# Chapter 2

**Example 2.1**: Area of Employment

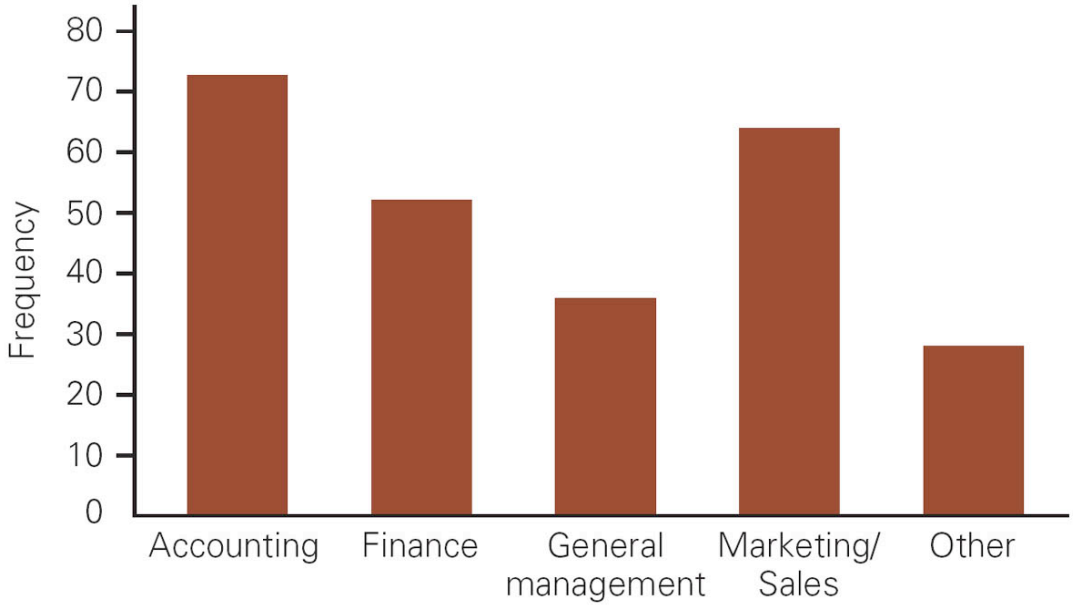
Raw Data

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 4 | 5 | 1 | 2 | 2 | 3 | 1 | 4 | 1 | 1 | 4 | 3 |
| 1 | 4 | 1 | 5 | 4 | 5 | 1 | 4 | 1 | 3 | 4 | 2 | 4 |
| 1 | 4 | 4 | 2 | 2 | 1 | 1 | 3 | 4 | 1 | 5 | 1 | 2 |
| 1 | 1 | 4 | 5 | 3 | 2 | 4 | 4 | 4 | 4 | 3 | 1 | 3 |
| 1 | 5 | 1 | 2 | 4 | 3 | 2 | 1 | 1 | 1 | 1 | 1 | 3 |
| 2 | 1 | 1 | 3 | 4 | 4 | 1 | 3 | 2 | 4 | 4 | 3 | 4 |
| 4 | 1 | 4 | 3 | 4 | 2 | 1 | 1 | 2 | 1 | 1 | 2 | 2 |
| 2 | 5 | 1 | 4 | 4 | 2 | 2 | 4 | 4 | 4 | 4 | 5 | 1 |
| 3 | 4 | 4 | 5 | 2 | 1 | 4 | 1 | 4 | 1 | 3 | 5 | 2 |
| 1 | 4 | 1 | 5 | 3 | 1 | 1 | 1 | 5 | 1 | 4 | 1 | 4 |
| 2 | 2 | 4 | 2 | 1 | 2 | 1 | 4 | 3 | 1 | 4 | 1 | 2 |
| 4 | 4 | 2 | 3 | 2 | 3 | 5 | 5 | 2 | 2 | 4 | 1 | 5 |
| 5 | 1 | 3 | 2 | 2 | 2 | 2 | 1 | 1 | 4 | 5 | 4 | 2 |
| 2 | 1 | 3 | 4 | 2 | 3 | 5 | 1 | 1 | 3 | 1 | 1 | 4 |
| 2 | 4 | 4 | 1 | 2 | 4 | 4 | 1 | 4 | 4 | 5 | 3 | 2 |
| 1 | 2 | 2 | 5 | 1 | 3 | 3 | 5 | 2 | 4 | 4 | 4 | 5 |
| 2 | 1 | 4 | 3 | 5 | 5 | 4 | 2 | 4 | 5 | 3 | 5 | 4 |
| 3 | 4 | 2 | 1 | 2 | 3 | 2 | 1 | 3 | 1 | 2 | 2 | 1 |
| 3 | 1 | 4 | 1 | 3 | 1 | 3 | 2 | 5 | 2 | 2 | 3 | 5 |
| 1 | 1 | 3 | 4 | 1 | 1 | | | | | | | |

