

Chapter 253

Pareto Charts

Introduction

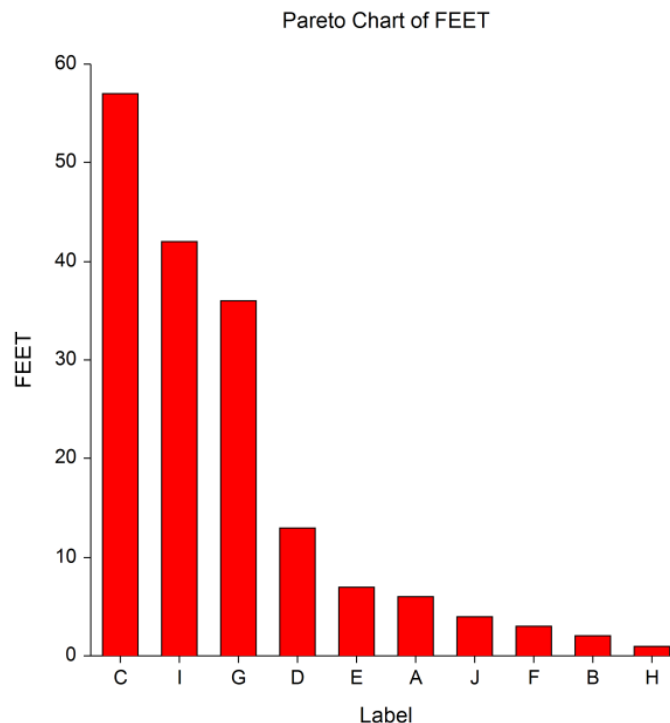
An Italian economist, Vilfredo Pareto (1848-1923), noticed a great inequality in the distribution of wealth. A few people owned most of the wealth. J. M. Juran found that this same phenomenon of the “vital few and the trivial many” applied to many areas of SPC. He is credited with coining the terms “Pareto chart” and “Pareto analysis” to represent this phenomenon.

In quality control, Pareto analysis refers to the tendency for the bulk of the quality problems to be due to a few of the possible sources. Hence, by isolating and correcting the major problem areas, you obtain the greatest increase in quality. The Pareto chart is a graphic display that emphasizes the Pareto principle using a bar graph in which the bars are arranged in decreasing magnitude.

NCSS provides two Pareto chart styles as well as a numerical report.

Pareto Charts

The following plot shows a Pareto chart depicting the number of defective board-feet (in 100's) from ten different mills. Notice that three mills account for almost 80% of the defective product. Obviously, efforts should be concentrated on correcting defects in these three mills.



Data Structure

The table below shows the data for the above Pareto chart. It gives the number of defective board-feet (in 100's) from ten different mills (labeled A - J). These data are contained on the QATest dataset.

QATest Dataset (Subset)

Label	Feet
A	6
B	2
C	57
D	13
E	7
F	3
G	36
H	1
I	42
J	4

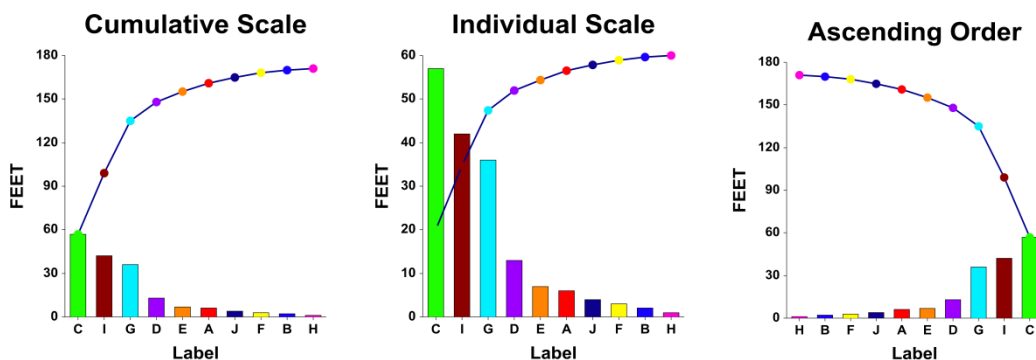
Pareto Chart Window Options

This section describes the specific options available on the Pareto Chart window, which is displayed when the Pareto Chart button is clicked. Common options, such as axes, labels, legends, and titles are documented in the Graphics Components chapter.

