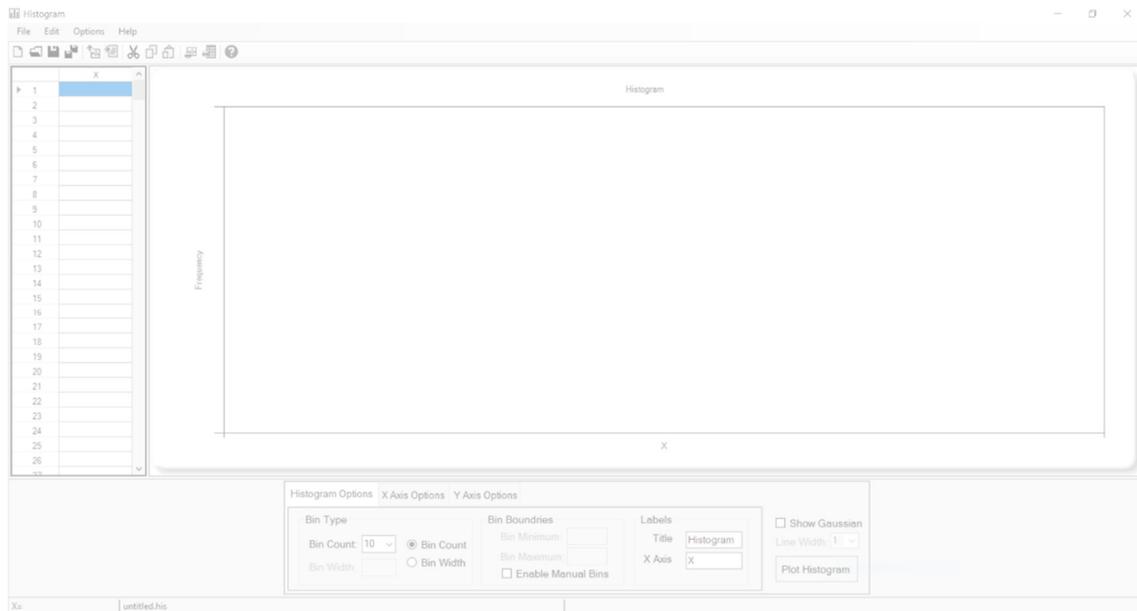


# Histogram

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.