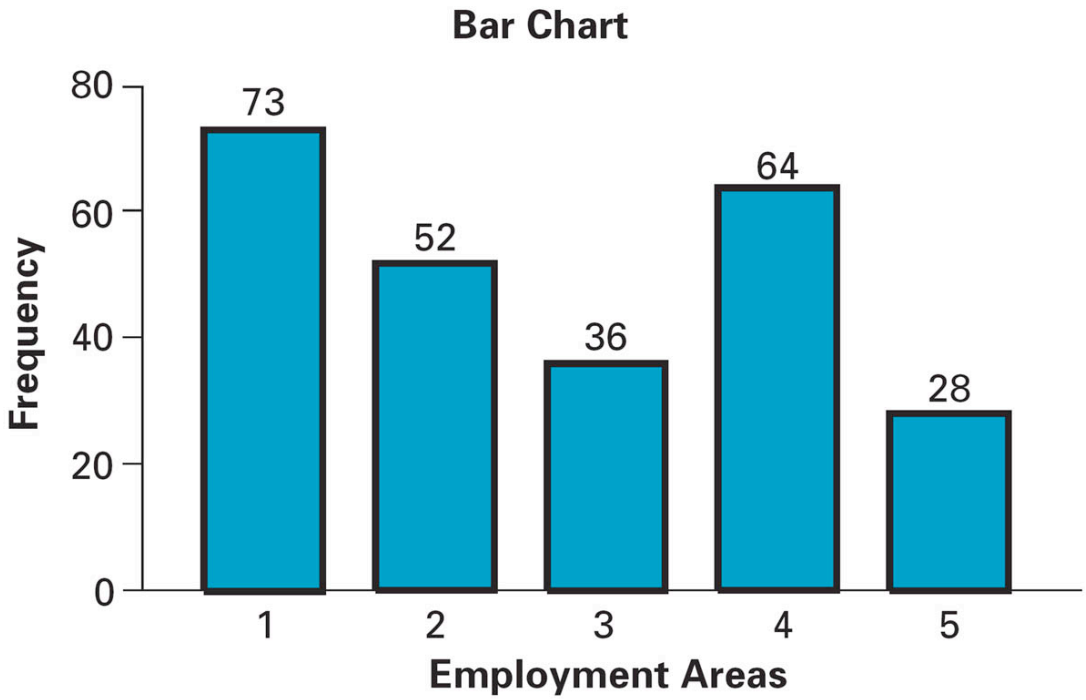
Tabular Representation

| Area | Frequency | Relative Frequency |
|---|---|---|
| Accounting | 73 | 28.9% |
| Finance | 52 | 20.6 |
| General management | 36 | 14.2 |
| Marketing/Sales | 64 | 25.3 |
| Other | 28 | 11.1 |
| Total | 253 | 100 |

