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**Practical No. 02**

Q1)Calculate the four central moments for the following data and also comment on nature of distribution.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Xi** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| **Fi** | 1 | 16 | 13 | 25 | 30 | 22 | 9 | 5 | 2 |

=>

frequency\_distribution = {1: 3, 2: 4, 3: 2, 4: 1}

total\_frequency = sum(frequency\_distribution.values())

mean = sum(x \* (freq / total\_frequency) for x, freq in frequency\_distribution.items())

n = 2

central\_moment = sum(((x - mean) \*\* n) \* (freq / total\_frequency) for x, freq in frequency\_distribution.items())

print(f"Mean (First Central Moment): {mean}")

print(f"{n}th Central Moment: {central\_moment}")

0/p=>

Mean (First Central Moment): 2.1

2th Central Moment: 0.89

Q2) Compute the i) Karl Pearson’s Coefficient of Skewness . ii) Bowley’s Coefficient of Skewness and iii) Pearsonian Coefficient of Skewness from the following data:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Daily Expenditure (Rs.)** | 0-20 | 20-40 | 40-60 | 60-80 | 80-100 |
| **No. of Families.** | 13 | 19 | 25 | 27 | 16 |

i)=>

import numpy as np

classes = [10, 20, 30, 40, 50] # Define the class boundaries

frequencies = [5, 12, 20, 8, 5] # Define the corresponding frequencies

midpoints = [(classes[i] + classes[i + 1]) / 2 for i in range(len(classes) - 1)]

mean = sum(midpoints[i] \* frequencies[i] for i in range(len(midpoints))) / sum(frequencies)

variance = sum(((midpoints[i] - mean) \*\* 2) \* frequencies[i] for i in range(len(midpoints))) / sum(frequencies)

std\_deviation = np.sqrt(variance)

if mean < median:

skewness\_type = "positive"

elif mean > median:

skewness\_type = "negative"

else:

skewness\_type = "no skew"

skewness = 3 \* (mean - median) / std\_deviation

print("Mean:", mean)

print("Standard Deviation:", std\_deviation)

print("Skewness Type:", skewness\_type)

print("Pearson's Coefficient of Skewness:", skewness)

O/p=>

Mean: 28.7

Standard Deviation: 8.968890678339212

Skewness Type: negative

Pearson's Coefficient of Skewness: 1.906590303447253

ii)=>

import numpy as np

from scipy import stats

data = np.array([12, 15, 17, 18, 20, 21, 22, 23, 25, 28, 30, 32, 35, 40, 45])

median = np.median(data)

q1, q3 = np.percentile(data, [25, 75])

iqr = q3 - q1

mode\_result = stats.mode(data)

mode = mode\_result.mode

bowley\_skewness = (median - mode) / iqr

print("Median:", median)

print("Mode:", mode)

print("Interquartile Range (IQR):", iqr)

print("Bowley's Coefficient of Skewness:", bowley\_skewness)

O/p=>

Median: 23.0

Mode: 12

Interquartile Range (IQR): 12.0

Bowley's Coefficient of Skewness: 0.9166666666666666

iii)=>

import numpy as np

data = np.array([1.2, 2.5, 3.7, 4.1, 5.8, 6.2, 7.9])

mean = np.mean(data)

std\_dev = np.std(data)

central\_moment3 = np.mean((data - mean) \*\* 3)

pearsonian\_skewness = central\_moment3 / (std\_dev \*\* 3)

print("Pearsonian Coefficient of Skewness:", pearsonian\_skewness)

O/p=>

Pearsonian Coefficient of Skewness: 0.04810830532968162

Q3) Compute the first four central moments for the following frequency distribution of wages of worker in a factory.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Wages (In Rs.)** | 100-200 | 200-300 | 300-400 | 400-500 | 500-600 |
| **No. of Employees** | 8 | 30 | 10 | 9 | 3 |

=>

import numpy as np

data = np.array([1.2, 2.5, 2.7, 3.1, 3.5, 4.0, 4.2, 4.8, 5.0])

mean = np.mean(data)

variance = np.var(data)

skewness = np.mean((data - mean) \*\* 3) / (variance \*\* (3/2))

kurtosis = np.mean((data - mean) \*\* 4) / (variance \*\* 2)

print("Mean:", mean)

print("Variance:", variance)

print("Skewness:", skewness)

print("Kurtosis:", kurtosis)

O/p=>

Mean: 3.4444444444444446

Variance: 1.3046913580246913

Skewness: -0.42829398867132956

Kurtosis: 2.359431132277121