Statistika

Ukuran pemusatan data

Mean/rata-rata

Median/nilai tengah

modus

Mean/Rata-rata

- Computation of the mean requires data measured on an **interval or ratio scale**.
- The mean is obtained by computing the sum, or total, for the entire set of scores, then dividing this sum by the number of scores.

$$\text{mean} = \frac{\Sigma x}{n} \quad \begin{array}{l} \leftarrow \text{ sum of all data values} \\ \hline \leftarrow \text{ number of data values} \end{array}$$

Rumus Mean (Data Tunggal)

$$\bar{x} = \frac{\sum x}{n}$$ is the mean of a set of *sample* values.

$$\mu = \frac{\sum x}{N}$$ is the mean of all values in a *population*.

Notation

Σ	denotes the *sum* of a set of data values.
x	is the *variable* usually used to represent the individual data values.
n	represents the *number of data values* in a *sample*.
N	represents the *number of data values* in a *population*.

Contoh

Suppose a basketball team has 10 players and the heights (in cm) are as follows:

180	188	184	190	182
185	200	181	183	187

The mean height of the plaers is calculated as follows

$$\bar{x} = \frac{1860}{10} = 186$$

This is the representative height of the players in the team.

Rumus Mean (data kelompok)

$$\bar{x} = \frac{x_1 f_1 + x_2 f_2 + \ldots + x_n f_n}{f_1 + f_2 + \ldots + f_n} \quad \text{atau} \quad \bar{x} = \frac{\sum_{i=1}^{n} x_i f_i}{\sum_{i=1}^{n} f_i}$$

- $\bar{x}$ = rataan hitung dari data kelompok
- f_i = frekuensi kelas ke-i
- x_i = nilai tengah kelas ke-i

Contoh

Diketahui data nilai ulangan matematika adalah sebagai berikut:

Nilai	Frekuensi
31 – 40	3
41 – 50	5
51 – 60	10
61 – 70	11
71 – 80	8
81 – 90	3

Tentukan rata-rata nilai ulangan tsb!

Contoh

Pertama tentukan nilai tengah masing-masing kelas, contoh:

$$x_1 = \frac{40,5 + 30,5}{2} = \frac{71}{2} = 35,5$$

Agar lebih mudah, bisa dimasukan dalam tabel. Selain itu hasil nilai tengah dikalikan dengan frekuensi tiap kelas seperti berikut.

Nilai	Frekuensi	x_i	$f_i \times x_i$
31 – 40	3	35,5	106,5
41 – 50	5	45,5	227,5
51 – 60	10	55,5	555
61 – 70	11	65,5	720,5
71 – 80	8	75,5	604
81 – 90	3	85,5	256,5
Jumlah	40	**Jumlah**	2.470

$$\bar{x} = \frac{\sum x_i \times f_i}{\sum f_i}$$
$$= \frac{2.470}{40}$$
$$= 61.75$$

Jadi, rata-rata nilai ulangan matematika adalah 61,75.

The Median

- If the scores in a distribution are listed in order from smallest to largest, the median is defined as the **midpoint** of the list.
- The median divides the scores so that 50% of the scores in the distribution have values that are equal to or less than the median.
- Computation of the median requires scores that can be placed in rank order (smallest to largest). Therefore, computation of the median requires data measured on an **ordinal, interval, or ratio scale.**
- One advantage of the median is that it is relatively unaffected by extreme scores.

Computation of the Median

1. With an odd number of scores, list the values in order, and the median is the middle score in the list.

2. With an even number of scores, list the values in order, and the median is half-way between the middle two scores

The Median: An Example

Consider again the heights (in cm) of 10 basketball players.

Let us arrange the heights from the shorest to the tallest

180	181	182	183	**184**
185	187	188	190	200

Since there are 10 players, the median is the average of the 5 and 6 observations.

The median is $\frac{184+185}{2} =$**184,5**

Median data kelompok

$$Me = Q_2 = Tb + \left(\frac{\frac{1}{2}n - f_k}{f_i} \right) p$$

- T_b = tepi bawah kelas median
- n = jumlah seluruh frekuensi
- f_k = jumlah frekuensi sebelum kelas median
- f_i = frekuensi kelas median
- p = panjang kelas interval

Contoh

Tentukan median dari data nilai ulangan matematika berikut ini.

Nilai	Frekuensi
31 – 40	3
41 – 50	5
51 – 60	10
61 – 70	11
71 – 80	8
81 – 90	3

Pertama kita tentukan frekuensi kumulatif.
Karena jumlah siswa ada 40, maka median berada diantara data ke 20 dan 21

Nilai	Frekuensi	fkk
31 – 40	3	3
41 – 50	5	8
51 – 60	10	18
61 – 70	11	29
71 – 80	8	37
81 – 90	3	40

