DPP

DAILY PRACTICE PROBLEMS

Class : XIth
Subject : MATHS
Date :
DPP No. :5

Solutions

Topic :-STATISTICS

82 **(a)**

For a moderately skewed distribution

Mode $= 3$ Median -2 Mean

$\Rightarrow 6\lambda = 3$ Median -18λ

$\Rightarrow$ Median $= 8\lambda$

83 **(b)**

Given series is 148, 146, 144, 142,... whose first term and common difference is

$a = 148, d = (146 - 148) = -2$

$S_n = \frac{n}{2}[2a + (n+1)d] = 125$ (given)

$\Rightarrow 125n = \frac{n}{2}[2 \times 148 + (n-1) \times (-2)]$

$\Rightarrow n^2 - 24n = 0 \Rightarrow n(n-24) = 0$

$\Rightarrow n = 24 \quad (n \neq 0)$

84 **(b)**

Let us assume that line of regression y on x is

$2x - 7y + 6 = 0$ *and x on y is* $7x - 2y + 1 = 0$

$\therefore b_{yx} = \frac{2}{7}$ *and* $b_{xy} = \frac{2}{7}$

$\therefore \quad r = \sqrt{\left(\frac{2}{7}\right)\left(\frac{2}{7}\right)} = \frac{2}{7}$

86 **(b)**

Given that, $n_1 = 10, \bar{x}_1 = 12, n_2 = 20, \bar{x}_2 = 9$

$\therefore \quad \bar{x} = \frac{n_1\bar{x}_1 + n_2\bar{x}_2}{n_1 + n_2} = \frac{10 \times 12 + 20 \times 9}{10 + 20}$

$= \frac{120 + 180}{30} = \frac{300}{30} = 10$

89 **(a)**

$\because$ Mode=3 Median-2 Mean

$\because$ Mode=3(22)-2(21)

$\Rightarrow$ Mode=66-42=24

90 **(c)**

Let $x_1, x_2, \ldots, x_n$ be n observations. Then,

$\bar{X} = \frac{1}{n}\sum x_i$

Let $y_i = \frac{x_i}{\alpha} + 10$. Then,

$\frac{1}{n}\sum_{i=1}^{n} y_i = \frac{1}{\alpha}\left(\frac{1}{n}\sum x_i\right) + \frac{1}{n}(10\,n)$

$\Rightarrow \bar{Y} = \frac{1}{\alpha}\bar{X} + 10 = \frac{\bar{X} + 10\,\alpha}{\alpha}$

91 **(b)**

The formula for combined mean is

$\bar{X} = \frac{n_1\bar{X}_1 + n_2\bar{X}_2}{n_1 + n_2}$ ...(i)

We are given $\bar{X} = 25, \bar{X}_1 = 26, \bar{X}_2 = 21$

Let $n_1 + n_2 = 100$, where n_1 denotes the number of men and n_2 the number of women

$\therefore n_2 = 100 - n_1$

Substituting those values in (i), we have

$25 = \frac{26\,n_1 + 21(100 - n_1)}{100} \Rightarrow n_1 = 80$

$\therefore n_1 + n_2 = 100 \Rightarrow n_2 = 20$

Hence, the percentages of men and women are 80 and 20 respectively

92 **(c)**

If $d_i = \frac{x_i - A}{h}$, then $\sigma_x = |h|\sigma_d$

Now, $-2x_i - 3 = \frac{x_i + \frac{3}{2}}{-\frac{1}{2}}$

Here, $h = -\frac{1}{2}$

$\therefore \quad \sigma_d = \frac{1}{|h|}\sigma_x$

$= 2 \times 3.5 = 7$

93 **(c)**

Let $d_i = x_i - 8$

$\therefore \sigma_x^2 = \sigma_d^2 = \frac{1}{18}\sum d_i^2 - \left(\frac{1}{8}\sum d_i\right)^2$

$= \frac{1}{18} \times 45 - \left(\frac{9}{18}\right)^2 = \frac{5}{2} - \frac{1}{4} = \frac{9}{4}$

$\Rightarrow \sigma_x^2 = \frac{3}{2}$

94 **(c)**

Given, $\sigma = 9$

Let a student obtains x marks out of 75. Then, his marks out of 100 are $\frac{4x}{3}$. Each observation is multiply by $\frac{4}{3}$

