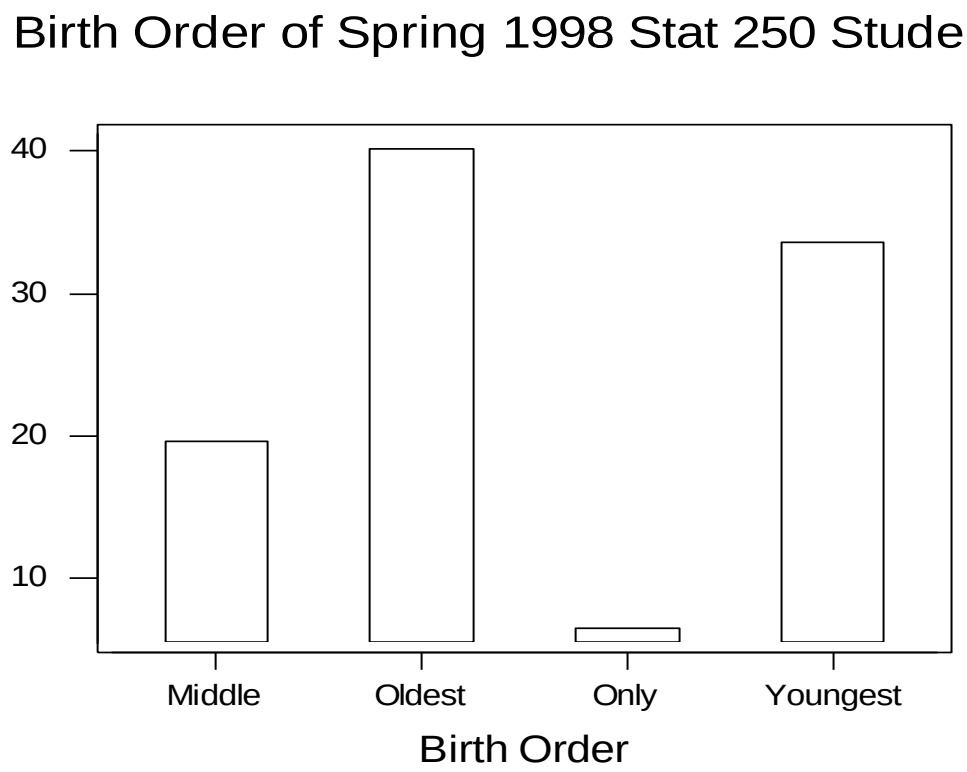
Descriptive Statistics

Summarizing data using graphs

Which graph to use?

- Depends on type of data
- Depends on what you want to illustrate
- Depends on available statistical software

Bar Chart



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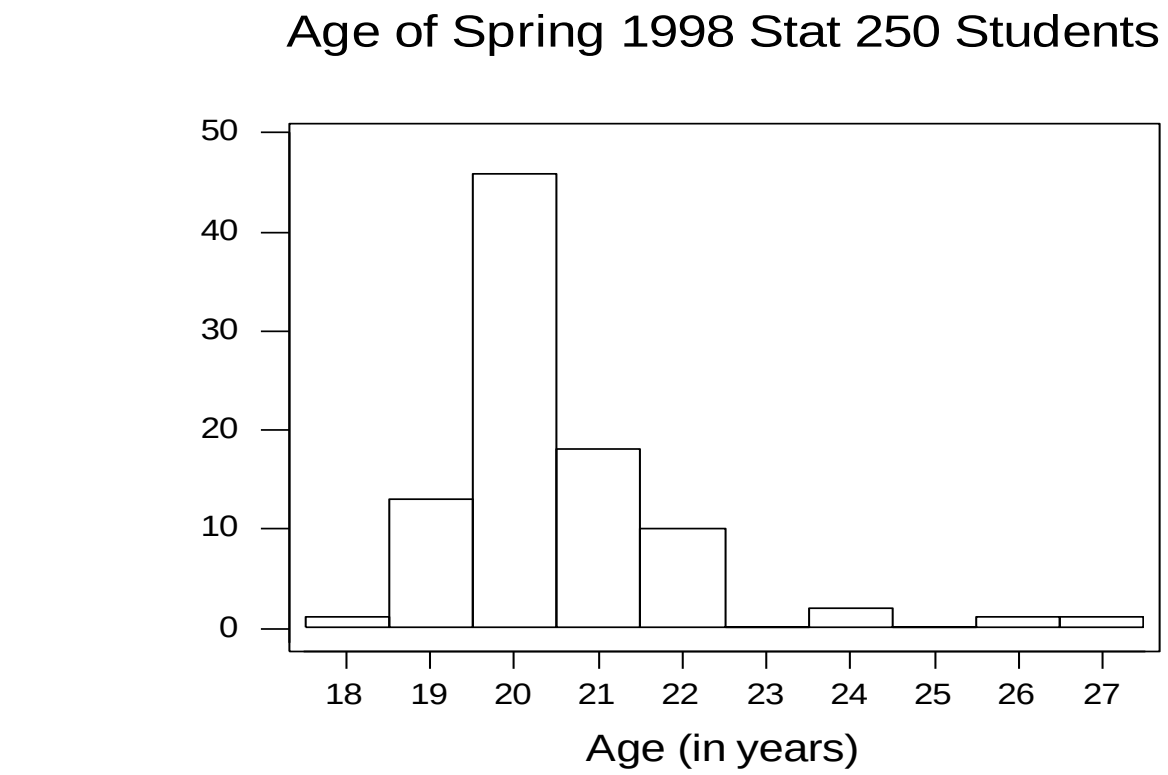
Bar Chart

