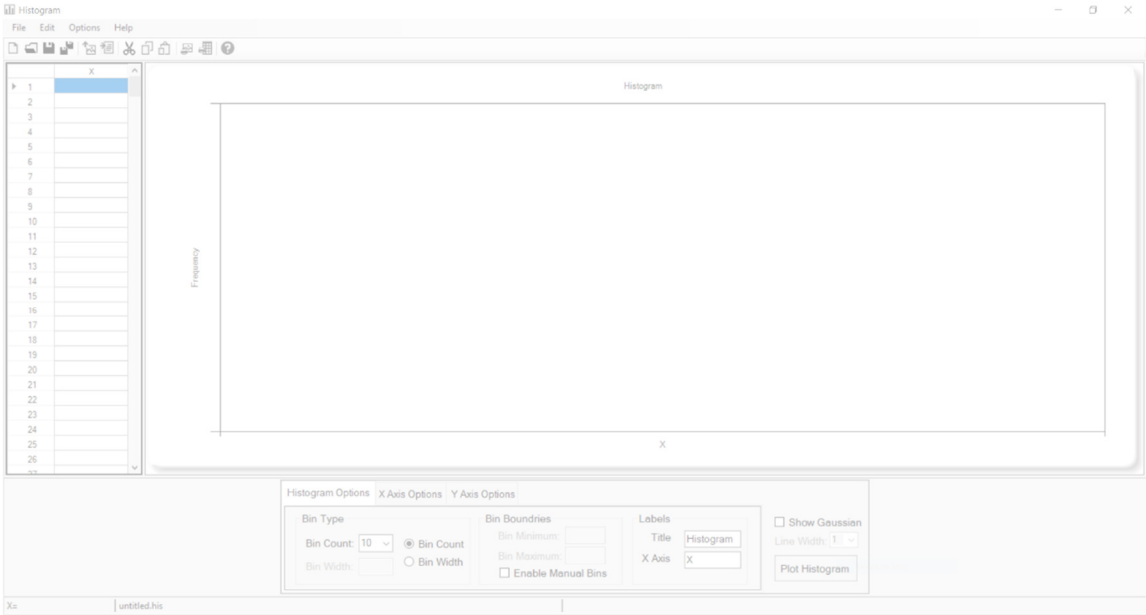


Histogram

v. 2.0.6.0

User Guide



Introduction and Basic Usage

To create a histogram, type data in the data column and click the **Plot Histogram** button. The sample size, average and standard deviation are also calculated and displayed to the user.

