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Reg# 16549

Semester: 6th

Final Term Paper: PROBABILITY & STATISTICS

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Q1:- Construct a grouped distribution table for the following data. and Calculate Mean, Mode, Median & Quartiles.

423, 369, 387, 411, ... 390

Answer:- In Ascending:-

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

Max Value = 431

Min value = 363

Range = 431 - 363

= 68

Since range is 68 we will choose as interval length of 10.

class interval	frequancy	Mid-points	f·m	cf
360-369	2	364.5	729	2
370-379	3	374.5	1123.5	5
380-389	5	384.5	1922.5	(10)
390-399	(7)	394.5	2761.5	17
400-409	5	404.5	2022.5	22
410-419	4	414.5	1658	26
420-429	3	424.5	1273.5	29
430-439	1	434.5	434.5	30
	30		11925	

$$\text{Mean} = \frac{\Sigma f \cdot m}{\Sigma f}$$

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

Mean = 397.5

$$\text{Median} = l_n + \left(\frac{\frac{\Sigma f}{2} - cf_{cb}}{fm}\right)$$

$$= 399.5 + \left(\frac{\frac{30}{2} - 10}{7}\right) 399.5 - 389.5$$

$$= 389.5 + \left(\frac{15-10}{7}\right)^{7} 10$$

$$= 389.5 \left(\frac{5}{7}\right) 10$$

$$= 389.5 + 50/7$$

$= 389.5 + 7.1428$

Median = 396.6

$lm = 389.5$
$\Delta_1 = 7-5 = 2$
$\Delta_2 = 7-5 = 2$
$C = 399.5 - 389.5 = 10$

$$\text{Mode} = lm + \left(\frac{\Delta 1}{\Delta 1 + \Delta 2}\right) C$$

$$= 389.5 + \left(\frac{2}{2+2}\right) 10$$

$$= 389.5 + \left(\frac{2^{1}}{4_{2}}\right) 10$$

$$= 389.5 + \frac{10}{2} 5$$

$= 389.5 + 5$

Mode = 394.5

Quartile finding

Class Interval	frequency	C.f
360-369	2	2
370-379	3	5
380-389	5	10
390-399	7	17
400-409	5	22
410-419	4	26
420-429	3	29
430-439	1	30
	30	

$$Q.D = \frac{Q_3 - Q_1}{2}$$

$$Q_1 = l + \frac{h}{f}(\Sigma_1 - c) \qquad \Sigma_1 = \frac{n}{4} = \frac{30}{4} = 7.5$$

$l = 390 \quad f = 7 \quad h = 4 \quad c = 10$

$$= 390 + \frac{4}{7}(7.5 - 10)$$

$$= 390 + 0.5(-2.5)$$

$$= 390 - 2$$

Quartile = 388

Q2:- By Multiplying each of the numbers 3,6,2,1,7,5 by 2 & then adding 5, we obtain 11, 17, 9, 7, 19, 15. What is the relation between the Standard derivation & the means of the two Sets.

x	$x_i - u$	$(x_i - u)^2$
7	−6	36
9	−4	16
11	−2	4
17	4	16
15	2	4
19	6	36
$\Sigma x = 78$	$\Sigma (x_i - u) = 0$	$\Sigma (x_i - u)^2 = 112$

$$\text{Mean} = \frac{\Sigma x}{N}$$

$$\frac{78}{6}$$

$$= 13$$

$$S.D = \sigma = \sqrt{\frac{\Sigma (x_i - u)^2}{N}} = \sigma = \sqrt{\frac{112}{13}}$$

The mean is a measure of central tendency the standard deviation is a measure of dispessum. Both are appropciate descuptive statistics for normally distributed data sets using ratio or internal scaling Both mean and S.D are used in calculating some coerelation cofficients, effect sizes it scores.

The mean is a measure of central tendency. The standard deviation is a measure of dispersion. Both are appropriate descriptive statistics for normally distributed data sets using ratio or interval scaling. Both mean and standard deviation are used in calculating some correlation coefficients, effect sizes, t scores, F scores (Analysis of variance).

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Q3:- For the following grouped distribution table Calculate. The variance & Standard Daviation

Class	64-84	85-104	105-124	125-144	145-164	165-184	185-204
Freqwng	15	18	27	10	6	5	13

Ans:-

Class	f	x	$(x-\bar{x})$	$(x-\bar{x})^2$	$f(x-x)^2$
64-84	15	74	-49	2401	36015
85-104	18	94.5	-28.5	812.25	14620.5
105-124	27	114.5	-8.5	72.25	1951
125-144	10	134	11	121	1210
145-164	6	154.5	31.5	992.25	5953.5
165-184	5	174.5	51.5	2652.25	13261
185-204	13	194.5	71.5	5112.25	66459
Total=		94			139470

$\bar{x} = 123$

Variance $= S^2 = \frac{\Sigma f(x-\bar{x})^2}{n}$ = Standard Derivation

$\because n = \Sigma f = \frac{139470}{94} = 1484$ $= \sqrt{S^2} = \sqrt{1484}$

$= S = 38.5$

Q4. if two fair dice are thrown, what is the probability of getting

1. A double six
2. A Sum of 8 or more dots.

Solution: The Sample Space S is represented by the following 36 outcomes

$$S = \{(1,1), (1,2), (1,3), (1,4), (1,5), (1,6)$$
$$(2,1), (2,2), (2,3), (2,4), (2,5), (2,6)$$
$$(3,1), (3,2), (3,3), (3,4), (3,5), (3,6)$$
$$(4,1), (4,2), (4,3), (4,4), (4,5), (4,6)$$
$$(5,1), (5,2), (5,3), (5,4), (5,5), (5,6)$$
$$(6,1), (6,2), (6,3), (6,4), (6,5), (6,6)\}$$

(1) Let A be the event that double six occurs

$A = \{(6,6)\}$ & thus

$P(A) = 1/36$

(2) Let B denotes that Sum of 8 or more dots occurs

$$B = \{(2,6), (3,5), (3,6), (4,4), (4,5), (4,6), (5,3), (5,4), (5,5)$$
$$(5,6), (6,2), (6,3), (6,4), (6,5), (6,6)\}$$

Hence

$P(B) = 15/36 = 5/12$

Q5:- Let $C_1, C_2, \cdots CMC1, C2, \cdots, CM$ be a parition of the Sample Space SS, & AA & BB be two events. Suppose we known that

- A & B are conditionally independent given C_i, for all $\in \{1,2,\cdots,M\}$
- B is independent of all C_is.

Prove that A & B are independent.

Solution:- Since the C_i's from a partition of the sample Space. We can apply the law of total probability for $A \cap B$:

$$P(A \cap B) = \sum_{i=1}^{M} P(A \cap B \mid C_i) P(C_i)$$

$$= \sum_{i=1}^{M} P(A \mid C_i) P(B \mid C_i) P(C_i) \quad (A \text{ \& } B \text{ are conditionally independent})$$

$$= \sum_{i=1}^{M} P(A \mid C_i) P(B) P(C_i) \quad (B \text{ is independent of all } C_i\text{'s})$$

$$= P(B) \sum_{i=1}^{M} P(A \mid C_i) P(C_i)$$

$$= P(B) P(A) \quad (\text{law of total Probability})$$