

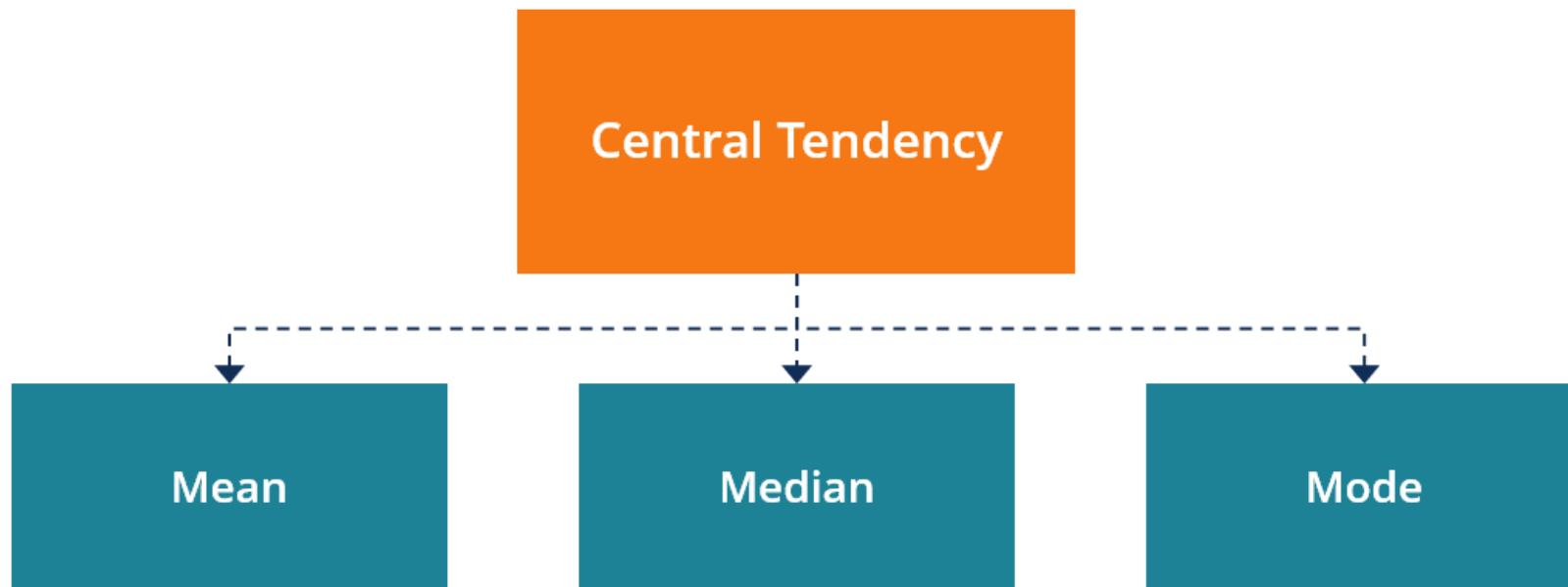
CHAPTER 4

MEASURES OF CENTRAL TENDENCY

MEASURES OF CENTRAL TENDENCY

Descriptive statistics that offer information on where the scores in a data set tend to cluster.

Examples: Mean, Median, Mode.



THE MEAN

The arithmetic average of a variable within a set of data.

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

\bar{x} = Mean

\sum = Summation

x = Values in a column

n = Sample size

A MEAN EXAMPLE

We have five college student's test scores on a particular exam:

	grades
student_1	85
student_2	90
student_3	75
student_4	86
student_5	91

$$\bar{x} = \frac{(85 + 90 + 75 + 86 + 91)}{5}$$

$$\bar{x} = ?$$

THE MEDIAN

A score that cuts a distribution in half, or more simply, the true middle number.

