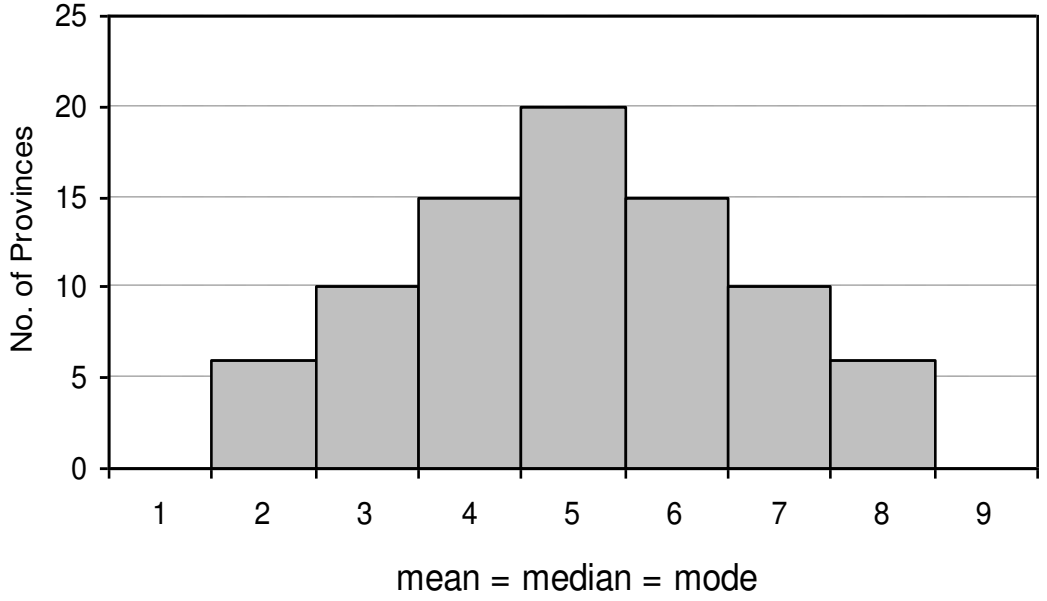
Measure of Skewness

Symmetric Distribution

* a distribution is symmetric if it can be folded along the vertical axis so that the two sides coincide

* if the distribution is symmetric, the mean, the median, and the mode are equal and are located at the same position along the horizontal axis

FIGURE 1a. Example of a Symmetric Distribution



Skewed Distribution

* if the two sides do not coincide, distribution is said to be asymmetric

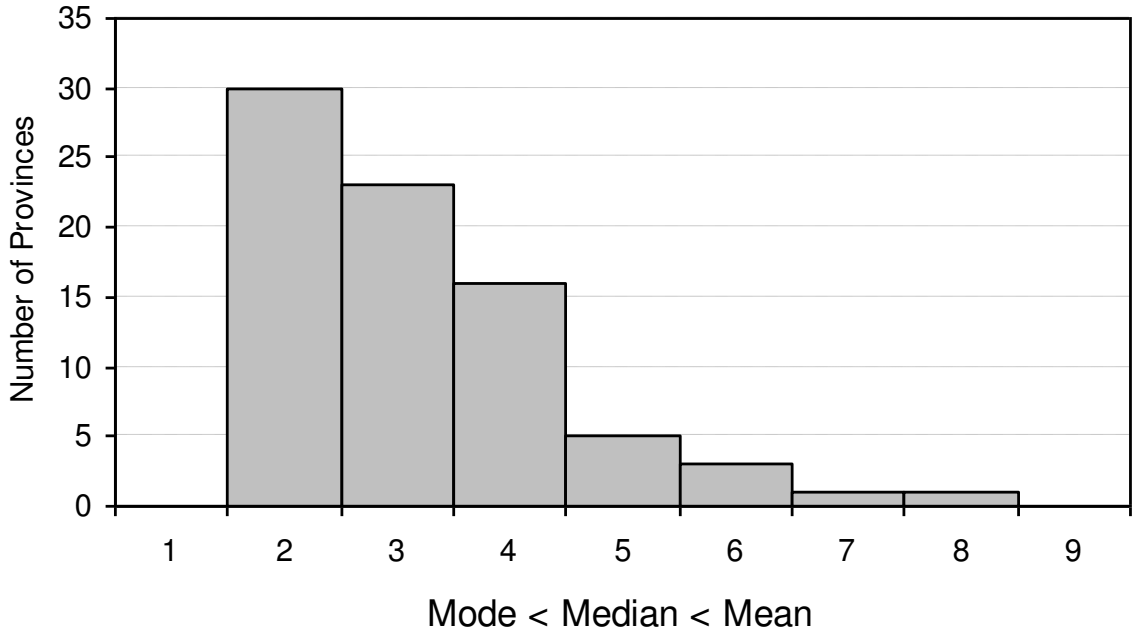
* a distribution that is asymmetric with respect to a vertical axis is said to be skewed.

