

Mathematics LBS 4

Spreadsheet Mathematics: Statistics and Graphing

Lab 8: Creating a Frequency Distribution and a Histogram



Microsoft Excel Logo and all screens captured by permission of Microsoft

Goal To use Excel to create a Frequency Distribution and a Histogram from a set of data.

Learning Outcomes After completing this section, the student should be able to

- take data from an Excel spreadsheet and group it into appropriate intervals
- create “bins” to define the intervals upper limits
- use the "Histogram" tool to obtain a “Frequency Table” of a set of data
- create a chart using the frequency table
- use “chart options” to construct and label a histogram or frequency polygon

Prior Learning Before attempting this unit it is expected that the student has

- completed Lab 1 of "Spreadsheet Math" and/or knows how to enter and format data in an Excel Spreadsheet
- completed the Statistics Module in LBS-5 Mathematics
- learned how to construct a frequency distribution and histogram by hand

Contents

- Review of Grouping Data into a Frequency Distribution
- Using Excel to Construct a Frequency Distribution
- Creating a Chart Using Excel's Chart Wizard
- Using the Chart Options to label and format your chart
- Bar Width
- A Frequency Polygon
- Hand - in Assignment

Spreadsheet Math

Lab 8: Creating a Frequency Distribution and Histogram

New Words: Histogram, Bin, Frequency Distribution, Chart

Grouping Data into a Frequency Distribution:

When working with large amounts of data it is often desirable to group the data into **intervals** and count how many pieces of data fall into each interval. This is called a **Frequency Distribution Table**. This frequency distribution can then be used to construct a **Histogram or Polygon** which will show which values occur most often.

Using Excel to construct a Frequency Distribution

1. Open the Excel Worksheet you saved from Lab 2. (the number of litres of gas used by each of the 45 cabs.) or re-enter this data on a new worksheet.

A large taxicab company has a fleet of 45 cabs. The following are the number of litres of gasoline each cab used last month.

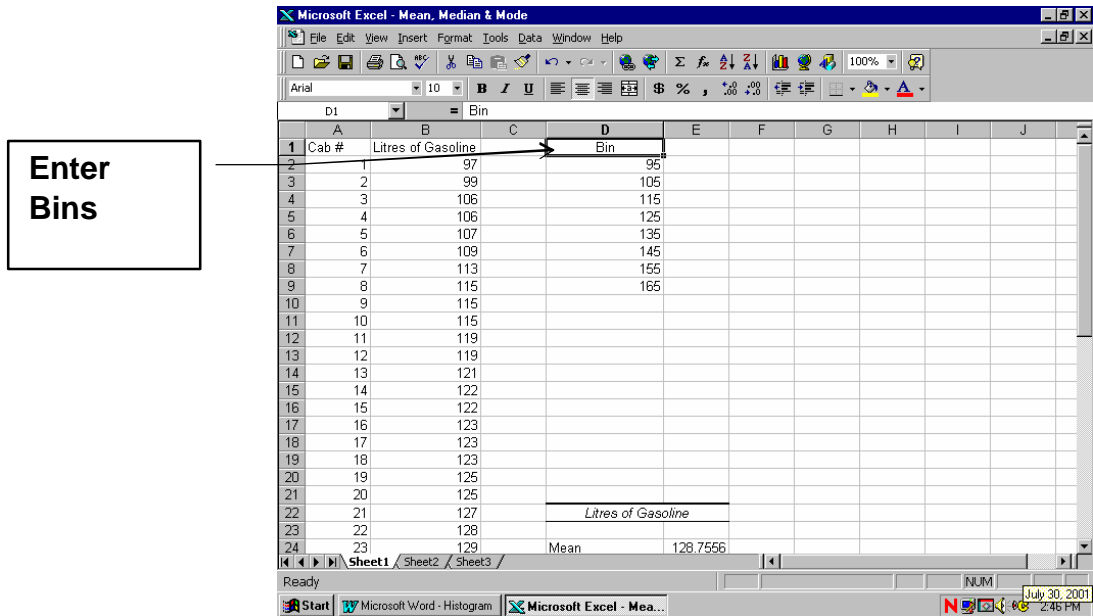
123	132	130	119	106	97	154	162	154	132	121	109
123	115	130	125	144	115	107	132	144	128	129	113
129	99	122	139	123	125	115	145	150	142	119	145
139	141	146	132	127	122	106	135	149			

2. Before you can construct a **frequency distribution** you must decide what your **intervals** will be. Generally it is desirable to have between 5 and 15 intervals of equal width. We must be sure to include all values from the smallest to largest piece of data.

