

## Cumulative Frequency Distribution

The cumulative frequency distribution gives the reader an opportunity to look at any category and determine immediately the number of observations that belong to a particular category and all categories below it.

**Table 3.3.4 – Cumulative Frequency Distribution of Revenue Data**

Revenue (Millions of Dollars)	Frequency	Cumulative Frequency
0 to 40	50	50
41 to 81	30	80
82 to 122	14	94
123 to 163	3	97
164 to 204	1	98
205 to 245	0	98
246 to 286	1	99
287 to 327	0	99
328 to 368	0	99
369 to 409	1	100

In this example, the reader can easily see in Table 3.3.4 that 97 out of 100 revenues are less than or equal to \$163 million.

## Cumulative Relative Frequency

To obtain the cumulative relative frequency, add the relative frequencies of all preceding classes to the relative frequency of the current class.

**Table 3.3.5 – Cumulative Relative Frequency Distribution of Revenue Data**

Revenue (Millions of Dollars)	Frequency	Relative Frequency	Cumulative Relative Frequency
0 to 40	50	0.50	0.50
41 to 81	30	0.30	0.80
82 to 122	14	0.14	0.94
123 to 163	3	0.03	0.97
164 to 204	1	0.01	0.98
205 to 245	0	0.00	0.98
246 to 286	1	0.01	0.99
287 to 327	0	0.00	0.99
328 to 368	0	0.00	0.99
369 to 409	1	0.01	1.00

From the cumulative relative frequency in Table 3.3.5, it is easy to see that 97% of the revenues are less than or equal to \$163 million.

### Definition

#### Cumulative Frequency

The **cumulative frequency** is the sum of the frequency of a particular class and all preceding classes.

### Definition

#### Cumulative Relative Frequency

The **cumulative relative frequency** is the proportion of observations in a particular class and all preceding classes.



## 3.3 Exercises

### Basic Concepts

1. What are the fundamental decisions in constructing frequency distributions for quantitative data?
2. Describe the general guidelines for selecting the number of classes for a quantitative frequency distribution.
3. What is a good starting point for determining the class width?

4. What is a relative frequency distribution? How do you calculate relative frequencies from raw frequencies?
5. What is a cumulative frequency distribution?
6. What is a cumulative relative frequency distribution?

### Exercises

7. A business magazine was conducting a study into the amount of travel required for mid-level managers across the U.S. Seventy-five managers were surveyed for the number of days they spent traveling each year.

Mid-Level Manager Travel	
Days Traveling	Frequency
0 – 6	15
7 – 13	21
14 – 20	27
21 – 27	9
28 – 34	2
35 and above	1

- a. Construct a relative frequency distribution.
  - b. Construct a cumulative frequency distribution.
8. The closing prices (in pence) for selected stocks trading on the London Stock Exchange were as follows. Construct a frequency distribution for the stock prices.

Closing Prices	
Stock	Closing Price (Pence)
Allied Lyons	439
Babcock	208
Barclays Bank	543
Bass Ltd	992
British GE	238
Cadbury Sch	257
Guinness	379
Hanson Trust	169
Lucas Indus	655
Reed Int'l	467
STC	318
Tate & Lyle	833
Thorm EMI	741
Utd. Biscuit	326

9. Every year, the average temperatures of 100 selected U.S. cities are published by the National Oceanic and Atmospheric Administration. The average temperature ( $^{\circ}\text{F}$ ) for the month of October for 15 randomly selected cities from the list of 100 are listed in the following table.

Average Temperatures ( $^{\circ}\text{F}$ )				
68.5	50.9	67.5	57.5	56.0
47.1	50.1	65.8	51.5	49.5
75.2	56.0	62.3	53.0	46.1

- Construct a frequency distribution for the average temperatures for the month of October.
  - Construct a relative frequency distribution for the average temperatures for the month of October.
  - Construct a cumulative frequency distribution for the average temperatures for the month of October.
10. Consider the assets (in billions of dollars) of the 10 largest life insurance companies listed in the following table.

Assets (Billions of Dollars)				
148.4	110.8	55.6	52.4	50.4
42.7	41.7	36.2	35.7	35.7

- Construct a frequency distribution for the assets (in billions of dollars) of the 10 largest life insurance companies.
- Construct a relative frequency distribution for the assets (in billions of dollars) of the 10 largest life insurance companies.
- Construct a cumulative frequency distribution for the assets (in billions of dollars) of the 10 largest life insurance companies.

## 3.4 Graphical Displays of Quantitative Data

Several types of graphs and tabular displays will be discussed in this section such as histograms, line graphs, stem-and-leaf displays, and dot plots.

### Histograms

A histogram is a common graphical method that reveals the distribution of the data. Histograms are often constructed based on frequency distributions of quantitative data. Histograms look similar to bar graphs but are used to analyze quantitative data rather than qualitative data.

Each of the classes in the frequency distribution is represented by a vertical bar whose height is proportional to the frequency of the interval. The horizontal boundaries of each vertical bar correspond to the class boundaries. Once the frequency distribution has been calculated, all the information necessary for plotting a histogram is available. In Figure 3.4.1, the histogram is created from the frequency distribution of the revenue data in Table 3.3.2.

#### Definition

##### Histogram

A **histogram** is a bar graph of a frequency or relative frequency distribution in which the height of each bar corresponds to the frequency or relative frequency of each class.