Two Types of Skewness

Positively Skewed or Skewed to the Right Distribution

* distribution tapers more to the right than to the left
* has a longer tail to the right compared to a much shorter left tail
* values are more concentrated below than above the mean
* large values in the right tail are not offset by correspondingly low values in the left tail and consequently the mean will be greater than the median

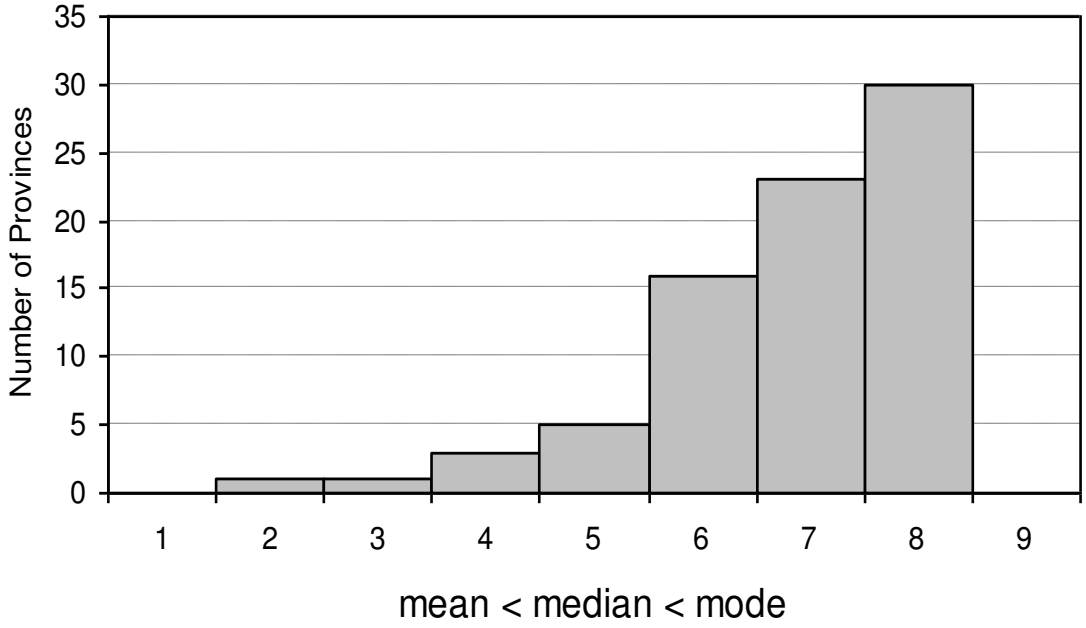
FIGURE 1b. Example of a Skewed to the Right Distribution



Negatively Skewed or Skewed to the Left Distribution

* distribution tapers more to the left than to the right
* has longer tail to the left compared to a much shorter right tail
* values are more concentrated above than below the mean
* small values in the left tail will make the mean less than the median

FIGURE 1c. Example of a Skewed to the Left Distribution



Measure of skewness

* shows the degree of asymmetry, or departure from symmetry of a distribution

* indicates also the direction of the distribution

$\bar{X}$

Pearson's First and Second Coefficient of Skewness

1. $SK = \frac{\bar{X} - Mo}{s}$ where $\bar{X}$ = mean, Mo = mode, s = standard deviation

2. $SK = \frac{3(\bar{X} - Md)}{s}$ where $\bar{X}$ = mean Md = median, s = standard deviation

Remarks:

1. Since the mode is frequently only an approximation, formula 2 is preferred.
2. Interpretation of the measure of skewness:

$SK > 0$: positively skewed since $\bar{X} > Md > Mo$

$SK < 0$: negatively skewed since $\bar{X} < Md < Mo$

Example: Given the following statistics on weights of court justices in kilograms:

$\bar{x}$ =74.1 Md = 75 Mo = 84 s = 11.25

Using the first formula,

$$SK = \frac{74.1 - 84}{11.25} = -0.88$$ (skewed to the left)

Using the second formula,

$$SK = \frac{3(74.1 - 75)}{11.25} = -0.24$$ (skewed to the left)