

### MEASURES VARIABILITY FOR GROUPED DATA

**STANDARD DEVIATION AND VARIANCE** 

## + Formula for **VARIANCE** (grouped data)

$$s_g^2 = \frac{n\sum f_i x_i^2 - (\sum f_i x_i)^2}{n(n-1)}$$

#### where

 $f_i$  is the frequency of the  $i^{th}$  class  $x_i$  is the class mark of the  $i^{th}$  class n is the number of observations

## + Formula for STANDARD DEVIATION (grouped data)

$$s_g = \sqrt{\frac{n\sum f_i x_i^2 - (\sum f_i x_i)^2}{n(n-1)}}$$

$$s_g = \sqrt{s_g^2}$$

where

 $f_i$  is the frequency of the  $i^{th}$  class  $x_i$  is the class mark of the  $i^{th}$  class n is the number of observations

# EXAMPLE + Compute for the variance and standard deviation of the following FDT.

Age (in years)	Frequency		
15-18	4		
19-22	8		
23-26	14		
27-30	9		
31-34	8		
35-39	7		
Total	50		

### This table will serve as your reference for the computation of variance and standard deviation of grouped data.

	В	С	D	G				
	Class Limit Lower Upper		Class Frequency	Class				
			(fi)	Mark (xi)				
	15	18	4	16.5				
	19	22	8	20.5				
	23	26	14	24.5				
	27 30		9	28.5				
	31	34	8	32.5				
	35 38		7	36.5				
	TOTAL		50=n					
eet1	cet1 Sheet2 (A)							

### Then, extend the table by adding a column for $f_iX_i$ and $f_iX_i^2$ .

Limit	Class Frequency	Class	EIVI	vi*vi	fi*xi*xi
Upper	(fi)	Mark (xi)	ΓΙΛΙ	XI XI	II XI XI
18	4	16.5	66	272.25	1089
22	8	20.5	164	420.25	3362
26	14	24.5	343	600.25	8403.5
30	9	28.5	256.5	812.25	7310.25
34	8	32.5	260	1056.25	8450
38	7	36.5	255.5	1332.25	9325.75
ΓAL	50=n		1345		37940.5
	Upper 18 22 26 30 34 38	Upper (fi)  18 4 22 8 26 14 30 9 34 8 38 7	Upper       (fi)       Mark (xi)         18       4       16.5         22       8       20.5         26       14       24.5         30       9       28.5         34       8       32.5         38       7       36.5	Upper     (fi)     Mark (xi)     FIXI       18     4     16.5     66       22     8     20.5     164       26     14     24.5     343       30     9     28.5     256.5       34     8     32.5     260       38     7     36.5     255.5	Upper         (fi)         Mark (xi)         FIXI         xi*xi           18         4         16.5         66         272.25           22         8         20.5         164         420.25           26         14         24.5         343         600.25           30         9         28.5         256.5         812.25           34         8         32.5         260         1056.25           38         7         36.5         255.5         1332.25

#### To compute for the variance, we have

$$s_g^2 = \frac{n\sum f_i x_i^2 - (\sum f_i x_i)^2}{n(n-1)}$$

$$s_g^2 = \frac{50(37940.5) - (1345)^2}{50(50 - 1)}$$

$$s_g^2 = \frac{1897025 - 1809025}{50(49)}$$

Class Limit		Class Frequency	Class	FIVI	xi*xi	fi*xi*xi
Lower	Upper	(fi)	Mark (xi)	FIXI	XI · XI	II.XI.XI
15	18	4	16.5	66	272.25	1089
19	22	8	20.5	164	420.25	3362
23	26	14	24.5	343	600.25	8403.5
27	30	9	28.5	256.5	812.25	7310.25
31	34	8	32.5	260	1056.25	8450
35	38	7	36.5	255.5	1332.25	9325.75
TO	ΓAL	50=n		1345		37940.5

$$s_g^2 = \frac{88000}{2450}$$
  $s_g^2 = 35.91836735 \approx 35.92$ 

#### To compute for the standard deviation, we have

$$s_g = \sqrt{s_g^2}$$

$$s_g = \sqrt{35.91836735}$$

$$s_g = 5.99319318$$
  
 $s_g \approx 5.99$ 

$$s_g \approx 5.99$$

Class	Limit	Class Frequency	Class	FIXI	xi*xi	fi*xi*xi
Lower	Upper	(fi)	Mark (xi)	ΓΙΛΙ	XI XI	II XI XI
15	18	4	16.5	66	272.25	1089
19	22	8	20.5	164	420.25	3362
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