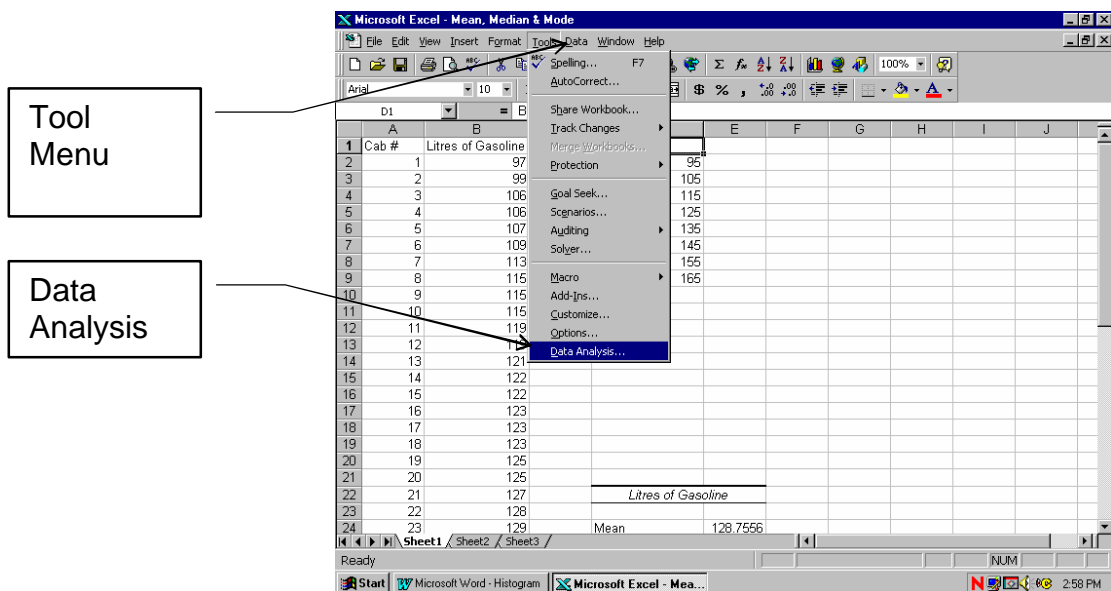
For the taxicab example the minimum value is 97 and the maximum is 162. A compact histogram could start the first interval at 95, use an interval width of 10, and finish the last interval at 165. This would require 7 intervals. Excel adds a empty interval at each end; at the low end is the interval "95 or less," and at the high end is an interval "more than 165".

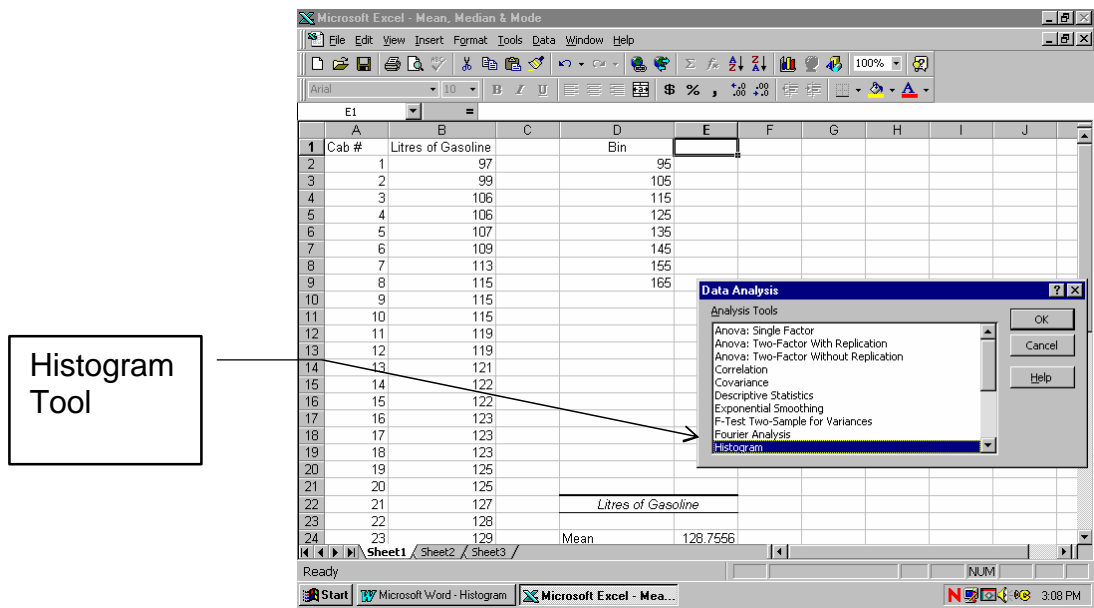
Excel refers to the maximum value for each interval as a **bin**. Here, the first bin is 95, and the first interval will contain all values that are 95 or less. The second bin is 105, and the second interval will contain all values between 96 and 105. The third bin is 115 and the third interval will contain all values between 106 and 115, etc.

