

STANDARD DEVIATION (GROUPED DATA)

CHANGE OF SCALE & ORIGIN METHOD

01. CI : 0 – 10 10 – 20 20 – 30 30 – 40 40 – 50
 f : 11 15 25 12 7

CI	f	x	$u = \frac{x - 25}{10}$	fu	fu ²
0 – 10	11	5	-2	-22	44
10 – 20	15	15	-1	-15	15
20 – 30	25	25	0	0	0
30 – 40	12	35	1	12	12
40 – 50	7	45	2	14	28
	70			-11	99

$$\begin{aligned} \sigma_U &= \sqrt{\frac{\sum fu^2}{\sum f} - \left(\frac{\sum fu}{\sum f}\right)^2} \\ &= \sqrt{\frac{99}{70} - \left(\frac{-11}{70}\right)^2} \\ &= \sqrt{\frac{6930 - 121}{70^2}} \\ &= \sqrt{\frac{6809}{4900}} \\ &= 1.179 \end{aligned}$$

LOG CALC	
	3.8331
	- 3.6902
	<hr style="width: 50%; margin: 0 auto;"/> 0.1429
	2
	AL(0.0715)
	1.179

$\sigma_x = 10 \times \sigma_U = 11.79$

02 CI : 0 – 10 10 – 20 20 – 30 30 – 40 40 – 50
 f : 10 20 40 25 05

CI	f	x	$u = \frac{x - 25}{10}$	fu	fu ²
0 – 10	10	5	-2	-20	40
10 – 20	20	15	-1	-20	20
20 – 30	40	25	0	0	0
30 – 40	25	35	1	25	25
40 – 50	05	45	2	10	20
	100			-5	105

$$\begin{aligned} \sigma_U &= \sqrt{\frac{\sum fu^2}{\sum f} - \left(\frac{\sum fu}{\sum f}\right)^2} \\ &= \sqrt{\frac{105}{100} - \left(\frac{-5}{100}\right)^2} \\ &= \sqrt{\frac{10500 - 25}{100^2}} \\ &= \sqrt{\frac{10475}{10000}} \\ &= 1.023 \end{aligned}$$

LOG CALC	
	4.0203
	- 4.0000
	<hr style="width: 50%; margin: 0 auto;"/> 0.0203
	2
	AL(0.0101)
	1.023

$\sigma_x = 10 \times \sigma_U = 10.23$

03. find the standard deviation for the following data

CI :	0 – 20	20 – 40	40 – 60	60 – 80	80 – 100
f :	14	16	40	20	10

CI	f	x	$u = \frac{x - 50}{20}$	fu	fu ²
0 – 20	14	10	-2	-28	56
20 – 40	16	30	-1	-16	16
40 – 60	40	50	0	0	0
60 – 80	20	70	1	20	20
80 – 100	10	90	2	20	40
	100			-4	132

$$\begin{aligned} \sigma_U &= \sqrt{\frac{\sum fu^2}{\sum f} - \left(\frac{\sum fu}{\sum f}\right)^2} \\ &= \sqrt{\frac{132}{100} - \left(\frac{-4}{100}\right)^2} \\ &= \sqrt{\frac{13200 - 16}{100^2}} \\ &= \sqrt{\frac{13184}{10000}} \\ &= 1.148 \end{aligned}$$

LOG CALC	
	4.1199
-	4.0000
	<u>0.1199</u>
	2
AL(0.0599)	
	1.148

$$\begin{aligned} \sigma_X &= 20 \times \sigma_U \\ &= 22.96 \end{aligned}$$

04. find the standard deviation for the following data

CI :	20 – 25	25 – 30	30 – 35	35 – 40	40 – 45
f :	11	15	24	26	14

CI	f	x	$u = \frac{x - 32.5}{5}$	fu	fu ²
20 – 25	11	22.5	-2	-22	44
25 – 30	15	27.5	-1	-15	15
30 – 35	24	32.5	0	0	0
35 – 40	26	37.5	1	26	26
40 – 45	14	42.5	2	28	56
	90			17	141

$$\begin{aligned} \sigma_U &= \sqrt{\frac{\sum fu^2}{\sum f} - \left(\frac{\sum fu}{\sum f}\right)^2} \\ &= \sqrt{\frac{141}{90} - \left(\frac{17}{90}\right)^2} \\ &= \sqrt{\frac{12690 - 289}{90^2}} \\ &= \sqrt{\frac{12401}{8100}} \\ &= 1.237 \end{aligned}$$

LOG CALC	
	4.0934
-	3.9085
	<u>0.1849</u>
	2
AL(0.0925)	
	1.237

$$\begin{aligned} \sigma_X &= 5 \times \sigma_U \\ &= 6.185 \end{aligned}$$

05. find the standard deviation for the following data

CI : 0 – 10 10 – 20 20 – 30 30 – 40 40 – 50 50 – 60 60 – 70
 f : 4 12 4 45 20 12 3

CI	f	x	$u = \frac{x - 35}{10}$	fu	fu ²
0 – 10	4	5	-3	-12	36
10 – 20	12	15	-2	-24	48
20 – 30	4	25	-1	-4	4
30 – 40	45	35	0	0	0
40 – 50	20	45	1	20	20
50 – 60	12	55	2	24	48
60 – 70	3	65	3	9	27
	100			13	183

$$\begin{aligned} \sigma_U &= \sqrt{\frac{\sum fu^2}{\sum f} - \left(\frac{\sum fu}{\sum f}\right)^2} \\ &= \sqrt{\frac{183}{100} - \left(\frac{13}{100}\right)^2} \\ &= \sqrt{\frac{18300 - 169}{100^2}} \\ &= \sqrt{\frac{18131}{10000}} \\ &= 1.347 \end{aligned}$$

LOG CALC	
	4.2584
-	4.0000
	<u>0.2584</u>
	2
	AL(0.1292)
	1.347

$$\sigma_X = 10 \times \sigma_U = 13.47$$

06. find the standard deviation for the following data

marks more than : 0 10 20 30 50 50
 no of students : 50 46 40 20 10 3

CI	f	x	$u = \frac{x - 25}{10}$	fu	fu ²
0 – 10	4	5	-2	-8	16
10 – 20	6	15	-1	-6	6
20 – 30	20	25	0	0	0
30 – 40	10	35	1	10	10
40 – 50	7	45	2	14	28
50 – 60	3	55	3	9	27
	50			19	87

$$\begin{aligned} \sigma_U &= \sqrt{\frac{\sum fu^2}{\sum f} - \left(\frac{\sum fu}{\sum f}\right)^2} \\ &= \sqrt{\frac{87}{50} - \left(\frac{19}{50}\right)^2} \\ &= \sqrt{\frac{4350 - 361}{50^2}} \\ &= \sqrt{\frac{3989}{2500}} \\ &= 1.263 \end{aligned}$$

LOG CALC	
	3.6009
-	3.3979
	<u>0.2030</u>
	2
	AL(0.1015)
	1.263

$$\sigma_X = 10 \times \sigma_U = 12.63$$

