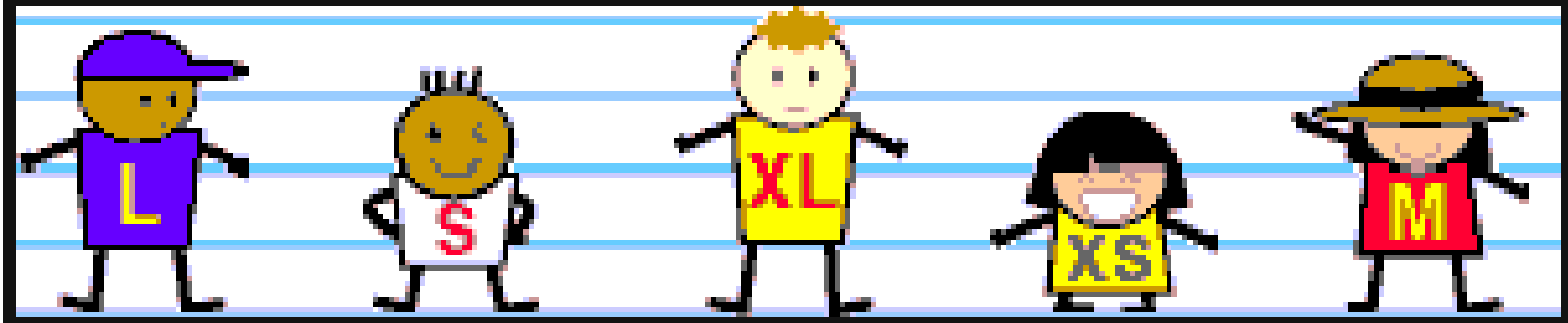
CENTRAL TENDENCY:
Mean, Median, Mode



New Statistical Notation

- Σ : sigma
  - The symbol Σ means to sum (add) the scores

Central Tendency

What Is Central Tendency?

- A score that indicates where the *center* of the distribution *tends* to be located.

- Tells us about the shape and nature of the distribution.

Measures of Central Tendency

- Mode
- Median
- Mean

The Mode

- The most frequently occurring score.
- Typically useful in describing central tendency when the scores reflect a *nominal scale* of measurement.

The Mode

- It does not make sense to take the average in nominal data.
  - Gender: 67 males --- 1
    50 females ---- 2

14	14	13	15	11	15
13	10	12	13	14	13
14	15	17	14	14	15

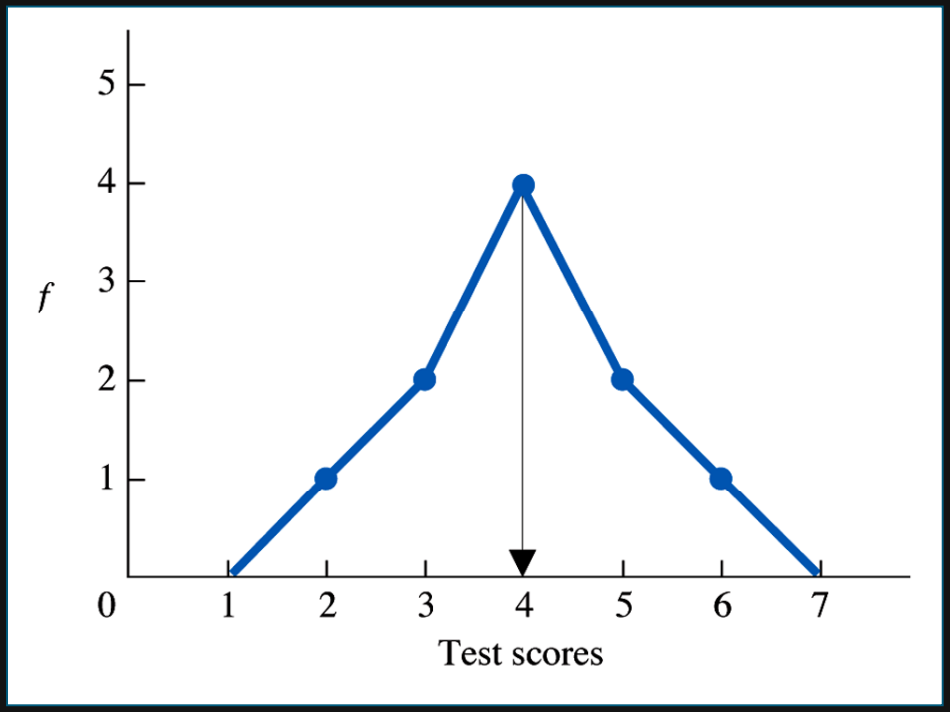
Score	*f*
17	1
16	0
15	4
14	6
13	4
12	1
11	1
10	1

N=18

What is the mode?