- Enter **Bin** as a label in cell **D1**, enter 95 in cell **D2**, and enter 105 in cell **D3**, and 115 in cell **D4**. Continue entering bins to 165. See example below.

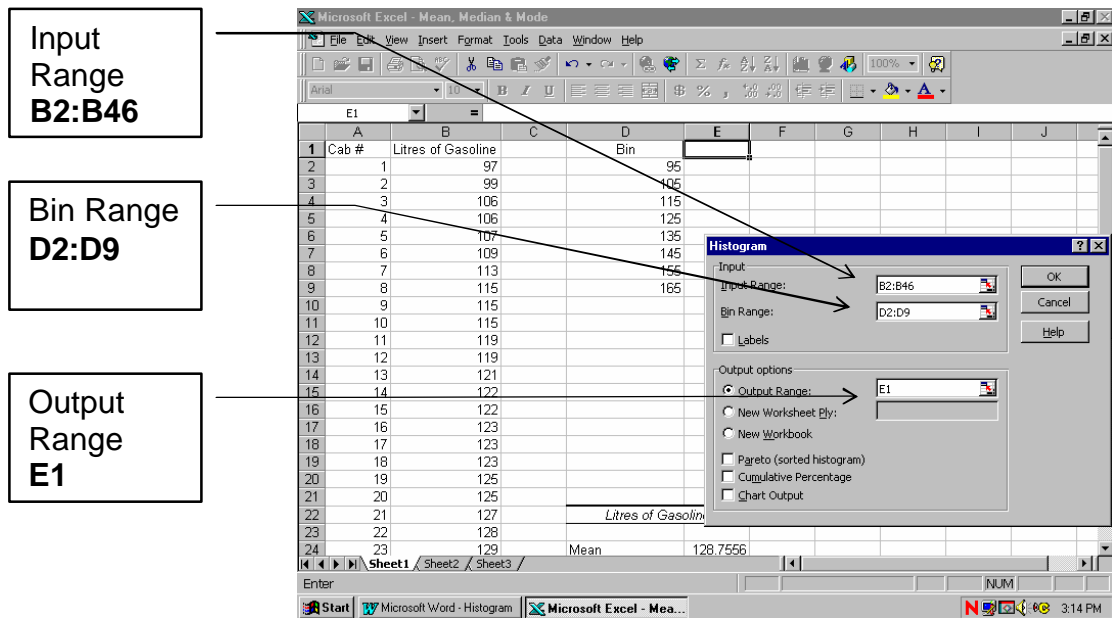


- From the Tool Menu, choose the Data Analysis command and choose Histogram from the list of Analysis Tools.





5. Histogram Dialog Box:



Input Range: Enter the range of cells containing all the data to be grouped (B2:B46)

Bin Range: Enter the range of cells containing the values that separate the intervals (D2:D9).

Output Range: Enter the reference for the upper-left cell of the range where you want the output table to appear (E1)

- Click OK to see the Frequency Table.

Frequency Table

Cab #	Litres of Gasoline	Bin	Frequency
1	97	95	0
2	99	105	2
3	106	115	8
4	106	125	10
5	107	135	11
6	109	145	8
7	113	155	5
8	115	165	1
9	115	More	0
10	115		
11	119		
12	119		
13	119		
14	121		
15	122		
16	122		
17	123		
18	123		
19	123		
20	125		
21	125		
22	127		
23	128		
24	129		

Mean: 128.7556

Create a Chart:

Excel's **Chart Wizard** will create several types of graphs and charts with your given data.

