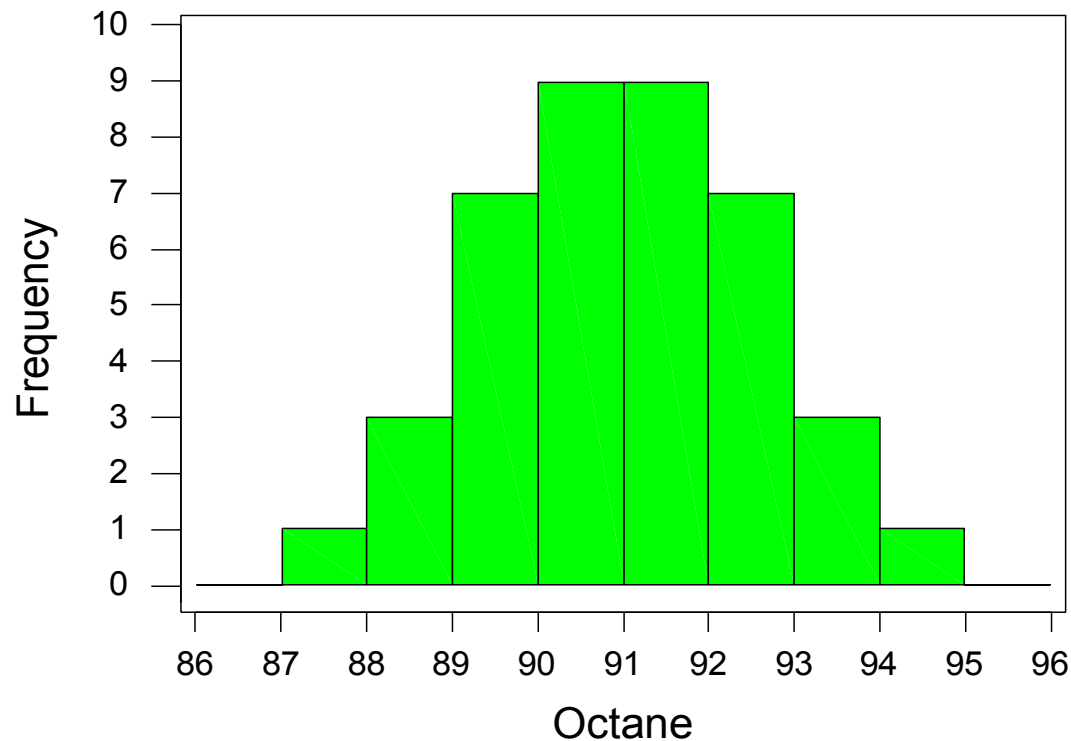


4.2 Shapes of Distributions

- Symmetry
 - Symmetrical or asymmetrical
 - If symmetrical, mounded or flat?
- Skew
 - Right, left
- Peaks or Modes
 - Unimodal, bimodal, multiple peaks
- Spread
 - Narrow spread or wide spread

Histogram of Octane

Histogram of Octane Rating



Symmetrical

One peak

A distribution is **symmetric** if its left half is a mirror image of its right half.

