

# Central Tendency

Course: Statistics 1

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# Central Tendency

A single value that best characterize a group of data as a whole

## Measure of central **location**

- Mean
- Median
- Mode

86	83	90	87	89	82	84	85	86	85
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# Concept of Average

$$\bar{X} = \frac{\sum X}{N}$$

- **Average** is part of the concept of *central tendency*
- A **single value** describing the entire distribution
- “Average” or **mean** or **Arithmetic mean**
- Add up all the numbers and divide by how many numbers there are
- ***X-bar*** for sample and  **$\mu$**  for population

# Mean – Arithmetic Mean

$$\bar{X} = \frac{\sum X}{N} = \frac{857}{10} = 85.7$$

X
86
83
90
87
89
82
84
85
86
85
$\sum X = 857$

$$\bar{X} = \frac{\sum X}{N} = \frac{857}{10} = 85.7$$

## Algebraic Sum of Deviations

- The algebraic sum of deviations of each data point from the mean is always **0**
- Deviation is  $(X - \bar{X})$

X	$(X - \bar{X})$
86	0.3
83	-2.7
90	4.3
87	1.3
89	3.3
82	-3.7
84	-1.7
85	-0.7
86	0.3
85	-0.7
$\sum X = 857$	$\sum (X - \bar{X}) = 0$

# Median

- The value that exactly separates the upper half of the distribution from the lower half
- A central tendency measure located such that 50% of scores or data points are lower than the median and 50% are greater
- The 50<sup>th</sup> percentile

## Median – Odd Data

- **Odd Data:** The central score of data ranked in order of magnitude
- Median is the *middle value* of ranked data
  - Median is **17**

12	14	16	17	18	20	21
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# Median – Even Data

- **Even Data:** Average of two centermost scores
- Median is the average of the two middle values of ranked data
  - Median is **85.5** =  $(85 + 86)/2$

82	83	84	85	85	86	86	87	89	90
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# Median - Mean

- Mean
  - The exact center of the deviations or distances of the scores from mean
  - Affected by extreme or atypical values
  - Stable measures in repeated sampling
- Median
  - The exact center of the scores themselves
  - Not affected by extreme or atypical values
  - Preferred measures in skewed distributions

