Central Tendency

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Introduction

- In statistics a central tendency is a central value or a typical value for probability distribution
- It is occasionally called an average or just the center of the distribution
- The most common measures of central tendency are the arithmetic mean the median, and the mode.

Importance Of Central Tendency

- To find representative value.
- To make more brief data.
- To make comparison.

Mean

- The mean is calculated by adding all the numbers in the data together and dividing by the number elements contained in data set.

Example

Data set 2,5,9,3,5,4,7

- Mean calculated as

2+5+9+3+5+4+7 divided by 7

$$\frac{2+5+9+3+5+4+7}{7} = 5$$

Example:

- The marks for a students in 6 subjects are
- 10,81,84,83,82,80
- n=6

- So $\bar{X} = \frac{\Sigma X}{n} = 10+81+84+83+82+80$

$$= \frac{420}{6} = 70$$

Mean for Grouped Data

- If we want to measure the mean of data that has frequency distribution we used this formula:

$$\bar{x} = \frac{\sum (x \cdot f)}{\sum f}$$

Example:

Listed below are the grade of students semester courses. If we want to calculate the GPA

Course	Grade	Points (x)	Credits (f)	x * f
Math	A	4	5	20
History	B	3	3	9
Health	A	4	2	8
Art	C	2	2	4

$$X = \frac{\sum(x \cdot f)}{\sum f}. \quad \overline{X} = \frac{4*5+3*3+4*2+2*2}{5+3+2+2} = \frac{20+9+8+4}{12} = \frac{41}{12} = 3.42$$

Median(middle)

The Median of data set is dependent on whether the number of elements in the data set is odd or even.

- First reorder the data set from the smallest to the largest.
- Mark off high and low values until you reach the middle.
- If there 2 middles, add term and divided by 2.

Examples: Odd Number of Element

Data Set =2,5,9,3,5,4,7

Reordered =2,3,4,5,5,7,9

Median=5

Examples :Even Number of Elements

Data Set= 2,5,9,3,5,4

Reordered=2,3,**4,5**,5,9

- Median=(4+5)/2= 4.5

Mode: Most Often

- The Mode for a data set is the element that occurs the most often
- It is not uncommon for a data set to have more than one mode
- This happens when two or more elements occur with equal frequency in the data set

Example:

- Data Set=2,5,9,3,5,4,7
- Mode =5

- **Example:**
- Data Set:2,5,2,3,5,4,7
- Mode =**2 and 5**

Range

The Range for a data set is the difference between the largest value and smallest value contained in the data set

First **reorder** the data set from smallest to largest then **subtract** the first element from the last element.

Examples:

Data set =2,5,9,3,5,4,7

Reordered= **2**,3,4,5,5,7,**9**

Range=(9-2)=7

Standard deviation

Standard deviation is a measure of how each value in a data set varies or deviates from the mean.

Steps to Finding Standard Deviation

- Find the mean of the set of data: $\overline{x}$
- Find the difference between each value and the mean: $x - \overline{x}$
- Square the difference $(x - \overline{x})^2$
- Find the average (mean) of these squares: $\frac{\sum (x - \overline{x})^2}{n}$
- Take the square root to find the standard deviation $\sqrt{\frac{\sum (x - \overline{x})^2}{n}}$

Let’s try one

- Find the mean and the standard deviation for the values 9, 4, 5, 6

$\bar{x}$ _____ Find the mean.

x	$\bar{x}$	$x - \bar{x}$	$(x - \bar{x})^2$

Organize the next steps in a table.

$$\sigma = \sqrt{\frac{\Sigma(x - \bar{x})^2}{n}}$$ Find the standard deviation.

Let's try one

- Find the mean and the standard deviation for the values 9, 4, 5, 6

$$\bar{x} = \frac{(9+4+5+6)}{4} = 6$$ Find the mean.

x	$\bar{x}$	$x - \bar{x}$	$(x - \bar{x})^2$
9	6	3	9
4	6	-2	4
5	6	-1	1
6	6	0	0
		sum	14

Organize the next steps in a table.

$$\sigma = \sqrt{\frac{\Sigma(x - \bar{x})^2}{n}}$$ Find the standard deviation.