Flat or Uniform

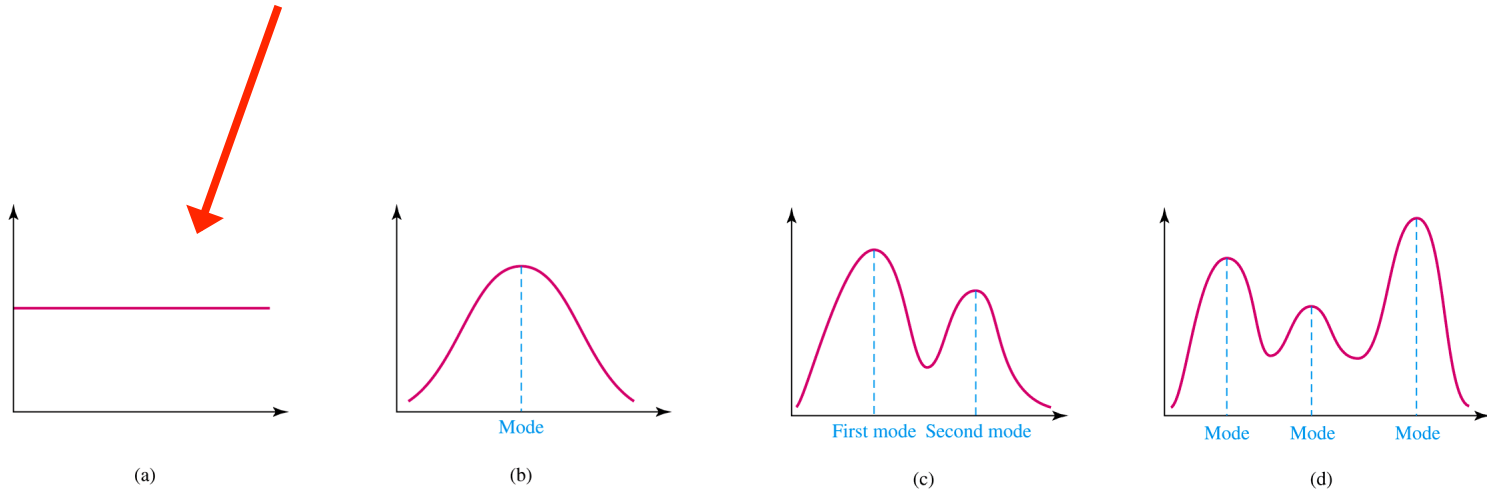
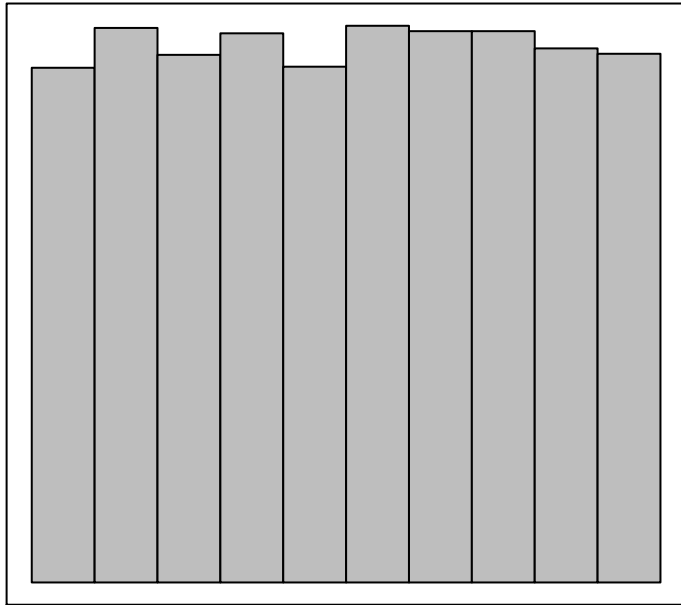


Figure 4.4

Perfectly flat

Flat or Uniform



Not perfectly flat, but close. We want to describe the *general* shape of the distribution.

Not symmetrical

- A distribution that is not symmetric must have values that tend to be more spread out on one side than on the other. In this case, we say that the distribution is **skewed**.

