

Chapter 2

Tim Busken

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Chapter 2

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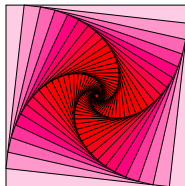
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Characteristics of Data [2]

- 1 **Center:** A representative or average value that indicates where the middle of the data set is located.
- 2 **Variation:** A measure of the amount that the data values vary.
- 3 **Distribution:** The nature or shape of the spread of data over the range of values (such as bell-shaped, uniform, or skewed).
- 4 **Outliers:** Sample values that lie very far away from the vast majority of other sample values.
- 5 **Time:** Changing characteristics of the data over time.



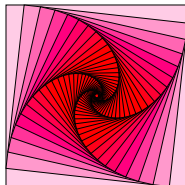
Frequency Distribution Tables [2]

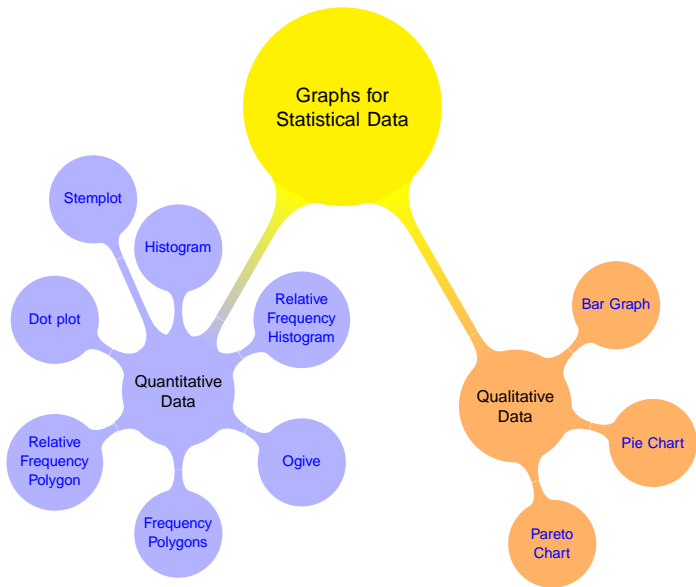
Definition

A **Frequency Distribution Table** shows how a data set is partitioned among all of several categories (or classes) by listing all of the categories along with the number of data values in each of the categories.

[click this text to access pg 47 in the text; class handout](#)

[click this to access the worksheet we filled out in class.](#)





Remember the pulse rate data we examined in the last class?

Table 2-1 Pulse Rates (beats per minute) of Females and Males

Females																			
76	72	88	60	72	68	80	64	68	68	80	76	68	72	96	72	68	72	64	80
64	80	76	76	76	80	104	88	60	76	72	72	88	80	60	72	88	88	124	64
Males																			
68	64	88	72	64	72	60	88	76	60	96	72	56	64	60	64	84	76	84	88
72	56	68	64	60	68	60	60	56	84	72	84	88	56	64	56	56	60	64	72

We used a frequency distribution table to summarize the large data set of 40 pulse rates associated with females.

Table 2-2 Pulse Rates of Females

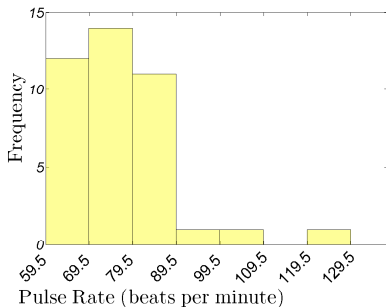
Pulse Rate	Frequency
60-69	12
70-79	14
80-89	11
90-99	1
100-109	1
110-119	0
120-129	1

Histogram

A histogram is a graphic version of a frequency distribution table. The histogram helps us visualize the shape of the data.

Table 2-2 Pulse Rates of Females

Pulse Rate	Frequency
60-69	12
70-79	14
80-89	11
90-99	1
100-109	1
110-119	0
120-129	1



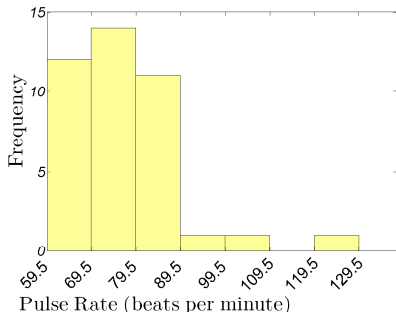
Histograms

Definition

A **Histogram** is a graph consisting of bars of equal width drawn adjacent to each other (without gaps). The horizontal scale represents the classes of quantitative data values and the vertical scale represents the frequencies. The heights of the bars correspond to the frequency values.

