

**Topic :-STATISTICS**

181 (d)

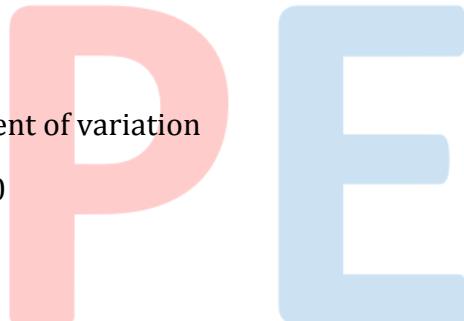
Given that,  $n_1 = 4$ ,  $\bar{x} = 7.5$ ,  $n_1 + n_2 = 10$ ,  $\bar{x} = 6$

$$\begin{aligned}\therefore 6 &= \frac{4 \times 7.5 + 6 \times \bar{x}_2}{10} \\ \Rightarrow 60 &= 30 + 6\bar{x}_2 \\ \Rightarrow \bar{x}_2 &= \frac{30}{6} = 5\end{aligned}$$

182 (c)

Since, percentage of coefficient of variation

$$\begin{aligned}&= \frac{\text{Standard deviation}}{\text{Mean}} \times 100 \\ \therefore 45 &= \frac{\sigma}{12} \times 100 \\ \Rightarrow \sigma &= \frac{45 \times 12}{100} = 5.4\end{aligned}$$



183 (c)

Given that,  $x_1 < x_2 < x_3 < \dots < x_{201}$

$\therefore$  Median of the given observation  $= \left(\frac{201+1}{2}\right)$ th item Now, deviation will be minimum if taken from the median.  $\therefore$  Mean deviation will be minimum, if  $k = x_{101}$

184 (a)

It is true that median and mode can be determined graphically

186 (b)

Given that,  $\sum_{i=1}^{20} (x_i - 30) = 2$

$$\begin{aligned}\Rightarrow \sum_{i=1}^{20} x_i - \sum_{i=1}^{20} (30) &= 2 \\ \Rightarrow \bar{x} &= \frac{20.30}{20} + \frac{2}{20} \\ &= 30 + 0.1 = 30.1\end{aligned}$$

187 (c)

Let the number of boys and girls be  $x$  and  $y$

$$\therefore 52x + 42y = 50(x + y)$$

$$\Rightarrow 2x = 8y$$

$$\Rightarrow x = 4y$$

$\therefore$  Total number of students in the class

$$= x + y = 5y$$

$\therefore$  Required percentage of boys

$$= \frac{4y}{5y} \times 100\% = 80\%$$

188 (a)

$$\text{Since, } \frac{x + (x + 2) + (x + 4) + (x + 6) + (x + 8)}{5} = 11$$

$$\Rightarrow \frac{5x + 20}{5} = 11 \Rightarrow x = 7$$

$$\therefore \text{Mean of the last three values} = \frac{11 + 13 + 15}{3} = 15$$

189 (c)

Let  $a, a, \dots, n$  times and  $-a, -a, \dots, n$  times, ie, mean = 0

$$\text{And SD} = \sqrt{\frac{n(a - 0)^2 + n(-a - 0)^2}{2n}} = 2 \quad (\text{given})$$

$$\Rightarrow 4 = \frac{2na^2}{2n}$$

$$\Rightarrow a^2 = 4$$

$$\Rightarrow |a| = 2$$

190 (b)

The required mean is given by

$$\bar{X} = \frac{1 \cdot 1^2 + 2 \cdot 2^2 + 3 \cdot 3^2 + \dots + n \cdot n^2}{1^2 + 2^2 + \dots + n^2} = \frac{\sum n^3}{\sum n^2}$$

$$\Rightarrow \bar{X} = \frac{\frac{n(n+1)^2}{2}^2}{\frac{n(n+1)(2n+1)}{6}} = \frac{3n(n+1)}{2(2n+1)}$$

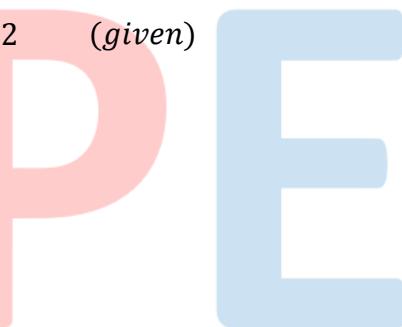
193 (c)