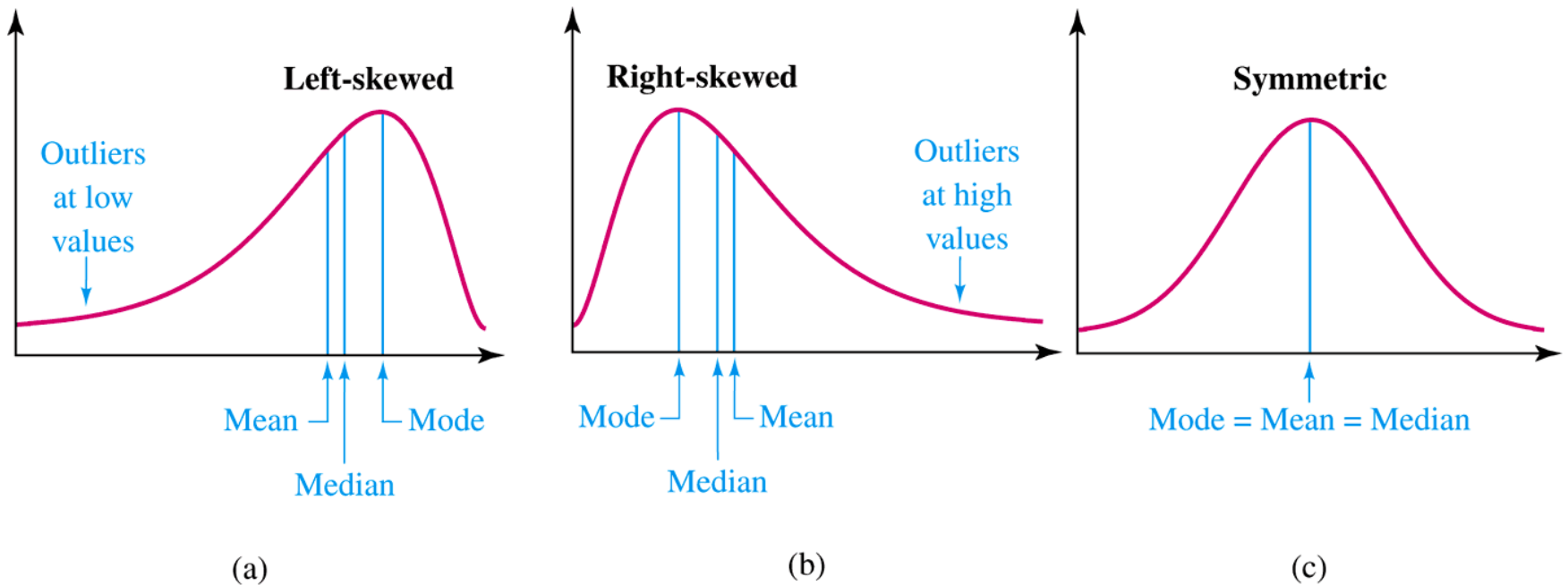
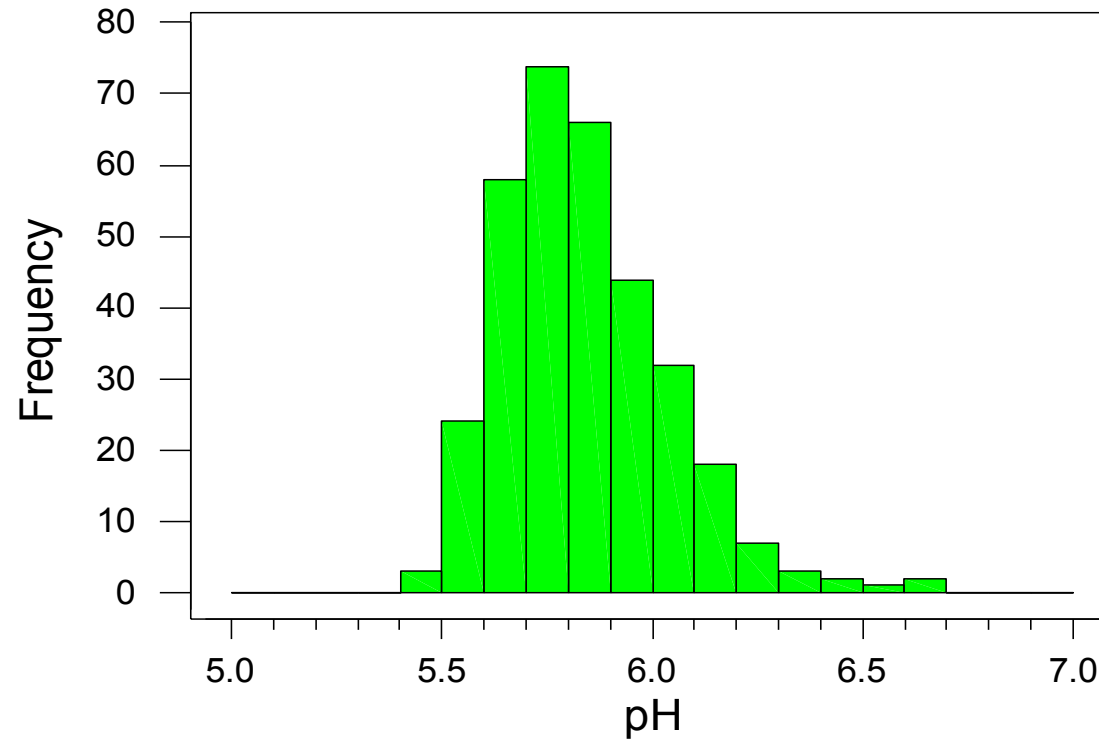


Figure 4.7 (a) Skewed to the left (left-skewed): The mean and median are less than the mode. (b) Skewed to the right (right-skewed): The mean and median are greater than the mode. (c) Symmetric distribution: The mean, median, and mode are the same.