Steps to Find the Median

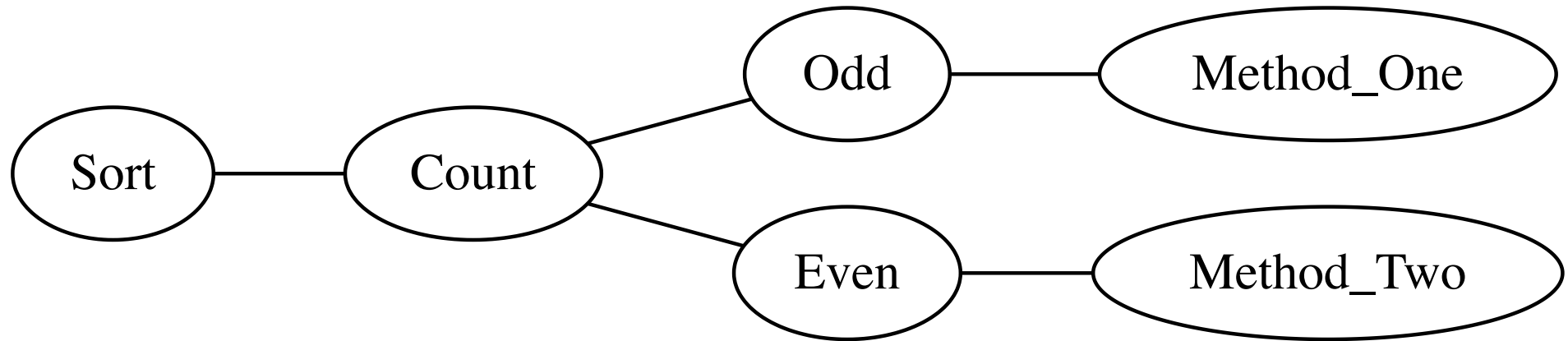


Figure 1: ?(caption)

ODD NUMBER (METHOD ONE)

We only need one step for this!

$$\text{Median} = \frac{n + 1}{2}$$

n = Sample size

EVEN NUMBER (METHOD TWO)

LM and UM are numbers within the column.

Step 1

$$\text{LowerMiddle}(LM) = \frac{n}{2}$$

Step 2

$$\text{UpperMiddle}(UM) = \frac{n}{2} + 1$$

Step 3

$$\text{Median} = \frac{LM + UM}{2}$$

METHOD ONE EXAMPLE

We have nine college student's test scores on a particular exam:

	grades
student_1	85
student_2	90
student_3	75
student_4	86
student_5	62
student_6	79
student_7	96

$$\text{Median} = \frac{? + 1}{2}$$

METHOD TWO EXAMPLE

We have four college student's test scores on a particular exam:

	grades
student_1	85
student_2	90
student_3	75
student_4	86

$$(LM) = \frac{?}{2}$$

$$(UM) = \frac{?}{2} + 1$$

$$Median = \frac{(?+?)}{2}$$

THE MODE

The most frequent number in a set of scores or column.

Simply sort your values in ascending order, then count and compare (Hint: Look for numbers that repeat).

The image shows a handwritten example on a green grid background. At the top, the numbers 2, 4, 5, 5, 4, 5 are written. Below them, a blue arrow points to the sorted sequence 2, 4, 4, 5, 5, 5. The three 5s are highlighted in red, and each has a red number below it: 1, 2, and 3, indicating their frequency. At the bottom, the text 'MODE =' is followed by a red 5 inside a black square box. A 'wikiHow' logo is in the bottom right corner.