- Summarizes categorical data.
- Horizontal axis represents categories, while vertical axis represents either counts ("**frequencies**") or percentages ("**relative frequencies**").
- Used to illustrate the differences in percentages (or counts) between categories.

Histogram



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Analogy

Bar chart is to categorical data as
histogram is to ...

measurement data.

Histogram

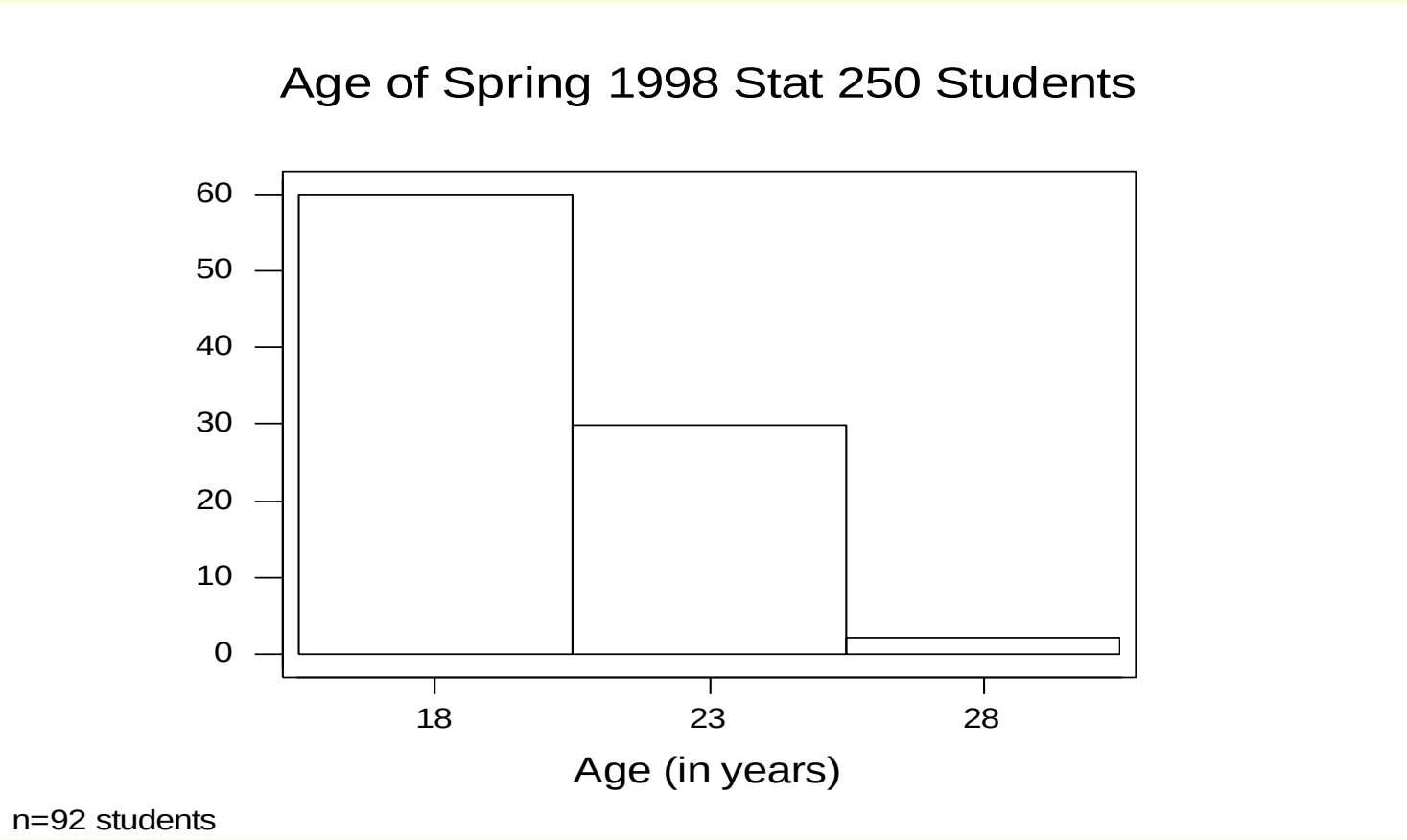
- Divide measurement up into equal-sized categories.
- Determine number (or percentage) of measurements falling into each category.
- Draw a bar for each category so bars' heights represent number (or percent) falling into the categories.
- Label and title appropriately.