Right-skewed

pH of Pork Loins



Right-skewed

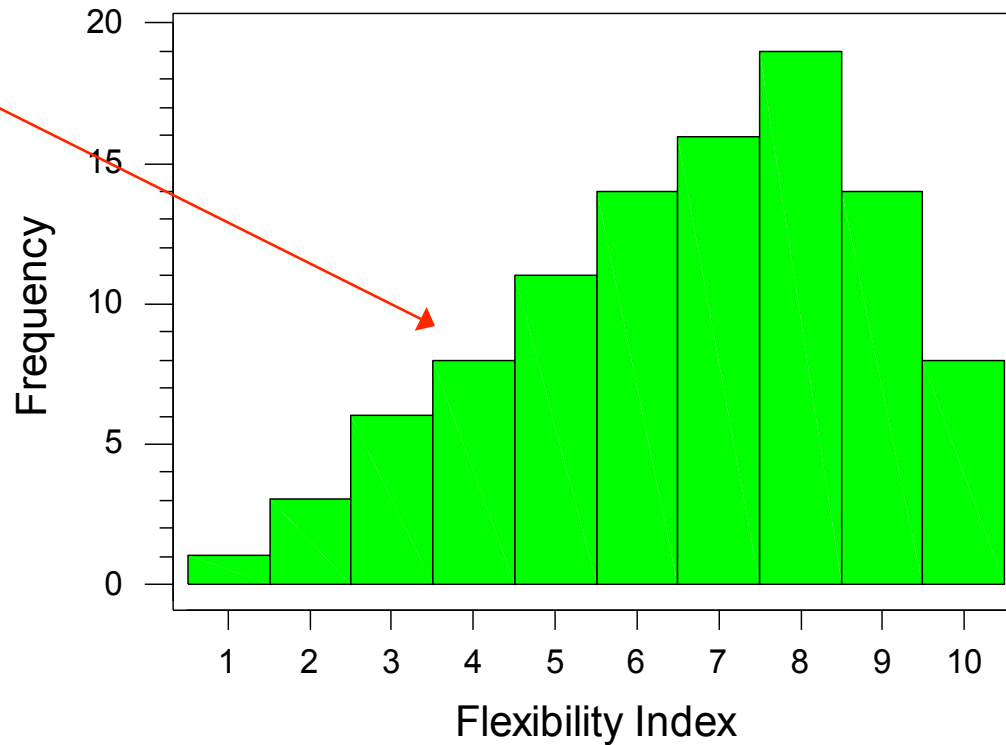
'ski slope' to the right



Left-skewed

'ski slope' to the left

Flexibility Index of Young Adult Men



Right-skewed or Left-skewed

- A distribution is **left-skewed** if its values are more spread out on the left side.
- A distribution is **right-skewed** if its values are more spread out on the right side.

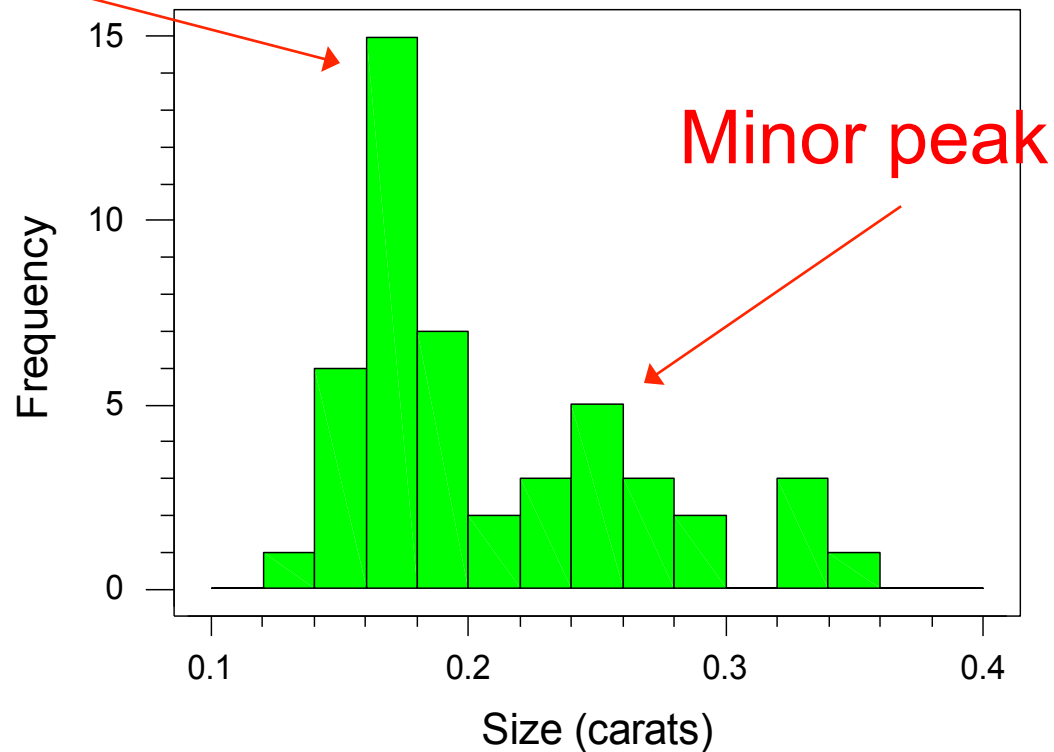
Number of Modes

- If there are numerous obvious peaks, we say there are multiple modes.
 - One peak → unimodal
 - Two peaks → bimodal
 - More than two peaks → multiple modes
- Some peaks can be ‘major’ peaks and some can be ‘minor’ peaks

