DPP
DAILY PRACTICE PROBLEMS

Class : XIth
Date :

Solutions

Subject : MATHS
DPP No. :9

# Topic :-STATISTICS

163 **(a)**

Arranging the given values in ascending order of magnitude, we get

$x-\frac{7}{2}, x-3, x-\frac{5}{2}, x-2, x-\frac{1}{2}, x+\frac{1}{2}, x+4, x+5$

There are 8 observations in this series

$\therefore$ Median $=$ AM of 4th and 5th observation

$\Rightarrow$ Median $=$ AM of $(x-2)$ and $(x-1/2)$

$\Rightarrow$ Median $=\frac{x-2+x-\frac{1}{2}}{2}=x-\frac{5}{4}$

165 **(a)**

We have,

$\sum X=a\sum U+b\sum V$

$\overline{X}=\frac{1}{n}\sum X=a\cdot\left\{\frac{1}{n}\sum U\right\}+b\left\{\frac{1}{n}\sum V\right\}=a\,\overline{U}+b\,\overline{V}$

166 **(d)**

$\bar{x}=5$

Variance $=\frac{1}{n}\Sigma x_i^2-(\bar{x}^2)$

$0=\frac{1}{n}.400-25$

$\Rightarrow n=\frac{400}{25}$

$=16$

168 **(a)**

We have,

$r=\max_{i\neq j}|x_i-x_j|$ and, $S^2=\frac{1}{n-1}\sum_{i=1}^{n}(x_i-\overline{X})^2$

Now,

$(x_i-\overline{X})^2=\left\{x_i-\frac{x_1+x_2+\ldots+x_n}{n}\right\}^2$

$\Rightarrow (x_i - \overline{X})^2 = \frac{1}{n^2}[(x_i - x_1) + (x_i - x_2) + \dots + (x_i - x_{i-1}) + (x_i - x_{i+1}) + \dots + (x_i - x_n)]^2$

$\Rightarrow (x_i - \overline{X})^2 \le \frac{1}{n^2}[(n-1)r]^2 \quad [\because |x_i - x_j| \le r]$

$\Rightarrow (x_i - \overline{X})^2 \le r^2$

$\Rightarrow \sum_{i=1}^{n} (x_i - \overline{X})^2 \le \frac{n\,r^2}{(n-1)}$

$\Rightarrow \frac{1}{n-1} \sum_{i=1}^{n} (x_i - \overline{X})^2 \le \frac{n\,r^2}{(n-1)}$

$\Rightarrow S^2 \le \frac{n\,r^2}{(n-1)} \Rightarrow S \le r\sqrt{\frac{n}{n-1}}$

169 **(b)**

$\bar{x} = \frac{1+2+3+\dots+n}{n} = \frac{(n+1)}{2}$

$\therefore \sigma^2 = \frac{\Sigma(x_i)^2}{n} - (\bar{x})^2$

$= \frac{\Sigma n^2}{n} - \left(\frac{n+1}{2}\right)^2$

$= \frac{n(n+1)(2n+1)}{6n} - \left(\frac{n+1}{2}\right)^2 = \frac{n^2-1}{12}$

172 **(d)**

Since, SD < Range

$\Rightarrow \sigma \le (b-a)$

$\Rightarrow \sigma^2 \le (b-a)^2$

174 **(b)**

$\because\ 8 + 12 + f_1 + 16 + f_2 + 10 = 75$

$\Rightarrow\ f_1 + f_2 = 29$ ...(i)

And $120 + 240 + 25f_1 + 480 + 35f_2 + 400 = 28.07 \times 75$

$\Rightarrow\ 1240 + 25f_1 + 35f_2 = 2105.25$

$\Rightarrow\ 5f_1 + 7f_2 = 173.25$ ...(ii)

On solving eqs. (i) and (ii), we get

$f_1 = 15$ and $f_2 = 14$

175 **(a)**

Given, n=15, $\Sigma x^2 = 2830, \Sigma x = 170$

Since, one observation 20 was replaced by 30, then

$\Sigma x^2 = 2830 - 400 + 900 = 3330$

And $\Sigma x = 170 - 20 + 30 = 180$

Variance, $\sigma^2 = \frac{\Sigma x^2}{n} - \left(\frac{\Sigma x}{n}\right)^2 = \frac{3330}{15} - \left(\frac{180}{15}\right)^2$

$$= \frac{3330 - 12 \times 180}{15} = \frac{1170}{15} = 78.0$$

178 **(a)**

We have, $Z = aX + bY$ ...(i)

$\Rightarrow \bar{Z} = a\bar{X} + b\bar{Y}$ ...(ii)

$Z - \bar{Z} = a(X - \bar{X}) + b(Y - \bar{Y})$

$\Rightarrow (Z - \bar{Z})^2 = a^2(X - \bar{X})^2 + b^2(Y - \bar{Y})^2 + 2ab(X - \bar{X})(Y - \bar{Y})$

$\Rightarrow \frac{1}{n}\sum (Z - \bar{Z})^2 = a^2\frac{1}{n}\sum (X - \bar{X})^2 + b^2\frac{1}{n}\sum (Y - \bar{Y})^2 + 2ab\frac{1}{n}\sum (X - \bar{X})(Y - \bar{Y})$

$\Rightarrow \sigma_Z^2 = a^2\sigma_X^2 + b^2\sigma_Y^2 + 2ab \operatorname{cov}(X, Y)$

$\Rightarrow \sigma_Z^2 = a^2\sigma_X^2 + b^2\sigma_Y^2 + 2ab\, r\sigma_X\sigma_Y$

$$\left[\therefore \frac{\operatorname{cov}(X,Y)}{\sigma_X\sigma_Y} = r\right]$$

180 **(b)**

The required AM is given by

$$\bar{X} = \frac{1 + 2 + 2^2 + 2^3 + \dots + 2^n}{n+1} = \frac{(2^{n+1} - 1)}{(n+1)(2-1)} = \frac{2^{n+1} - 1}{n+1}$$

| ANSWER-KEY | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Q. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| **A.** | D | A | A | C | A | D | C | A | B | C |
| | | | | | | | | | | |
| Q. | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| **A.** | B | D | A | B | A | B | B | A | C | B |
| | | | | | | | | | | |