DPP
DAILY PRACTICE PROBLEMS

Class : XIth
Date :

Solutions

Subject : MATHS
DPP No. :2

Topic :-STATISTICS

22 **(a)**

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

Variance, $\sigma^2 = \frac{\sum (x_i)^2}{n} - (\bar{x})^2$

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

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

$= \frac{n^2-1}{12}$

25 **(a)**

Coefficient of skewness $= \frac{Q_3 - Q_1 - 2(median)}{Q_3 - Q_1}$

$= \frac{25.2 + 14.6 - 2(18.8)}{25.2 - 14.6}$

$= \frac{2.2}{10.6} = 0.20$

27 **(a)**

Let $x_1, x_2, \ldots, x_n$ and $y_1, y_2, \ldots y_n$ be two series of observations with geometric means G_1 and G_2 respectively

Then,

$G_1 = (x_1 \cdot x_2 \cdot \ldots \cdot x_n)^{1/n}$ and $G_2 = (y_1 \cdot y_2 \cdot \ldots \cdot y_n)^{1/n}$

Since G is the geometric mean of the ratios of the corresponding observations

$\therefore G = \left(\frac{x_1}{y_1} \cdot \frac{x_2}{y_2} \cdot \ldots \cdot \frac{x_n}{y_n}\right)^{1/n} = \frac{(x_1 x_2 \ldots x_n)^{1/n}}{(y_1 \cdot y_2 \ldots y_n)^{1/n}} = \frac{G_1}{G_2}$

28 **(d)**

We know that,

$r = \pm \sqrt{b_{yx} . b_{xy}}$

Also we know that sign of r, b_{xy}, b_{yx} *are all same*.

$\therefore r = (\text{sign } of\ b_{yx}) \sqrt{b_{yx} . b_{xy}}$

30 **(b)**

Let $Y = \frac{a\,X + b}{c}$. Then, $\overline{Y} = \frac{1}{c}(a\,\overline{X} + b)$

$\therefore Y - \overline{Y} = \frac{a}{c}(X - \overline{X})$

$\Rightarrow \frac{1}{N}\sum (Y - \overline{Y})^2 = \frac{a^2}{c^2}\frac{1}{N}\sum (X - \overline{X})^2$

$\therefore \sigma_Y = \sqrt{\frac{a^2}{c^2} \times \frac{1}{N}\sum (X - \overline{X})^2} = \sqrt{\frac{a^2}{c^2}\sigma^2} = \left|\frac{a}{c}\right|\sigma$

31 **(d)**

We have,

$\overline{X} = \frac{x_1 + x_2 + \dots + x_{n-1} + x_n}{n}$

$\Rightarrow n\,\overline{X} = x_1 + x_2 + \dots + x_{n-1} + x_n$

Let $\overline{Y}$ be the new mean when x_2 is replaced by λ. Then,

$\overline{Y} = \frac{x_1 + \lambda + x_3 + \dots + x_{n-1} + x_n}{n}$

$\Rightarrow \overline{Y} = \frac{(x_1 + x_2 + \dots + x_n) - x_2 + \lambda}{n}$

$\Rightarrow \overline{Y} = \frac{n\,\overline{X} - x_2 + \lambda}{n}$

32 **(b)**

Let $x_1, x_2, \dots x_n$ be n values of x.

Then, $\sigma = \frac{1}{n}\sum_{\mathrm{i}=1}^{\mathrm{n}} (\mathrm{x_i} - \overline{\mathrm{x}})^2 \dots$ (i)

The variable $ax + b$ takes values $ax_1 + b, ax_2 + b, \dots, ax_n + b$ with mean $\bar{x} + b$.

$\therefore SD\ of\ (ax + b) = \sqrt{\frac{1}{n}\sum_{\mathrm{i}=1}^{\mathrm{n}} \{(\mathrm{ax_i} - \mathrm{b}) - (\mathrm{a}\overline{\mathrm{x}} + \mathrm{b})\}^2}$

$= \sqrt{a^2.\frac{1}{n}\sum_{\mathrm{i}=1}^{\mathrm{n}} (\mathrm{x_i} - \overline{\mathrm{x}})^2}$

$= |a|\sigma$

Alternate SD$(ax + b) = SD(ax) + SD(b)$

=$|a|SD(x) + 0$

$= |\mathrm{a}|\sigma$

33 **(d)**

Mean $= \frac{1}{10}[(x_1 + x_2 + \dots + x_{10}) + (4 + 8 + \dots + 40)]$

$= \frac{1}{10}(x_1 + x_2 + \dots + x_{10}) + \frac{4}{10}(1 + 2 + \dots + 10)$

$= 20 + \frac{4 \times 10 \times 11}{10 \times 2} = 42$

35 **(d)**

$$\bar{x} = \frac{1}{2n+1}[a + (a+d) + \dots + (a+2nd)]$$

$$= \frac{1}{2n+1}[(2n+1)a + d(1+2+\dots+2n)]$$

$$= a + d\frac{2n}{2}.\frac{(2n+1)}{2n+1} = a + nd$$

$$\therefore \text{MD from mean} = \frac{1}{2n+1}\sum |x_1 - \bar{x}|$$

$$= \frac{1}{2n+1}2|d|(1+2+\dots+n)$$

$$= \frac{n(n+1)|d|}{(2n+1)}$$

36 **(b)**

Given, $\sigma_{10}^2 = \frac{99}{12} = \frac{33}{4}$

$$\Rightarrow \sigma_{10} = \frac{\sqrt{33}}{2}$$

SD of required series $= 3\sigma_{10} = \frac{3\sqrt{33}}{2}$

38 **(b)**

We know that,

$\text{var}(aX+b) = a^2\text{var}(X)$

$$\therefore \text{var}\left(\frac{aX+b}{c}\right) = \left(\frac{a}{c}\right)^2 \text{var}(X) = \frac{a^2}{c^2}\sigma^2$$

$$\therefore \text{SD} = \sqrt{\text{var}\left(\frac{aX+b}{c}\right)} = \left|\frac{a}{c}\right|\sigma$$

39 **(b)**

We have,

$$\sigma^2 = \frac{1}{2\,n+1}\sum_{r=0}^{2\,n}\{(a+rd)-(a+nd)\}^2$$

$$\Rightarrow \sigma^2 = \frac{2\,d^2}{2\,n+1}\{1^2+2^2+\dots+n^2\}$$

$$\Rightarrow \sigma^2 = \frac{n(n+1)}{3}d^2 \Rightarrow \sigma = \sqrt{\frac{n(n+1)}{3}}d$$

40 **(a)**

Given that, mean=5, median=6

For a moderately skewed distribution, we have

Mode =3 median $-$ 2 mean

$\Rightarrow$Mode $= 3(6) - 2(5) = 8$

ANSWER-KEY

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