DPP

DAILY PRACTICE PROBLEMS

Class : XIth **Solutions** **Subject : MATHS**

Date : **DPP No. :6**

Topic :-STATISTICS

101 **(c)**

We have,

$n_1 = 7, \overline{X}_1 = 10, n_2 = 3, \overline{X}_2 = 5$

$\therefore$ Combined mean $= \dfrac{n_1\overline{X}_1 + n_2\overline{X}_2}{n_1 + n_2} = \dfrac{85}{10} = 8.5$

103 **(b)**

From the given table, it is clear that required mode=6

104 **(a)**

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

$\therefore \quad M = \dfrac{x_1 + x_2 + x_3 + \ldots + x_n}{n}$

$= \dfrac{x_1 + x_2 + \ldots + x_{n-4} + x_{n-3} + x_{n-2} + x_{n-1} + x_n}{n}$

$\Rightarrow nM = a + x_{n-3} + x_{n-2} + x_{n-1} + x_n$

$\Rightarrow \dfrac{nM - a}{4} = \dfrac{x_{n-3} + x_{n-2} + x_{n-1} + x_n}{4}$

105 **(b)**

The mean of the series $a, a + d, a + 2\,d, \ldots, a + 2\,nd$ is

$\overline{X} = \dfrac{1}{2\,n + 1}[a + a + d + a + 2\,d + \ldots + a + 2\,nd]$

$\Rightarrow \overline{X} = \dfrac{1}{2\,n + 1}\left\{\dfrac{2\,n + 1}{2}(a + a + 2\,nd)\right\} = a + nd$

$\therefore$ Mean deviation from mean

$$\text{M.D.} = \frac{1}{2\,n + 1}\sum_{r=0}^{2\,n} |(a + rd) - (a + nd)|$$

$$\Rightarrow \text{M.D.} = \frac{1}{2\,n + 1}\sum_{r=0}^{2\,n} |r - n|d$$

$$\Rightarrow \text{M.D.} = \frac{1}{2\,n + 1}\{2\,d(1 + 2 + \ldots + n)\} = \frac{n(n + 1)}{2\,n + 1}d$$

106 **(c)**

Let $x_1, x_2, \ldots, x_n$ be n values of variable X. Then,

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

Let $y_1 = x_1 + 1, y_2 = x_2 + 2, y_3 = x_3 + 3, \ldots, y_n = x_n + n$. Then, the mean of the new series is given by

$\overline{X}' = \frac{1}{n}\sum y_i$

$\Rightarrow \overline{X}' = \frac{1}{n}\sum_i (x_i + i)$

$\Rightarrow \overline{X}' = \frac{1}{n}\sum_i x_i + \frac{1}{n}(1 + 2 + 3 + \ldots + n)$

$\Rightarrow \overline{X}' = \overline{X} + \frac{1}{n} \cdot \frac{n(n+1)}{2} = \overline{X} + \frac{n+1}{2}$

107 **(c)**

Mean $= \frac{\sum_{i=1}^{n}(x_i + 2i)}{n} = \frac{\sum_{i=1}^{n} x_i + 2(1 + 2 + \ldots + n)}{n}$

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

109 **(b)**

If mean, median and mode coincides, then their is a symmetrical distribution

111 **(d)**

Let $x_i/f_i; i = 1,2,\ldots,n$ be a frequency distribution.

Then,

S.D. $= \sqrt{\frac{1}{N}\sum_{i=1}^{n} f_i(x_i - \overline{X})^2}$ and M.D. $= \frac{1}{N}\sum_{i=1}^{n} f_i|x_i - \overline{X}|$

Let $|x_i - \overline{X}| = z_i; i = 1,2,\ldots,n$. Then,

$(\text{S.D.})^2 - (\text{M.D.})^2 = \frac{1}{N}\sum_{i=1}^{n} f_i z_i^2 - \left(\frac{1}{N}\sum_{i=1}^{n} f_i z_i\right)^2 = \sigma_z^2 \geq 0$

$\Rightarrow$S.D. $\geq$ M.D.

112 **(d)**

We have,

$Q_3 = 17$ and $Q_1 = 10 \Rightarrow$ Q.D. $= \frac{1}{2}(Q_3 - Q_1) = 3.5$

113 **(c)**

When the origin is changed, then the coefficient of correlation is unsalted.

114 **(c)**

$\bar{x} = \frac{31 + 32 + 33 + \ldots + 47}{47} = \frac{663}{17} = 39$

$\therefore \sum_{i=1}^{17}(x_i - \bar{x})^2 = (31 - 39)^2 + (32 - 39)^2$

$+ (33 - 39)^2 + (34 - 39)^2 + (35 - 39)^2$

$+ (36 - 39)^2 + (37 - 39)^2 + (38 - 39)^2$

$+ (39 - 39)^2 + (40 - 39)^2 + (41 - 39)^2$

$+ (42-39)^2 + (43-39)^2 + (44-39)^2$
$+ (45-39)^2 + (46-39)^2 + (47-39)^2$
$= 64 + 49 + 36 + 25 + 16 + 9 + 4 + 1 + 0 + 1$
+4+9+16+25+36+49+64
=408

Hence, standard deviation $= \sqrt{\frac{408}{17}} = \sqrt{24} = 2\sqrt{6}$

117 **(b)**

Arranging the terms in increasing order

Value x	**Frequency f**	**Commulative frequency**
7	2	2
8	1	3
9	5	8
10	4	12
11	6	18
12	1	19
13	3	22

$\because \quad N = 22$

$\because$ Median number $= \frac{N+1}{2} = 11.5$

Which comes under the cumulative frequency the corresponding value of $x$will be the median ie,

Median=10

118 **(d)**

${}^{2n+1}C_0 + {}^{2n+1}C_1 + {}^{2n+1}C_2 + \dots + {}^{2n+1}C_{2n} + {}^{2n+1}C_{2n+1} = 2^{2n+1}$

Now, ${}^{2n+1}C_0 = {}^{2n+1}C_{2n+1}$,

${}^{2n+1}C_1 = {}^{2n+1}C_{2n} \dots {}^{2n+1}C_r = {}^{2n+1}C_{2n-r+1}$

So, sum of first $(n+1)$ terms= sum of last $(n+1)$ terms

$\Rightarrow {}^{2n+1}C_0 + {}^{2n+1}C_1 + {}^{2n+1}C_2 + \dots + {}^{2n+1}C_n = 2^{2n}$

$$\Rightarrow \frac{{}^{2n+1}C_0 + {}^{2n+1}C_1 + {}^{2n+1}C_2 + \dots + {}^{2n+1}C_n}{n+1} = \frac{2^{2n}}{(n+1)}$$

119 **(c)**

If both two regression lines are perpendicular, then correlation coefficient will be zero.

120 **(b)**

The mean of the series $a, a+d, \dots\dots, a+2nd$ is

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

$$= \frac{1}{2n+1}\left[\frac{2n+1}{2}(a + a + 2nd)\right] = a + nd$$

$\therefore$ Mean deviation from mean

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

$$= \frac{1}{2n+1} \sum_{r=0}^{2n} (r - n)d$$

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

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

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