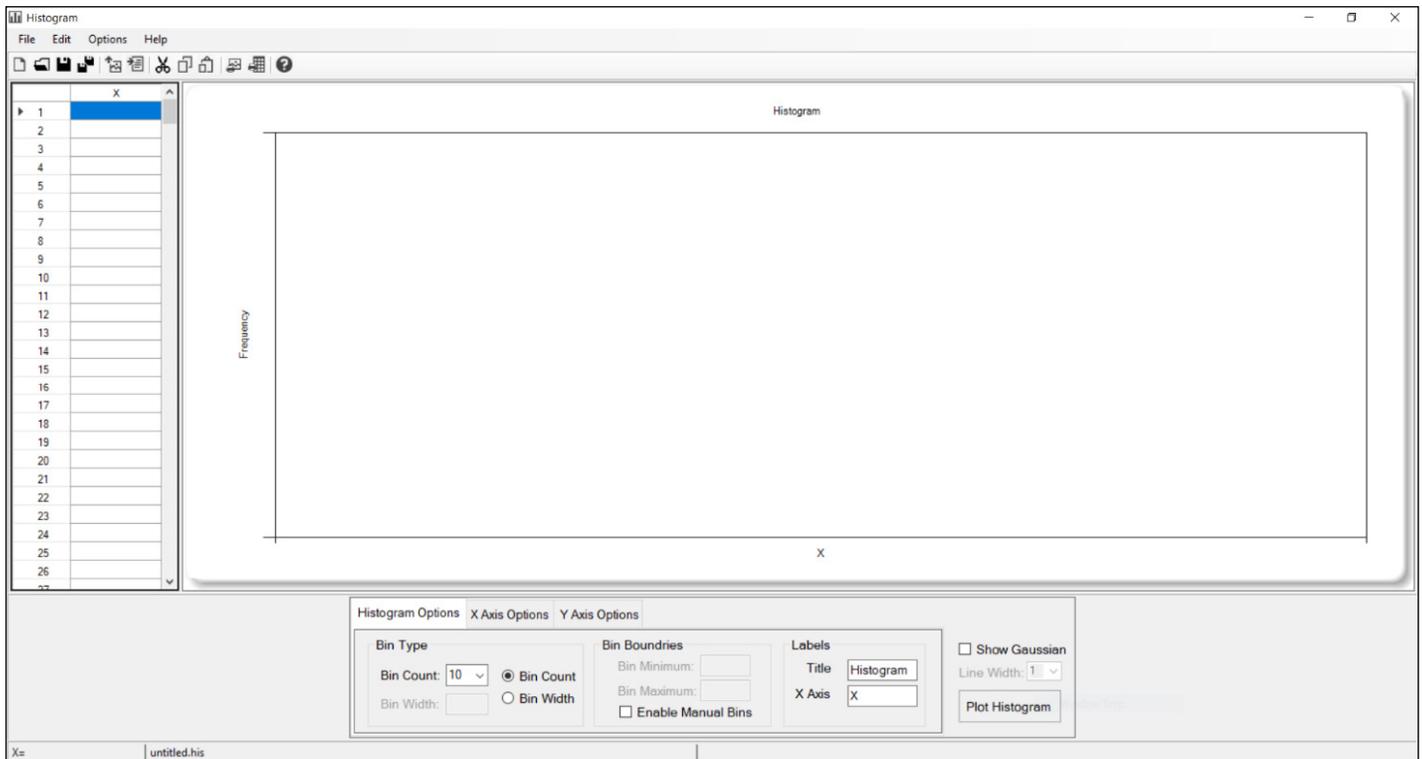


Figure 1: Screen shot of Histogram before any data has been entered.

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

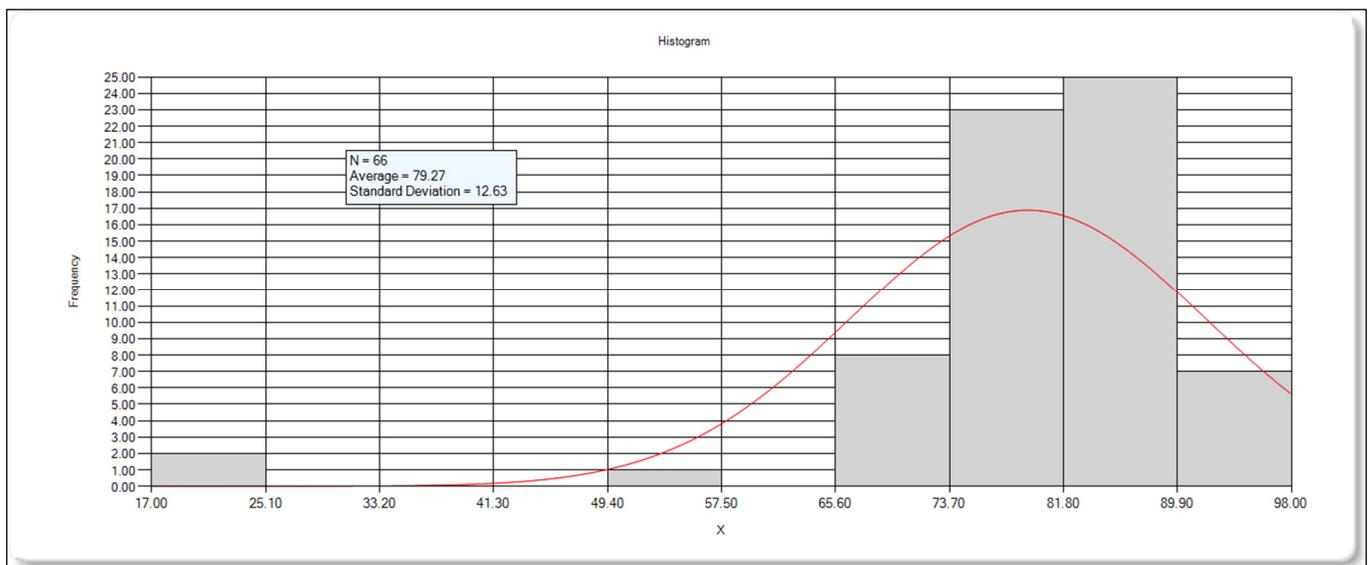


Figure 2: Sample grade data binned into ten bins with the normalized Gaussian distribution shown. Note the sample size, average and standard deviation are displayed.