$\therefore$ New SD, $\sigma = \frac{4}{3} \times 9 = 12$

Hence, variance is $\sigma^2 = 144$

95 **(c)**

We have,

$$\overline{X}=\frac{0\times {}^nC_0\times +1\times {}^nC_1+2\times {}^nC_2+\ldots+n\times {}^nC_n}{{}^nC_0+{}^nC_1+{}^nC_2+\ldots+{}^nC_n}$$

$$\Rightarrow\overline{X}=\frac{\sum_{r=0}^{n} r\times {}^nC_r}{\sum_{r=0}^{n} {}^nC_r}$$

$$\Rightarrow\overline{X}=\frac{1}{2^n}\sum_{r=1}^{n} r\times\frac{n}{r}\,{}^{n-1}C_{r-1}\left[\because\sum_{r=0}^{n}{}^nC_r=2^n\,;{}^nC_r=\frac{n}{r}\,{}^{n-1}C_{r-1}\right]$$

$$\Rightarrow\overline{X}=\frac{n}{2^n}\sum_{r=1}^{n}{}^{n-1}C_{r-1}$$

$$\Rightarrow\overline{X}=\frac{n}{2^n}(2^{n-1})=\frac{n}{2}\ \left[\because\sum_{r=1}^{n}{}^{n-1}C_{r-1}=2^{n-1}\right]$$

and,

$$\frac{1}{N}\sum f_i x_i^2=\frac{1}{2^n}\sum_{r=0}^{n} r^2\,{}^nC_r$$

$$\Rightarrow\frac{1}{N}\sum f_i x_i^2=\frac{1}{2^n}\sum_{r=0}^{n}\{r(r-1)+r\}\,{}^nC_r$$

$$\Rightarrow\frac{1}{N}\sum f_i x_i^2=\frac{1}{2^n}\left\{\sum_{r=0}^{n} r(r-1)\,{}^nC_r+\sum_{r=0}^{n} r\,{}^nC_r\right\}$$

$$\Rightarrow\frac{1}{N}\sum f_i x_i^2=\frac{1}{2^n}\left\{\sum_{r=2}^{n} r(r-1)\frac{n}{r}\times\frac{n-1}{r-1}\,{}^{n-2}C_{r-2}\right.$$

$$\left.+\sum_{r=1}^{n} r\frac{n}{r}\,{}^{n-1}C_{r-1}\right\}$$

$$\Rightarrow\frac{1}{N}\sum f_i x_i^2=\frac{1}{2^n}\left\{n(n-1)\sum_{r=2}^{n}{}^{n-2}C_{r-2}+n\sum_{r=1}^{n}{}^{n-1}C_{r-1}\right\}$$

$$\Rightarrow\frac{1}{N}\sum f_i x_i^2=\frac{1}{2^n}\{n(n-1)2^{n-2}+n\cdot 2^{n-1}\}=\frac{n(n-1)}{4}+\frac{n}{2}$$

$$\therefore \mathrm{Var}(X)=\frac{1}{N}\sum f_i x_i^2-\overline{X}^2=\frac{n(n-1)}{4}+\frac{n}{2}-\frac{n^2}{4}=\frac{n}{4}$$

96 **(d)**

The new observations are obtained by adding 20 to each. Hence, σ does not change.

97 **(c)**

Class	**Mid value x**	f	fx	$d = x - m$	fd	fd^2
0-10	5	2	10	-20.7	-41.4	856.98
10-20	15	10	150	-10.7	-107	1148.9
20-30	25	8	200	-0.7	-5.6	3.92
30-40	35	4	140	9.3	37.2	345.96
40-50	45	6	270	19.3	115.8	2234.94
		$\Sigma f = 30$	$\Sigma fx = 770$		$\Sigma fd = -1$	$\Sigma fd^2 = 4586.70$

M=$\frac{770}{30} = 25.7$

SD (σ)=$\sqrt{\frac{\Sigma fd^2}{\Sigma f} - \left(\frac{\Sigma fd}{\Sigma f}\right)^2}$

$$= \sqrt{\frac{4586.7}{30} - \left(\frac{-1}{30}\right)^2}$$

$\sqrt{15289 - 0.005 = 12365}$

$\therefore$ Coefficient of SD=$\frac{\sigma}{x} = \frac{12.365}{25.7} = 0.481$

and Coefficient of variance $=$ coeff.of SD $\times 100$

$= 0.481 \times 100 = 48.1$

98 **(c)**

We have,

$$\overline{X} = \frac{1 + 2 + 3 + \ldots + n}{n} = \frac{n(n+1)}{2\,n} = \frac{n+1}{2}$$

100 **(d)**

Karl pearson's coefficient of correlation r lies in the interval [-1, 1].

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