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TOPIC: Measures of Central Tendenc

Measures of Central Tendency

Prof.I.Muthuchamy Ph.D.

Professor

Department of Educational Technology

Bharathidasan University,

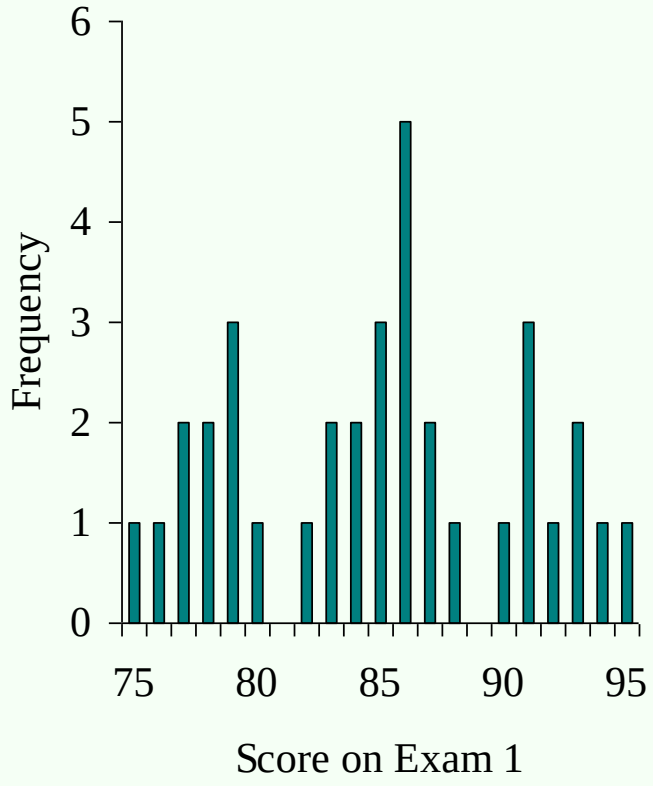
Trichy-620 023

Measures of Central Tendency

- A *measure of central tendency* is a descriptive statistic that describes the average, or typical value of a set of scores
- There are three common measures of central tendency:
  - the mode
  - the median
  - the mean