Multiple Peaks

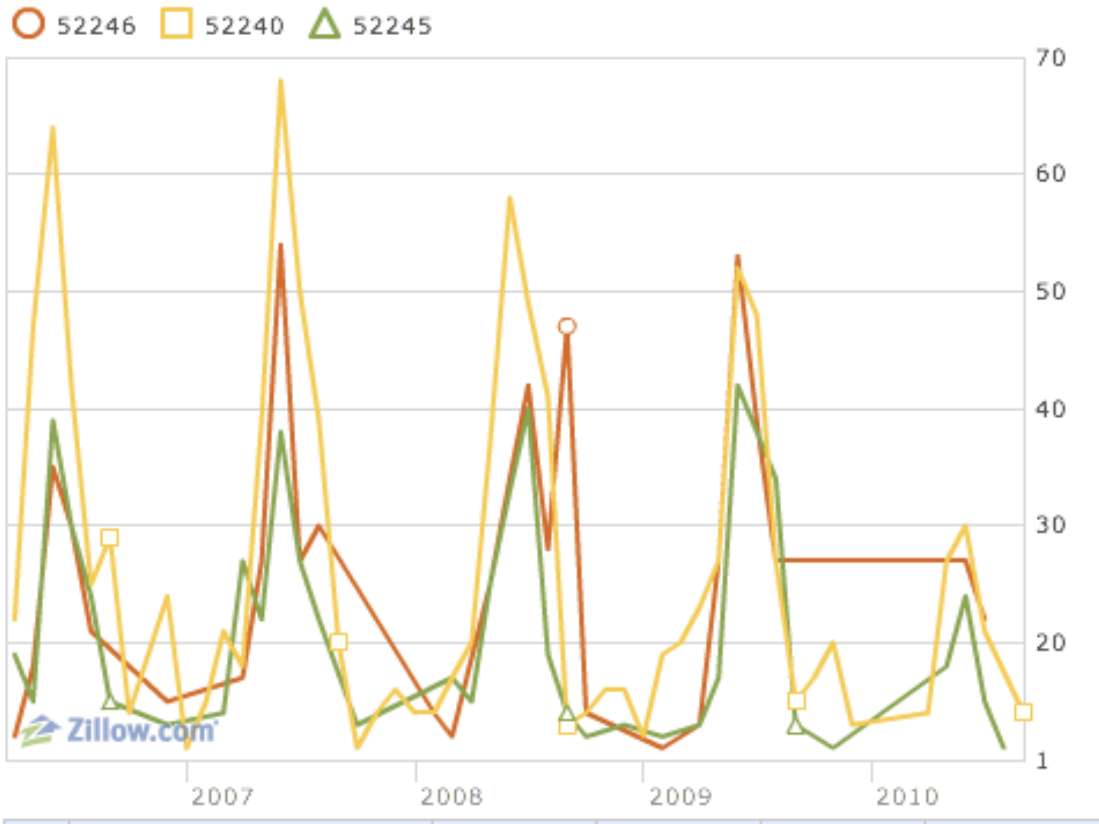
Major peak

Size of Diamonds (carats)



Time-Series Diagrams – example

Homes sold in Iowa City by zip code and month



Multiple peaks

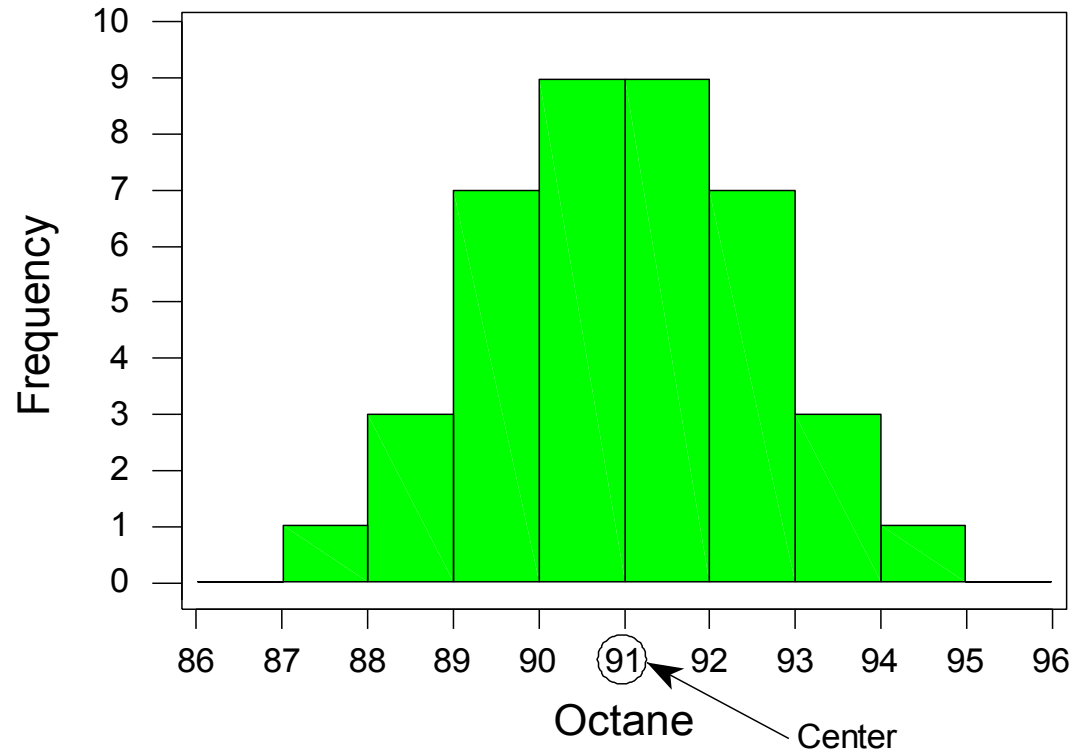
Year (data by the month)

Measures of Center

- These help describe a distribution, too.
- A typical or representative value.
 - Mean, Median, Mode
- Summary of the whole batch of numbers.
- For symmetric distributions – easy.