- Highlight the frequency table (E1:F9), and **Click on the Chart Wizard** button on the tool bar.

Chart Wizard

Select Column Type 1

Click Next

Chart Wizard - Step 1 of 4 - Chart Type

Standard Types: Column, Bar, Line, Pie, XY (Scatter), Area, Doughnut, Radar, Surface, Bubble, Stock

Chart sub-type: Clustered Column. Compares values across categories.

Buttons: Cancel, < Back, Next >, Finish

2. Select Column and the first sub-type
3. Click "Next" to see chart and Data Range which is already selected because you highlighted the frequency table . (E1:F10)

Data Range (E1:F10)

Click next

Bin	Frequency
95	0
105	2
115	8
125	10
135	11
145	8
155	5
165	1
More	0

4. Click next to see chart options.

Bin	Frequency
95	0
105	2
115	8
125	10
135	11
145	8
155	5
165	1
More	0

Chart Options

Select Legend Tab. Deselect the legend by clicking once on the **Show Legend Box**. This will make the legend box disappear and the chart will spread out.

Select Title Tab and fill in the title of your graph . We might call it “ Gas Used by Taxicabs in July”.

Label the x-axis as “Litres of Gas” and the y-axis as “Number of Cabs”

Legend Tab

Title Tab

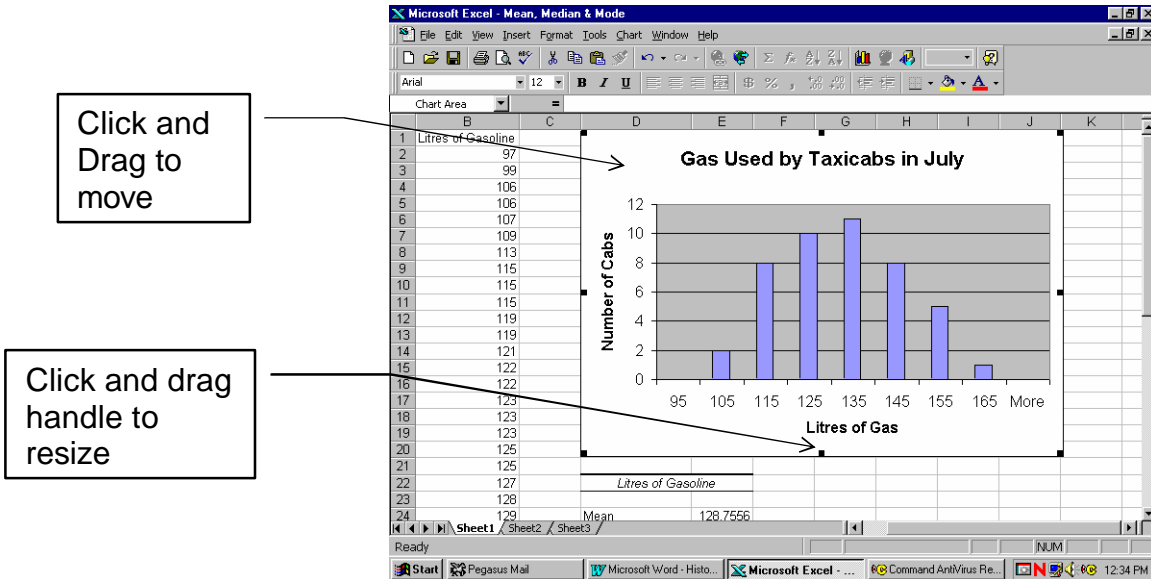
Click on Next

- Click on "next " and you will be asked whether you wish to place the chart as a new sheet. If you select this option you will see your chart on a page by itself. Or you may place your Chart as an object in your worksheet #1.