Unimodal Distributions

When a polygon has one hump (such as on the normal curve) the distribution is called ***unimodal.***



14	14	13	15	11	12
15	10	12	13	12	13
15	15	17	12	15	12

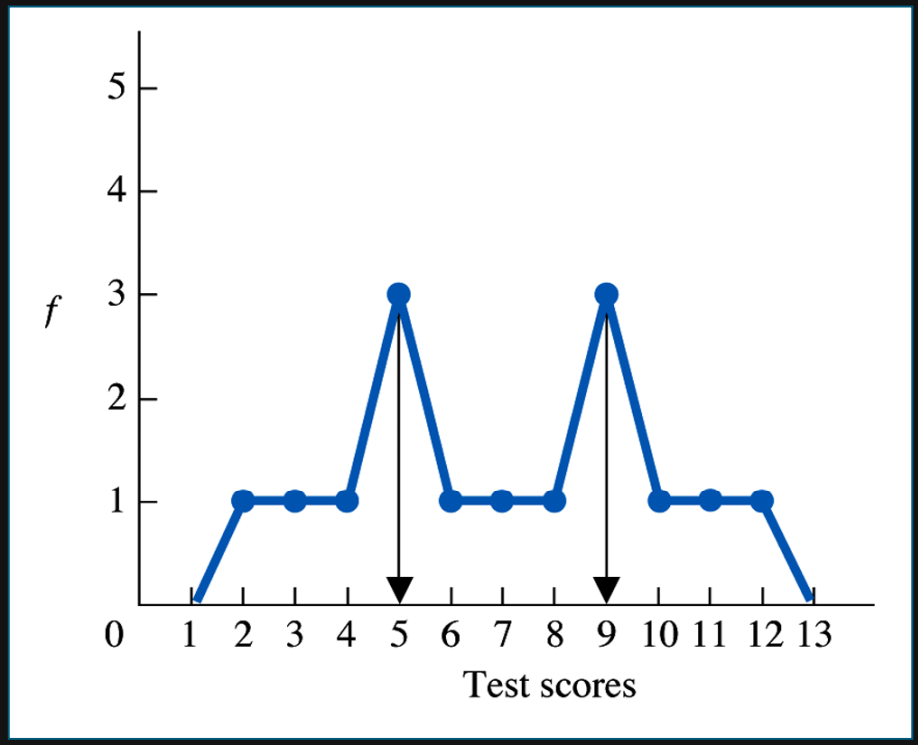
Score	*f*
17	1
16	0
15	5
14	2
13	3
12	5
11	1
10	1

N=18

What is the mode?

Bimodal Distributions

When a distribution has two scores that are most frequently occurring, it is called ***bimodal***.



Example

Score	*f*
7	1
6	4
5	5
4	4
3	6
2	7
1	9

N=36

What is the mode?

Uses of The Mode

- In nominal data
  - Since we cannot use mean or median
- Also in ordinal, interval or ratio data, along with mean and median

Problems with The Mode

- Gives us limited information about a distribution
  - Might be misleading
  - EXP: 7 7 7 20 20 21 22 22 23 24
    - What is the mode here?

The Median (Mdn)

- The score at the 50th percentile, (in the middle)

- Used to summarize ordinal or highly skewed interval or ratio scores.

Determining the Median

- When data are normally distributed, the median is the same score as the mode.
- When data are not normally distributed, follow the following procedure:
  - Arrange the scores from highest to the lowest.
  - If there are an odd number of scores, the median is the score in the middle position.
  - If there are an even number of scores, the median is the average of the two scores in the middle.

The Median (Mdn)

- A better measure of central tendency than mode
  - Only one score can be the median
  - It will always be around where the most scores are.
- EXP: 1 2 3 3 4 7 9 10 11
- EXP: 1 2 3 3 4 6 7 9 10 11

14	14	13	15	11	15
13	10	12	13	14	13
14	15	17	14	14	15

Score	*f*
17	1
16	0
15	4
14	6
13	4
12	1
11	1
10	1

N=18

What is the median?