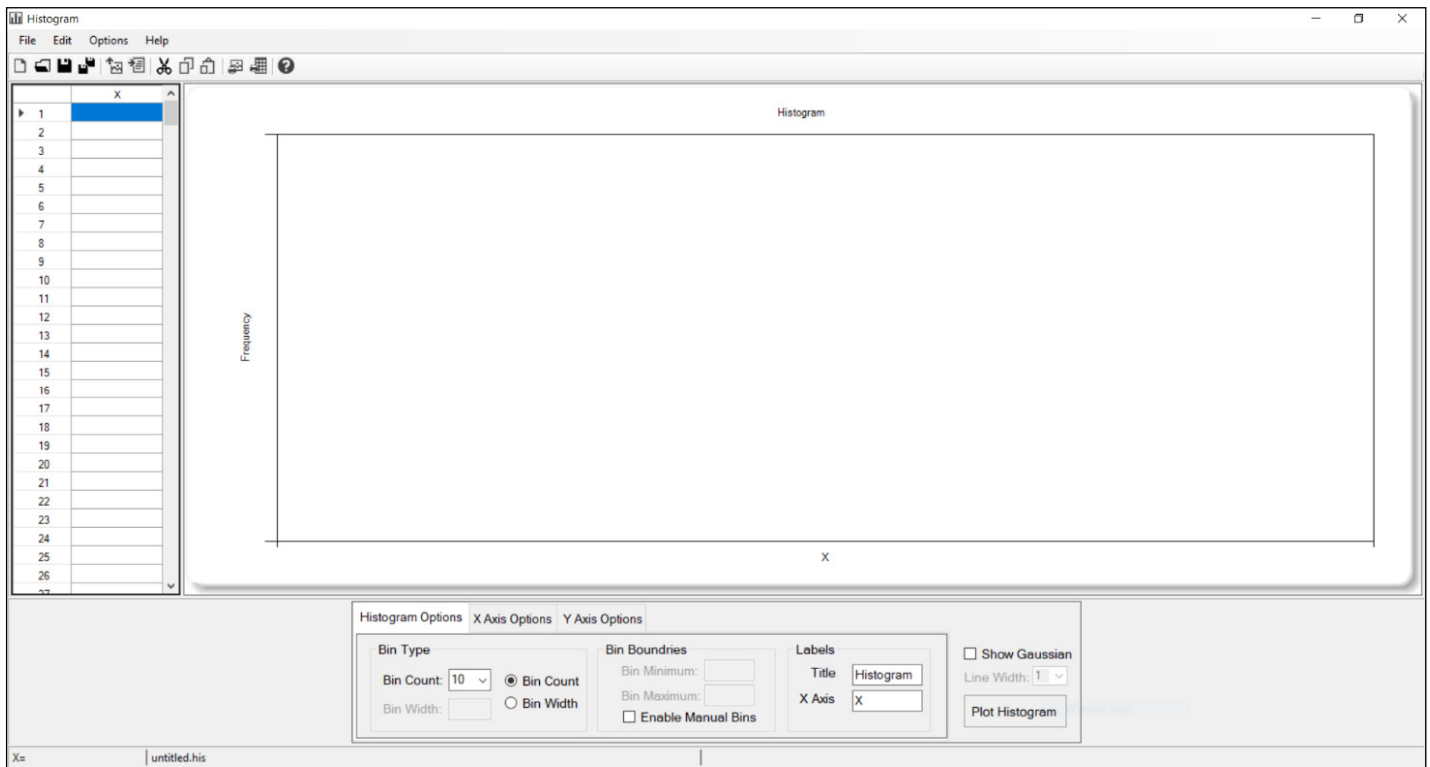


Figure 1: Screen shot of Histogram before any data has been entered.

Figure 2 shows an example histogram of grades using the default setting of 10 bins.

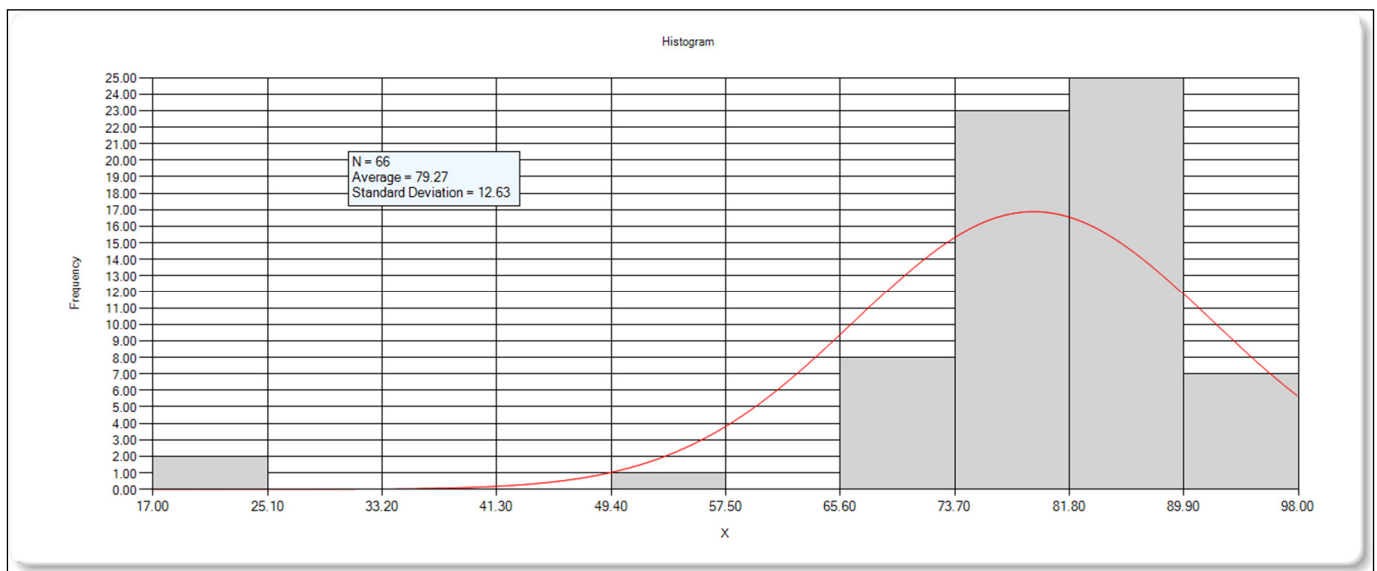


Figure 2: Sample grade data binned into ten bins with the normalized Gaussian distribution shown. Note the sample size, average and standard deviation are displayed.