Histogram

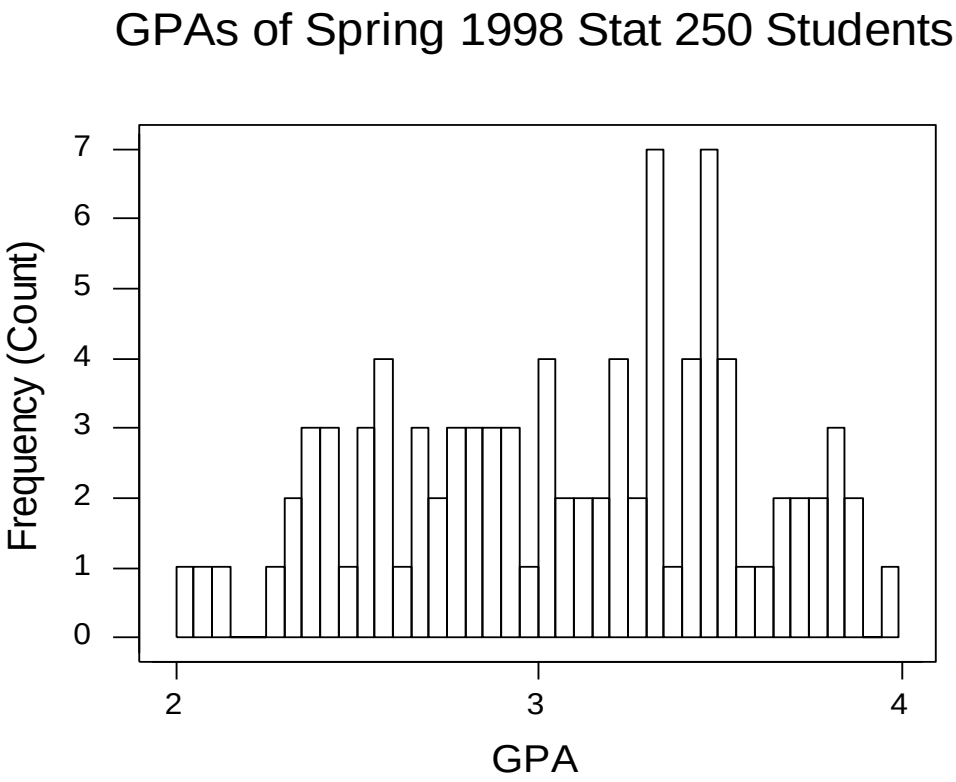
Use common sense in determining number of categories to use.

(Trial-and-error works fine, too.)

