SOLUTIONS (WORKSHEET NO.: 1) STATS

QNS: 1

x	f	fx	$\lvert x-14\rvert$	$f\lvert x-14\rvert$
5	7	35	9	63
10	4	40	4	16
15	6	90	1	6
20	3	60	6	18
25	5	125	11	55
	$\Sigma f=25$	$\Sigma fx=350$		$\Sigma f\lvert x-14\rvert=158$

$$\bar{x} = \frac{\Sigma fx}{\Sigma f} = \frac{350}{25} = 14$$

$$M.D = \frac{1}{N}\Sigma f|x-\bar{x}|$$

$$= \frac{1}{25}(152)$$

$$\boxed{M.D = 6.32}$$ Ans

QNS 2 →

x	f	C.F	$\lvert x-30\rvert$	$f\lvert x-30\rvert$
15	3	3	15	45
21	5	8	9	45
27	6	14	3	18
30	7	(21)	0	0
35	8	29	5	40
	$N=29$			$\Sigma f\lvert x-30\rvert=148$

$\frac{N+1}{2} = \frac{29+1}{2} = 15 \rightarrow$ go to CF table $\therefore$ **Median = 30**

$$M.D = \frac{1}{N} \Sigma f|x - Median|$$

$$= \frac{1}{29} \times 148$$

$$\boxed{M.D = 5.1 \text{ (Approx)}}$$ Ans

Ques: 3 →

36, 72, 46, 42, 53, 60, 45, 51, 49

First arrange in Ascending order

36, 42, 45, 46, 49, 51, 53, 60, 72

Here $n = 9$

$$\text{Median} = \left(\frac{n+1}{2}\right)^{th} = \left(\frac{9+1}{2}\right)^{th} = 5^{th} \text{ observation}$$

$$\therefore \boxed{\text{Median} = 49}$$

x	$\lvert x - 49 \rvert$
36	13
42	7
45	4
46	3
49	0
51	2
53	4
60	11
72	23
	$\Sigma \lvert x - 49 \rvert = 67$

$$M.D = \frac{1}{n} \Sigma |x - Median|$$

$$= \frac{1}{9}(67)$$

$$\boxed{M.D = 7.44 \text{ Approx}}$$

(Note: Misprint in worksheet Answer)

Q.4

C.I	f	x	d'	fd'	$\lvert x-125.3 \rvert$	$f\lvert x-125.3 \rvert$
95-105	9	100	-3	-27	25.3	227.7
105-115	13	110	-2	-26	15.3	198.9
115-125	26	120	-1	-26	5.3	137.8
125-135	30	(130)	0	0	4.7	141
135-145	12	140	1	12	14.7	176.4
145-155	10	150	2	20	24.7	247
	$\Sigma f = 100$			-47		1128.8

Mean $= a + \left(\frac{\Sigma f d'}{\Sigma f}\right) \times h$

$= 130 + \left(\frac{-47}{100}\right) \times 10$

$= 130 - 4.7$

$= 125.3$

Mean

M.D $\frac{1}{N} \Sigma f \lvert x - \text{Mean} \rvert$

$= \frac{1}{100} \times (1128.8)$

M.D = 11.288 Ans

Q.No. 5

C.I	f	CF	x	$\lvert x-27.9\rvert$	$f\lvert x-27.9\rvert$
0-10	6	6	5	22.9	137.4
10-20	8	14	15	12.9	103.2
20-30	14	(28)	25	2.9	40.6
30-40	16	44	35	7.1	113.6
40-50	4	48	45	17.1	68.4
50-60	2	50	55	27.1	54.2
	N=50				517.4

$\frac{N}{2} = 25 \longrightarrow$ go to CF table

$f = 14$; $l = 20$; $CF = 14$; $h = 10$

$$\text{Median} = l + \left(\frac{\frac{N}{2} - (F}{f}\right) \times h = 20 + \frac{(25-14)}{14} \times 10$$

$$= 20 + 7.86$$

$$= 27.86$$

(01) (27.9) (Approx)

$$M.D = \frac{1}{N} \Sigma f|x - \text{Median}|$$

$$= \frac{1}{50} \times (517.4)$$

$$\boxed{M.D = 10.34 \text{ (Approx)}}$$ Ans

Qn 6

~~7~~ 7.5	f	x	d'	fd'	fd'^2
70-75	3	72.5	-4	-12	48
75-80	4	77.5	-3	-12	36
80-85	7	82.5	-2	-14	28
85-90	7	87.5	-1	-7	7
90-95	15	(92.5)	0	0	0
95-100	9	97.5	1	9	9
100-105	6	102.5	2	12	24
105-110	6	107.5	3	18	54
110-115	3	112.5	4	12	48
	$\Sigma f = 60$			$\Sigma fd' = 6$	$\Sigma fd'^2 = 254$

