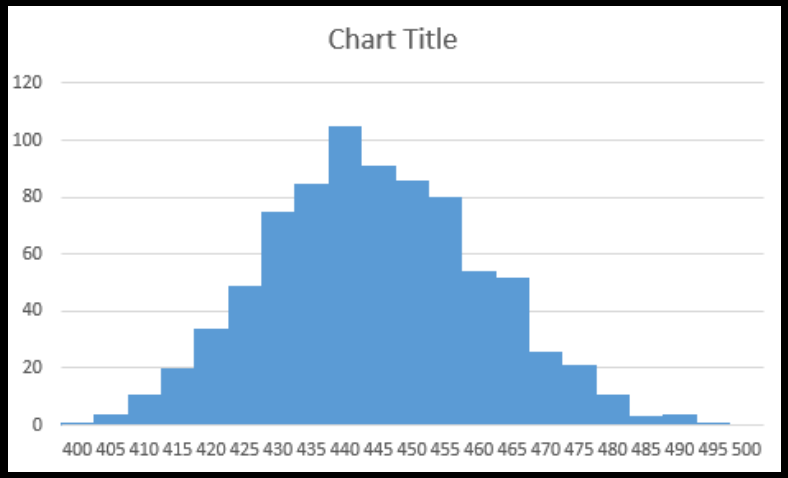
1. Starting here…



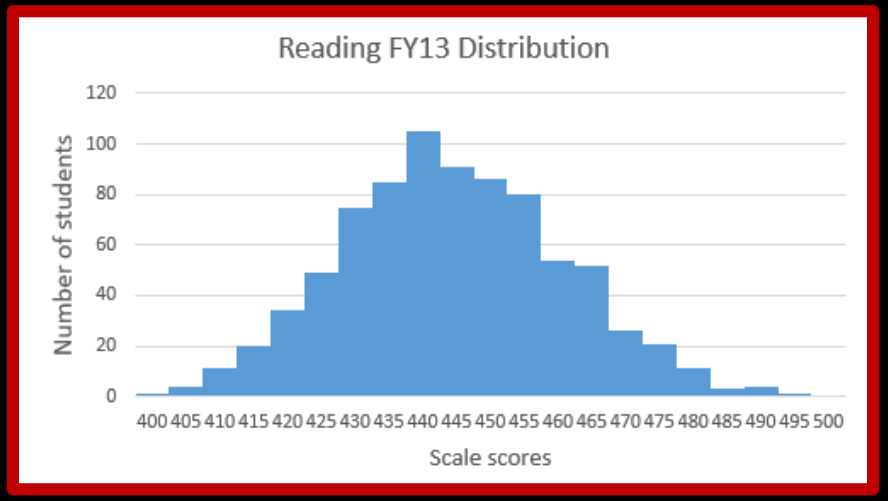
2. Set bar widths…



3. Set Axes…



4. Add Labels.



Web Sources for Further Info

Software	Approach	URL
Excel	Frequency table using COUNTIFS (available in Excel 2007 and later)	www.tinyurl.com/DBC-hist-COUNTIFS (see 1 below)
	Frequency table using FREQUENCY function	www.tinyurl.com/DBT-hist-Frequency (see 2 below)
	Histogram addin	
Google Sheets	Frequency table using COUNTIF	www.tinyurl.com/DBC-hist-google

1: The page at this link describes the FREQUENCY function as well, but I particularly like the COUNTIFS description.

2: The page at this link also describes COUNTIFS and three other completely different ways to do frequency tables.