Too few categories



Too many categories



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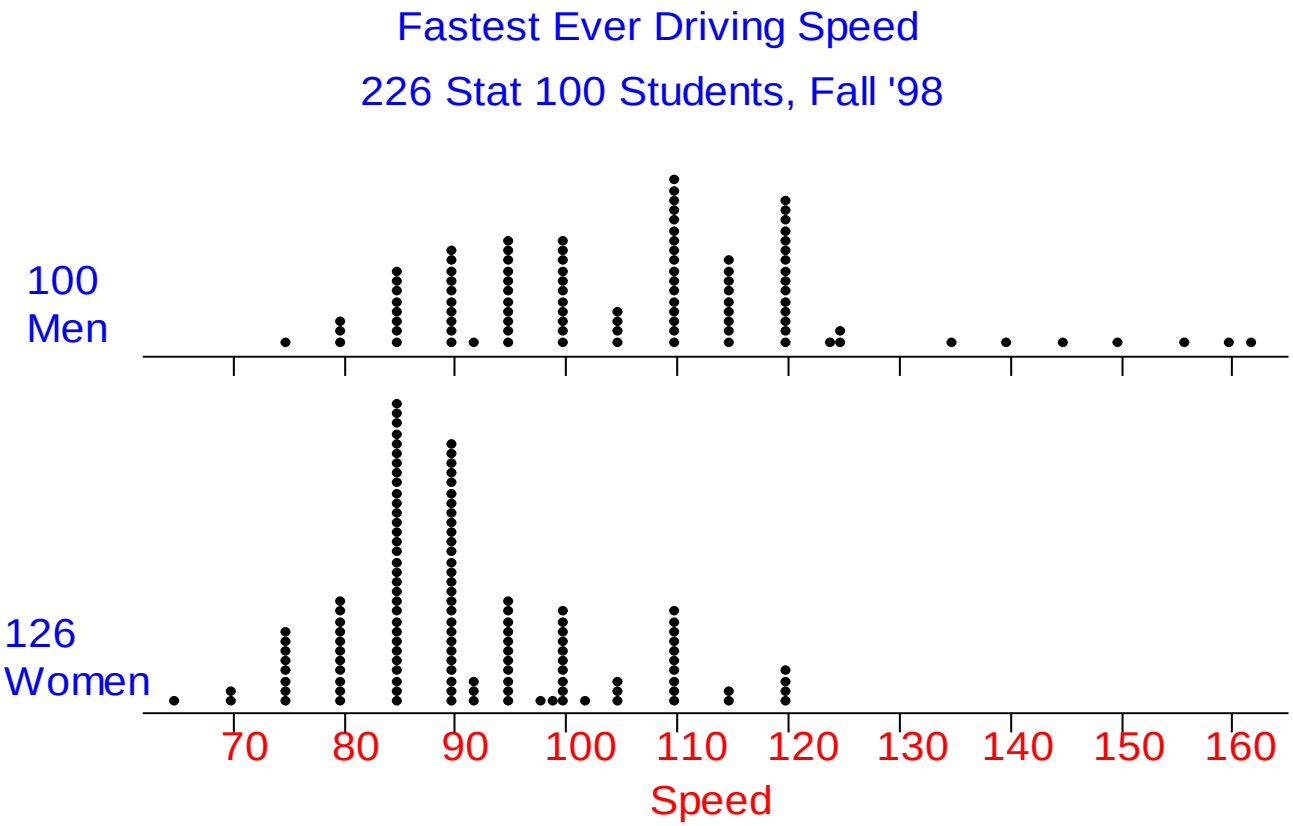
Dot Plot


Fastest Ever Driving Speed
226 Stat 100 Students, Fall '98
100
Men
126
Women
70
80
90
100
110
120
130
140
150
160
Speed

Dot Plot

- Summarizes measurement data.
- Horizontal axis represents measurement scale.
- Plot one dot for each data point.