2, 4, 5, 5, 4, 5

→ 2, 4, 4, 5, 5, 5

1 2 3

MODE = 5

wikiHow

A MODE EXAMPLE

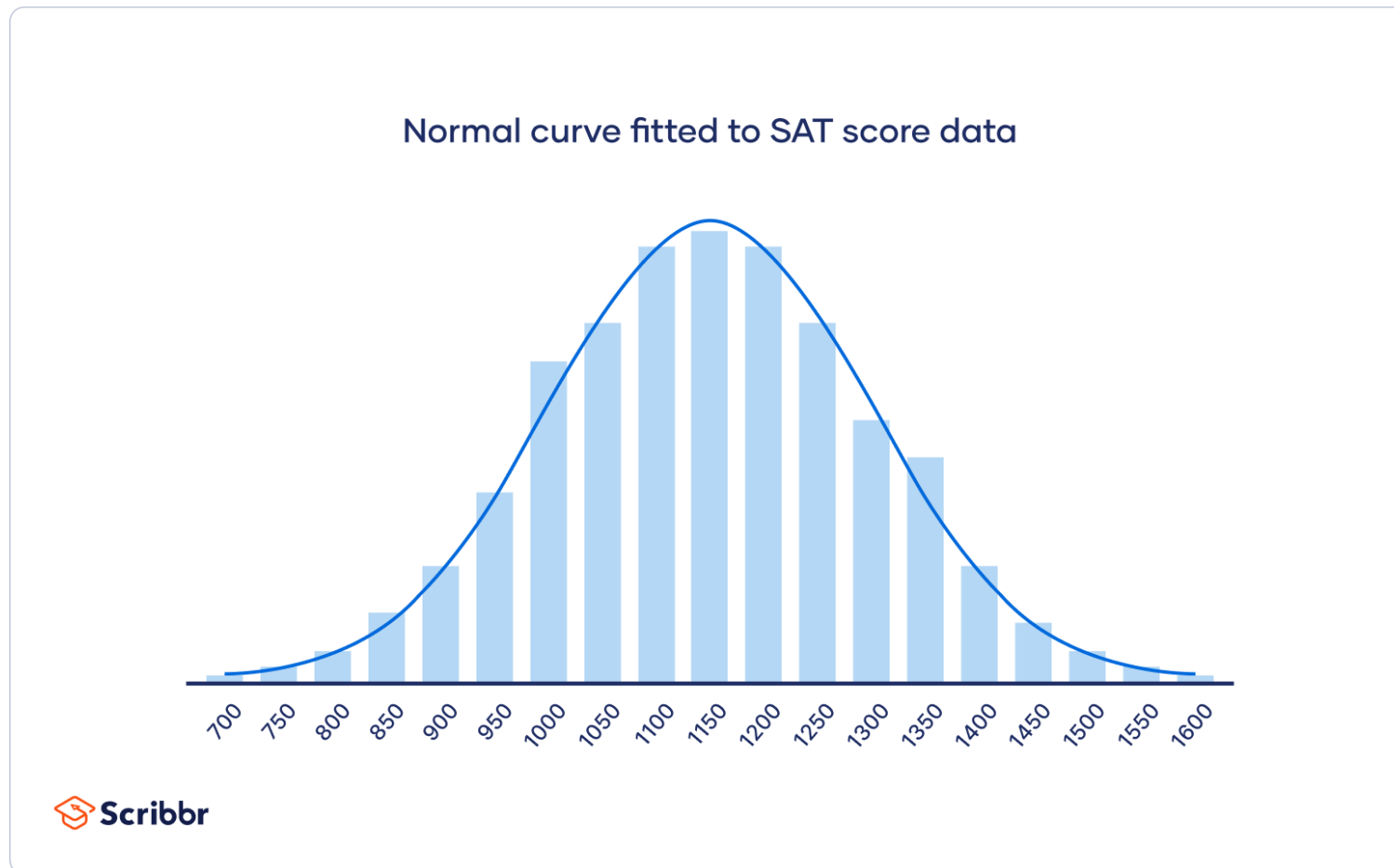
We have seven college student's test scores on a particular exam:

	grades
student_1	85
student_2	90
student_3	75
student_4	85
student_5	62
student_6	79
student_7	96

Mode =?

