Calculation of S.D in Grouped data

Two methods — C.I. and f

1. Long method [Actual Mean Method]
2. Short method [Assumed Mean Method]

LONG METHOD

Steps :-

1. Find X = Midpoint of C.I
2. Find N = Total of 'f'
3. Find fX = Multiply 'f' and 'X'
4. Find Total of $fX = \Sigma fX$
5. Find Mean $(M) = \frac{\Sigma fX}{N}$
6. Find $d = X - M$
7. Find $d^2 = d \times d$
8. Find fd^2 = Multiply 'f' and d^2,
9. Find Total of $fd^2 = \Sigma fd^2$
10. Find $\frac{\Sigma fd^2}{N}$
11. Find $S.D = \sqrt{\frac{\Sigma fd^2}{N}}$

Ques Find S.D from the given data

C.I वर्ग-अंतर	f आवृत्तियाँ	X Midpoint	fX	$d = X - M = X - 14$	d^2	fd^2
0-4	1	2	2	-12	144	144
5-9	3	7	21	-7	49	147
10-14	2	12	24	-2	4	8
15-19	1	17	17	3	9	9
20-24	1	22	22	8	64	64
25-29	2	27	54	13	169	338
	$N = 10$		$\Sigma fX = 140$			$\Sigma fd^2 = 710$

$$M = \frac{\Sigma fX}{N} = \frac{140}{10} = 14.$$

0, 1, 2, 3, 4

2 - 14 = -12

(10) $\frac{\Sigma fd^2}{N} = \frac{710}{10} = 71$

$$S.D = \sqrt{\frac{\Sigma fd^2}{N}} = \sqrt{71}$$

$S.D = 8.426$

$\boxed{S.D = 8.43}$ Ans

Short Method

Steps :- (1) Find x = Mid point of C.I

(2) Find N = total of 'f'

(3) Find Assumed Mean (A.M)
कल्पित मध्यमान

(4) Find d = (x − A.M) / common diff between x

(5) Find fd = Multiply 'f' and 'd'

(6) Find total of fd = Σfd

(7) Find fd^2 = 'fd × d'

(8) Find Σfd^2 = total of fd^2

(9) Find $\frac{\Sigma fd}{N}$

(10) Find $\left(\frac{\Sigma fd}{N}\right)^2$

(11) Find $\frac{\Sigma fd^2}{N}$

(12) Find $S.D = \sqrt{\frac{\Sigma fd^2}{N} - \left(\frac{\Sigma fd}{N}\right)^2} \times i$

i = size of C.I

Que Find S.D by short method (Assumed Mean method)

C.I	f	(Mid point) X	d = (X − Am)/5 (X − 12)/5	fd	fd^2
0-4	1	2	−2	−2] −5	4
5-9	3	7	−1	−3]	3
10-14	2	12	0	0	0
15-19	1	17	1	1] +9	1
20-24	1	22	2	2	4
25-29	2	27	3	6]	18
	N=10			Σfd = 4	$\Sigma fd^2 = 30$

(1) Midpoint of C.I

(2) N = 10

(3) A.M = 12

(4) d = (x − 12)/5

(5) fd

(6) Σfd = 4

(7) fd^2

(8) $\Sigma fd^2 = 30$

(9) $\frac{\Sigma fd}{N} = \frac{4}{10} = 0.4$

(10) $\left(\frac{\Sigma fd}{N}\right)^2 = (0.4)^2 = 0.16$

(11) $\frac{\Sigma fd^2}{N} = \frac{30}{10} = 3$

(12) $S.D = \sqrt{\frac{\Sigma fd^2}{N} - \left(\frac{\Sigma fd}{N}\right)^2} \times i$

(x − 12)/5
2 − 12/5
−10/5 = −2

9 − 5 = 4

$$S.D = \sqrt{3 - 0.16 \times 5}$$

$$= \sqrt{2.84 \times 5}$$

$$= 1.685 \times 5$$

$$= 8.425$$

$$\boxed{S.D = 8.43}$$ Ans