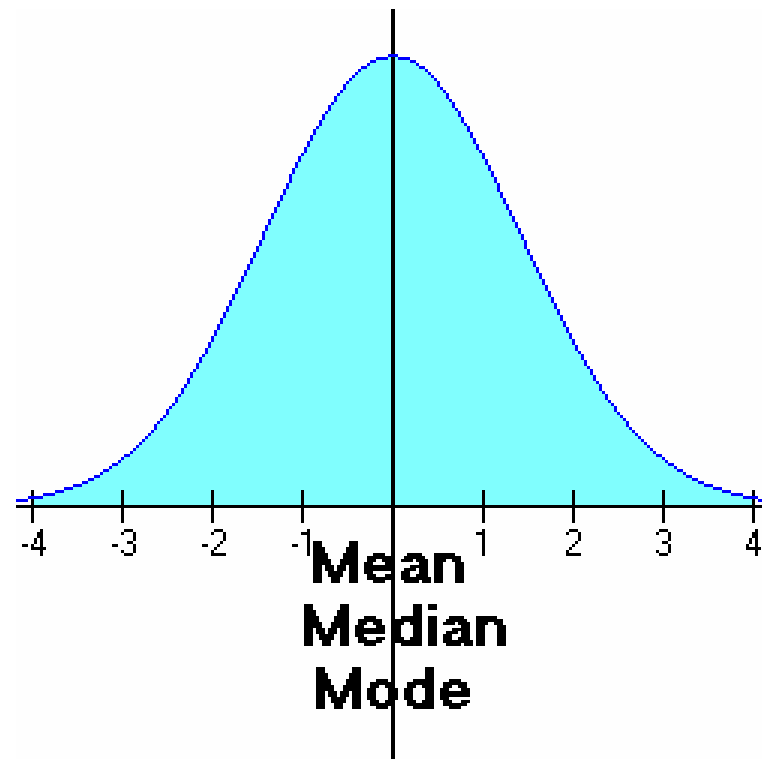
# Mode

The score that appears **most frequent**

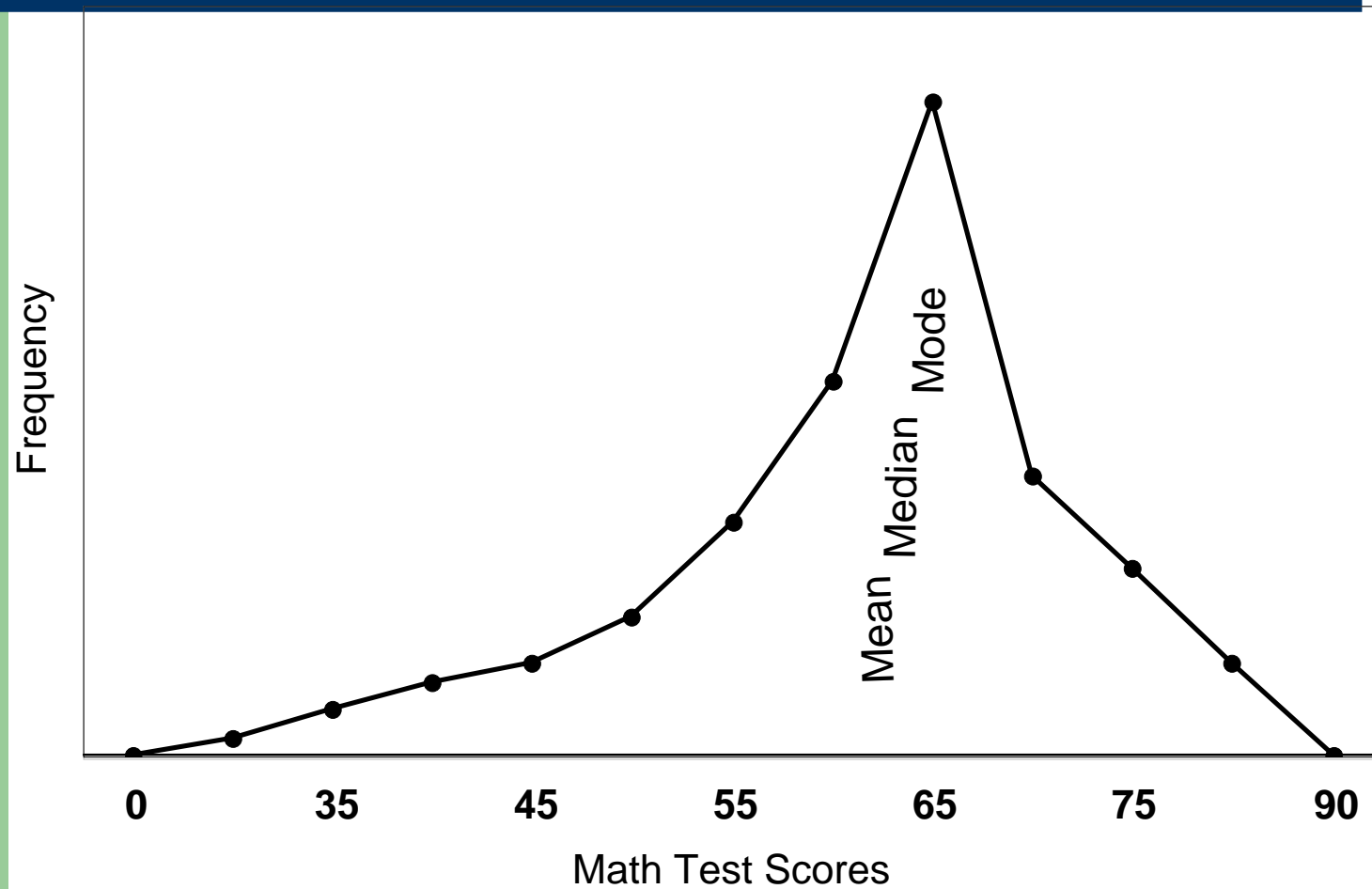
- The value that gives the **highest frequency** in a frequency distribution
- **Easily obtained** by inspection
- Useful in **locating points of concentration** of like scores
- There may be more than one mode - *Bimodal*