# 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  $bw = \frac{(x_{\max} - x_{\min})}{bc}$  where  $x_{\max}$  and  $x_{\min}$  are the maximum and minimum data values.
- ii. The boundary minimum is then set to:  $boundaryMin = x_{\min} - \frac{bw}{2}$ .
- iii. Finally, a new bin width is calculated to span the range  $[x_{\min} - \frac{bw}{2}, x_{\max} + \frac{bw}{2}]$  in the user-supplied number of bins. That is,  $bwNew = \frac{((x_{\max} + \frac{bw}{2}) - (x_{\min} - \frac{bw}{2}))}{bc}$ , which

simplifies to  $bwNew = bw \cdot \left(1.0 + \frac{1.0}{bc}\right)$ . As a result,  $boundaryMax = x_{\max} + \frac{bw}{2}$ .

b. If **Bin Boundaries** are enabled –  $bw = \frac{(bin_{\max} - bin_{\min})}{bc}$  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.  $\boxed{\text{bc} = \left\lceil \frac{(x_{\max} - x_{\min} + \text{bw})}{\text{bw}} \right\rceil}$  where  $x_{\max}$  and  $x_{\min}$  are the maximum and minimum data

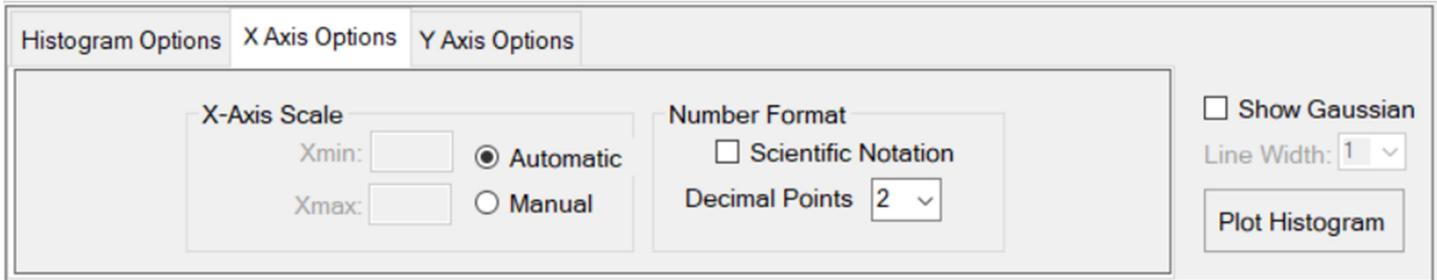
values, and the  $\lceil \rceil$  symbol indicates that the result is rounded up to the next integer value to make sure there are enough bins to cover the entire range of data. As in 1a)

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 –  $\text{bc} = \left\lceil \frac{(\text{bin}_{\max} - \text{bin}_{\min})}{\text{bw}} \right\rceil$  where  $\text{bin}_{\max}$  and  $\text{bin}_{\min}$  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.

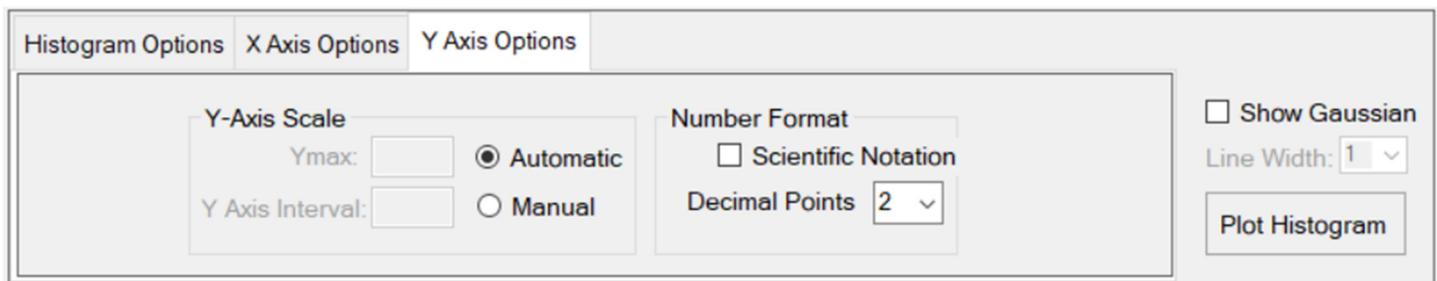
## *X and Y Axis Options*

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 dropdown for 'Decimal Points' set to '2'. On the right side, 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 dropdown for 'Decimal Points' set to '2'. On the right side, there is a checkbox for 'Show Gaussian' (unchecked), a 'Line Width:' dropdown set to '1', and a 'Plot Histogram' button.