$$= \sqrt{\frac{14}{4}} = 1.87$$

Z-Score :More Measures of Variation

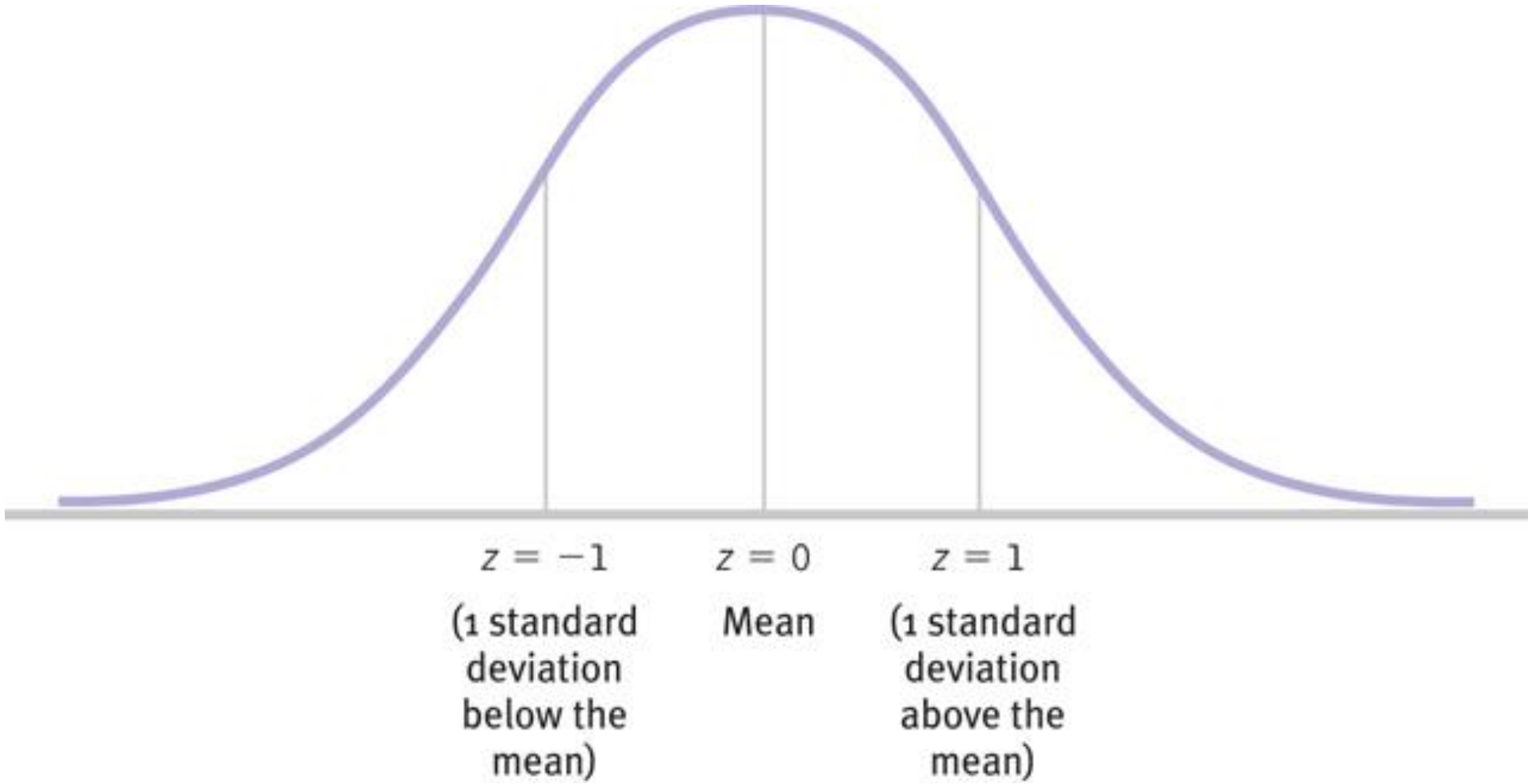
Z-Score: The Z-Score is the number of standard deviations that a value is from the mean.

