

RD Sharma
Solutions
Class 11 Maths
Chapter
Ex

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
	90			10		150

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
	300			137		665

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
	79			-71		305

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

$$\text{Mean} = 45$$

$$\text{Variance} = 16$$

$$n = 10$$

$$\sum x_i = 450$$

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

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

$$\text{Variance} = 16$$

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

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

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

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

$$(\text{Sum of squares of corrected values})$$

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

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

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

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