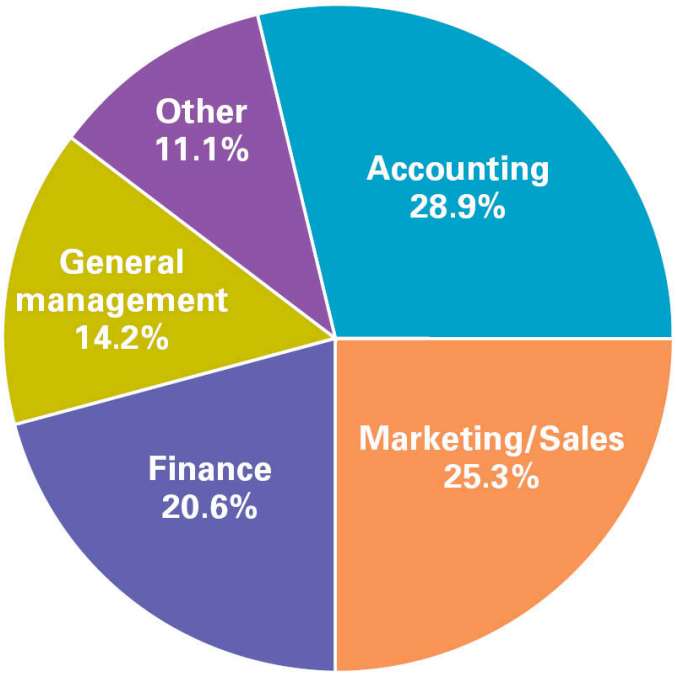
Bar Chart



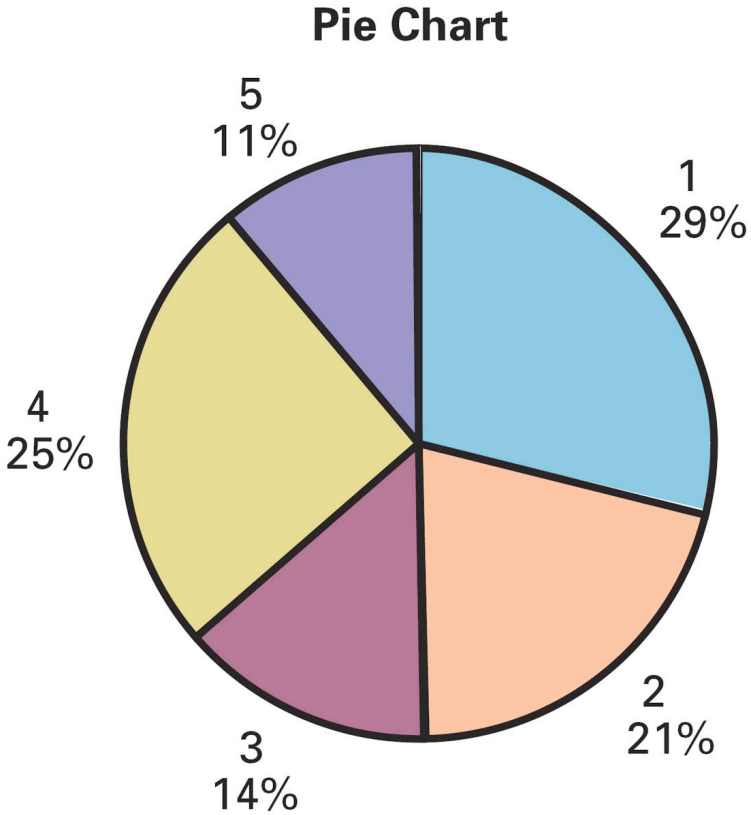

From Excel



Pie Chart




From Excel



**Example 2.4**: Monthly Bills —Long-Distance Telephone Calls

Raw Data

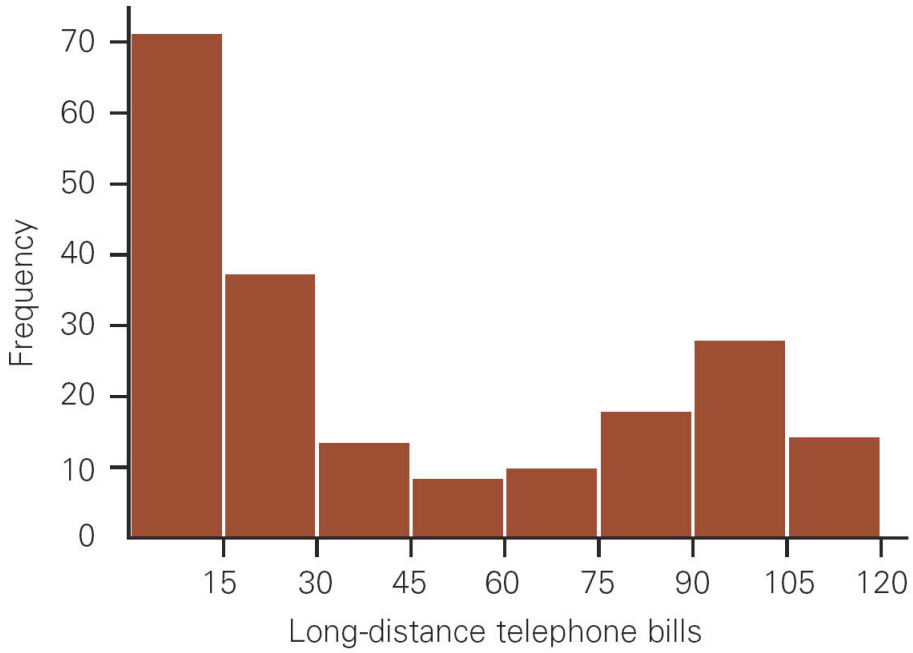
| | | | | | | |
|---|---|---|---|---|---|---|
| 42.19 | 38.45 | 29.23 | 89.35 | 118.04 | 110.46 | 0 |
| 72.88 | 83.05 | 95.73 | 103.15 | 94.52 | 26.84 | 93.93 |
| 90.26 | 72.78 | 101.36 | 104.8 | 74.01 | 56.01 | 39.21 |
| 48.54 | 93.31 | 104.88 | 30.61 | 22.57 | 63.7 | 104.84 |
| 6.45 | 16.47 | 89.5 | 13.36 | 44.16 | 92.97 | 99.56 |
| 92.62 | 78.89 | 87.71 | 93.57 | 0 | 75.71 | 88.62 |
| 99.5 | 85 | 0 | 8.41 | 70.48 | 92.88 | 3.2 |
| 115.5 | 2.42 | 1.08 | 76.69 | 13.62 | 88.51 | 55.99 |
| 12.24 | 119.63 | 23.31 | 11.05 | 8.37 | 7.18 | 11.07 |
| 1.47 | 26.4 | 13.26 | 21.13 | 95.03 | 29.04 | 5.42 |
| 77.21 | 72.47 | 0 | 5.64 | 6.48 | 6.95 | 19.6 |
| 8.11 | 9.01 | 84.77 | 1.62 | 91.1 | 10.88 | 30.62 |
| 100.05 | 26.97 | 15.43 | 29.25 | 1.88 | 16.44 | 109.08 |
| 2.45 | 21.97 | 17.12 | 19.7 | 6.93 | 10.05 | 99.03 |
