Matematika 3
Statistics

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1 Formula

1.1 Mean

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

Where:

- $\bar{x}$ = mean
- $\sum_x$ = sum of all values
- n = number of values

1.2 Median

1.2.1 Median

$$\text{Me} = \frac{^x(\frac{n}{2}) \ + \ ^x(\frac{n}{2}+1)}{2}$$

Where:

- Me = median
- $^x(\frac{n}{2})$ = value of $\frac{n}{2}$th item
- $^x(\frac{n}{2}+1)$ = value of $\frac{n}{2}+1$th item

1.2.2 Grouped Median

$$\text{Me} = b + p\left(\frac{\frac{1}{2}n - F}{f}\right)$$

Where:

- Me = median
- b = lower boundary of median class
- p = class interval
- n = number of values
- F = cumulative frequency of class before median class
- f = frequency of median class

1.3 Mode

$$\text{Mode} = \text{L} + \text{c}\left(\frac{l}{l+u}\right)$$

Where:

- Mode = mode
- L = lower boundary of modal class
- c = class interval
- l = frequency of modal class and the one before it
- u = frequency of modal class and the one after it

2 Questions

2.1 Question 1

Determine the mean, median, and mode of the following data:

Value	Frequency
5-9	4
10-14	9
15-19	16
20-24	12
25-29	6
30-34	3

- **Mean**:

$$\begin{aligned}
\bar{x} &= \frac{\sum_x}{n} \\
&= \frac{4(7) + 9(12) + 16(17) + 12(22) + 6(27) + 3(32)}{50} \\
&= \frac{28 + 108 + 272 + 264 + 162 + 96}{50} \\
&= \frac{930}{50} \\
&= 18.6
\end{aligned}$$

- **Median**:

$$\begin{aligned}\text{Me} &= b + p\left(\frac{\frac{1}{2}n - F}{f}\right) \qquad\qquad = 15 + 5\left(\frac{\frac{1}{2}(50) - 4}{16}\right)\\ &= 15 + 5\left(\frac{25-4}{16}\right)\\ &= 15 + 5\left(\frac{21}{16}\right)\\ &= 15 + 5\,(1.31)\\ &= 15 + 6.55\\ &= 21.55\end{aligned}$$

- **Mode**:

$$\begin{aligned}\text{Mode} &= \text{L} + \text{c}\left(\frac{l}{l+u}\right)\\ &= 15 + 5\left(\frac{16}{16+12}\right)\\ &= 15 + 5\left(\frac{16}{28}\right)\\ &= 15 + 5\,(0.57)\\ &= 15 + 2.85\\ &= 17.85\end{aligned}$$

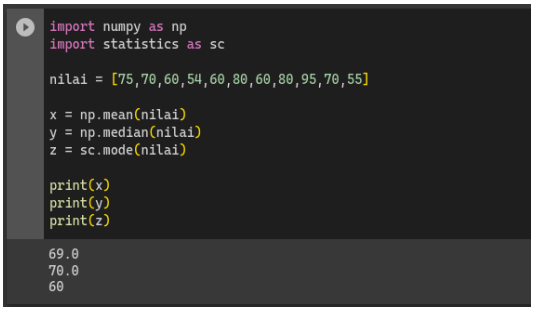
2.2 Question 2

Give 3 examples of each the benefits of mean, median, and mode in everyday life.

- **Mean**:
    1. Finding the average score of a student in a class to determine the student's grade.
    2. Finding the average temperature of a city to determine the city's climate.
    3. Finding the average air quality of a city to determine the city's Air Quality Index (AQI).
- **Median**:
    1. Deciding which property to buy based on the median price of the property.
    2. Finding best value for money product based on the median price of the product.
    3. As an alternative to mean when there are a lot of outliers that can skew the data.
- **Mode**:
    1. Finding the most frequently occuring phone number to determine the most contacted person.
    2. Finding the most common price of a product to determine the price of a similar product.
    3. Finding the most common age of a group of people to determine the target audience.

2.3 Question 3

Type the following code and calculate manually, is the result the same?



```
import numpy as np
import statistics as sc

nilai = [75,70,60,54,60,80,60,80,95,70,55]

x = np.mean(nilai)
y = np.median(nilai)
z = sc.mode(nilai)

print(x)
print(y)
print(z)
```

```
69.0
70.0
60
```

$$\begin{aligned}\text{Data} &= [75, 70, 60, 54, 60, 80, 60, 80, 95, 70, 55] \\ \text{Sorted} &= [54, 55, 60, 60, 60, 70, 70, 75, 80, 80, 95]\end{aligned}$$

- **Mean**:

$$\begin{aligned}\bar{x} &= \frac{\sum_x}{n} \\ &= \frac{75 + 70 + 60 + 54 + 60 + 80 + 60 + 80 + 95 + 70 + 55}{11} \\ &= \frac{759}{11} \\ &= 69\end{aligned}$$

- **Median**: Since the data is ungrouped and the count is odd, the median is the middle value, which is 70.
- **Mode**: Since the data isn't grouped, we can find the most occuring value which is 60.

2.4 Question 4

Find the mode from this data

Value	Frequency
5 - 10	4
11 - 16	6
17 - 22	12
23 - 28	8
29 - 34	8

Mode:

$$\begin{aligned}
\text{Mode} &= \text{L} + \text{c}\left(\frac{l}{l+u}\right) \\
&= 16.5 + 5\left(\frac{(12-8)}{(12-8)+(12-6)}\right) \\
&= 16.5 + 5\left(\frac{4}{4+6}\right) \\
&= 16.5 + 5\left(\frac{4}{10}\right) \\
&= 16.5 + 2 \\
&= 18.5
\end{aligned}$$

2.5 Question 5

Determine the mean and median

Value	Frequency
11 - 20	3
21 - 30	5
31 - 40	10
41 - 50	11
51 - 60	8
61 - 70	3

- **Mean**:

$$\begin{aligned}
\bar{x} &= \frac{\sum x_i f_i}{n} \\
&= \frac{(15)(3) + (25)(5) + (35)(10) + (45)(11) + (55)(8) + (65)(3)}{40} \\
&= \frac{45 + 125 + 350 + 495 + 440 + 195}{40} \\
&= \frac{1650}{40} \\
&= 41.25
\end{aligned}$$

- **Median**:

$$\begin{aligned}
\text{Me} &= b + p\left(\frac{\frac{1}{2}n - F}{f}\right) \\
&= 40.5 + 10\left(\frac{\frac{1}{2}(40) - 10}{11}\right) \\
&= 40.5 + 10\left(\frac{20 - 10}{11}\right) \\
&= 40.5 + 10\left(\frac{10}{11}\right) \\
&= 40.5 + 9.09 \\
&= 49.59
\end{aligned}$$

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Value: 57