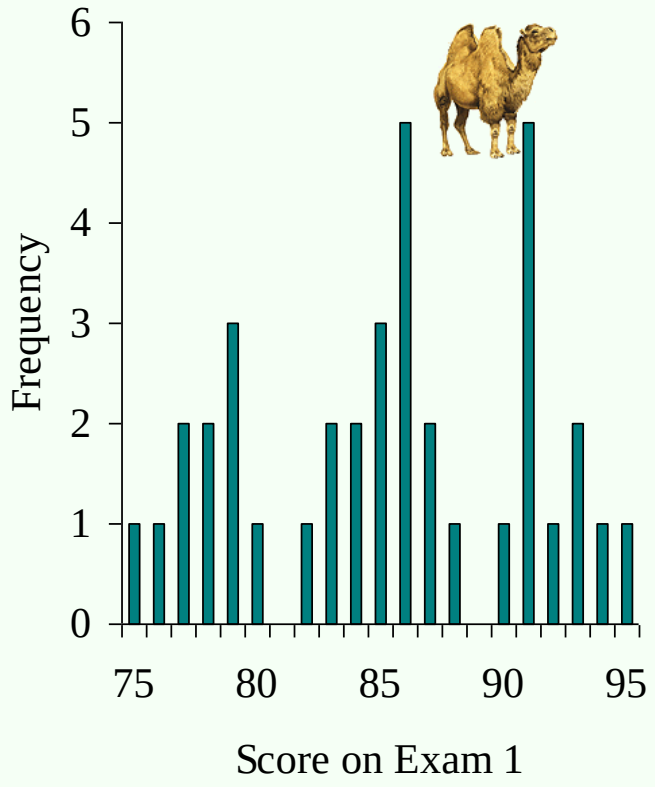
The Mode

- The *mode* is the score that occurs most frequently in a set of data



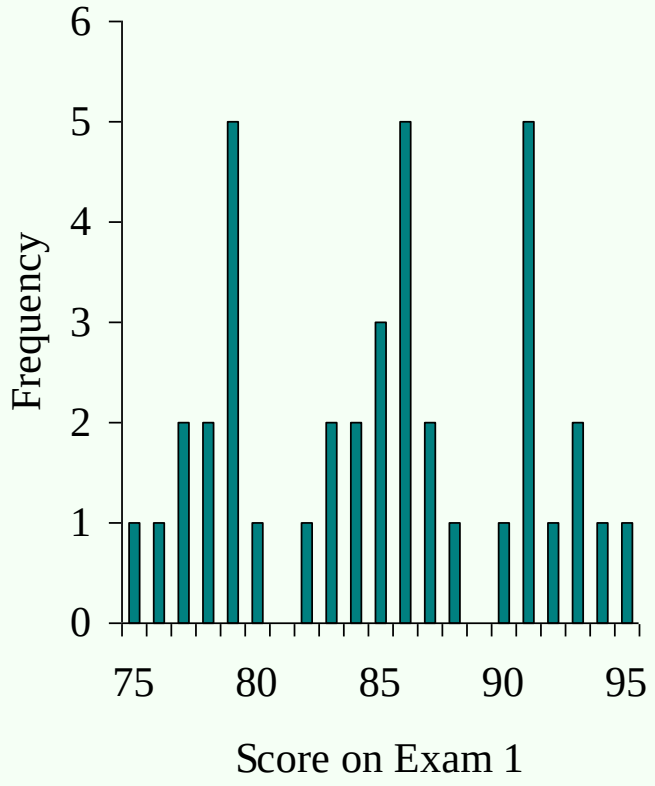
Bimodal Distributions

- When a distribution has two “modes,” it is called *bimodal*



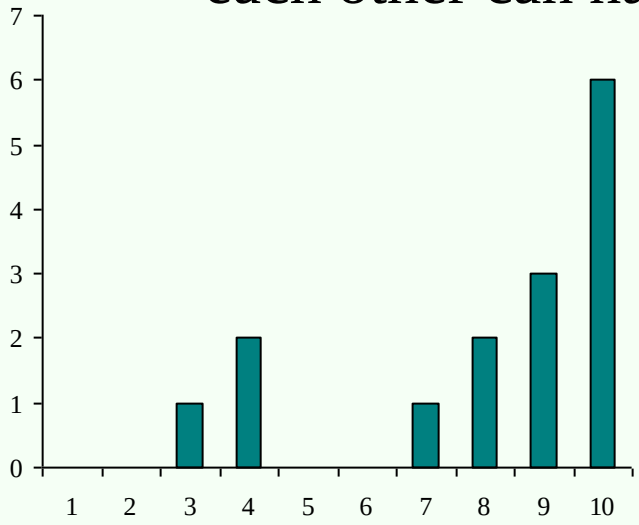
Multimodal Distributions

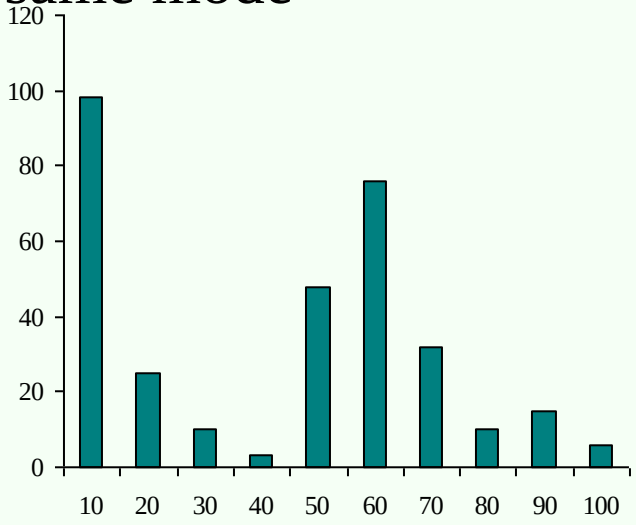
- If a distribution has more than 2 “modes,” it is called *multimodal*