Print on a new sheet

Place on worksheet

6. Click on Finished to see your graph.

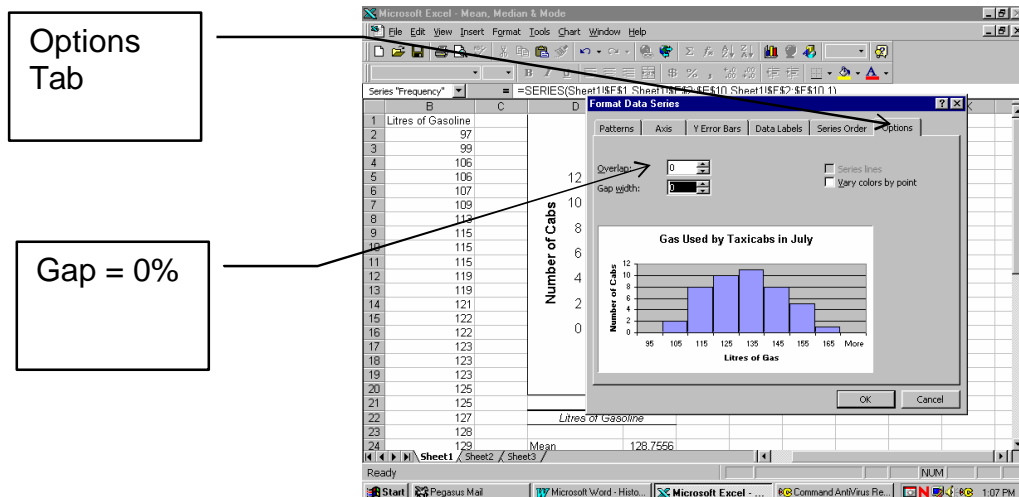


Format your Graph:

You may move the chart by clicking just inside the chart's outer border and dragging the chart to the desired location. To resize the chart, first click the chart area and then click and drag one of the eight handles.

Bar Width:

In the traditional histogram, the bars are adjacent to each other, not separated. **Double Click** on one of the bars; in the **Format Data Series** dialog box on the **options tab**, change the gap width from 150% to 0%. Click OK..



Construct a Frequency Polygon:

To change your histogram to a polygon, first, **right click** on the chart area, and select **chart type**.

Bin	Frequency
95	0
105	2
115	8
125	10
135	11
145	8
155	5
165	1
More	0

Right click on chart area

Select Chart type

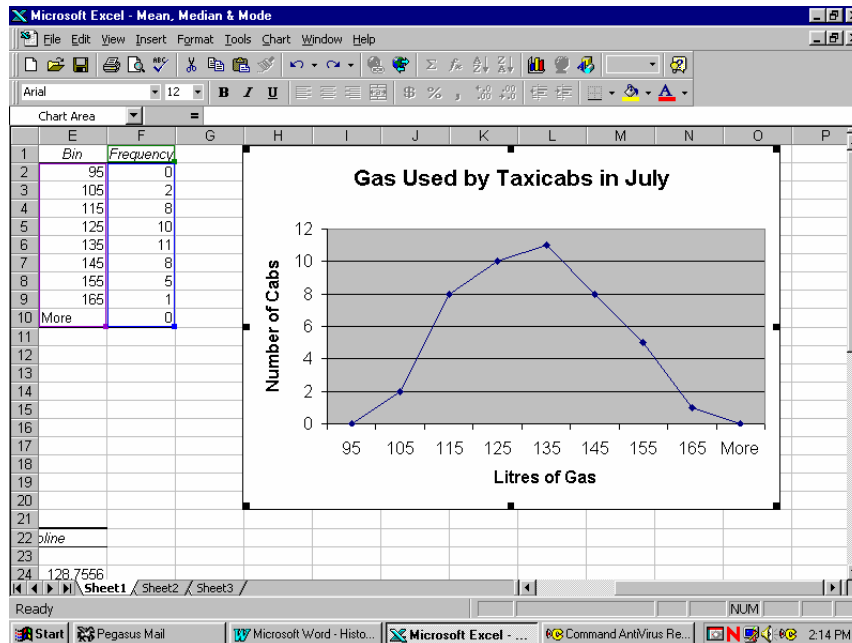
This time select the **Line Graph** sub-type 4 and click OK.

Select Line Type 4

Click OK

Your chart will change to a frequency polygon but will keep the same data and the same labels.

Frequency Distribution Polygon



Hand- in Exercise:

1. Construct a frequency distribution and histogram for the following selling prices of new cars sold in July at Auto King:

18,500	21,900	25,400	40,600
31,000	39,200	31,500	18,500
45,300	23,800	21,600	35,700
19,600	40,400	21,300	23,000
21,900	22,000	24,900	21,800

Use intervals \$5,000. Wide starting at \$15,000.

2. What is the average cost of a new car sold that month at Auto King.
3. What was the price range of greatest number of cars sold.
4. Print your worksheet showing your Frequency Table and raw data.
5. Hand in your worksheet and a histogram of sales for the month of July.