Here,  $n = 7$ , sum = 315

$$\therefore \text{Mean} = \frac{315}{7} = 45$$

Now, standard deviation

$$= \sqrt{\frac{(12 - 45)^2 + (23 - 45)^2 + (34 - 45)^2 + (45 - 45)^2 + (56 - 45)^2 + (67 - 45)^2 + (78 - 45)^2}{7}}$$



$$= \sqrt{\frac{2(1089 + 484 + 121)}{7}} = \sqrt{\frac{3388}{7}}$$

$$\sqrt{484} = 22$$

194 (a)

$$\text{We know, } \sigma^2 = \frac{n_1(\sigma_1^2 + d_1^2) + n_2(\sigma_2^2 + d_2^2)}{n_1 + n_2}$$

Where  $d_1 = m_1 - a$ ,  $d_2 = m_2 - a$ ,  $a$  being the mean of the whole group

$$\therefore 15.6 = \frac{100 \times 15 + 150 \times m_2}{250}$$

$$\Rightarrow m_2 = 16$$

$$\text{Thus, } 13.44 = \frac{[(100 \times 9 + 150 \times \sigma^2) + 100 \times (0.6)^2 + 150 \times (0.4)^2]}{250}$$

$$\Rightarrow \sigma = 4$$

195 (a)

We have,

$$\text{GM} = (1 \times 2 \times 4 \times 8 \times \dots \times 2^n)^{1/n} = (1 \times 2^1 \times 2^2 \times 2^3 \times \dots \times 2^n)^{1/n}$$

$$\Rightarrow \text{GM} = \left\{ 2^{\frac{n(n+1)}{2}} \right\}^{1/n} = 2^{\frac{n+1}{2}}$$

196 (a)

Given the standard deviation (SD) of the variable  $x$  is 10.

$$\therefore \text{Standard deviation of } 50 + 5x = 5x = 50 \quad [\because x = 10]$$

197 (c)

$$\text{Given, } 3x + 2y = 26$$

$$\Rightarrow y = -\frac{3}{2}x + 13$$

$$\text{And } 6x + y = 31$$

$$\Rightarrow x = -\frac{1}{6}y + \frac{31}{6}$$

$$\therefore r = -\sqrt{\left(\frac{-3}{2}\right)\left(\frac{-1}{6}\right)}$$

$$\Rightarrow r = -\frac{1}{2}$$

198 (b)

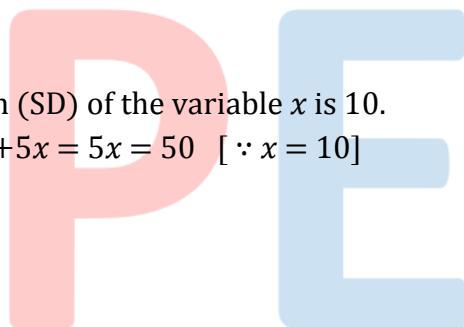
$$\text{We Know, } (\sigma_x - \sigma_y)^2 \geq 0$$

$$\Rightarrow \sigma_x^2 + \sigma_y^2 \geq 2\sigma_x\sigma_y$$

$$\Rightarrow \frac{\sigma_x\sigma_y}{\sigma_x^2 + \sigma_y^2} \leq \frac{1}{2}$$

If  $\theta$  is angle between two regression lines with correlation coefficient  $r$ , then  $\tan \theta =$

$$\left( \frac{1 - r^2}{r} \right) \left( \frac{\sigma_x\sigma_y}{\sigma_x^2 + \sigma_y^2} \right)$$



$$\Rightarrow \tan\theta \leq \frac{1-y^2}{2y}$$

$$\Rightarrow \tan^2 \theta \leq \left(\frac{1-y^2}{2y}\right)^2$$

Since,  $\sin^2 \theta \leq 1$  and  $1-y^2 < 1+y^2$

$$\therefore \sin\theta \leq 1-y^2$$

199 (c)

Given, SD = 2 =  $\sqrt{\frac{100}{n} - \left(\frac{20}{n}\right)^2}$

$$\Rightarrow 4 = \frac{100}{n} - \frac{400}{n^2}$$

$$\Rightarrow n^2 - 25n + 100 = 0$$

$$\Rightarrow n = 20, 5$$

200 (a)

${}^{2n}C_0, {}^{2n}C_1, {}^{2n}C_2, \dots, {}^{2n}C_n$  are binomial coefficients which are in odd numbers (because n is even) and middle binomial coefficient is  ${}^{2n}C_{n/2}$  which is required median.

#### ANSWER-KEY

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