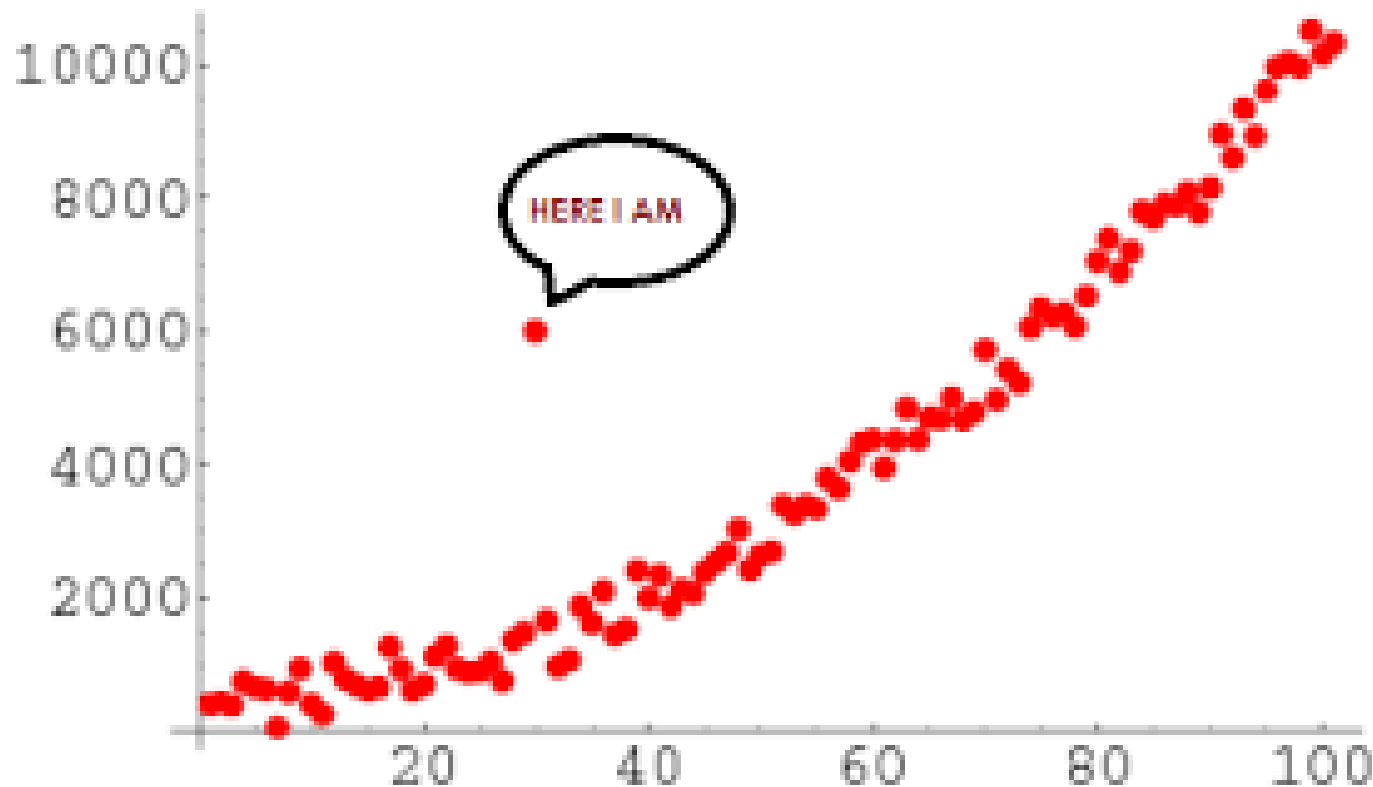
NORMAL DISTRIBUTION

A set of scores that cluster in the center and tapers off to the left and right sides of the number line.