Stem-and-Leaf Plot

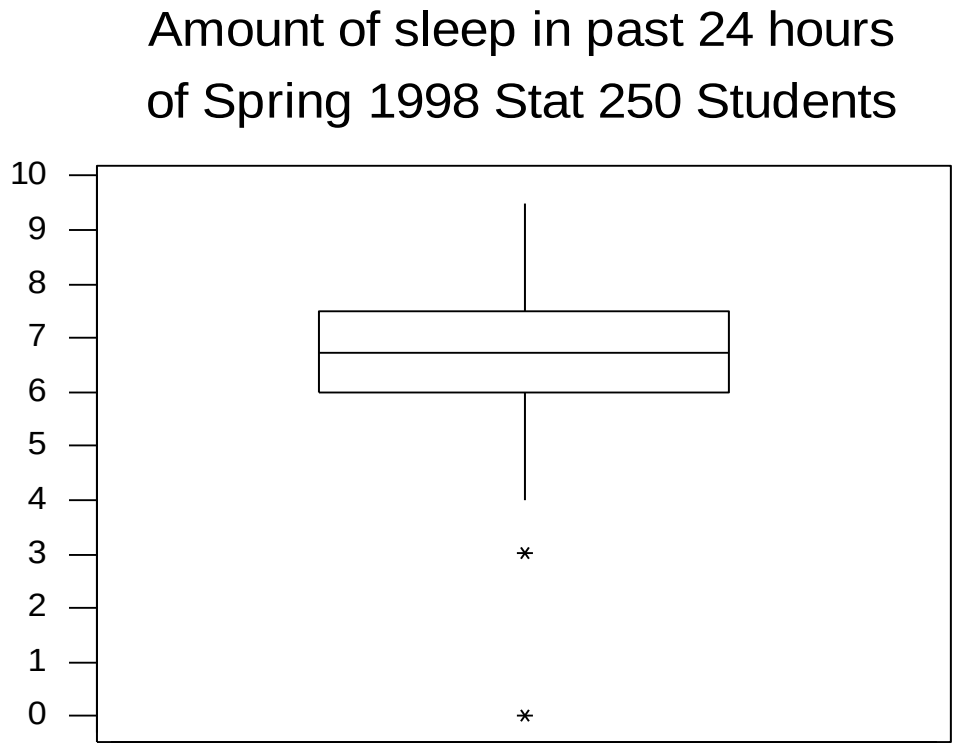
```
Stem-and-leaf of Shoes     N  = 139   Leaf Unit = 1.0

   12     0 223334444444
   63     0 555555555555566666666677777778888888888899999999
  (33)    1 000000000000111122222333333344 4
   43     1 555555556667777888
   25     2 0000000000023
   12     2 5557
    8     3 0023
    4     3
    4     4 00
    2     4
    2     5 0
    1     5
    1     6
    1     6
    1     7
    1     7 5
```

Stem-and-Leaf Plot

- Summarizes measurement data.
- Each data point is broken down into a "**stem**" and a "**leaf**."
- First, "stems" are aligned in a column.
- Then, "leaves" are attached to the stems.

Box Plot


Amount of sleep in past 24 hours
of Spring 1998 Stat 250 Students
10
9
8
7
6
5
4
3
2
1
0

Box Plot

- Summarizes measurement data.
- Vertical (or horizontal) axis represents measurement scale.
- Lines in box represent the 25th percentile ("**first quartile**"), the 50th percentile ("**median**"), and the 75th percentile ("**third quartile**"), respectively.

