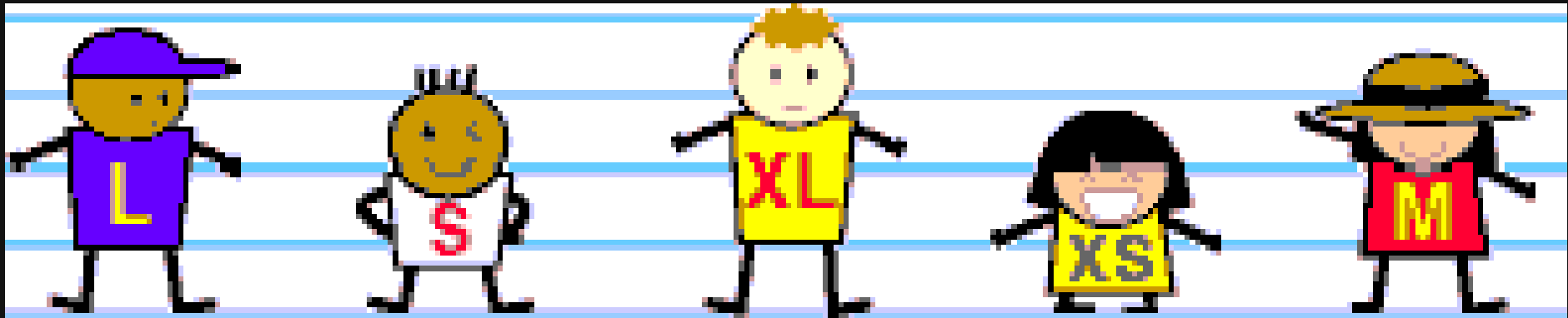


# CENTRAL TENDENCY: Mean, Median, Mode



# New Statistical Notation

- $\Sigma$  : sigma
  - The symbol  $\Sigma$  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