$$\text{Mean} = a + \left(\frac{\Sigma fd'}{\Sigma f}\right) \times h$$

$$= 92.5 + \left(\frac{6}{60}\right) \times 5$$

$$= 92.5 + 0.5$$

Mean = 93

$$\text{variance} = h^2 \left[\frac{1}{N} \Sigma fd'^2 - \left(\frac{1}{N} \Sigma fd'\right)^2 \right]$$

$$= 25 \left[\frac{1}{60} \times 254 - \left(\frac{1}{60} \times 6\right)^2 \right]$$

$$= 25 \left[\frac{254}{60} - \frac{1}{100} \right]$$

$$= 25 \left(\frac{1270 - 3}{300} \right) = \frac{25 \times 1267}{300/12} = 105.5$$

$\therefore$ **Variance = 105.5** (6)

$S.D = \sqrt{105.5} = 10.27$ Approx

Ans

Q N.7

CF	f	x	d'	fd'	fd'^2
32.5 – 36.5	15	34.5	-2	-30	60
36.5 – 40.5	17	38.5	-1	-17	17
40.5 – 44.5	21	(42.5)	0	0	0
44.5 – 48.5	22	46.5	1	22	22
48.5 – 52.5	25	50.5	2	50	100
	$\Sigma f = 100$			$\Sigma fd' = 25$	$\Sigma fd'^2 = 199$

$$\text{Mean} = a + \frac{\Sigma fd'}{\Sigma f} \times c$$

$$= 42.5 + \frac{25}{100} \times 4$$

$$= 42.5 + 1$$

Mean = 43

$$\text{Variance} = h^2\left[\frac{1}{N}\Sigma fd'^2 - \left(\frac{1}{N}\Sigma fd'\right)^2\right]$$

$$= 16\left[\frac{1}{100}(199) - \left(\frac{25}{100}\right)^2\right]$$

$$= 16\left[\frac{199}{100} - \frac{1}{16}\right]$$

$$= 16\left[\frac{3184 - 100}{1600}\right] = \frac{3084}{100} = 30.84$$

$S.D = \sqrt{30.84} = 5.55$

$\therefore$ SD = 5.55 Approx Ans

Q.N. 8

$n = 20$

Inc. Mean = 10

Inc. S.D = 2

Inc. Variance $= (2)^2 = 4$

$$\text{Inc. Mean} = \frac{\text{Inc. } \Sigma x}{n}$$

$$10 = \frac{\text{Inc. } \Sigma x}{20}$$

Inc $\Sigma x = 200$

Case I when Wrong item replaced by 12

Correct $\Sigma x = 200 - 8 + 12$

$= 204$

$$\text{Correct Mean} = \frac{\text{Correct } \Sigma x}{n} = \frac{204}{20} = 10.2$$

$\therefore$ Correct Mean = 10.2

Case 2 when wrong item is ommited

Correct $\Sigma x = 200 - 8 = 192$

$$\text{Correct Mean} = \frac{192}{19} = 10.1$$

$\therefore$ Correct Mean = 10.1

Now Inc. variance $= \frac{1}{n}$ Inc. $\Sigma x^2 -$ (Inc. Mean)^2

$$4 = \frac{1}{20} \text{ Inc.} \Sigma x^2 - (10)^2$$

$$\Rightarrow 104 = \frac{1}{20} \text{ Inc } \Sigma x^2$$

$$\Rightarrow \text{Inc } \Sigma x^2 = 2080$$

Case I When wrong item is replaced by 12

Correct $\Sigma x^2 = 2080 - 64 + 144$

$= 2160$

Now Correct variance $= \frac{1}{20}(2160) - (\text{Correct Mean})^2$

$= 108 - (10-2)^2$

$= 108 - 104.04$

$= 3.96$

Correct S.D $= \sqrt{3.96} = 1.98$

Correct SD = 1.98

Case 2 When wrong item is omitted

Correct $\Sigma x^2 = 2080 - 64 = 2016$

Correct variance $= \frac{1}{19}(2016) - (10.1)^2$

$= 106.1 - 102.01$

$= 4.09$

SD $= \sqrt{4.09} = 2.02$ Ans

—x—