The Mean

- The score located at the mathematical center of a distribution
- Used to summarize interval or ratio data in situations when the distribution is symmetrical and unimodal

Determining the Mean

- The formula for the sample mean is

$$\overline{X} = \frac{\Sigma X}{N}$$

14	14	13	15	11	15
13	10	12	13	14	13
14	15	17	14	14	15

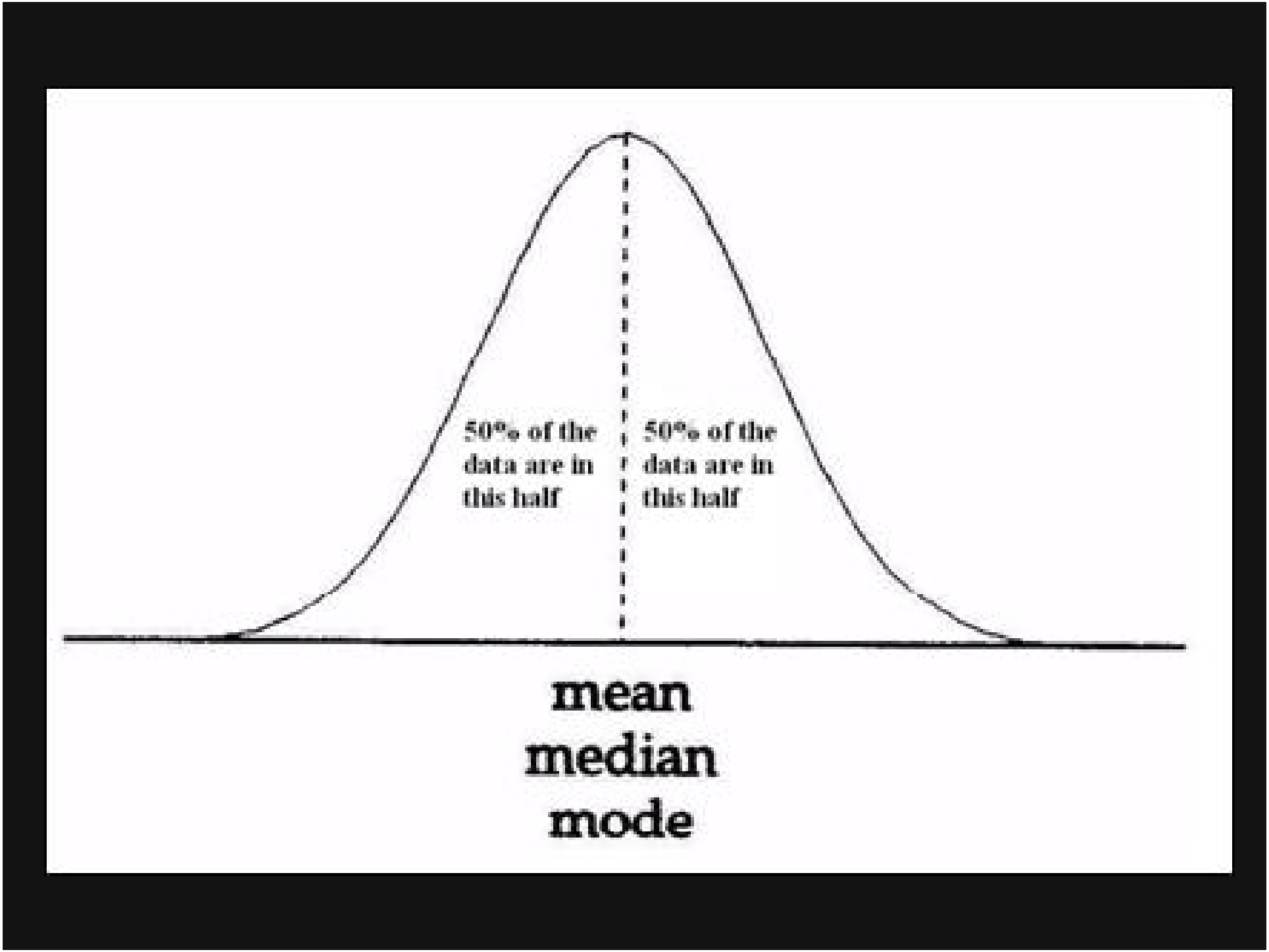
Score	*f*
17	1
16	0
15	4
14	6
13	4
12	1
11	1
10	1

N=18

What is the mean?