Histogram of Octane

Histogram of Octane Rating



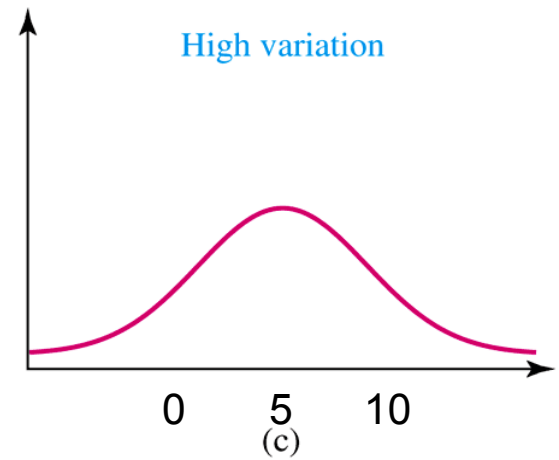
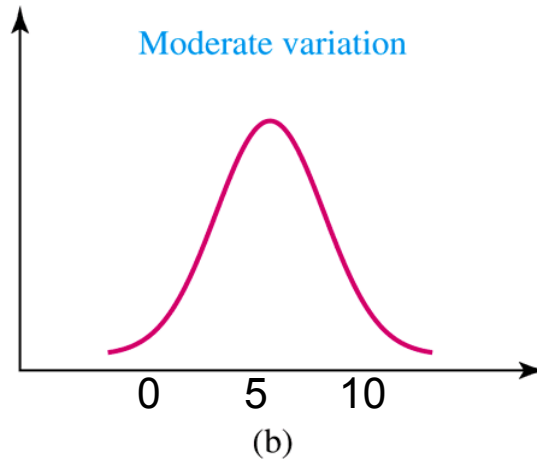
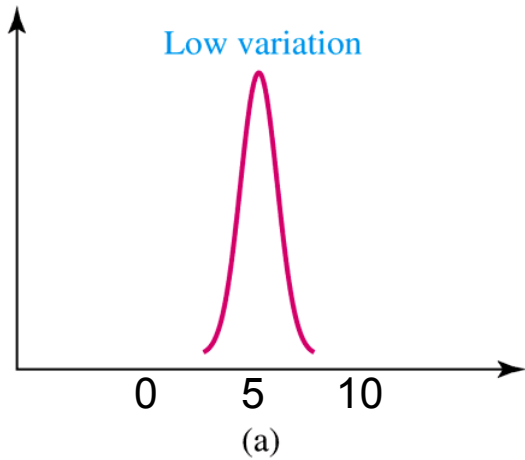
Spread

- Variation matters.
 - Tightly clustered?
 - Spread out?
 - Low and high values?

Variation describes how widely data are spread out about the center of a data set.

Spread

- Variation matters.

