AN INTRODUCTION TO STATISTICS

LECTURE 3

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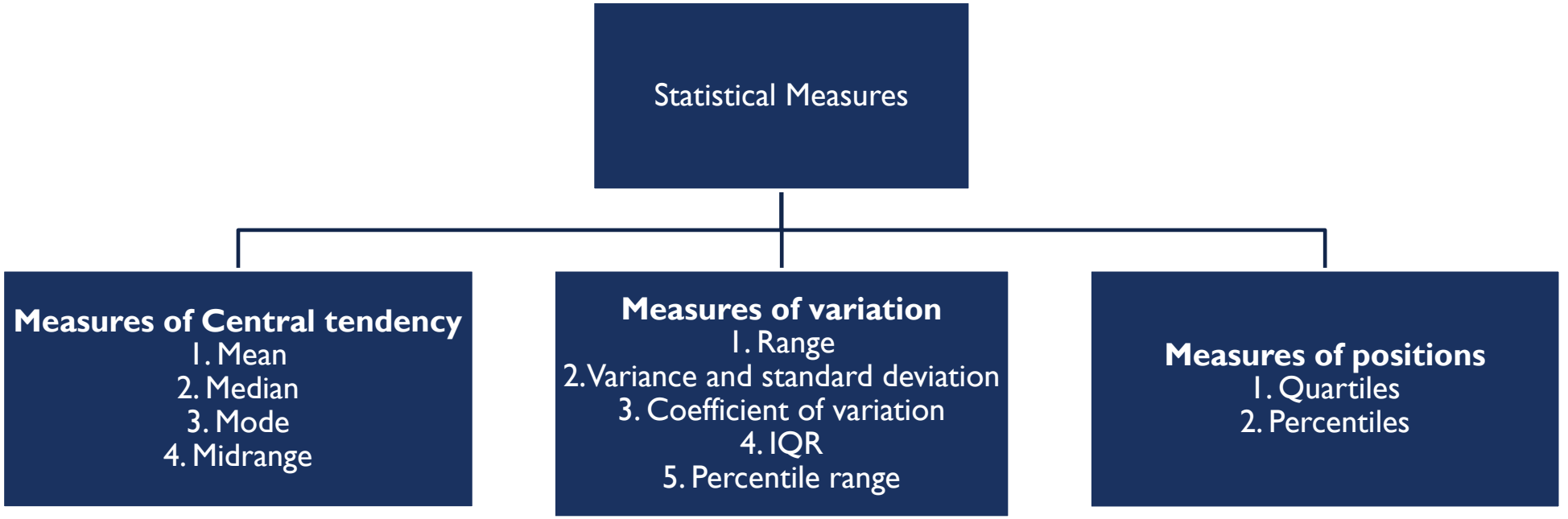
STATISTICAL MEASURES



MEASURES OF CENTRAL TENDENCY (MEAN)

- It is the value at the center or middle of a data set as Mean, Median, Mode and Midrange.
- **Arithmetic Mean**: the sum of data divided by the number of data points. It is a measure of central tendency that is sensitive to outliers.
- $\bar{x}$ is pronounced 'x-bar' and denotes the mean of a set of sample values (ungrouped data)

$$\bar{x} = \frac{\Sigma x}{n}$$

- μ is pronounced 'mu' and denotes the mean of all values in a population

$$\mu = \frac{\Sigma x}{N}$$

MEASURES OF CENTRAL TENDENCY (MEDIAN)

- **Median** :the middle value when the original data values are arranged in order of increasing (or decreasing) magnitude
- Median: Middle value if odd number of values, or average of the middle two values otherwise.
- often denoted by $\tilde{x}$ (pronounced 'x-tilde')

5.40 1.10 0.42 0.73 0.48 1.10

0.42 0.48 0.73 1.10 1.10 5.40

(even number of values – no exact middle shared by two numbers)

MEDIAN is 0.915

5.40 1.10 0.42 0.73 0.48 1.10 0.66

0.42 0.48 0.66 0.73 1.10 1.10 5.40

(in order - odd number of values)

exact middle MEDIAN is 0.73

MEASURES OF CENTRAL TENDENCY (MODE)

- Mode :the value that occurs most frequently
- The mode is not always unique. A data set may be: (Bimodal - Multimodal - No Mode)
- denoted by M
- The only measure of central tendency that can be used with nominal data

a. 5.40 1.10 0.42 0.73 0.48 1.10	⇦ Mode is 1.10
b. 27 27 27 55 55 55 88 88 99	⇦ Bimodal - 27 & 55
c. 1 2 3 6 7 8 9 10	⇦ No Mode

MEASURES OF CENTRAL TENDENCY (MIDRANGE)

- Midrange: the value midway between the highest and lowest values in the original data set

$$\text{Midrange} = \frac{\text{highest score} + \text{lowest score}}{2}$$

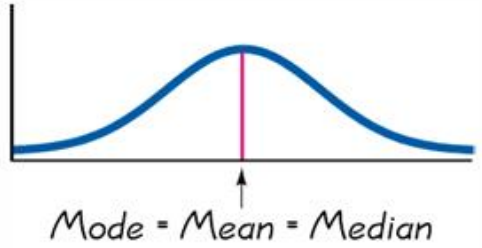
- Example: Find the midrange of the data set $327, $465, $672, $150, $230.