Options

Most of the available options in Histogram are self-explanatory: save, print, cut, copy, paste, etc. However, a few of the options are worth explaining.

Histogram Options

The **Histogram Options** tab (see Figure 3) allows the user to select the **Bin Type**: Bin Count or Bin Width. Optionally, the minimum and maximum bin boundaries can be specified.

Figure 3: Histogram Options

1. **Bin Count** – If the bin count (bc) is specified by the user (the default is 10 bins), then the bin width (bw) is calculated using either:

- a. If **Bin Boundaries** are disabled (the default). To keep the minimum and maximum data values from falling exactly on the boundary minimum and maximum respectively, the following procedure is used –

- i. An initial bin width is calculated using $bw = (x_{\max} - x_{\min}) / bc$ where x_{\max} and x_{\min} are the maximum and minimum data values.
- ii. The boundary minimum is then set to: $\text{boundaryMin} = x_{\min} - bw/2$.
- iii. Finally, a new bin width is calculated to span the range $[x_{\min} - bw/2, x_{\max} + bw/2]$ in the user-supplied number of bins. That is, $bwNew = \frac{((x_{\max} + bw/2) - (x_{\min} - bw/2))}{bc}$, which simplifies to $bwNew = bw \cdot \left(1.0 + \frac{1.0}{bc}\right)$. As a result, $\text{boundaryMax} = x_{\max} + bw/2$.

- b. If **Bin Boundaries** are enabled – $bw = (bin_{\max} - bin_{\min}) / bc$ where bin_{\max} and bin_{\min} are the maximum and minimum bin boundary values specified by the user.

2. **Bin Width** – If the bin width (bw) is specified by the user, then the bin count (bc) is calculated using either:

a. If **Bin Boundaries** are disabled (the default) –

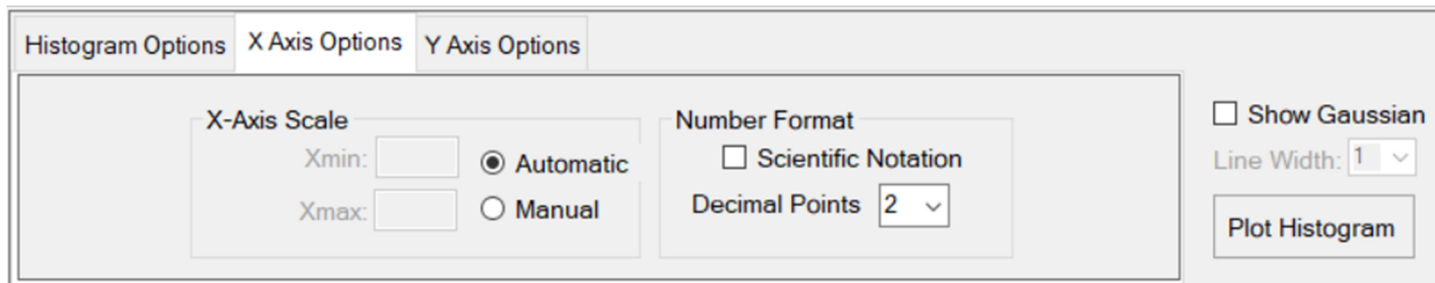
i. $\boxed{\text{boundaryMin} = x_{\min} - \text{bw}/2}$

ii. $\boxed{\text{bc} = \left\lceil (x_{\max} - x_{\min} + \text{bw}) / \text{bw} \right\rceil}$ where x_{\max} and x_{\min} are the maximum and minimum data values, and the $\lceil \rceil$ symbol indicates that the result is rounded up to the next integer value to make sure there are enough bins to cover the entire range of data. As in 1a) above, the range is set to $\left[x_{\min} - \text{bw}/2, x_{\max} + \text{bw}/2 \right]$ so as to have a bin for every data point.

b. If **Bin Boundaries** are enabled – $\text{bc} = \left\lceil (\text{bin}_{\max} - \text{bin}_{\min}) / \text{bw} \right\rceil$ where bin_{\max} and bin_{\min} are the maximum and minimum bin boundary values and the $\lceil \rceil$ symbol indicates that the result is rounded up to the next integer value to make sure there are enough bins to cover the entire range of data.