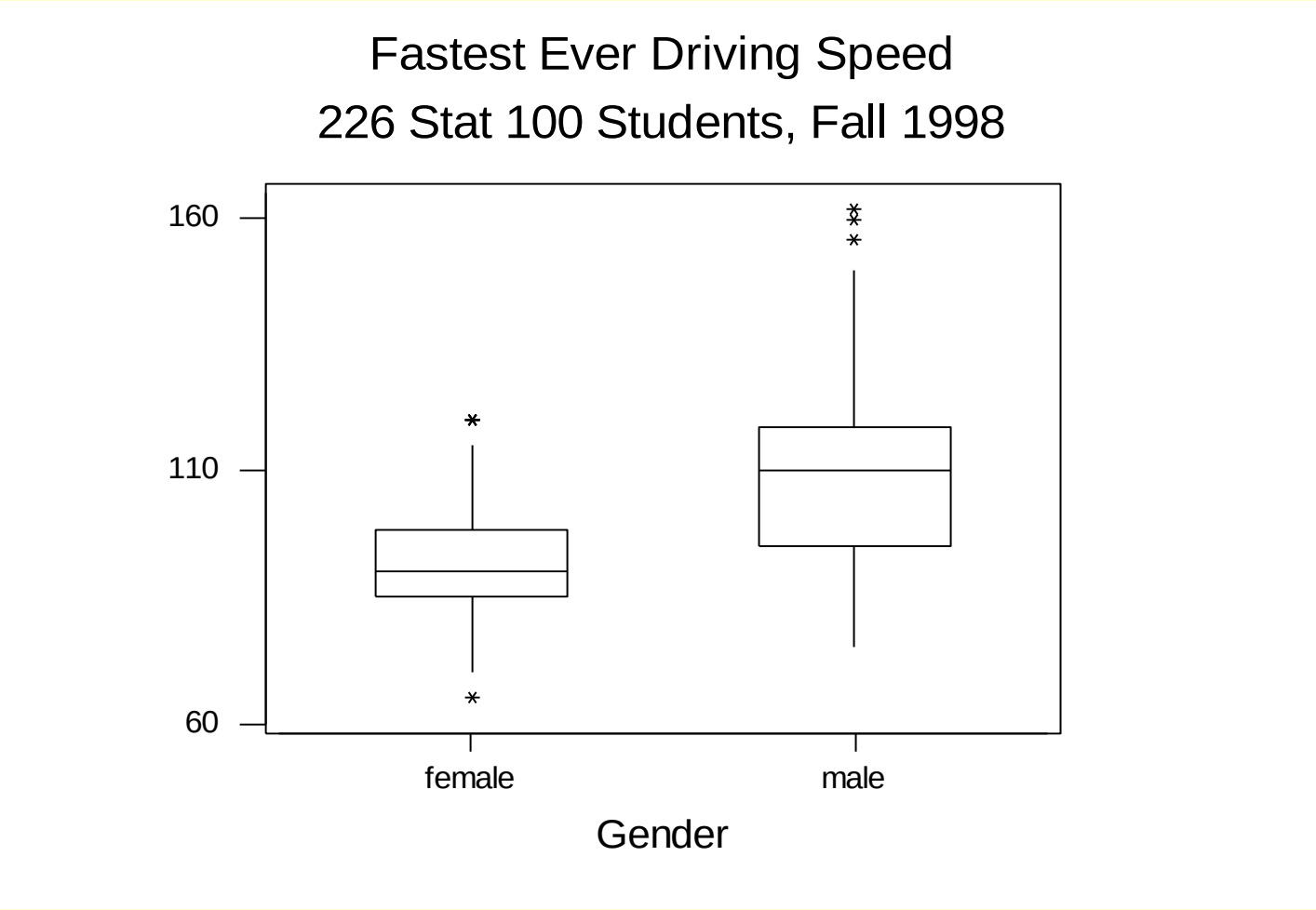
An aside...

- Roughly
  - The "**25th percentile**" is the number such that 25% of the data points fall below the number.
  - The "**median**" or "**50th percentile**" is the number such that half of the data points fall below the number.
  - The "**75th percentile**" is the number such that 75% of the data points fall below the number.

Box Plot (cont'd)

- "**Whiskers**" are drawn to the most extreme data points that are not more than 1.5 times the length of the box beyond either quartile.
  - Whiskers are useful for identifying outliers.
- "**Outliers**," or extreme observations, are denoted by asterisks.
  - Generally, data points falling beyond the whiskers are considered outliers.