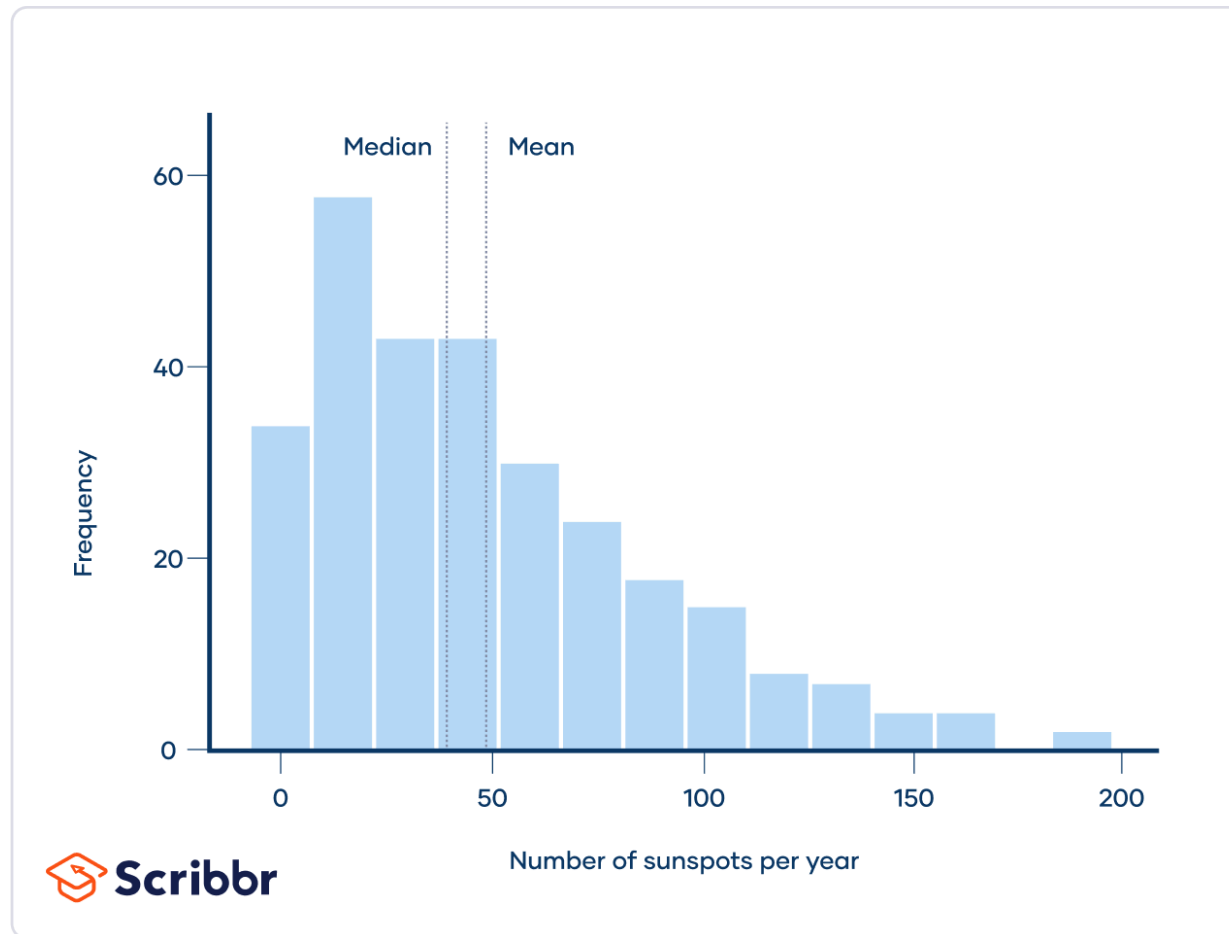
OUTLIERS

Extreme values that pull the distribution which leads to a **positive** or **negative** skew.