Pareto Chart Tab

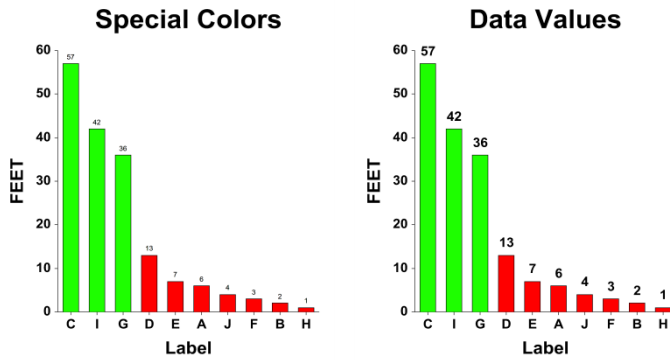
General Section

You can specify whether you want individual or cumulative scaling. You can also specify how you want the bars to be sorted.



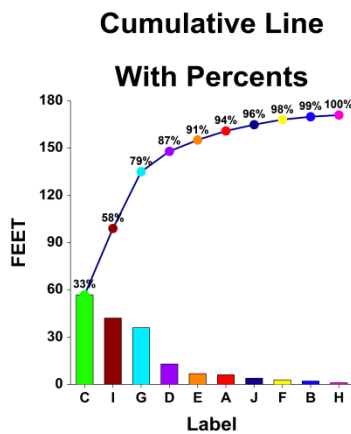
Bars Section

You can specify the format of the bars using the options in this section. You can add a connecting line and/or the data values to the plot.



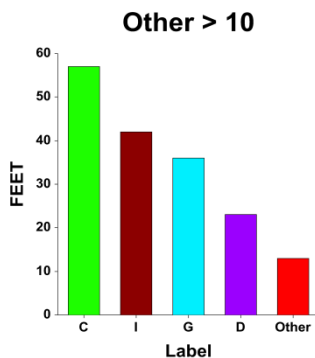
Cumulative Line Section

You can add specify the format of the cumulative line using the options in this section. You can add cumulative percentages above the symbols.



Other Category Section

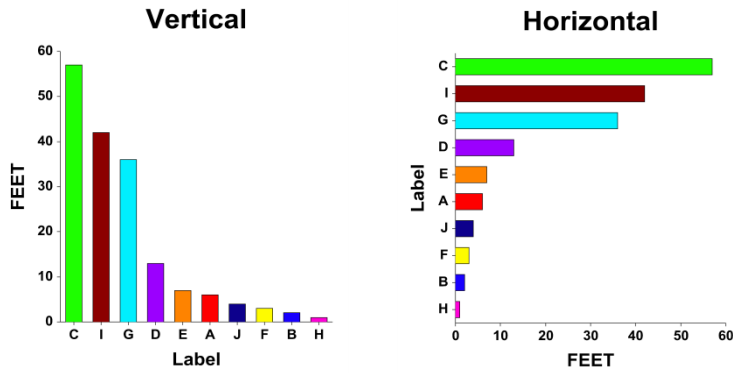
You can combine several low values into and Other category.



Layout Tab

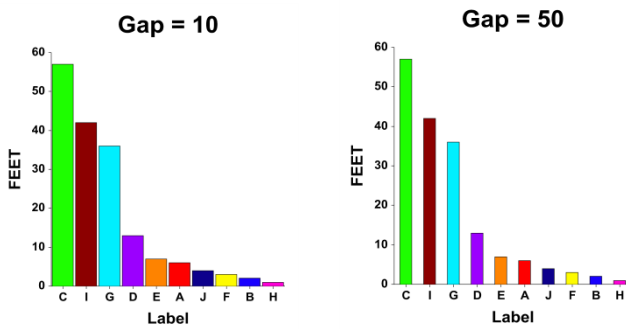
Orientation Section

You can orient the chart vertically or horizontally.