Table 2-2 Pulse Rates of Females

Pulse Rate	Frequency
60-69	12
70-79	14
80-89	11
90-99	1
100-109	1
110-119	0
120-129	1



Histograms

The bars on the horizontal scale are labeled with one of the following:

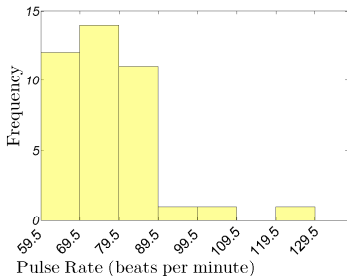
- ① Class boundaries
- ② Class midpoints
- ③ Lower class limits (introduces a small error)

Horizontal Scale for Histogram: Use class boundaries or class midpoints.

Vertical Scale for Histogram: Use the class frequencies.

Table 2-2 Pulse Rates of Females

Pulse Rate	Frequency
60-69	12
70-79	14
80-89	11
90-99	1
100-109	1
110-119	0
120-129	1



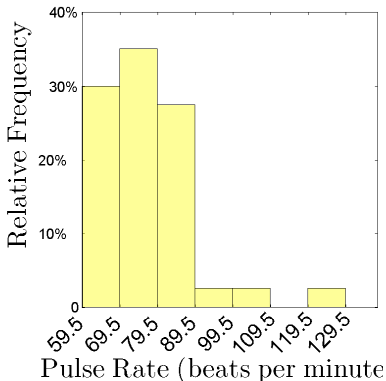
Percentage Histograms

Definition

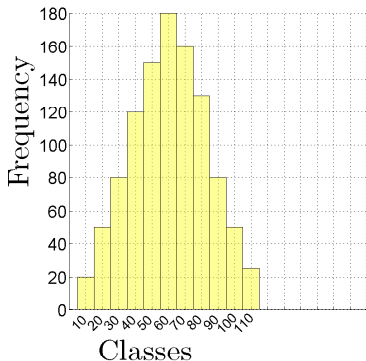
A **Relative Frequency Histogram** has the same shape and horizontal scale as the histogram, but the vertical scale is marked with relative frequencies (percentages).^[2]

Table 2-3 Relative Frequency Distribution of Pulse Rates of Females

Pulse Rate	Relative Frequency
60-69	30%
70-79	35%
80-89	27.5%
90-99	2.5%
100-109	2.5%
110-119	0
120-129	2.5%



The Normal Distribution



The distribution of the data is called “normal” (bell-shaped) when:

- the frequencies increase to a maximum, and then decrease;
- the distribution of the frequencies is symmetric: the left half of the graph is roughly a mirror image of the right half.

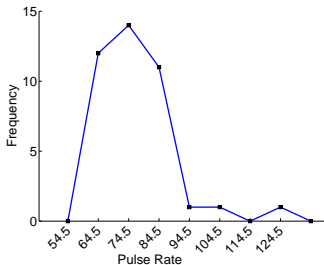
Frequency Polygons

Definition

A **Frequency Polygon** uses line segments connected to points located directly above class midpoint values.[2]

Table 2-2 Pulse Rates of Females

Pulse Rate	Frequency
60-69	12
70-79	14
80-89	11
90-99	1
100-109	1
110-119	0
120-129	1



Relative Frequency Polygons

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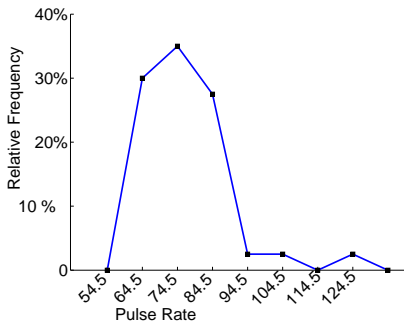
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Definition

A **Relative Frequency Polygon** uses percentages for the vertical scale.

Table 2-3 Relative Frequency Distribution of Pulse Rates of Females

Pulse Rate	Relative Frequency
60-69	30%
70-79	35%
80-89	27.5%
90-99	2.5%
100-109	2.5%
110-119	0
120-129	2.5%



Ogive

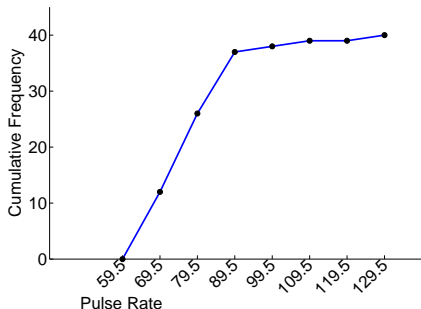
Definition

An **ogive** is a line graph that depicts *cumulative* frequencies.

