MEASURES OF CENTRAL TENDENCY: MEAN, MODE,MEDIAN

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Measures of Central Tendency

- Measure of central tendency provides a very convenient way of describing a set of scores with a single number that describes the PERFORMANCE of the group.
- It is also defined as a single value that is used to describe the "center" of the data.
- There are three commonly used measures of central tendency. These are the following:
  - MEAN
  - MEDIAN
  - MODE

MEAN

- It is the most commonly used measure of the center of data
- It is also referred as the "arithmetic average"
  - Computation of Sample Mean

$$\bar{X} = \frac{\Sigma x}{N} = \frac{x_1 + x_2 + x_3 + \ldots x_n}{N}$$

  - Computation of the Mean for Ungrouped Data

$$\bar{X} = \frac{\Sigma x}{n} \qquad \bar{X} = \frac{\Sigma f x}{n}$$

MEAN

Example:

Scores of 15 students in Mathematics I quiz consist of 25 items. The highest score is 25 and the lowest score is 10. Here are the scores: 25, 20, 18, 18, 17, 15, 15, 15, 14, 14, 13, 12, 12, 10, 10. Find the mean in the following scores.

x (scores)	
25	14
20	14
18	13
18	12
17	12
15	10
15	10
15	

$$\bar{X} = \frac{\Sigma x}{n}$$

$$= \frac{228}{15}$$

$$= 15.2$$

MEAN

Mean for Grouped Data

Grouped data are the data or scores that are arranged in a frequency distribution.

Frequency distribution is the arrangement of scores according to category of classes including the frequency.

Frequency is the number of observations falling in a category.

MEAN

The only one formula in solving the mean for grouped data is called *midpoint method*. The formula is:

$$\bar{X} = \frac{\Sigma f x_m}{n}$$

Where $\bar{X}$ = mean value

x_m = midpoint of each class or category

f = frequency in each class or category

$\Sigma f x_m$ = summation of the product of $f x_m$

MEAN

Example:

Scores of 40 students in a science class consist of 60 items and they are tabulated below.

X	f	Xm	fXm
10 - 14	5	12	60
15 - 19	2	17	34
20 - 24	3	22	66
25 - 29	5	27	135
30 - 34	2	32	64
35 - 39	9	37	333
40 - 44	6	42	252
45 - 49	3	47	141
50 - 54	5	52	260
	n = 40		Σ f Xm = 1 345

$$\bar{X} = \frac{\Sigma f x_m}{n}$$

$$= \frac{1\ 345}{40}$$

$$= 33.63$$

MEAN

Properties of the Mean

- It measures stability. Mean is the most stable among other measures of central tendency because every score contributes to the value of the mean.
- The sum of each score's distance from the mean is zero.
- It may easily affected by the extreme scores.
- It can be applied to interval level of measurement.
- It may not be an actual score in the distribution.
- It is very easy to compute.

MEDIAN

- Median is what divides the scores in the distribution into two equal parts.
- Fifty percent (50%) lies below the median value and 50% lies above the median value.
- It is also known as the middle score or the 50th percentile.

MEDIAN

Median of Ungrouped Data

1. Arrange the scores (from lowest to highest or highest to lowest).
2. Determine the middle most score in a distribution if *n* is an *odd number* and get the *average* of the two middle most scores if *n* is an *even number*.

Example 1: Find the median score of 7 students in an English class.

x (score)
19
17
16
15
10
5
2

MEDIAN

Example: Find the median score of 8 students in an English class.

x (score)
30
19
17
16
15
10
5
2

$$\tilde{x} = \frac{16 + 15}{2}$$

$$\tilde{x} = 15.5$$

MEDIAN

Solution:

$\frac{n}{2} = \frac{40}{2} = 20$ $\quad \frac{n}{2}$ is 35 - 39.