$$\text{Midrange} = \frac{\$150 + \$672}{2} = \$411$$

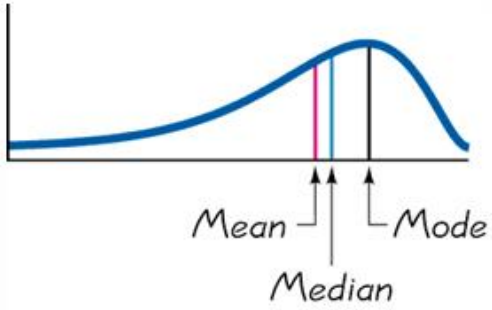
DEFINITIONS

- **Symmetric:** Data is symmetric if the left half of its histogram is roughly a mirror image of its right half.
- **Skewed:** Data is skewed if it is not symmetric and if it extends more to one side than the other

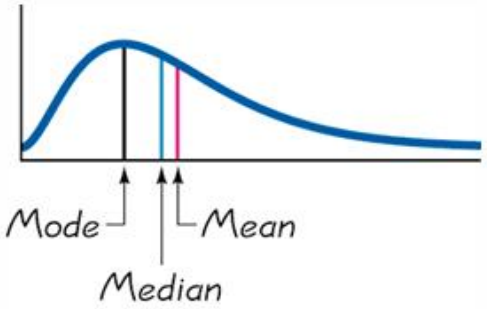
SYMMETRIC & SKEWNESS



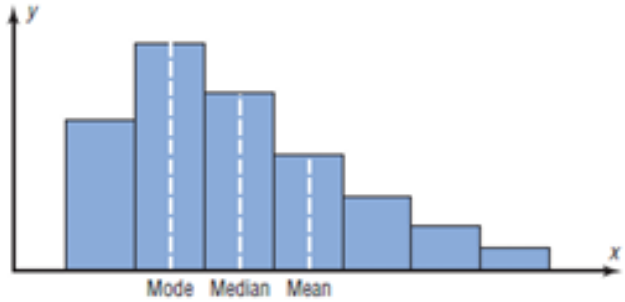
(b) Symmetric



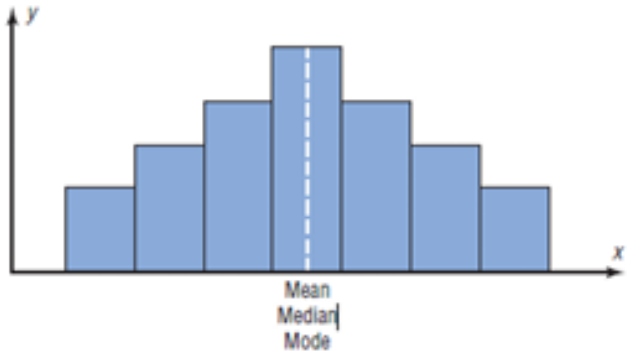
(a) Skewed to the Left (Negatively)



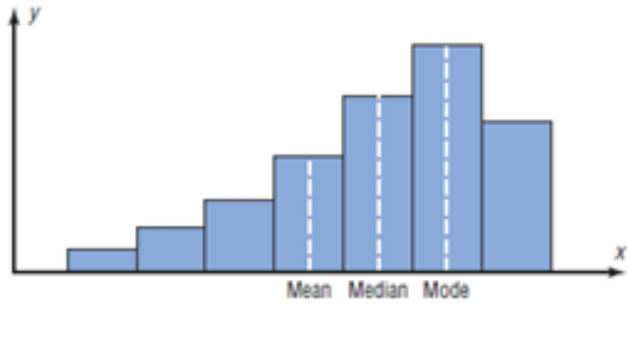
(c) Skewed to the Right (Positively)



(a) Positively skewed or right-skewed



(b) Symmetric



(c) Negatively skewed or left-skewed

MEASURES OF CENTRAL TENDENCY

- **Weighted Arithmetic Mean:** calculated by multiplying each value by its weight, summing these products, and then dividing by the sum of the weights.

A student received an A in English Composition I (3 credits), a C in Introduction to Psychology (3 credits), a B in Biology I (4 credits), and a D in Physical Education (2 credits). Assuming A = 4 grade points, B = 3 grade points, C = 2 grade points, D = 1 grade point, and F = 0 grade points, find the student's grade point average.

Solution

Course	Credits (w)	Grade (X)
English Composition I	3	A (4 points)
Introduction to Psychology	3	C (2 points)
Biology I	4	B (3 points)
Physical Education	2	D (1 point)

$$\bar{X} = \frac{\Sigma wX}{\Sigma w} = \frac{3 \cdot 4 + 3 \cdot 2 + 4 \cdot 3 + 2 \cdot 1}{3 + 3 + 4 + 2} = \frac{32}{12} = 2.7$$