- Ogives are useful for determining the number of values below a particular value.
- Class boundaries are located along the horizontal axis.

Table 2-4 Cumulative Frequency Distribution of Pulse Rates of Females

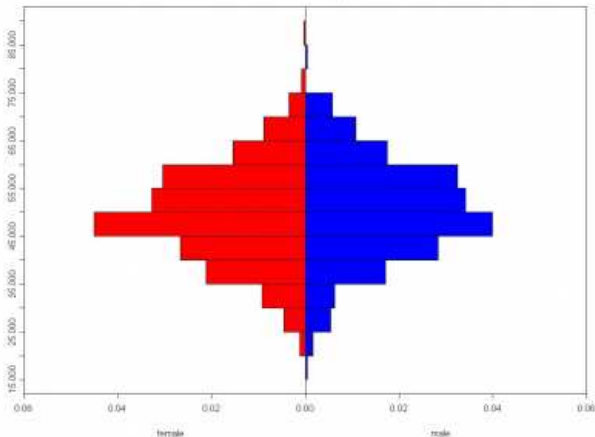
Pulse Rate	Cumulative Frequency
Less than 70	12
Less than 80	26
Less than 90	37
Less than 100	38
Less than 110	39
Less than 120	39
Less than 130	40



Back to Back Histograms

Good for comparative analysis.

Back to Back Histogram



Dot Plot

Definition

A **dot plot** Consists of a graph in which each data value is plotted as a point (or dot) along a scale of values. Dots representing equal values are stacked. [2]

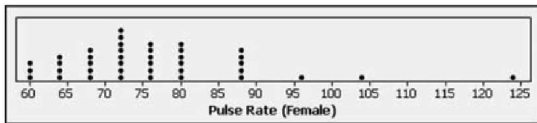


Table 2-1 Pulse Rates (beats per minute) of Females and Males

Females																			
76	72	88	60	72	68	80	64	68	68	80	76	68	72	96	72	68	72	64	80
64	80	76	76	76	80	104	88	60	76	72	72	88	80	60	72	88	88	124	64
Males																			
68	64	88	72	64	72	60	88	76	60	96	72	56	64	60	64	84	76	84	88
72	56	68	64	60	68	60	60	56	84	72	84	88	56	64	56	56	60	64	72

Stemplot

Definition

A **stem and leaf plot** represents quantitative data by separating each value into two parts: the stem (such as the leftmost digit) and the leaf (such as the rightmost digit). [2]

Stemplot	
stem (tens)	leaves(units)
6	0004444888888 ← Data values are 60, 60, 60, 64, . . . , 68
7	22222222666666
8	000000888888
9	6 ← Data value is 96
10	4 ← Data value is 104
11	
12	4 ← Data value is 124

Table 2-1 Pulse Rates (beats per minute) of Females and Males

Females																			
76	72	88	60	72	68	80	64	68	68	80	76	68	72	96	72	68	72	64	80
64	80	76	76	76	80	104	88	60	76	72	72	88	80	60	72	88	88	124	64
Males																			
68	64	88	72	64	72	60	88	76	60	96	72	56	64	60	64	84	76	84	88
72	56	68	64	60	68	60	60	56	84	72	84	88	56	64	56	56	60	64	72

Bar Graph

Definition

A **Bar Graph** Uses bars of equal width to show frequencies of categories of qualitative data. Vertical scale represents frequencies or relative frequencies. Horizontal scale identifies the different categories of qualitative data. [2]

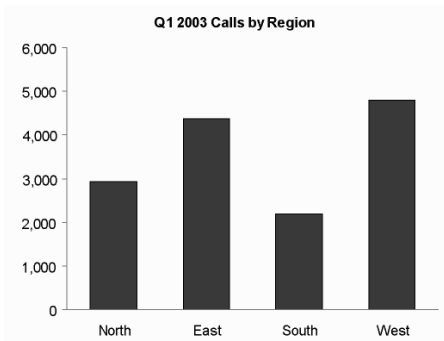


Figure : image borrowed from Perceptual Edge. [1]