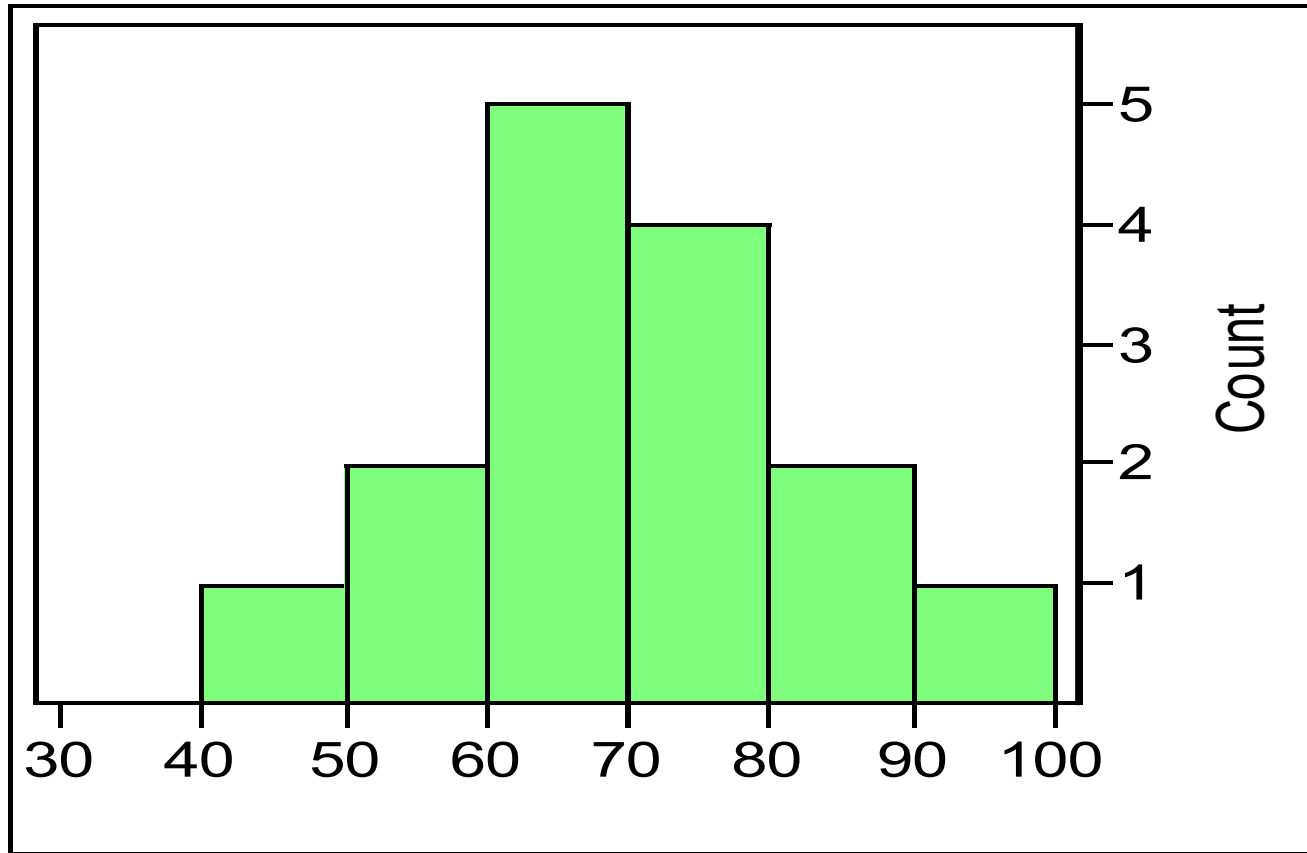




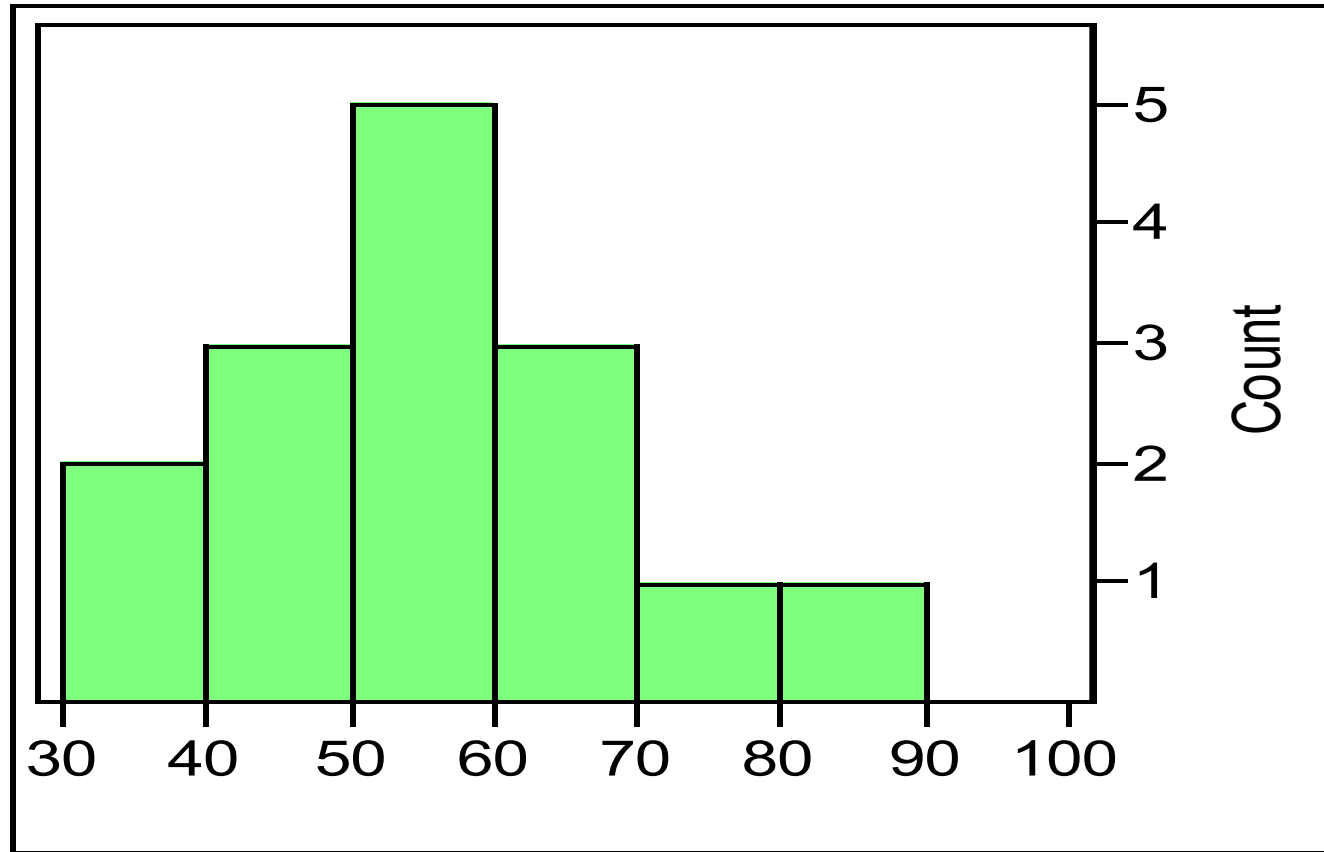
Comparing Distributions

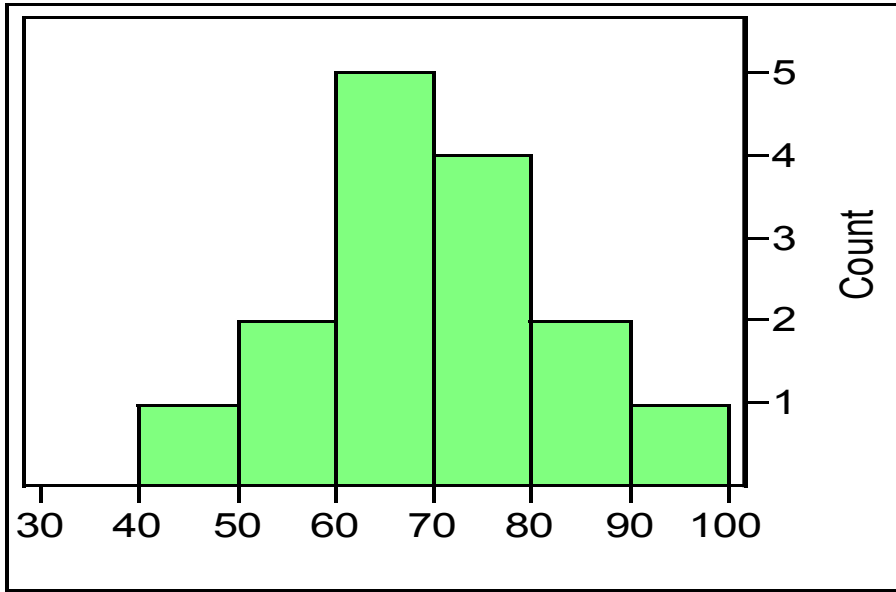
- How do the distributions compare in terms of...