When To Use the Mode

- The mode is not a very useful measure of central tendency
  - It is insensitive to large changes in the data set
    - That is, two data sets that are very different from each other can have the same mode





When To Use the Mode

- The mode is primarily used with nominally scaled data
  - It is the only measure of central tendency that is appropriate for nominally scaled data

The Median

- The *median* is simply another name for the 50th percentile
  - It is the score in the middle; half of the scores are larger than the median and half of the scores are smaller than the median

How To Calculate the Median

- Conceptually, it is easy to calculate the median
  - There are many minor problems that can occur; it is best to let a computer do it
- Sort the data from highest to lowest
- Find the score in the middle
  - middle = (N + 1) / 2
  - If N, the number of scores, is even the median is the average of the middle two scores

Median Example

- What is the median of the following scores:
  10 8 14 15 7 3 3 8 12 10 9
- Sort the scores:
  15 14 12 10 10 9 8 8 7 3 3
- Determine the middle score:
  middle = (N + 1) / 2 = (11 + 1) / 2 = 6
- Middle score = median = 9

Median Example

- What is the median of the following scores:
  24 18 19 42 16 12
- Sort the scores:
  42 24 19 18 16 12
- Determine the middle score:
  middle = (N + 1) / 2 = (6 + 1) / 2 = 3.5
- Median = average of 3rd and 4th scores:
  (19 + 18) / 2 = 18.5

When To Use the Median

- The median is often used when the distribution of scores is either positively or negatively skewed
  - The few really large scores (positively skewed) or really small scores (negatively skewed) will not overly influence the median

The Mean

- The *mean* is:
  - the arithmetic average of all the scores $(\Sigma X)/N$
  - the number, m, that makes $\Sigma(X - m)$ equal to 0
  - the number, m, that makes $\Sigma(X - m)^2$ a minimum
- The mean of a population is represented by the Greek letter μ; the mean of a sample is represented by $\bar{X}$

Calculating the Mean

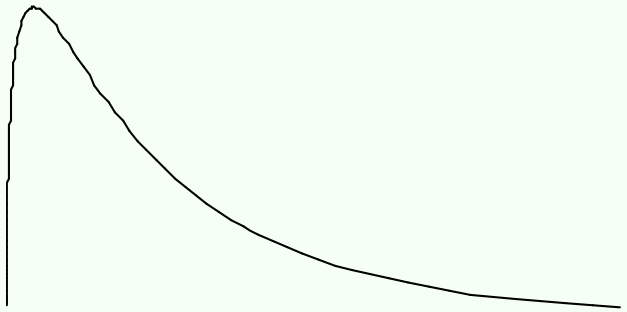
- Calculate the mean of the following data:
  1 5 4 3 2
- Sum the scores (ΣX):
  $1 + 5 + 4 + 3 + 2 = 15$
- Divide the sum ($\Sigma X = 15$) by the number of scores ($N = 5$):
  $15 / 5 = 3$
- Mean = $\overline{X} = 3$

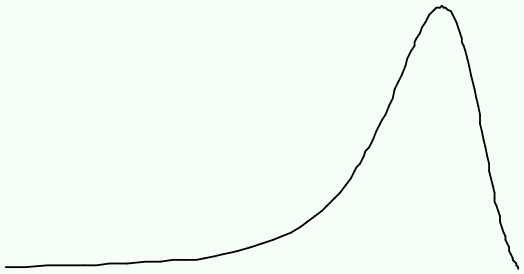
When To Use the Mean

- You should use the mean when
  - the data are interval or ratio scaled
    - Many people will use the mean with ordinally scaled data too
  - and the data are not skewed
- The mean is preferred because it is sensitive to every score
  - If you change one score in the data set, the mean will change

Relations Between the Measures of Central Tendency

- In symmetrical distributions, the median and mean are equal
  - For normal distributions, mean = median = mode
- In positively skewed distributions, the mean is greater than the median
- In negatively skewed distributions, the mean is smaller than the median





Thank You