Bar Graphs

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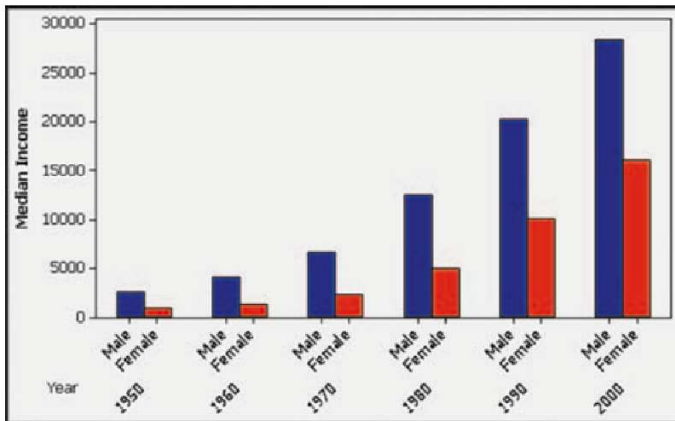
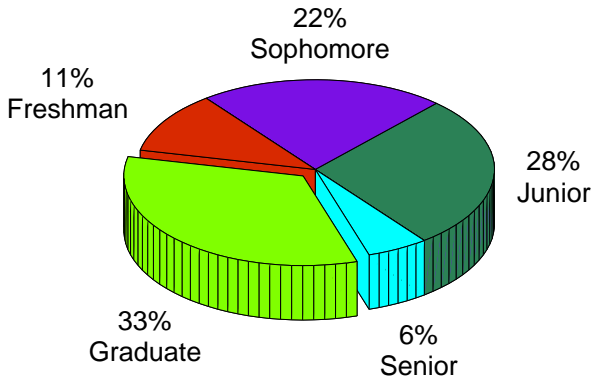


Figure : Median Income

Bar charts are also useful for comparing two population variables.

Pie Chart

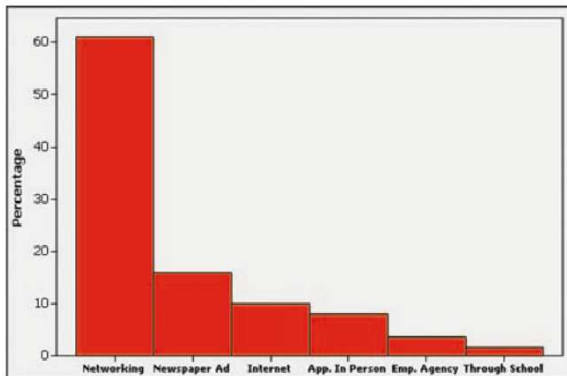


To calculate the central angle of any single percentage component of your pie chart, use the product $p \times 360^\circ$, where p is the percentage written as a decimal.

Pareto Chart

Definition

A **pareto chart** is a bar graph that has the bars arranged in descending order according to frequencies (or relative frequencies).



Pareto Charts

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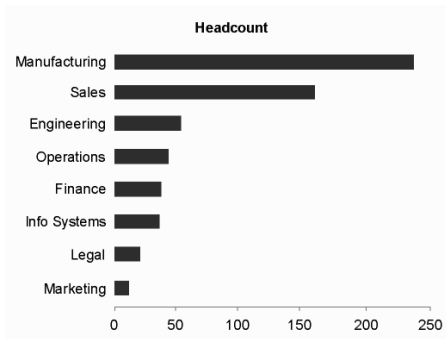


Figure : image borrowed from Perceptual Edge. [1]

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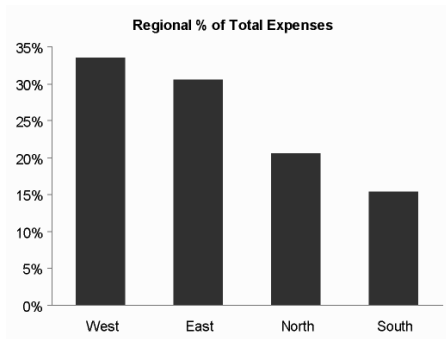


Figure : image borrowed from Perceptual Edge. [1]

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Works Cited

[Click this text to access the classroom worksheet.](#)

[Click this text to access the KEY.](#)

The census has a nice gallery of statistical graphs and image maps at [census.gov/dataviz/](https://www.census.gov/dataviz/)

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Accessed: 02/3/13.



M. F. TRIOLA, *Essentials of Statistics*, Addison-Wesley, fourth ed., 2011.