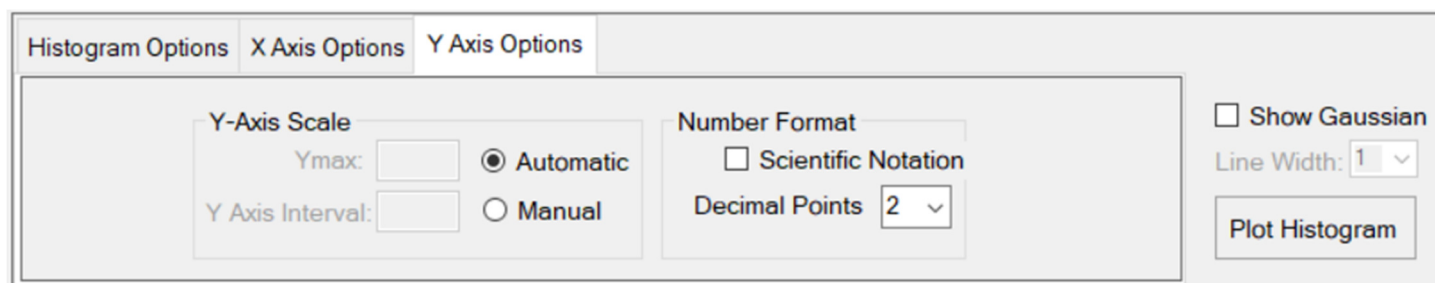
X and Y Axis Options

The options on the X Axis Options and Y Axis Options tabs are self-explanatory as seen in Figure 4 and Figure 5 shown below.



The screenshot shows the 'X Axis Options' tab selected. It contains two main sections: 'X-Axis Scale' and 'Number Format'. The 'X-Axis Scale' section has input fields for 'Xmin:' and 'Xmax:', with radio buttons for 'Automatic' (selected) and 'Manual'. The 'Number Format' section has a checkbox for 'Scientific Notation' (unchecked) and a 'Decimal Points' dropdown menu set to '2'. To the right, there is a checkbox for 'Show Gaussian' (unchecked), a 'Line Width' dropdown set to '1', and a 'Plot Histogram' button.

Figure 4: X axis options.



The screenshot shows the 'Y Axis Options' tab selected. It contains two main sections: 'Y-Axis Scale' and 'Number Format'. The 'Y-Axis Scale' section has input fields for 'Ymax:' and 'Y Axis Interval:', with radio buttons for 'Automatic' (selected) and 'Manual'. The 'Number Format' section has a checkbox for 'Scientific Notation' (unchecked) and a 'Decimal Points' dropdown menu set to '2'. To the right, there is a checkbox for 'Show Gaussian' (unchecked), a 'Line Width' dropdown set to '1', and a 'Plot Histogram' button.

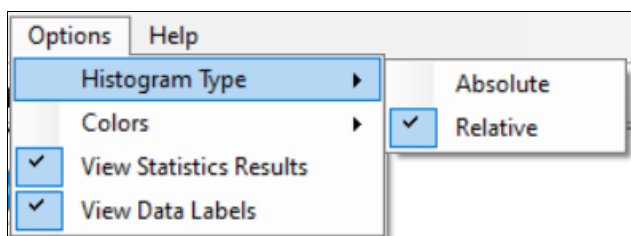
Figure 5: Y axis Options.

Show Gaussian

The Show Gaussian checkbox just above the Plot Histogram button will add a Gaussian plot using the average and standard deviation of the data normalized to the total histogram area.

Miscellaneous Options

A few other miscellaneous options are available in the file menu as shown in Figure 6 below.



The screenshot shows the 'Options' menu open. It lists several options: 'Histogram Type' (with a submenu arrow), 'Colors' (with a submenu arrow), 'View Statistics Results' (checked), and 'View Data Labels' (checked). The 'Histogram Type' submenu is open, showing 'Absolute' and 'Relative' (checked) options.