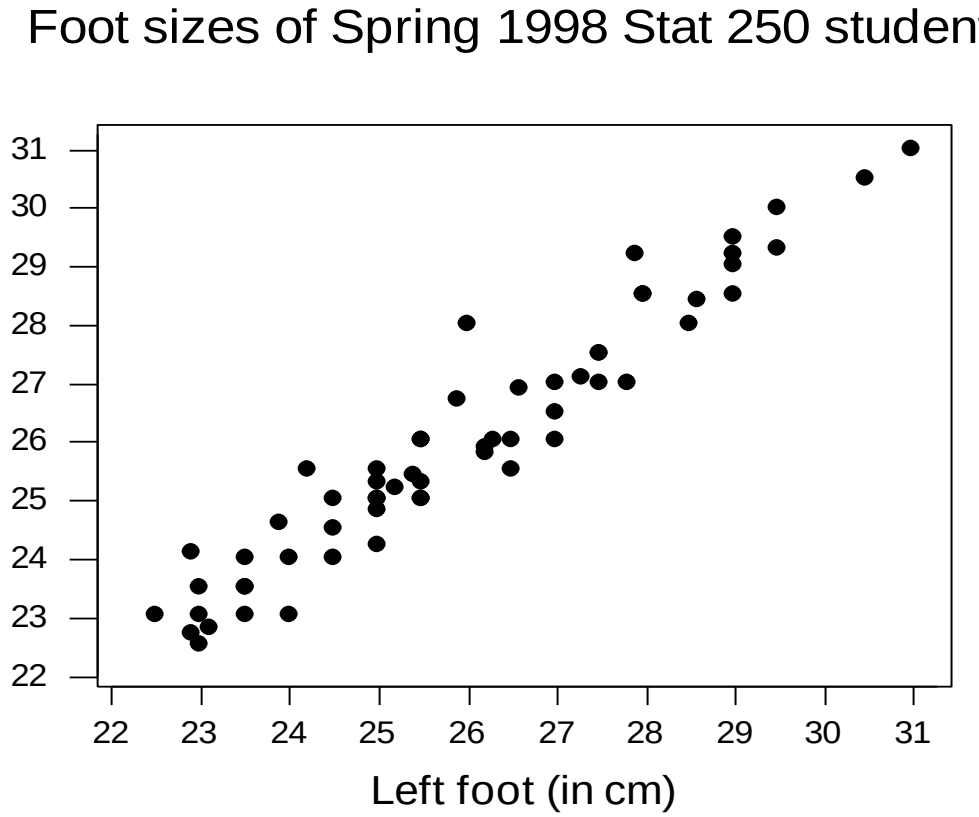
Using Box Plots to Compare



Which graph to use when?

- Stem-and-leaf plots and dotplots are good for small data sets, while histograms and box plots are good for large data sets.
- Boxplots and dotplots are good for comparing two groups.
- Boxplots are good for identifying outliers.
- Histograms and boxplots are good for identifying "**shape**" of data.

Scatter Plots



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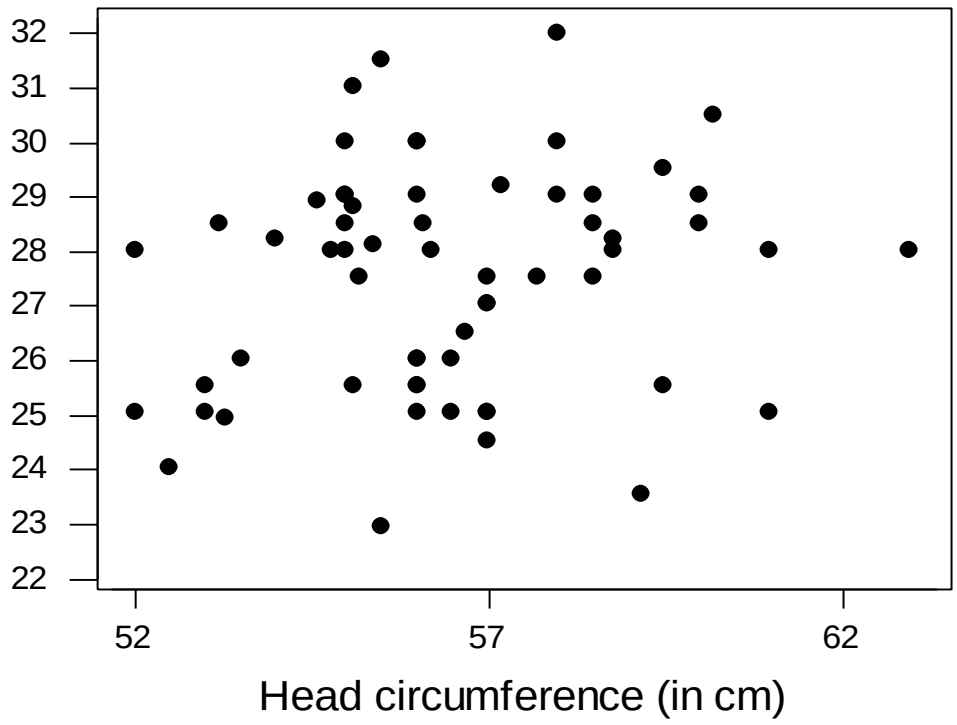
Scatter Plots

- Summarizes the relationship between two measurement variables.
- Horizontal axis represents one variable and vertical axis represents second variable.
- Plot one point for each pair of measurements.

No relationship



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Summary

- Many possible types of graphs.
- Use common sense in reading graphs.
- When creating graphs, don’t summarize your data too much or too little.
- When creating graphs, label everything for others. Remember you are trying to communicate something to others!