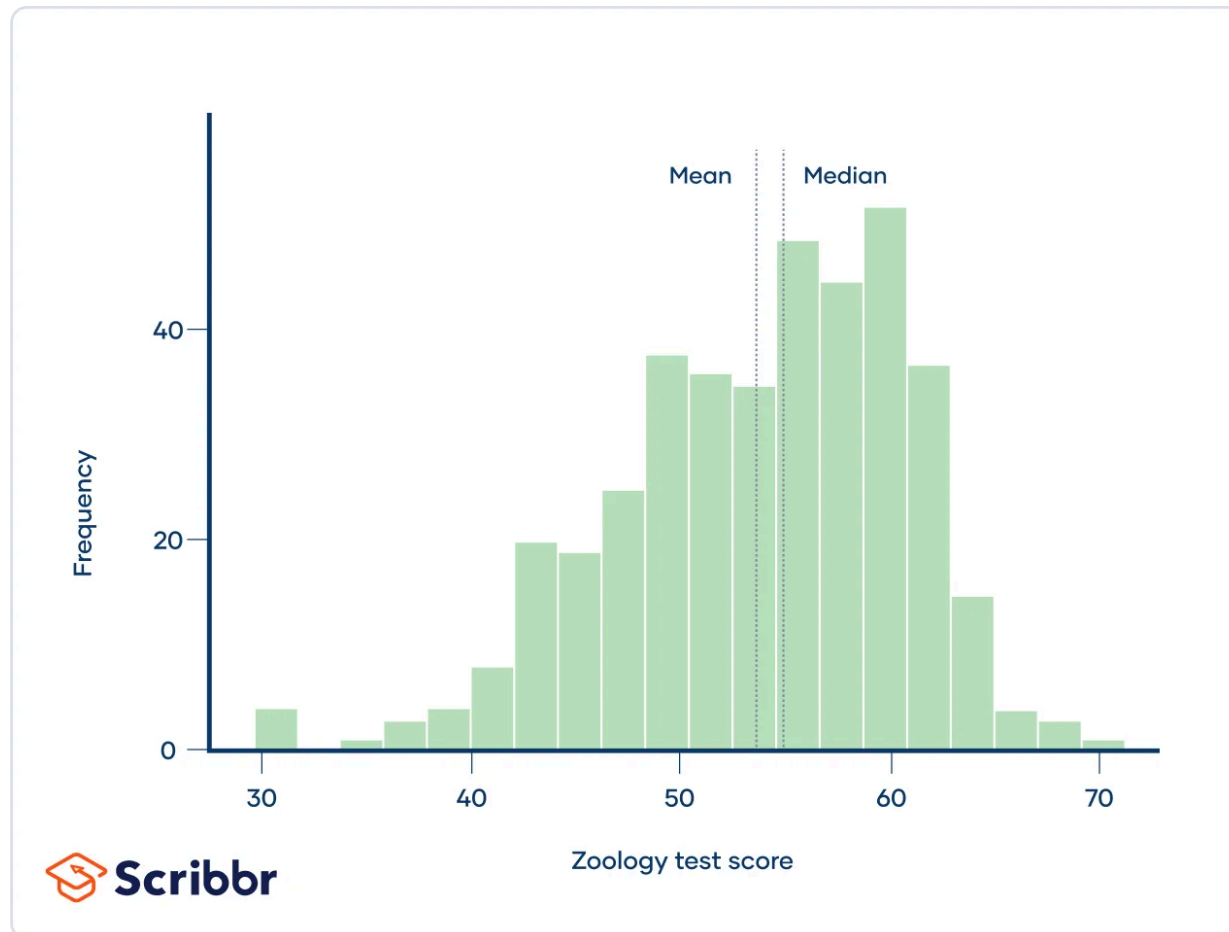
POSITIVE SKEW

A clustering of scores in a distribution with some large scores pulled (or **skewed**) toward the **positive** side of the x-axis



NEGATIVE SKEW

A clustering of scores in a distribution with some small scores that pulled (or **skewed**) the towards the **negative** side of the x-axis.



MNEMONIC DEVICES

These are **memory techniques** that aid in memory retention and retrieval.

Dates back to the early Greeks.

Helps transition short term to long term memory more quickly.

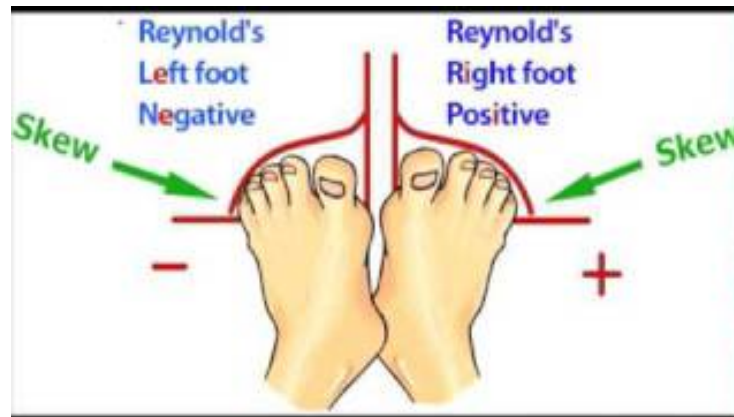


SKEW MNEMONIC

When you hear the word “skew” think of laying on a beach and putting your feet together while looking at the horizon.