| 29.24 | 15.21 | 28.77 | 9.12 | 118.75 | 0 | 13.95 |
| 14.34 | 79.52 | 2.72 | 9.63 | 21.34 | 104.4 | 2.88 |
| 65.9 | 20.55 | 3.43 | 10.44 | 21.36 | 24.42 | 95.52 |
| 6.72 | 35.32 | 117.69 | 106.84 | 8.4 | 90.04 | 3.85 |
| 91.56 | 10.13 | 5.72 | 33.69 | 115.78 | 0.98 | 19.45 |
| 0 | 27.21 | 89.27 | 14.49 | 92.17 | 21 | 106.59 |
| 13.9 | 9.22 | 109.94 | 10.7 | 0 | 11.27 | 72.02 |
| 7.74 | 5.04 | 33.4 | 6.95 | 6.48 | 11.64 | 83.26 |
| 15.42 | 24.49 | 89.13 | 111.14 | 92.64 | 53.9 | 114.67 |
| 27.57 | 64.78 | 45.81 | 56.04 | 20.39 | 31.77 | 94.67 |
| 44.32 | 3.69 | 19.34 | 13.54 | 18.89 | 1.57 | 0 |
| 5.2 | 2.8 | 5.1 | 3.03 | 9.16 | 15.3 | 75.49 |
| 68.69 | 35 | 9.12 | 18.49 | 84.12 | 13.68 | 20.84 |
| 100.04 | 112.94 | 20.12 | 53.21 | 15.3 | 49.24 | 9.44 |
| 2.67 | 4.69 | 41.38 | 45.77 | | | |

## Frequency Distribution

| Class Limits | Frequency |
|---|---|
| 0 to 15* | 71 |
| 15 to 30 | 37 |
| 30 to 45 | 13 |
| 45 to 60 | 9 |
| 60 to 75 | 10 |
| 75 to 90 | 18 |
| 90 to 105 | 28 |
| 105 to 120 | 14 |
| Total | 200 |