Z-Score

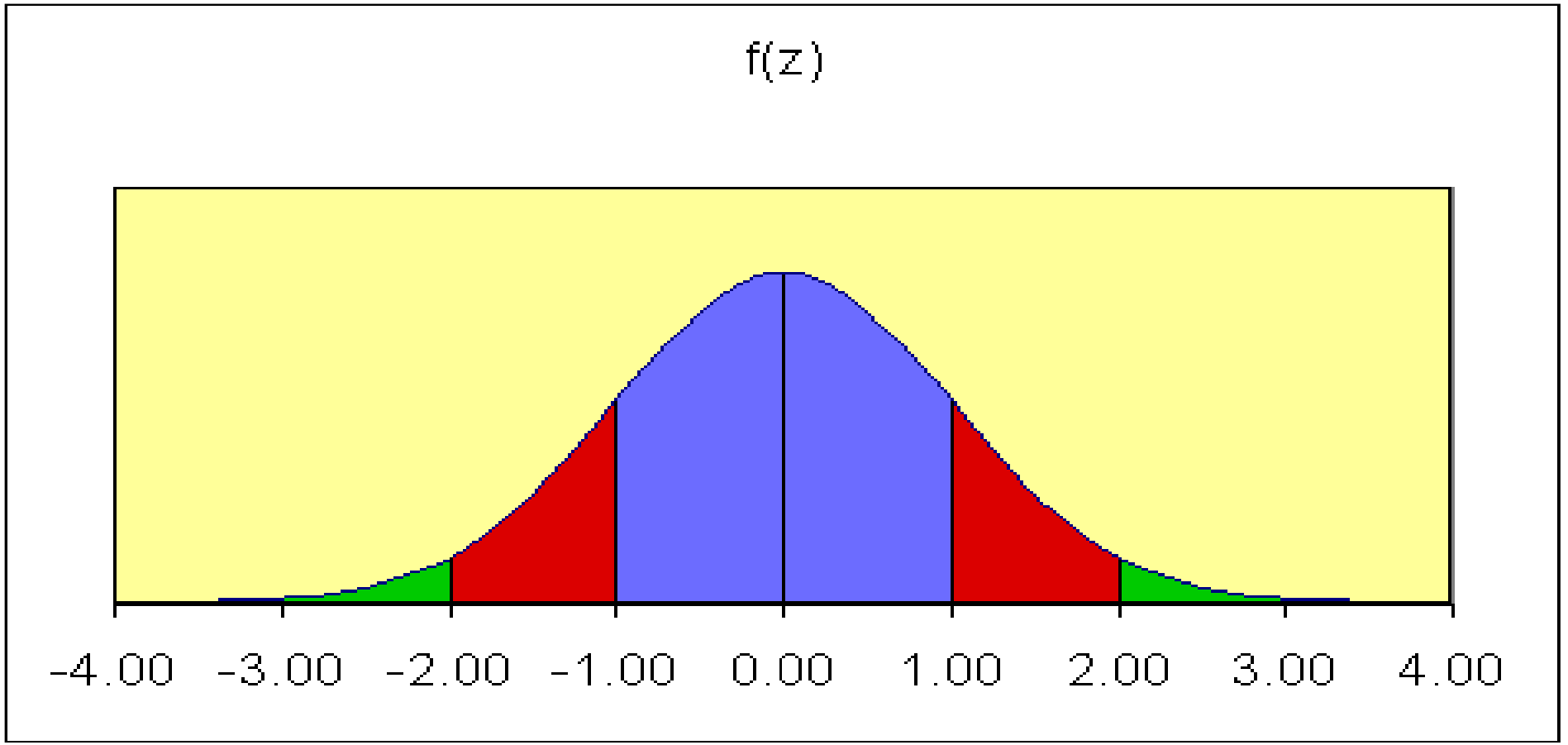
- A set of values has a mean of 22 and a standard deviation of 3. Find the *z*-score for a value of 24.

$$z\text{-score} = \frac{\text{value} - \text{mean}}{\text{standard deviation}}$$

$$= \frac{24-22}{3} \quad \text{Substitute.} \qquad = \frac{2}{3} = 0.66$$


$z = -1$
(1 standard deviation below the mean)
$z = 0$
Mean
$z = 1$
(1 standard deviation above the mean)

Blue- 68% Blue & Red- 95% Blue, Red & Green- 99.7%



Based off the standard deviation, ***Z-Scores*** are used to determine how far a way a sample is from the mean.

A Z-Score of 1 corresponds to one standard deviation from the mean. The **68-95-99.7 rule** is helpful in determining what the value of a z-score really means. The density curve demonstrating what is meant by the 68-95-99.7 rule.

The area under the **blue contains 68%** of the data. Where the blue ends is where z = 1 or z = -1.

The **red plus the blue contains 95 %** of the data with the outer edges being z = 2 or z = -2. Likewise, the **green added to the data contains 99.7% of the whole data**. If we had a z-score of 0.5 we know that our number is somewhere in the blue. A z-score of 2.5 would lie somewhere in the green.

Thank you for your kind attention