→ Data ke-20 ada di sini
artinya median ada di kelas ini

$$Me = Tb + \left(\frac{\frac{1}{2}n - fkk}{f_i} \right) \times p$$

$$Me = 60,5 + \left(\frac{\frac{1}{2} \cdot 40 - 18}{11} \right) \times 10$$

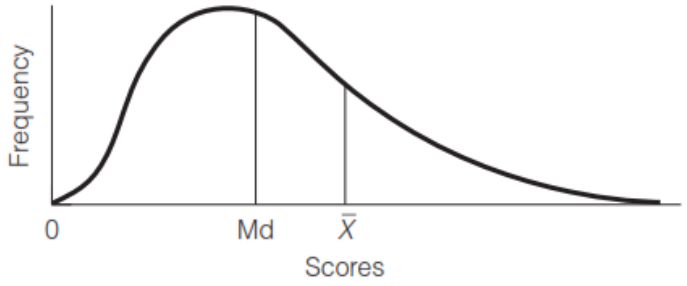
$$Me = 60,5 + \left(\frac{20 - 18}{11} \right) \times 10$$

$$Me = 60,5 + \left(\frac{2}{11} \right) \times 10$$

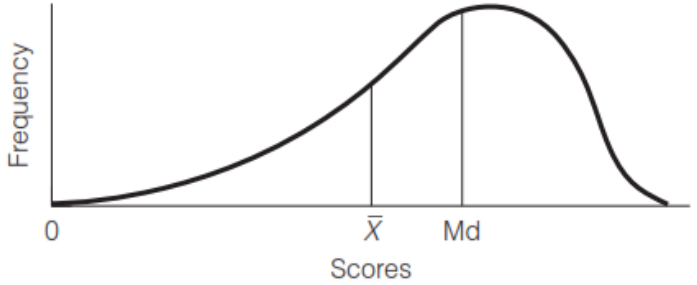
$$Me = 60,5 + 1,82 = 62,32$$

The relationship between Mean and Median

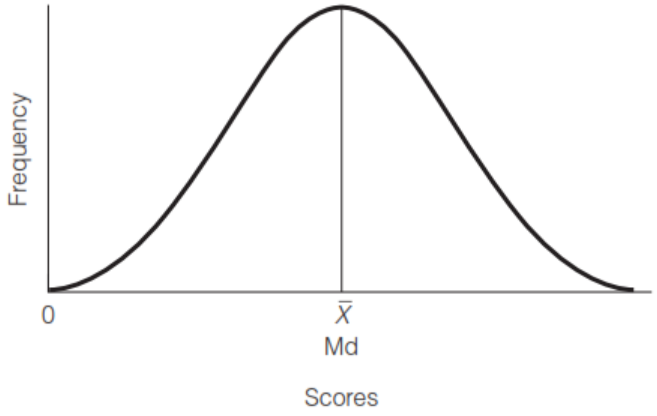
A Positively Skewed Distribution (The mean is greater in value than the median)



A Negatively Skewed Distribution (The mean is less than the median)



An Unskewed, Symmetrical Distribution (The mean and median are equal)



The Mode

- The mode is defined as the value in a distribution that occurs most frequently.
- The mode can be determined for data measured on any scale of measurement: **nominal, ordinal, interval, or ratio.**
- Distribution with two modes is called **bimodal**, and distributions with three or more modes are called **trimodal** or **multimodal**, respectively.

Contoh

Tentukan modus

Student	Number of Visits to the Library Last Week (x_i)
1	0
2	2
3	5
4	5
5	7
6	10
7	14
8	14
9	20
10	30

Dari tabel terlihat bahwa nilai yang paling sering muncul adalah 5 dan 14.
Jadi terdapat 2 modus yaitu 5 dan 14.

Suatu data bisa memiliki 1 modus
atau lebih, bisa juga tidak memiliki modus
jika semua datanya berbeda.

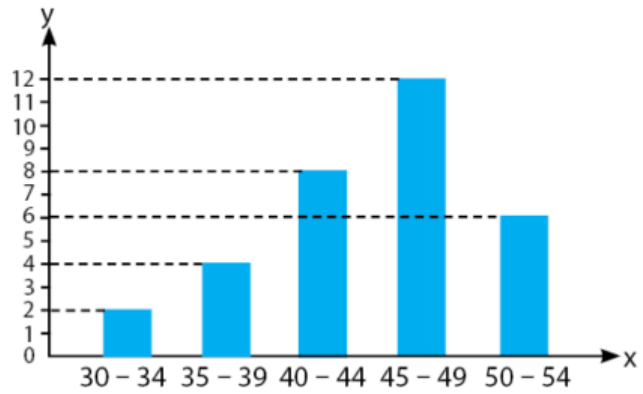
Modus data kelompok

$$Mo = Tb + \left(\frac{d_1}{d_1 + d_2} \right) p$$

- Tb = tepi bawah kelas modus
- d_1 = selisih frekuensi kelas modus dengan frekuensi sebelum kelas modus
- d_2 = selisih frekuensi kelas modus dengan frekuensi setelah kelas modus
- p = panjang kelas interval

Contoh

Tentukan modus dari diagram batang berikut.



Modus berada pada interval 45-49, sehingga

$T_b = 45 - 0{,}5 = 44{,}5$

$d_1 = 12 - 8 = 4$

$d_2 = 12 - 6 = 6$

$$Mo = Tb + \left(\frac{d_1}{d_1 + d_2}\right) \times p$$

$$Mo = 44{,}5 + \left(\frac{4}{4+6}\right) \times 5$$

$$Mo = 44{,}5 + \left(\frac{4}{10}\right) \times 5$$

$$Mo = 44{,}5 + 2 = 46{,}5$$

The Relationship Between Level of Measure and Measures of Central Tendency

Measure of Central Tendency	Level of Measurement		
	Nominal	Ordinal	Interval-Ratio
Mode	**YES**	Yes	Yes
Median	No	**YES**	Yes
Mean	No	Yes (?)	**YES**

Latihan

Di bawah ini merupakan data banyaknya kunjungan mahasiswa ke perpustakaan. Tentukan Mean, Modus, Median dari data tersebut!

Student	Number of Visits to the Library Last Week (x_i)
1	0
2	2
3	5
4	5
5	7
6	10
7	14
8	14
9	20
10	30