Central Tendency and Normal Distributions

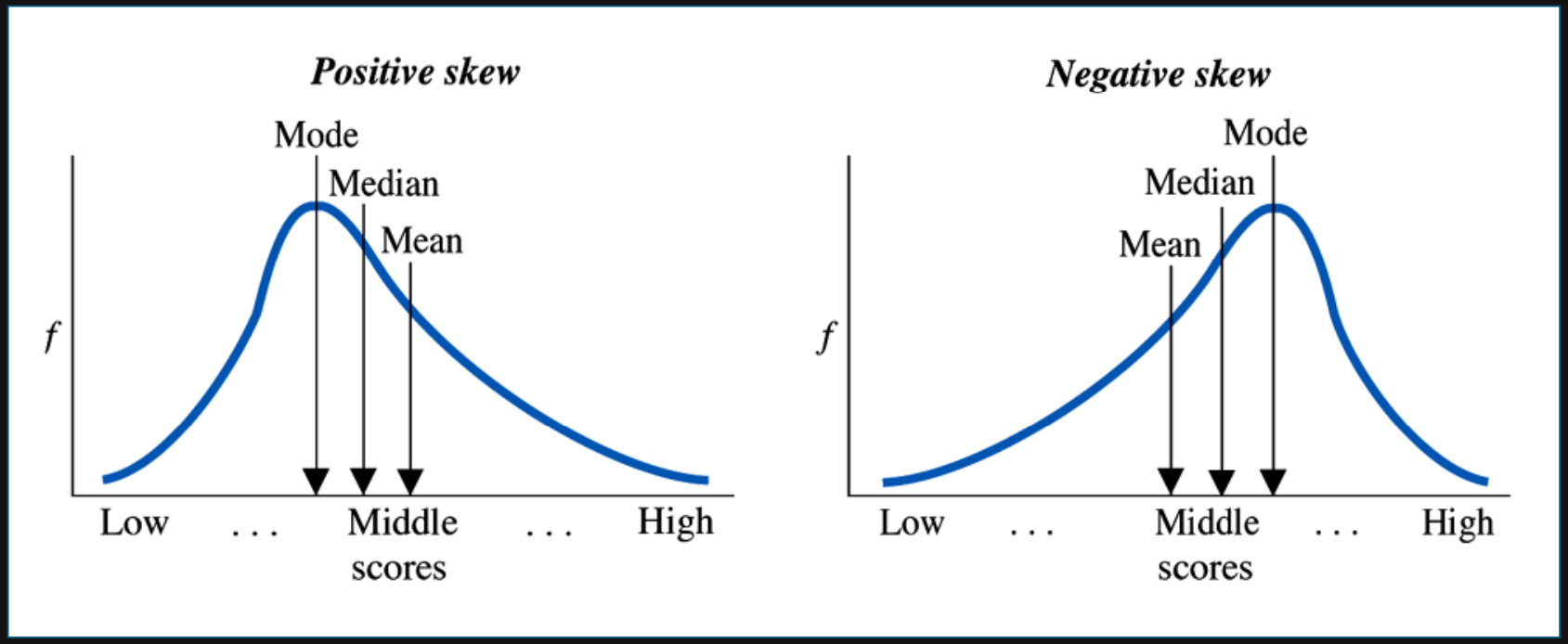
On a perfect normal distribution all three measures of central tendency are located at the same score.


50% of the data are in this half
50% of the data are in this half
mean
median
mode

Central Tendency

- Measures of Central Tendency:
  - **Mean**
    - The sum of all scores divided by the number of scores.
  - **Median**
    - The score in the middle when the scores are ordered.
  - **Mode**
    - The most frequent score.

Central Tendency and Skewed Distributions



Measurement Scale	Measures you CAN use	Best Measure of the "Middle"
Nominal	Mode	Mode
Ordinal	Mode Median	Median
Interval	Mode Median Mean	Symmetrical data: Mean Skewed data: Median
Ratio	Mode Median	Symmetrical data: Mean
	Mean	Skewed data: Median

Deviations Around the Mean

Deviations

- A score's **deviation** is the distance separate the score from the mean
  - $\sum = (X - X^{bar})$
- The sum of the deviations around the mean always equals 0.

More About Deviations

- When using the mean to predict scores, a deviation $(X-\bar{X})$ indicates our error in prediction.
- A deviation score indicates a raw score's location and frequency relative to the rest of the distribution.

Example 1

- Find the mean, median and mode for the set of scores in the frequency distribution table below

X	f
5	2
4	3
3	2
2	2
1	1

Example 2

- The following data are representing verbal comprehension test scores of males and females.
- Female: 26 25 24 24 23 23 22 22 21 21 21 20 20
  Male: 20 19 18 17 22 21 21 26 26 26 23 23 22
- Calculate mean, mode, median, for both males and females separately.
  - What kind of distribution is this?


Viewer
THE END