Figure 6: Miscellaneous options.

Example Histogram

Figure 7 below shows an example histogram of the final grades of 66 students. The average final grade was a 79.3 with approximately 10.6% received an A, 48.5% a B, and 34.8% a C.

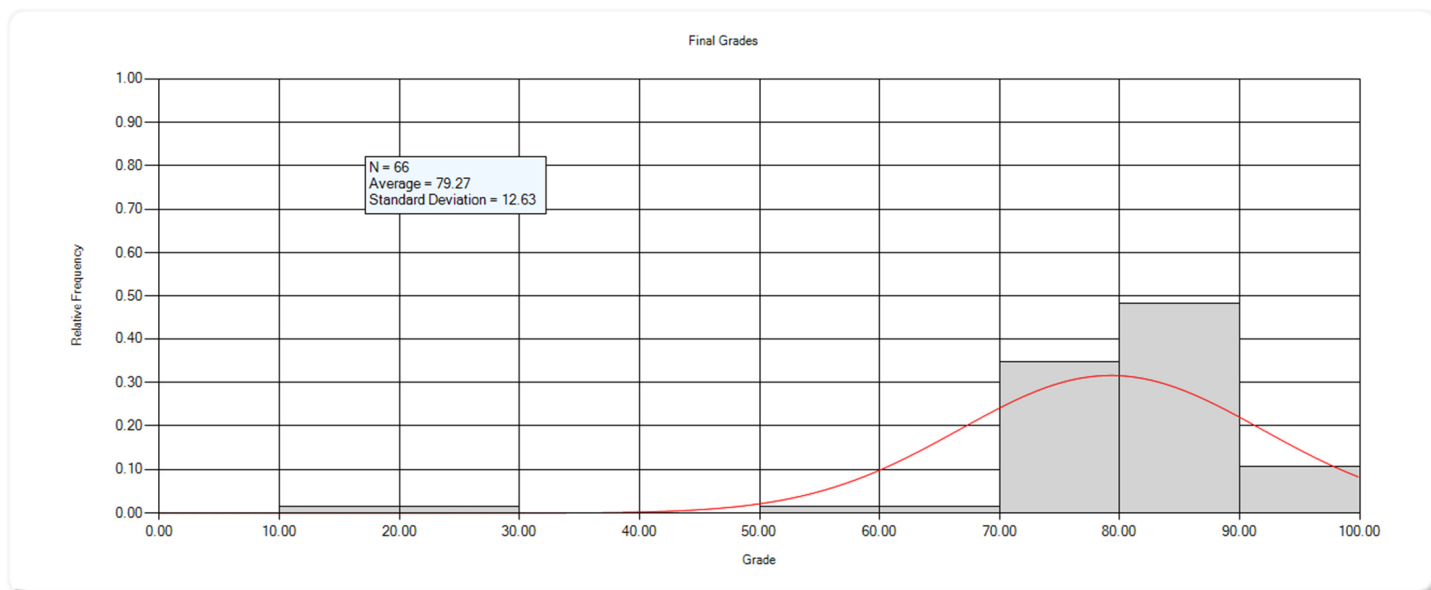


Figure 7: Example histogram showing grade distribution.

To obtain the example relative histogram shown in Figure 7, the bin width was set to 10, the boundary minimum to 0, and the boundary maximum to 100 (see Figure 8). This is particularly useful for looking at a distribution of grades.

Figure 8 shows the histogram option settings used for generating the example histogram in Figure 7. The settings are displayed in a dialog box with three tabs: Histogram Options, X Axis Options, and Y Axis Options. The Histogram Options tab is active, showing settings for Bin Type, Bin Boundaries, Labels, and a checkbox for Show Gaussian.

Bin Type	Bin Boundaries	Labels	Other Options
Bin Count: 10 Bin Width: 10	Bin Minimum: 0 Bin Maximum: 100 <input checked="" type="checkbox"/> Enable Manual Bins	Title: Final Grade X Axis: Grade	<input checked="" type="checkbox"/> Show Gaussian Line Width: 1 Plot Histogram

Figure 8: Histogram option settings used for generating the example histogram in Figure 7.