LL of the MC = 35

$L_n = 34.5$

cfp = 17

fm = 9

c.i = 5

$$\tilde{x} = L_B + \frac{\frac{n}{2} - cfp}{fm} \times c.i$$

$$= 34.5 + \frac{20 - 17}{9} \times 5$$

$$= 34.5 + 15/9$$

$$\tilde{x} = 36.17$$

MEDIAN

Median of Grouped Data

Formula:

$$\tilde{x} = L_B + \frac{\frac{n}{2} - cfp}{fm} \times c.i$$

$\tilde{X}$ = median value

MC = median class is a category containing the $\frac{n}{2}$

L_B = lower boundary of the median class (MC)

cfp = cumulative frequency before the median class if the scores are arranged from lowest to highest value

fm = frequency of the median class

c.i = size of the class interval

MEDIAN

Example: Scores of 40 students in a science class consist of 60 items and they are tabulated below. The highest score is 54 and the lowest score is 10.

X	f	cf<
10 - 14	5	5
15 - 19	2	7
20 - 24	3	10
25 - 29	5	15
30 - 34	2	**17 (cfp)**
35 - 39	**9 (fm)**	26
40 - 44	6	32
45 - 49	3	35
50 - 54	5	40
	n = 40	

MEDIAN

Properties of the Median

- It may not be an actual observation in the data set.
- It can be applied in ordinal level.
- It is not affected by extreme values because median is a positional measure.

When to Use the Median

- The exact midpoint of the score distribution is desired.
- There are extreme scores in the distribution.

MODE

The *mode* or the *modal score* is a score or scores that occurred most in the distribution.

It is classified as unimodal, bimodal, trimodal or mulitimodal.

Unimodal is a distribution of scores that consists of only one mode.

Bimodal is a distribution of scores that consists of two modes.

Trimodal is a distribution of scores that consists of three modes or *multimodal* is a distribution of scores that consists of more than two modes.

MODE

Example: Scores of 10 students in Section A, Section B and Section C.

Scores of Section A	Scores of Section B	Scores of Section C
25	25	25
24	24	25
24	24	25
20	20	22
20	18	21
20	18	21
16	17	21
12	10	18
10	9	18
7	7	18

MODE

The score that appeared most in Section A is 20, hence, the mode of Section A is *20.* There is only one mode, therefore, score distribution is called *unimodal.*

The modes of Section B are *18* and *24,* since both 18 and 24 appeared twice. There are two modes in Section B, hence, the distribution is a *bimodal distribution.*

The modes for Section C are *18, 21,* and *25.* There are three modes for Section C, therefore, it is called a *trimodal* or *multimodal distribution.*

MODE

Mode for Grouped Data

In solving the mode value in grouped data, use the formula:

$$\hat{X} = L_B + \frac{d_1}{d_1 + d_2} \times c.i$$

L_B = lower boundary of the modal class

Modal Class (MC) = is a category containing the highest frequency

d_1 = difference between the frequency of the modal class and the frequency above it, when the scores are arranged from lowest to highest.

d_2 = difference between the frequency of the modal class and the frequency below it, when the scores are arranged from lowest to highest.

c.i = size of the class interval

MODE

Example: Scores of 40 students in a science class consist of 60 items and they are tabulated below.

x	f
10 - 14	5
15 - 19	2
20 - 24	3
25 - 29	5
30 - 34	2
35 - 39	9
40 - 44	6
45 - 49	3
50 - 54	5
	n = 40

MODE

Modal Class = 35 - 39

LL of MC = 35

$L_B = 34.5$

$d_1 = 9 - 2 = 7$

$d_2 = 9 - 6 = 3$

c.i = 5

$$\hat{X} = L_B + \frac{d_1}{d_1 + d_2} \times c.i$$

$$= 34.5 + \frac{7}{7 + 3} \times 5$$

$$= 34.5 + 35/10$$

$$\hat{X} = 38$$

The mode of the score distribution that consists of 40 students is 38, because 38 occurred several times.

MODE

Properties of the Mode

- It can be used when the data are qualitative as well as quantitative.
- It may not be unique.
- It is affected by extreme values.
- It may not exist.

When to Use the Mode

- When the "typical" value is desired.
- When the data set is measured on a nominal scale.


Thank
You