Your right foot is the positive skew.

Your left foot in the negative skew.



POP QUIZ

01:00

Using the data below, calculate the mean, median, and mode.

	Wins_Under_Scott_Frost
2018	4
2019	5
2020	3
2021	3
2022	4

Mean = ?

Median = ?

Mode = ?

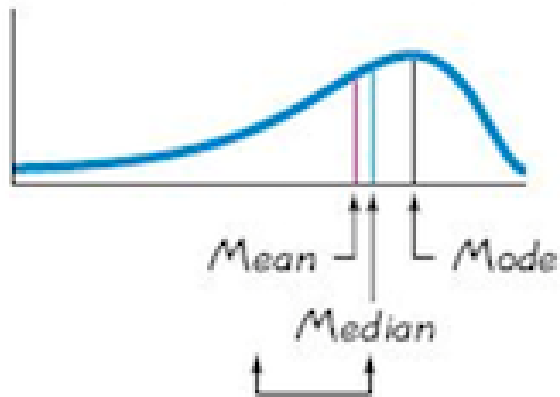
RECAP

- **Measure of central tendency**
- **Outliers**
- **Distributions and Skews**

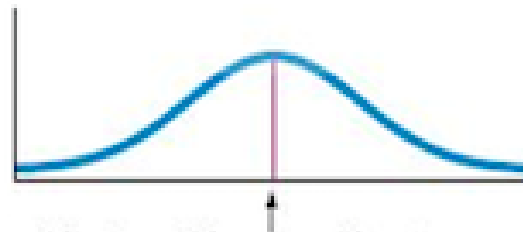
THE MEAN AND MEDIAN TO DETERMINE DISTRIBUTION SHAPE

Right skew occurs when our $\text{Mean} > \text{Median}$.

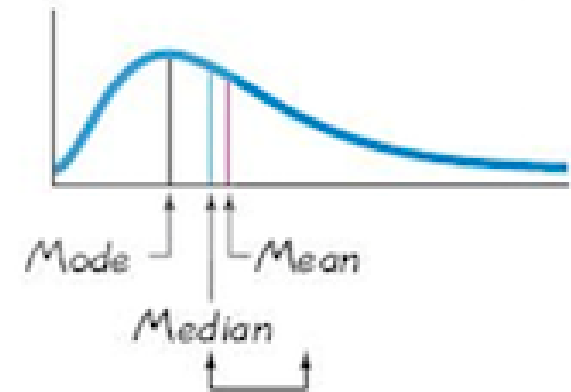
Left skew occurs when our $\text{Mean} < \text{Median}$.



The order of the mean and median may be reversed.



Mode = Mean = Median



The order of the median and mean may be reversed.

DEVIATION SCORE

The **deviation score** is the distance between the mean of a variable and any given raw score in that variable.

$$d_i = x_i - \bar{x}$$

d_i = deviation score

x_i = a given raw score (i.e., data point)

\bar{x} = the mean

DEVIATION SCORE

This tells us two important things:

- 1.) How far the raw score is from the mean (\bar{x})
- 2.) Whether the raw score is greater or less than the mean (\bar{x})

Positive deviation scores represent raw scores that greater than the mean.

Negative deviation scores represent raw scores that less than the mean.

DEVIATION SCORE EXAMPLE

1.) Calculate the (\bar{x})

2.) Calculate the $d_i = x_i - \bar{x}$ for each student

	grades
student_1	85
student_2	90
student_3	75
student_4	85
student_5	62
student_6	79
student_7	96

POSIT CLOUD

Head to Posit Cloud

POP QUIZ

01:00

You are a researcher at a think tank and you are about to present new findings regarding the DARE program. Your data has a (\bar{x}) of 45, a median that is 35, what type of skew will your sample have? And what direction does it point?

- A.) Positive Skew, Right**
- B.) Positive Skew, Left**
- C.) Negative Skew, Left**
- D.) Positive Skew, Right**

REVIEW

Any question about the exam?

Bring a calculator.

GOOD LUCK STUDYING



