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Semester: 6th

Paper: Probability and Statistics (MID TERM)

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Q1- Construct a grouped frequency distribution table (Page 1) & cumulative frequency curve (ogive) fo 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

Maximum Value = 363

Range = max value − min value

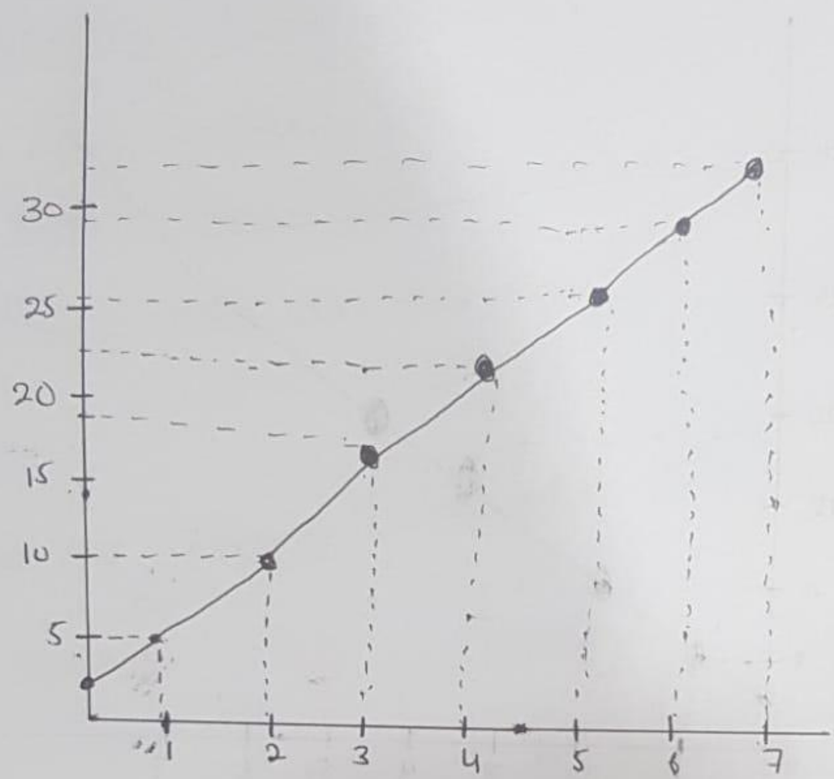
= 431 − 363

= 68

Grouped Frequency Distribution Table

Classes	Class Marks	Tally	Frequency f	Commulative frequency Σf	Class Boundries
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) (Page 2)



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2+3=5

5+5=10

7+10=17

17+5=22

22+4=26

26+3=29

29+1=30

Q2. For the observations given in Q1 (Page 3) Calculate Mean & ~~arithm~~ Geometric Mean

Ans:- Arithmetic Mean

x_i	f_i	$x_i f_i$
364.5	2	729
374.5	3	1123.5
384.5	5	1922.5
394.5	7	2761.5
404.5	5	2022.5
414.5	4	1658
424.5	3	1273.5
434.5	1	434.5
	$\Sigma f = 30$	$\Sigma f_i x_i$ 11925

$$\text{mean} = \bar{x} = \frac{\Sigma x_i f_i}{\Sigma f_i}$$

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

$$\text{Mean } \boxed{= 397.5}$$

Q2:- For the observation given in Q1 (Page 4) Calculate ~~of~~ Geometric Mean

Ans:- Geometric Mean

$$\log G = \frac{1}{n}\left[f_i \log x_i + f_2 \log x_2 + \cdots f_K \log x_K\right]$$

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

$$G = \text{Antilog}\left[\frac{\sum f_i \log x_i}{\sum f_i}\right]$$

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

$\sum f_i = 30$ $\quad$ $\sum f_i \log x_i = 77.9502$

$$G = \text{antilog}\left[\frac{\sum f_i \log x_i}{\sum f_i}\right]$$

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

$$\boxed{G = 396.588}$$

Q3: Define the following terms

a) Population and Sample
b) The Range
c) The Weighted Arithmetic Mean

Answer:
a) Population: A population or a statistical population is a collection or set of all possible observations whether finite or infinite, relevant to some characteristics of interest.

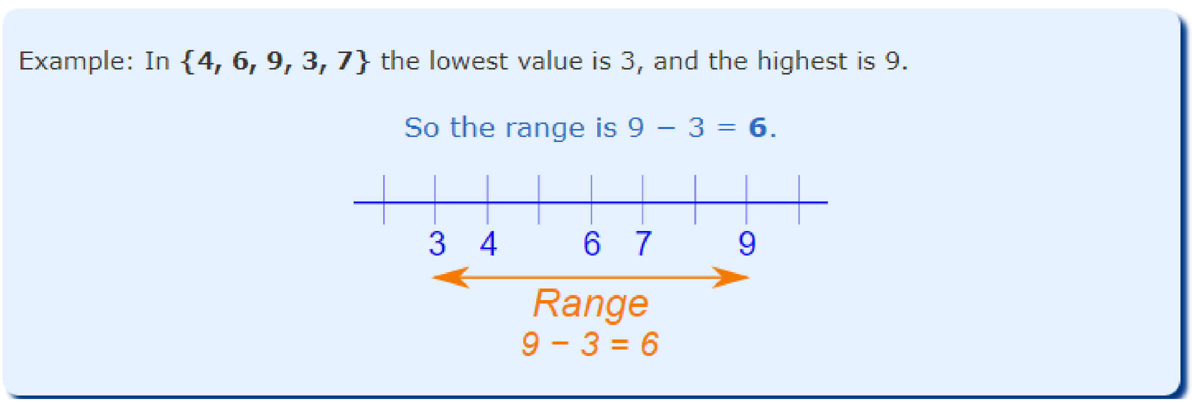
A statistical population may be real such as the heights of all the college students or hypothetical such as all the possible outcomes from the toss of a coin.

The number of observations in a finite population is called the size of the population denoted by the letter “N”.

b) Sample: A sample is a part or a subset of a population. The number of observations included in a sample is called the size of the sample and is denoted by the letter “n”.

The information derived from a sample data is used to draw conclusions about the population.

b) The Range: The Range is the difference between the lowest and highest values.



c)The Weighted Arithmetic Mean

The weighted arithmetic mean is similar to an ordinary arithmetic mean (the most common 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 a more general form in several other areas of mathematic.
If all the weights are equal, then the weighted mean is the same as the arithmetic mean. While weighted means generally behave in a similar fashion to arithmetic 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, 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, 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 80 and 90 is 85, so the unweighted mean of the two means is 85. However, this does not account for the difference in number of students in each class (20 versus 30); hence the value of 85 does not reflect the average student grade (independent of class). The average student grade can be obtained by averaging all the grades, without regard to classes (add all the grades up and divide by the total number of students):

{\displaystyle {\bar {x}} = {\frac {4300}{50}} =86.} {\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 larger class is given more "weight":

{\displaystyle {\bar {x}} = {\frac {(20\times 80) +(30\times 90)} {20+30}} =86.} {\bar {x}} = {\frac {(20\times 80) +(30\times 90)} {20+30}} =86.
Thus, the weighted mean makes it possible to find the mean average student grade without knowing each student's score. Only the class means and the number of students in each class are needed.