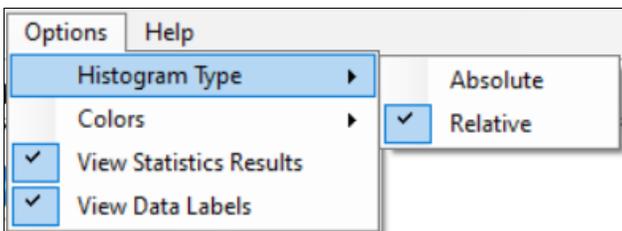
Figure 5: Y axis Options.

## *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. The 'Histogram Type' option is expanded, showing 'Absolute' and 'Relative' (checked). Other options in the menu include 'Colors', 'View Statistics Results' (checked), and 'View Data Labels' (checked).

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.

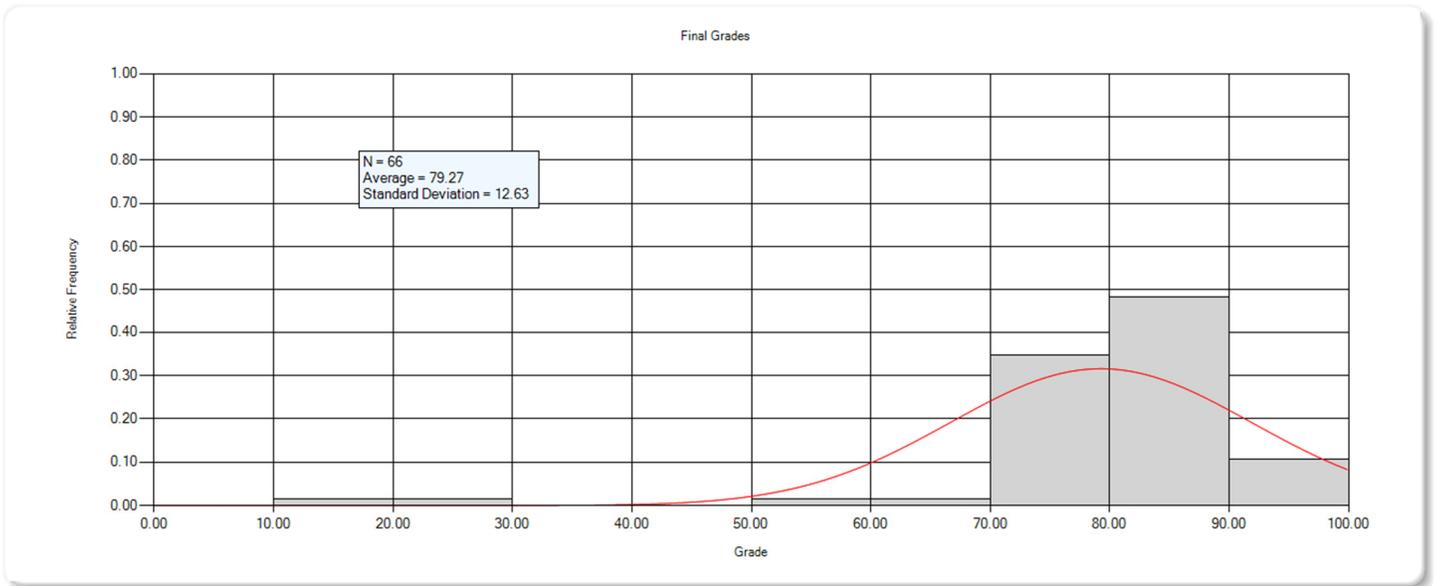


Figure 7: Example histogram showing grade distribution.

To obtain the example relative histogram show 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.

The screenshot shows the "Histogram Options" tab of a software interface. It contains several sections: "Bin Type" with "Bin Count" set to 10 and "Bin Width" selected; "Bin Boundaries" with "Bin Minimum" set to 0 and "Bin Maximum" set to 100, and "Enable Manual Bins" checked; "Labels" with "Title" set to "Final Grade" and "X Axis" set to "Grade"; and a "Show Gaussian" checkbox which is checked, with "Line Width" set to 1. A "Plot Histogram" button is located at the bottom right.

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