

**RD Sharma**  
**Solutions**  
**Class 11 Maths**  
**Chapter 32**  
**Ex 32.6**

### Statistics Ex 32.6 Q1

CI	f	x	$u=(x-A)/h$	fu	$u^2$	$fu^2$
0-10	14	5	-2	-28	4	56
10-20	13	15	-1	-13	1	13
20-30	27	25	0	0	0	0
30-40	21	35	1	21	1	21
40-50	15	45	2	30	4	60
	<b>90</b>			<b>10</b>		<b>150</b>

Here,  $N = 90$ ,  $A = 25$ ,  $\sum f\mu_i = 10$ ,  $\sum f\mu_i^2 = 150$  and  $h = 10$

$$\therefore \text{Mean} = \bar{x} = A + h \left( \frac{1}{N} \sum f_i \mu_i \right)$$

$$\Rightarrow \bar{x} = 25 + 10 \left( \frac{10}{90} \right) = 26.11$$

$$\text{var}(x) = h^2 \left[ \frac{1}{N} \sum f\mu_i^2 - \left( \frac{1}{N} \sum f\mu_i \right)^2 \right] = 100 \left[ \frac{150}{90} - \left( \frac{10}{90} \right)^2 \right] = 165.4$$

$$\therefore S.D. = \sqrt{\text{var}(x)} = \sqrt{165.4} = 12.86$$

## Statistics Ex 32.6 Q2

CI	f	x	$u=(x-A)/h$	$f*u$	$u^2$	$fu^2$
0-30	9	15	-3	-27	9	81
30-60	17	45	-2	-34	4	68
60-90	43	75	-1	-43	1	43
90-120	82	105	0	0	0	0
120-150	81	135	1	81	1	81
150-180	44	165	2	88	4	176
180-210	24	195	3	72	9	216
	<b>300</b>			<b>137</b>		<b>665</b>

Here,  $N = 300$ ,  $A = 105$ ,  $\sum f_i u_i = 137$ ,  $\sum f_i u_i^2 = 665$  and  $h = 30$

$$\therefore \text{Mean} = \bar{x} = A + h \left( \frac{1}{N} \sum f_i u_i \right)$$

$$\Rightarrow \bar{x} = 105 + 30 \left( \frac{137}{300} \right) = 118.7$$

$$\text{var}(x) = h^2 \left[ \frac{1}{N} \sum f_i u_i^2 - \left( \frac{1}{N} \sum f_i u_i \right)^2 \right] = 900 \left[ \frac{665}{300} - \left( \frac{137}{300} \right)^2 \right] = 1807.31$$

$$\therefore S.D. = \sqrt{\text{var}(x)} = \sqrt{1807.31} = 42.51$$

### Statistics Ex 32.6 Q3

CI	f	x	$u=(x-A)/h$	$f*u$	$u^2$	$fu^2$
0-10	18	5	-3	-54	9	162
10-20	16	15	-2	-32	4	64
20-30	15	25	-1	-15	1	15
30-40	12	35	0	0	0	0
40-50	10	45	1	10	1	10
50-60	5	55	2	10	4	20
60-70	2	65	3	6	9	18
70-80	1	75	4	4	16	16
	<b>79</b>			<b>-71</b>		<b>305</b>

Here,  $N = 79$ ,  $A = 35$ ,  $\sum f\mu_i = -71$ ,  $\sum f\mu_i^2 = 305$  and  $h = 10$

$$\therefore \text{Mean} = \bar{x} = A + h \left( \frac{1}{N} \sum f\mu_i \right)$$

$$\Rightarrow \bar{x} = 35 + 10 \left( \frac{-71}{79} \right) = 26.01$$

$$\text{var}(x) = h^2 \left[ \frac{1}{N} \sum f\mu_i^2 - \left( \frac{1}{N} \sum f\mu_i \right)^2 \right] = 100 \left[ \frac{305}{79} - \left( \frac{-71}{79} \right)^2 \right] = 305.30$$

$$\therefore S.D. = \sqrt{\text{var}(x)} = \sqrt{305.30} = 17.47$$

## Statistics Ex 32.6 Q4

We have,  $n = 100$ ,  $\bar{x} = 40$  and  $\sigma = 5.1$

$$\therefore \bar{x} = \frac{1}{n} \sum x_i$$

$$\Rightarrow \sum x_i = n\bar{x} = 100 \times 40 = 4000$$

$$\therefore \text{Incorrect } \sum x_i = 4000$$

and,

$$\sigma = 5.1$$

$$\Rightarrow \sigma^2 = 26.01$$

$$\Rightarrow \frac{1}{n} \sum x_i^2 - (\text{Mean})^2 = 26.01$$

$$\Rightarrow \frac{1}{100} \sum x_i^2 - 1600 = 26.01$$

$$\Rightarrow \sum x_i^2 = 1626.01 \times 100$$

$$\therefore \text{Incorrect } \sum x_i^2 = 162601$$

When the incorrect observation 50 is replaced by 40:

We have, Incorrect  $\sum x_i = 4000$

$$\therefore \text{Corrected } \sum x_i = 4000 - 50 + 40 = 3990$$

and,

$$\text{Incorrect } \sum x_i^2 = 162601$$

$$\therefore \text{Corrected } \sum x_i^2 = 162601 - 50^2 + 40^2 = 161701$$

$$\text{Now, Corrected mean} = \frac{3990}{100} = 39.90$$

$$\text{Corrected variance} = \frac{1}{100} \left( \text{Corrected } \sum x_i^2 \right) - (\text{Corrected mean})^2$$

$$\Rightarrow \text{Corrected variance} = \frac{161701}{100} - \left(\frac{3990}{100}\right)^2$$

$$\Rightarrow \text{Corrected variance} = \frac{161701 \times 100 - (3990)^2}{(100)^2}$$

$$\Rightarrow \text{Corrected variance} = \frac{16170100 - 15920100}{10000} = 25$$

$$\therefore \text{Corrected standard deviation} = \sqrt{25} = 5$$

### Statistics Ex 32.6 Q5

CI	Freq	MidValue	$u_i$	$f_i u_i$	$f_i u_i^2$
31-35	2	33	-4	-8	32
36-40	3	38	-3	-9	27
41-45	8	43	-2	-16	32
46-50	12	48	-1	-12	12
51-55	16	53	0	0	0
56-60	5	58	1	5	5
61-65	2	63	2	4	8
66-70	2	68	3	6	18
$N = 50$			$Total = -30 \quad Total = 134$		

$$\text{Mean} = 53 + 5 \times \frac{-30}{50} = 50$$

$$\text{Var} = 25 \times \left( \frac{134}{50} - \frac{9}{25} \right) = 58$$

$$SD = \sqrt{58} = 7.62$$

### Statistics Ex 32.6 Q6

Converting the given data into continuous frequency distribution by subtracting 0.5 from the lower limit and adding 0.5 to the upper limit of each class interval.

Class interval	$f_i$	Mid-value $x_i$	$u_i = \frac{x_i - 5.5}{1}$	$f_i u_i$	$u_i^2$	$f_i u_i^2$
1-2	6	1.5	-4	-24	16	96
3-4	4	3.5	-2	-8	4	16
5-6	5	5.5	0	0	0	0
7-8	1	7.5	2	2	4	4
	$N = \sum f_i = 16$			$\sum f_i u_i = -30$		$\sum f_i u_i^2 = 116$

$$N = 16, \sum f_i u_i = -30, \sum f_i u_i^2 = 116, A = 5.5 \text{ and } h = 1$$

$$\text{Mean} = A + h \left( \frac{1}{N} \sum f_i u_i \right) = 5.5 + 1 \left( \frac{1}{16} \times (-30) \right) = 3.625$$

$$\text{Var}(X) = h^2 \left\{ \left( \frac{1}{N} \sum f_i u_i^2 \right) - \left( \frac{1}{N} \sum f_i u_i \right)^2 \right\} = 1 \left\{ \left( \frac{1}{16} \times 116 \right) - \left( \frac{1}{16} \times (-30) \right)^2 \right\} = \{7.25 - 3.51\} = 3.74$$

Note: Answer given in the book is incorrect.

### Statistics Ex 32.6 Q7

<i>CI</i>	$x_i$	$f_i$	$u_i$	$f_i u_i$	$f_i u_i^2$
200-201	200.5	13	-1.5	-19.5	29.25
201-202	201.5	27	-1	-27	27
202-203	202.5	18	-0.5	-9	4.5
203-204	203.5	10	0	0	0
204-205	204.5	1	0.5	0.5	0.25
205-206	205.5	1	1	1	1
		$N = 70$		$Total = -54$	$Total = 62$

$$Mean = 203.5 + 2 \left( \frac{-54}{70} \right) = 201.9$$

$$Var = 4 \left( \frac{62}{70} - \left( \frac{-54}{70} \right)^2 \right) = 0.98$$

$$SD = \sqrt{0.98} = 0.99$$

### Statistics Ex 32.6 Q8

$$Mean = 40$$

$$SD = 10$$

$$n = 100$$

$$\sum x_i = 40 \times 100 = 4000$$

$$Corrected\ Sum = 4000 - 30 - 70 + 3 + 27 = 3930$$

$$Corrected\ Mean = \frac{3930}{100} = 39.3$$

$$Variance = 100$$

$$100 = \frac{\sum x_i^2}{100} - (40)^2$$

$$Incorrect\ \sum x_i^2 = 170000$$

$$Corrected\ \sum x_i^2 =$$

$$Incorrect\ \sum x_i^2 - (\text{Sum of squares of incorrect values}) +$$
  
$$(\text{Sum of squares of corrected values})$$

$$Corrected\ \sum x_i^2 = 170000 - (900 + 4900) + (9 + 729)$$

$$Corrected\ \sum x_i^2 = 164938$$

$$Corrected\ \sigma = \sqrt{\frac{Corrected\ \sum x_i^2}{n} - (Corrected\ Mean)^2}$$

$$Corrected\ \sigma = \sqrt{\frac{164938}{100} - (39.3)^2} = 10.24$$

## Statistics Ex 32.6 Q9

$$\text{Mean} = 45$$

$$\text{Variance} = 16$$

$$n = 10$$

$$\sum x_i = 450$$

$$\text{Corrected Sum} = 450 - 52 + 25 = 423$$

$$\text{Corrected Mean} = 42.3$$

$$\text{Variance} = 16$$

$$16 = \frac{\sum x_i^2}{10} - (45)^2$$

$$\text{Incorrect } \sum x_i^2 = 20410$$

$$\text{Corrected } \sum x_i^2 =$$

$$\text{Incorrect } \sum x_i^2 - (\text{Sum of squares of incorrect values}) +$$
  
$$(\text{Sum of squares of corrected values})$$

$$\text{Corrected } \sum x_i^2 = 20410 - 2704 + 625 = 18331$$

$$\text{Corrected } \sigma = \sqrt{\frac{\text{Corrected } \sum x_i^2}{n} - (\text{Corrected Mean})^2}$$

$$\text{Corrected } \sigma = \sqrt{\frac{18331}{10} - (42.3)^2} = 6.62$$

$$\text{Corrected Variance} = 6.62 * 6.62 = 43.82$$