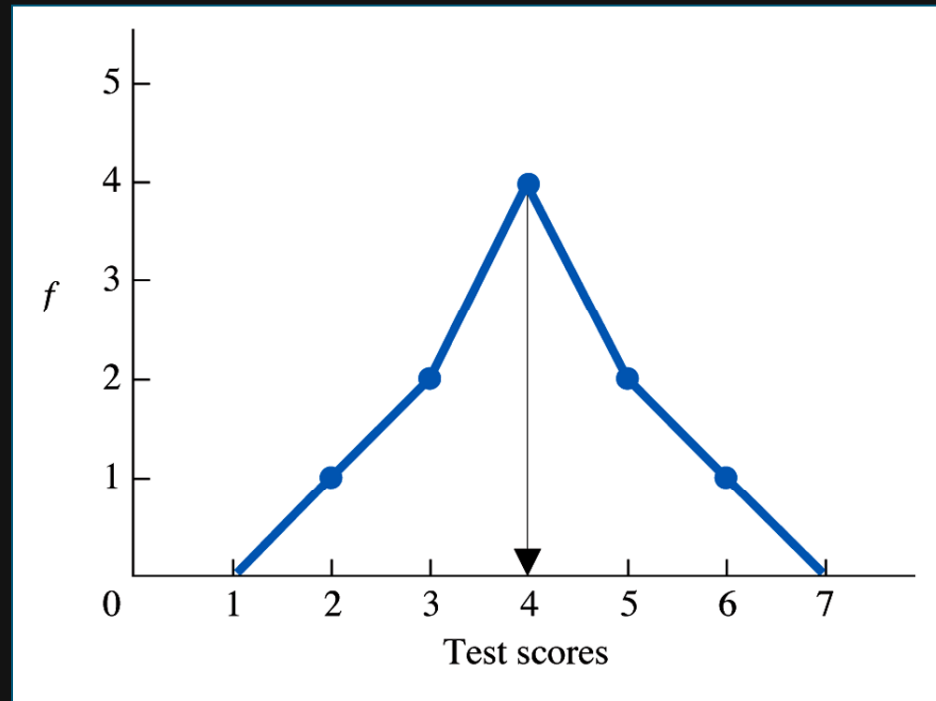
**N=18**

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*

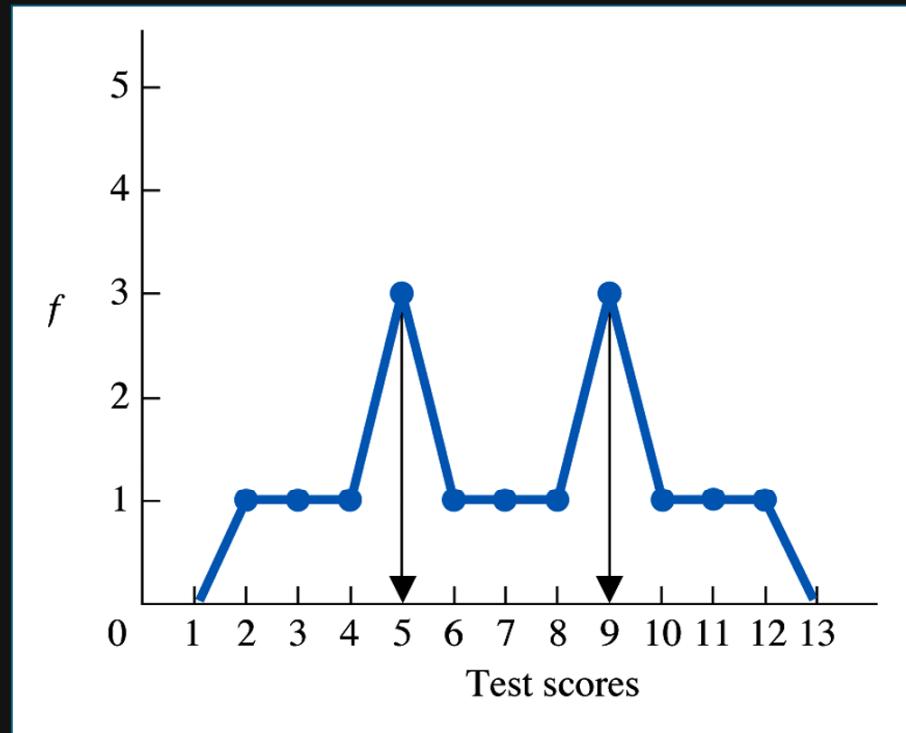
17    1  
16    0  
15    5  
14    2  
13    3  
12    5  
11    1  
10    1

**N=18**

What is the mode?

# Bimodal Distributions

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



# Example

<u>Score</u>	<u><i>f</i></u>
--------------	-----------------

7	1
---	---

6	4
---	---

5	5
---	---

4	4
---	---

3	6
---	---

2	7
---	---

1	9
---	---

What is the mode?

