# 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,

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

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

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

**30** **(b)**

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

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

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

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

**31** **(d)**

We have,

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

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

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

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

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

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

**32** **(b)**

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

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

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

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

$$= \sqrt{a^2 \cdot \frac{1}{n}\sum_{i=1}^{n}(x_i - \bar{x})^2}$$

$$= |a|\sigma$$

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

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

$$= |a|\sigma$$

**33** **(d)**

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

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

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

**35** **(d)**

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

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

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

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

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

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

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,

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

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

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

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 |
| | | | | | | | | | |