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Instructor :

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Subject::

Probability and Statistics.

Q1- Construct a grouped frequency distribution table and cumulative frequency curve (ogive) for the observations below.

423, 369, 387, 411, 393, 394, 371, 377, 389, 409, 392, 408, 431, 401, 363, 391, 405, 382, 400, 381, 399, 415, 428, 422, 396, 372, 410, 419, 386, 390.

Solution:-

Maximum Value = 431

minimum value = 363

Range = maximum value − minimum value

= 431 − 363

= 68.

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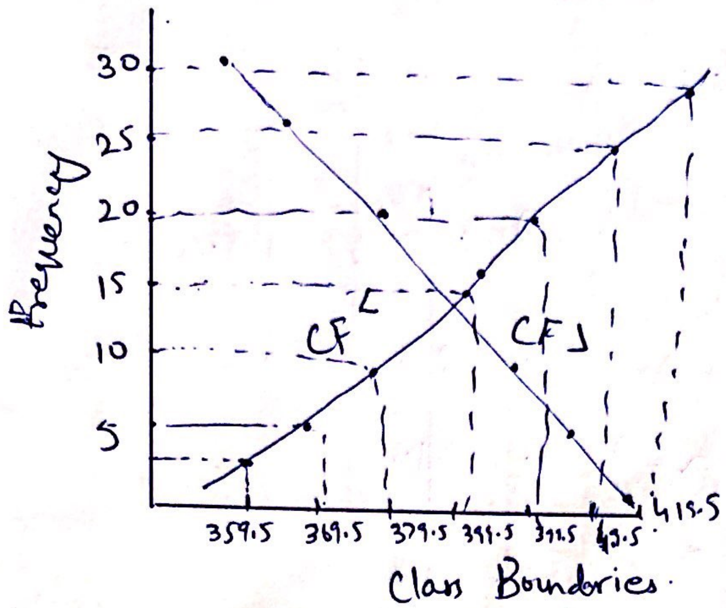
Frequency Distribution Table :-

Classes	Class marks.	Tally	frequency	Comulation CF	Class Boundaries.
360 - 369	364.5	II	2	2	359.5 — 369.5
370 - 379	374.5	III	3	2+3=5	369.5 - 379.5
380 - 389	384.5	~~IIII~~	5	5+5=10	379.5 — 389.5
390 - 399	394.5	~~IIII~~ II	7	10+7=17	389.5 — 399.5
400 - 409	404.5	~~IIII~~	5	17+5=22	399.5 — 409.5
410 - 419	414.5	IIII	4	22+4=26	409.5 — 419.5
420 - 429	424.5	III	3	26+3=29	419.5 — 429.5
430 - 439	434.5	I	1	29+1=30	429.5 — 439.5
			$\Sigma f = 30$		

→ Cumulative frequency Curve (ogive)



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2+3 = 5

5+5 = 10

7+10 = ~~20~~ 17

17+5 = 22

22+4 = 26

26+3 = 29

29+1 = 30

Q2: For the observations given in Q1 calculate Mean and Geometric Mean. 9

x_i	f_i	x_if_i
364.5	2	729
374.5	3	1123.5
384.5	5	1922.5
394.5	7	2161.5
404.5	5	2022.5
414.5	4	1658
424.5	3	1273.5
434.5	1	434.5
	$\Sigma f = 30$	Σf_ix_i 11925

$$\text{Mean} = \bar{x} = \frac{\Sigma x_if_i}{\Sigma f_i}$$

$$= \frac{11925}{30}$$

Mean $= 397.5$ Ans.

→ Geometric Mean:- (18)

$$\log G = \frac{1}{n}\left[f_1 \log x_1 + f_2 \log x_2 + \dots f_x \log x_x\right)$$

$$= \frac{1}{n} \Sigma f_i \log x_i$$

$$G = \text{Antilog}\left(\frac{\Sigma f_i \log x_i}{\Sigma f_i}\right)$$

$\log x_i$	f_i	$f_i \log x_i$
2.5616	2	5.1232
2.573	3	7.719
2.584	5	12.92
2.596	7	18.172
2.606	5	13.03
2.617	4	10.468
2.627	3	7.881
2.637	1	2.637
	$\Sigma f_i = 30$	$\Sigma f_i \log x_i = 77.9502$

$$G = \text{antilog}\left[\frac{\Sigma f_i \log x_i}{\Sigma f_i}\right)$$

$$= \text{antilog}\left[\frac{77.9502}{30}\right]$$

$$G = 396.583$$ Ans.

Q3- Define the following terms.

(a) Population and Sample.

A population data set contains all members of a specified group (the entire list of possible data values). (Utilizes the count n in formulas).

Example:- The population may be "All people living in the US.

→ Sample:-

A sample data set contains a part, or a subset, of a population. The size of a sample is always less than the size of the population from which it is taken. (Utilizes the count n-1 in formulas.

Example:- The sample may be "Some people living in the US".

(b) The Range :-

The range of a set of numbers is the difference between the least number in the set.

⇒ Example :-

Find the range :

(a) 150, 250, 825, 400, 18, 500

(b) 2.2, 1.8, 5.1, ~~8~~ 0.3

Solution :-

(a) The largest value is 825. The smallest value is 18.

Range = largest value − smallest value = 825 − 18 = 807.

(b) The largest value is 5.1. The smallest value is 0.3

Range = largest value − smallest value = 5.1 − 0.3 = 4.8

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(c) The weighted Arithmetic Mean:-

The weighted arithematic mean is similar to an ordinary arithematic mean (the commost type of average), except that instead of each of the data points contributing equally to the final average, some data points contribute more than others. The notion of weighted mean plays a role in descriptive statistics and also occurs in more general form in several others areas of mathematics.

If all the weights are equal, then the weighted mean is the same as the arithemetic mean. While weighted means generally behave in a similar fashion to arithematic means, they do have a few counterintuitive properties, as captured for instance in simpson's paradox.

→ Basic Example:-

Given two school classes, one with 20 students, and one with 30

Students, the grades in each class on a test were:

- Morning class = 62, 67, 71, 74, 76, 77, 78, 79, 79, 80, 81, 81, 82, 83, 84, 86, 89, 93, 98
- Afternoon class = 81, 82, 83, 84, 85, 86, 87, 87, 88, 88, 89, 89, 89, 90, 90, 90, 90, 91, 91, 92, 92, 93, 93, 94, 95, 96, 97, 98, 99.

The mean for the morning class is 80 and the mean of the afternoon class is 90. The unweighted mean of the grades in number of students in each class (20 versus 30). Hence the value of 85 does reflect the average grades without regard to classes (add all the grades up and divide by the total number of students.

$$\bar{x} = \frac{4300}{50} = 86$$

or, this can be accomplished by weighting the class means by the number of students in each class. The largest

$$\bar{x} = \frac{(20 \times 80) + (30 \times 90)}{20+30} = 86.$$

Thus the weighted mean makes it possible to find the mean avereage students grade without knowing each student.