Object Spacing and Size Section

You can change the size of the gap between individual bars.



Titles, Legend, Numeric Axis, Group Axis, Grid Lines, and Background Tabs

Details on setting the options in these tabs are given in the Graphics Components chapter.

Example 1 – Creating a Pareto Chart

This section presents an example of how to generate a Pareto chart. The data used are shown in the table at the beginning of the chapter and are found in the QATest dataset.

Setup

To run this example, complete the following steps:

1 Open the QATest example dataset

- From the File menu of the NCSS Data window, select **Open Example Data**.
- Select **QATest** and click **OK**.

2 Specify the Pareto Charts procedure options

- Find and open the **Pareto Charts** procedure using the menus or the Procedure Navigator.
- The settings for this example are listed below and are stored in the **Example 1** settings file. To load these settings to the procedure window, click **Open Example Settings File** in the Help Center or File menu.

Variables Tab

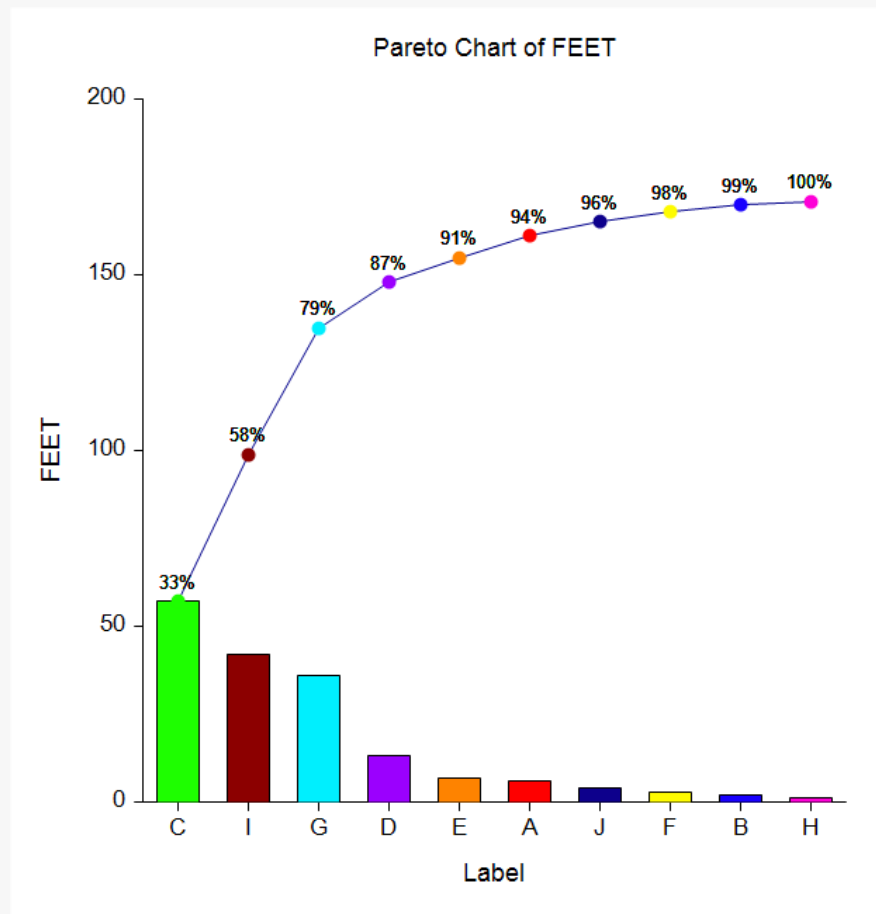
Data Variables **Feet**
Row Label Variable..... **Label**

3 Run the procedure

- Click the **Run** button to perform the calculations and generate the output.

Pareto and Cumulative Pareto Chart

Chart Section



This section displays the cumulative Pareto chart. Note that this version of the Pareto chart combines the bar chart version with a line representing the cumulative total for each bar. The cumulative percentage is displayed above the plotting symbol. For example, we see that 79% of the defects are caused by mills C, I, and G.

