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Statistical Methods (G.E.)

Date :- 5th March

Q(5)

Ans

Student	Marks in English	Marks in Hindi	Rank(E)	Rank(H)	d^2
A	15	18	4	7.5	12.25
B	13	16	2	3.5	2.25
C	17	18	6.5	7.5	1
D	14	15	3	1.5	2.25
E	18	19	8.5	10	2.25
F	12	16	1	3.5	6.25
G	20	18	11	7.5	12.25
H	16	15	5	1.5	12.25
I	18	21	8.5	12	12.25
J	17	17	6.5	5	2.25
K	19	18	10	7.5	6.25
L	21	20	12	11	1
				$\Sigma d^2 =$	72.5

$$T_x = \frac{2(4-1)}{12} + \frac{2(4-1)}{12} = 1$$

$$T_y = \frac{2(4-1)}{12} + \frac{2(4-1)}{12} + \frac{4(16-1)}{12} = 6$$

So the rank correlation coefficient is

$$\rho = 1 - \frac{6(\Sigma d^2 - T_x - T_y)}{n(n^2-1)}$$

$$\rho = 1 - \frac{6(72.5 - 1 - 6)}{12(144 - 1)}$$

$$\rho = 1 - \frac{65.5}{2(143)}$$

$$\left[\rho = 0.77\right] \text{ Ans}$$

Q (1)

Ans Measures of Central Tendency helps us to determine the central value of a data-set and also help in further mathematical calculations. That central value gives us the broad idea about data.

let $z = \Sigma f(x-A)^2$ is the sum of squares of deviation

so after 1st differentiation with respect to A

$$\frac{dz}{dA} = -2\Sigma f(x-A) \quad - (1)$$

2nd differentiation

$$\frac{d^2z}{dA^2} = -2\Sigma f(-1) \Rightarrow \frac{d^2z}{dA^2} = 2\Sigma f$$

Then $\frac{dz}{dA} = 0$

(3)

$$-2(\Sigma fx - A\Sigma f) = 0$$

$$A = \frac{\Sigma fx}{\Sigma f} = \bar{x}$$

So when $A = \bar{x}$ then $\frac{d^2z}{dA^2} > 0$

So on behalf of the concept of Maxima and minima, we can say that sum of square deviation is minimum when $A = \bar{x}$.

~~Mr. A travels X to Y in t_1 =~~

let assume that distance between X to Y = x km

then time ~~bef~~ for going X to Y $t_1 = \frac{x}{30}$ hrs

& time for coming Y to X $t_2 = \frac{x}{60}$ hrs

So avg speed = $\frac{\text{total distance}}{\text{total time}}$

$$= \frac{x+x}{\frac{x}{30} + \frac{x}{60}} = \frac{\overset{20}{\cancel{60}} \times 2x}{3x}$$

[avg speed = 40 km/h]

④

Q.③

Ans.

$$n = 200$$

$$\bar{x}_{inc} = 60$$

$$\sigma_{inc} = 20$$

So $$\bar{x}_{inc} = \frac{\sum x_{inc}}{n}$$

$$\sum x_{inc} = 200 \times 60 = 12000$$

the corrected sum $\sum x = 12000 - (3+67) + (18+17)$

$$\sum x = 11965$$

So the corrected mean

$$\bar{x}_c = \frac{11965}{200} = \underline{59.825}$$

Now

$$\sigma_{inc} = \frac{1}{N}\sqrt{N(\sum x_{inc}^2) - (\sum x)_{inc}^2}$$

$$20 = \frac{1}{200}\sqrt{200(\sum x_{inc}^2) - (12000)^2}$$

square both the sides

$$400 = \frac{1}{40000}\left(200 \sum x_{inc}^2 - (12000)^2\right)$$

(5)

$$\sum x_{inc}^2 = (400 + 3600) \times 200$$

$$\sum x_{inc}^2 = 800000$$

Then $$\sum x_c^2 = 800000 - (3^2 + 67^2) + (18^2 + 17^2)$$

$$= 796115$$

So corrected standard deviation

$$\sigma_c = \frac{1}{200}\sqrt{200 \times 796115 - (11965)^2}$$

$$\sigma_c = \frac{1}{200}\sqrt{159223000 - 143161225}$$

$$\sigma_c = \frac{1}{200}\sqrt{16061775}$$

$$\sigma_c = \frac{4007.714}{200}$$

$$\underline{\sigma_c = 20.038}$$

Now coefficient of variation

$$C.V = \frac{\sigma_c}{\bar{x}_c} \times 100 = \frac{20.038}{59.825} \times 100$$

$$\underline{C.V = 33.49}$$

(6)

Q. (2)
Ans.

Q. (2).

Ans. **Histogram** :- It's a graphical representation of grouped data. It consists of a set of continuous rectangles one over each class interval having their area proportional to the corresponding class frequency. We plot the class intervals on x-axis and class frequency on y-axis. It is necessary that class intervals are in exclusive form.

If the class intervals are of unequal length then we adjust the height of rectangles by using this formula

$$H = \left(\frac{\text{freq.}}{\text{width}}\right) \times k$$

H = Height

k = minimum class width

We can use this for understanding the distribution and also locate the mode, a measure of central tendency.

Ogive :- Ogive is of two types

(1) Less than type Ogive

(2) More than type Ogive

When we plot the less than cumulative frequency against the upper class limit then we got

the less than type Ogive. On the other hand when we plot more than cumulative frequency against the lower class limit then we get the more than type ogive. We connect the dots that is plotted by a smooth curve.

Ogive is helpful to determine the median. When these two types of ogive intersect then the intersection point is the median.