82	83	84	85	85	86	86	87	89	90
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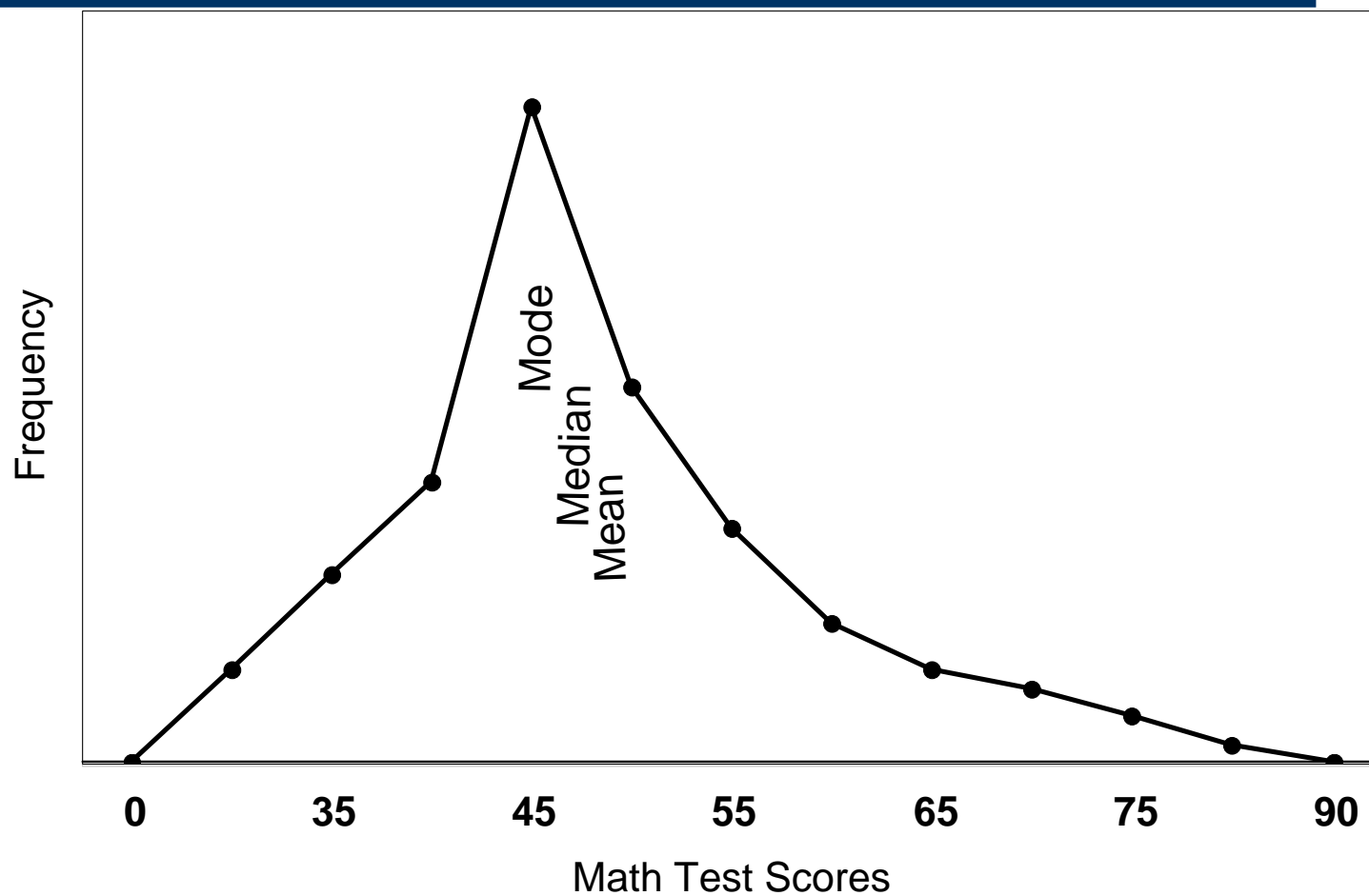
# Symmetrical Distribution - Normal



# Negative Skewed Distribution



# Positive Skewed Distribution



# Mean – Median - Mode

- Mean: Sum of deviations of data from mean is zero
- Median: 50% of data is below and above the median
- Mode: Value that occurs the most frequent