**N=36**

# 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

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

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

Score

*f*

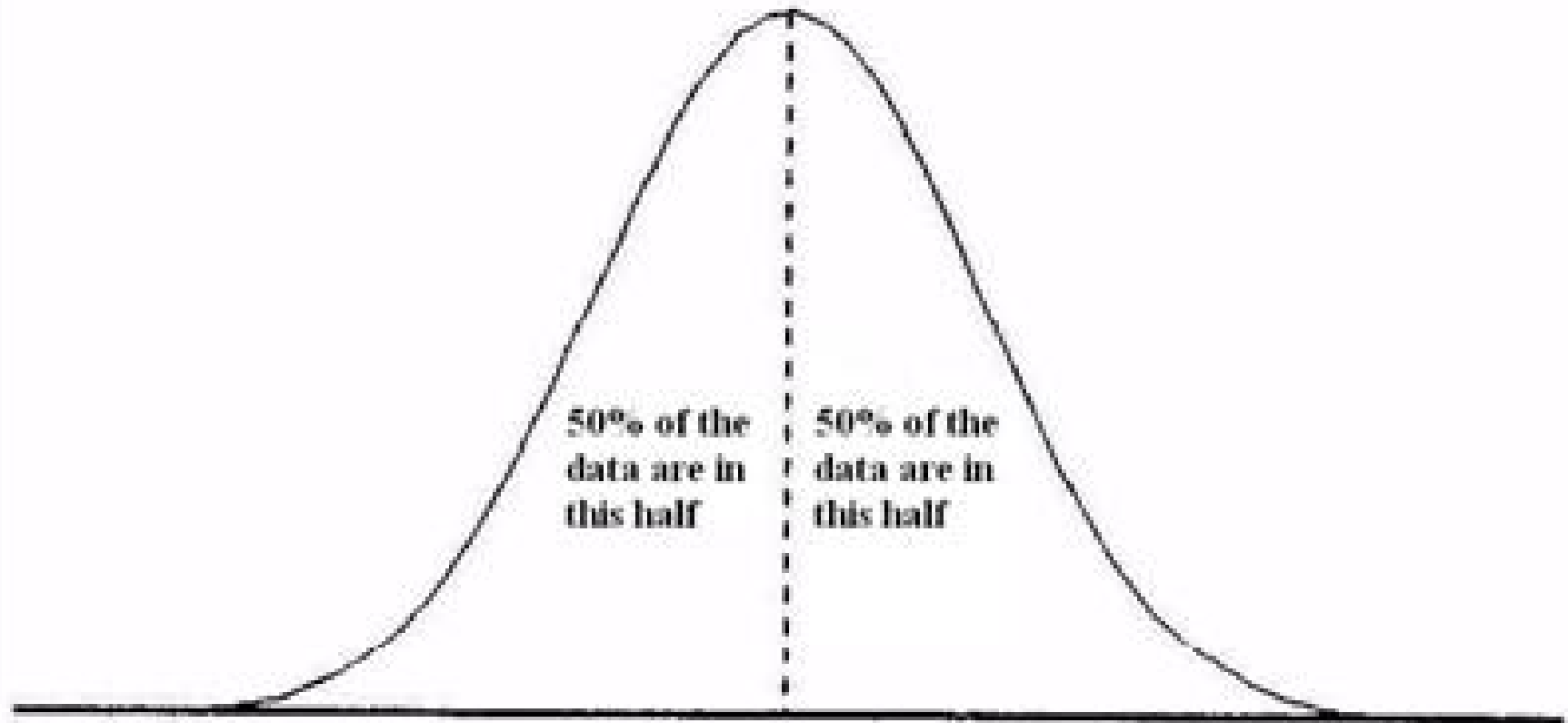
17	1
16	0
15	4
14	6
13	4
12	1
11	1
10	1

**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.



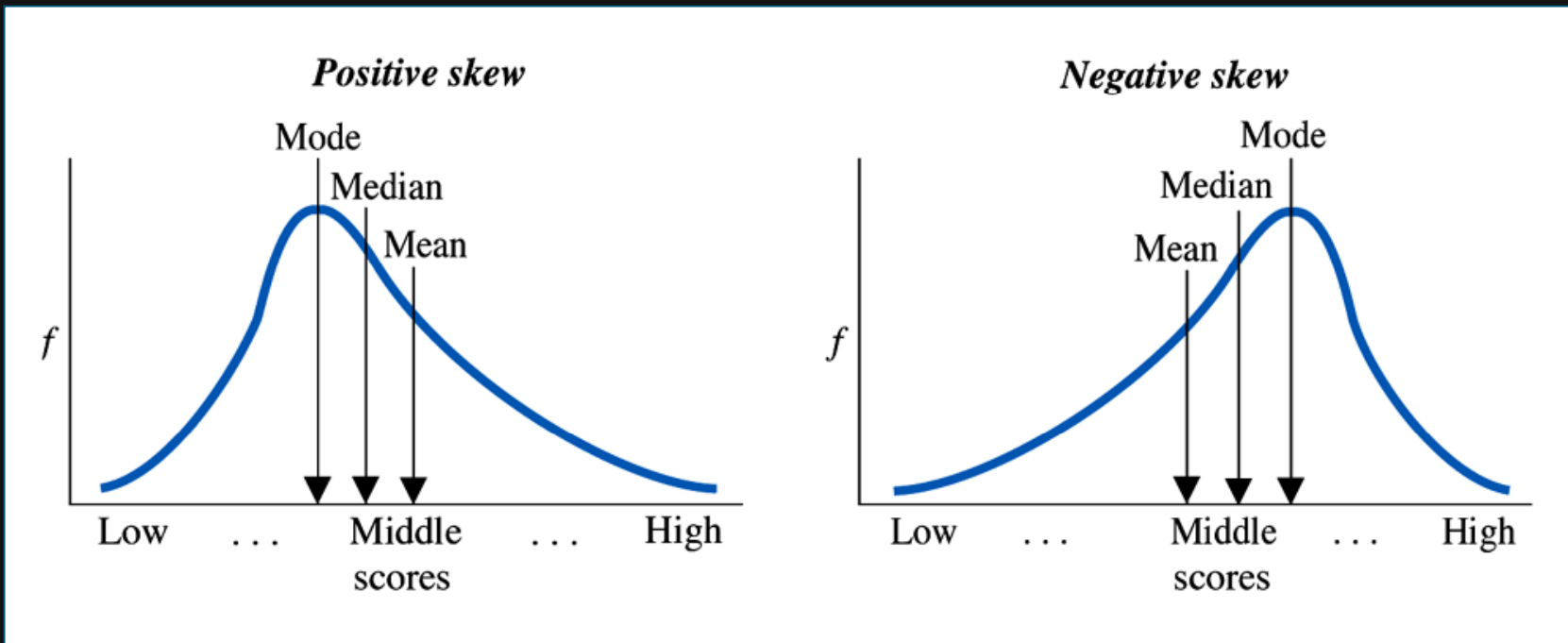
**mean**  
**median**  
**mode**

# 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 Skewed data: Median
	Mean	

*Deviations Around  
the Mean*

# Deviations

- A score's **deviation** is the distance separate the score from the mean

$$- \sum = (X - X^{\text{bar}})$$

- 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

<u>X</u>	<u>f</u>
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