 - Shape?
 - Center?
 - Spread?

Workout Times: Men

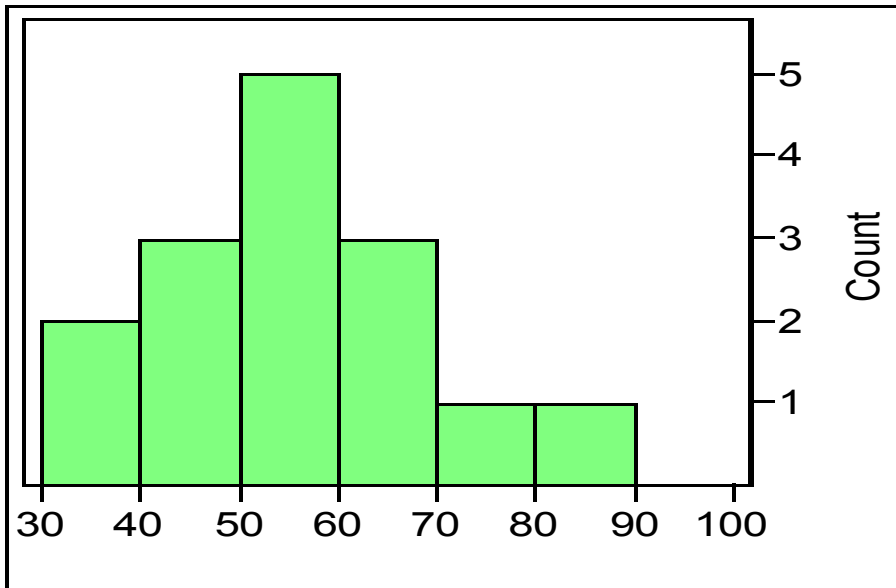


Workout Times: Women





Men



Women

To describe a distribution, use...

- Shape
- Center
- Spread