Pareto Numeric Report

Label	FEET	Cumulative FEET	Percent	Cumulative Percent
A	6	6	3.51	3.51
B	2	8	1.17	4.68
C	57	65	33.33	38.01
D	13	78	7.60	45.61
E	7	85	4.09	49.71
F	3	88	1.75	51.46
G	36	124	21.05	72.51
H	1	125	0.58	73.10
I	42	167	24.56	97.66
J	4	171	2.34	100.00

This report gives the numerical details of the analysis.

Example 2 – Using Several Variables

This section presents an example of how to generate a Pareto chart of the total for several variables. The data used are the values of S1 - S5 found in the QATest dataset. Suppose that these five variables represent the fifty daily numbers of defects produced by each of five shifts.

Setup

To run this example, complete the following steps:

1 Open the QATest example dataset

- From the File menu of the NCSS Data window, select **Open Example Data**.
- Select **QATest** and click **OK**.

2 Specify the Pareto Charts procedure options

- Find and open the **Pareto Charts** procedure using the menus or the Procedure Navigator.
- The settings for this example are listed below and are stored in the **Example 2** settings file. To load these settings to the procedure window, click **Open Example Settings File** in the Help Center or File menu.

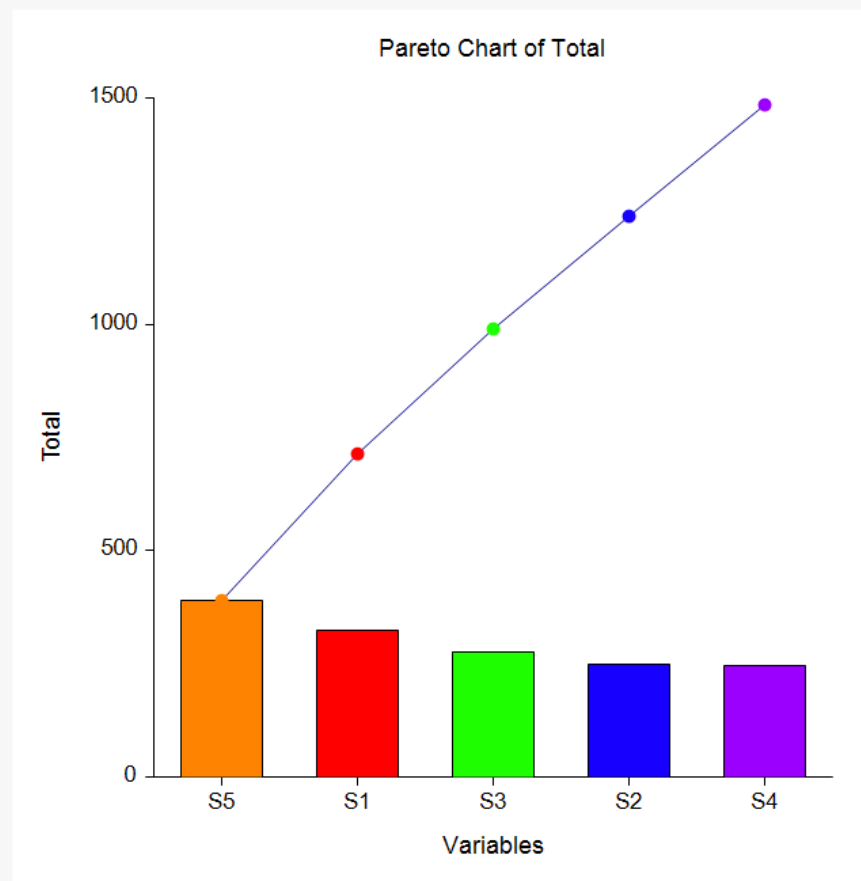
Variables Tab	
Data Variables	S1-S5
Chart Arrangement	Total By Variable
Reports Tab	
Numeric Report.....	Unchecked

3 Run the procedure

- Click the **Run** button to perform the calculations and generate the output.

Pareto Chart

Chart Section



Notice that a somewhat uniform defect rate in the five shifts is reflected here by almost identical bars and by an almost straight cumulative line.