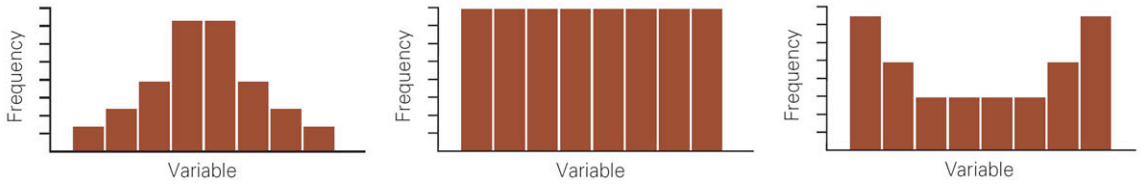
*Classes contain observations greater than their lower limits (except for the first class) and less than or equal to their upper limits.

## Histogram

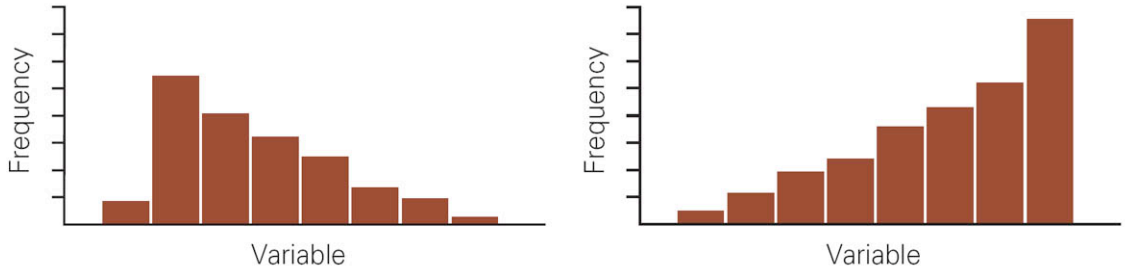


# Shapes of Histograms

## Symmetry



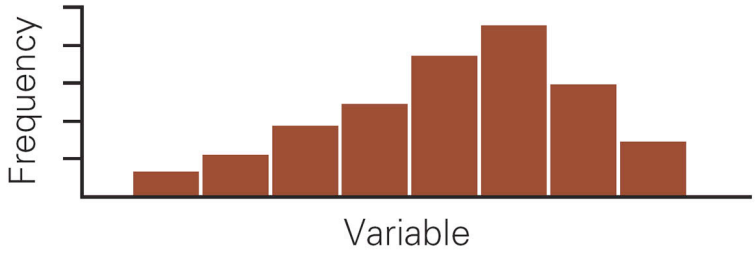

## Skewness



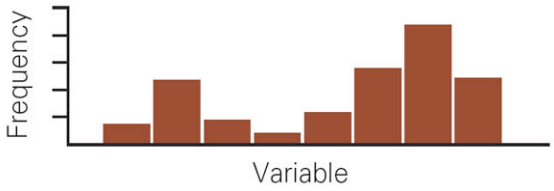

positively skewed

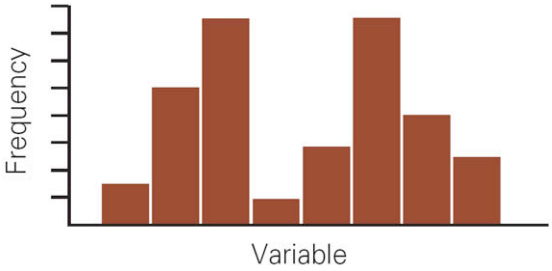
negatively skewed

## Unimodal

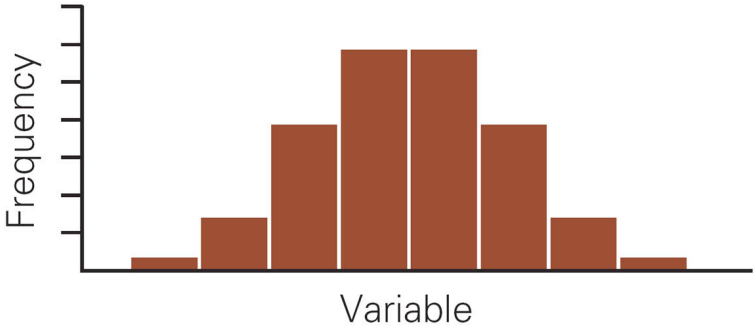



## Bimodal




## Bell Shaped

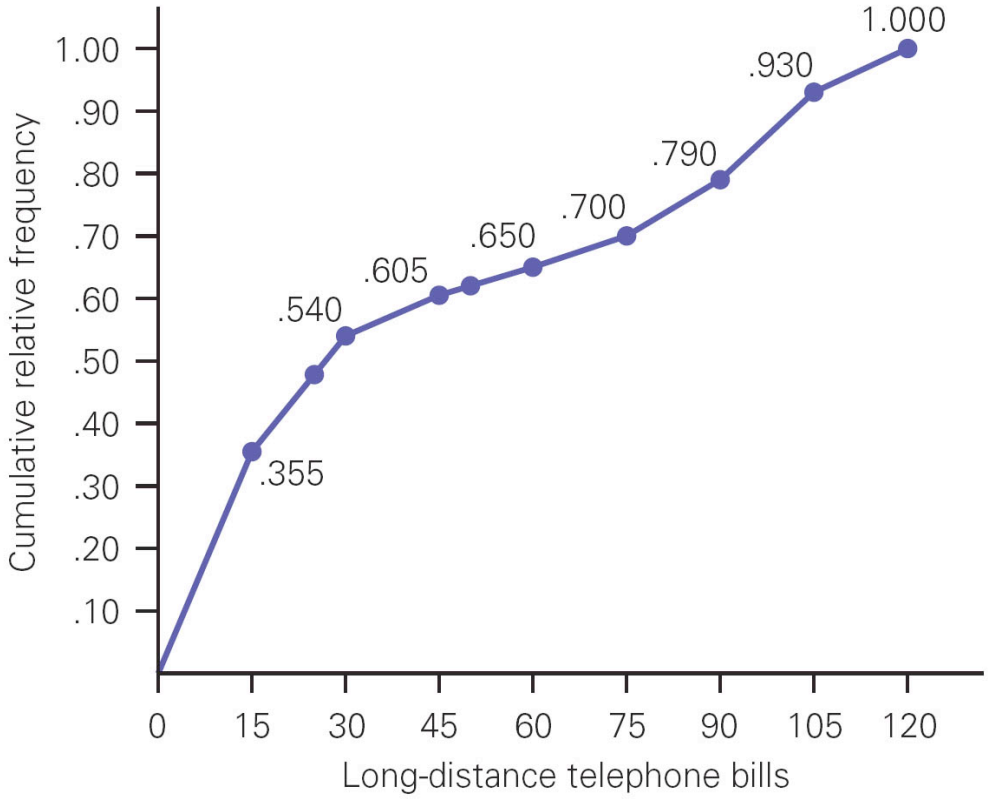


# Stem-and-Leaf Display

| Stem | Leaf |
|---|---|
| 0 | 000000000111112222223333345555556666666778888999999 |
| 1 | 000001111233333334455555667889999 |
| 2 | 00001111123446667789 99 |
| 3 | 001335589 |
| 4 | 124445589 |
| 5 | 33566 |
| 6 | 3458 |
| 7 | 022224556789 |
| 8 | 334457889999 |
| 9 | 00112222233344555999 |
| 10 | 001344446699 |
| 11 | 0124557889 |

# Ogive

## Cumulative Relative Frequency Distribution

| Class Limits | Relative Frequency | Cumulative Relative Frequency |
|---|---|---|
| 0 to 15 | 71/200 = .355 | 71/200 = .355 |
| 15 to 30 | 37/200 = .185 | 108/200 = .540 |
| 30 to 45 | 13/200 = .065 | 121/200 = .605 |
| 45 to 60 | 9/200 = .045 | 130/200 = .650 |
| 60 to 75 | 10/200 = .05 | 140/200 = .700 |
| 75 to 90 | 18/200 = .09 | 158/200 = .790 |
| 90 to 105 | 28/200 = .14 | 186/200 = .930 |
| 105 to 120 | 14/200 = .07 | 200/200 = 1.0 |

## Ogive