

Mean, Median and Mode using NumPy

Name		Date	
Class / Sec		Roll no.	

1 · AIM

To write a Python program that calculates the **mean**, **median** and **mode** of a given set of numerical data using the **NumPy** and **SciPy** libraries.

2 · SOFTWARE AND LIBRARIES USED

TOOL	WHAT IT IS FOR
Python 3	The programming language the program is written in
Jupyter Notebook	The environment used to write and run the code (IDLE or Colab also acceptable)
NumPy	Provides the mean() and median() functions for numerical data
SciPy	Provides stats.mode() , since NumPy has no built-in mode function

3 · THEORY

The three **measures of central tendency** each describe the middle of a dataset in a different way.

MEASURE	DEFINITION	WHEN IT IS THE RIGHT ONE
Mean	The sum of all values divided by how many there are	When the data has no extreme values pulling it
Median	The middle value once the data is arranged in order	When there are outliers — it is not dragged by them
Mode	The value that occurs most frequently	For categories, or to find the most common result

Note: For an **even** number of values the median is the average of the two middle values. For an **odd** number it is simply the middle one.

4 · PROGRAM

```
import numpy as np
from scipy import stats

# Marks scored by 10 students in a class test
marks = [45, 67, 89, 45, 78, 90, 45, 67, 88, 76]

# Calculate the three measures of central tendency
mean_val = np.mean(marks)
median_val = np.median(marks)
mode_val = stats.mode(marks, keepdims=True)

# Display the results
print("Marks entered      :", marks)
print("Number of students :", len(marks))
print("Mean    =", mean_val)
print("Median =", median_val)
print("Mode    =", mode_val.mode[0], "occurring", mode_val.count[0], "times")
```

5 · OUTPUT

Marks entered : [45, 67, 89, 45, 78, 90, 45, 67, 88, 76]
Number of students : 10
Mean = 69.0
Median = 71.5
Mode = 45 occurring 3 times

[PASTE SCREENSHOT HERE]

Paste a screenshot of your own program running, showing the code and the output together

6 · VERIFICATION BY HAND

The output should always be checked manually. This is what earns the observation marks.

MEASURE	WORKING
Mean	Sum = 45+67+89+45+78+90+45+67+88+76 = 690 → $690 \div 10 = \mathbf{69.0}$
Median	Sorted: 45, 45, 45, 67, 67, 76 , 78, 88, 89, 90 → $(67 + 76) \div 2 = \mathbf{71.5}$
Mode	45 appears three times; every other value appears once or twice → mode = 45

7 · OBSERVATION AND RESULT

Write two or three sentences in your own words. A useful observation compares the three values rather than just repeating them.

Example observation: The mean (69.0) is lower than the median (71.5) because three students scored 45, which pulls the average down. The mode of 45 shows this was the most common score. For this data the **median** better describes a typical student, since the mean is affected by the low scores.

8 · VIVA QUESTIONS FOR THIS PROGRAM

LIKELY QUESTION	SHAPE OF A STRONG ANSWER
Why did you import SciPy as well as NumPy?	NumPy has mean and median but no mode function , so mode comes from scipy.stats
Which measure is affected most by an outlier?	The mean . One very high or low value shifts it; the median barely moves
Why must data be sorted before finding the median?	The median is the middle value of ordered data. Unsorted, the middle item is not the median
What would the median be with 9 values instead of 10?	The single middle value — the 5th. Averaging two is only needed for an even count
Change one value and predict the new mean.	Be ready to do this out loud. Recompute the sum, divide by 10 again

9 · HOW THIS ENTRY IS MARKED

FULL MARKS

Aim and theory in **your own words** · commented code · a screenshot of **your** output · manual verification shown · an observation that **compares** the three values

LOSES MARKS

Code copied with no comments · no screenshot, or someone else's · no manual working · an observation that just restates the output as “mean is 69, median is 71.5”

Before you submit: Run the program **yourself** and screenshot **your own** output. Examiners check whether the screenshot matches the code on the page — and whether you can explain it in the viva.