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.

B	C	D	G
Class Limit		Class Frequency (fi)	Class Mark (xi)
Lower	Upper		
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	

Sheet2

Then, extend the table by adding a column for $f_i X_i$ and $f_i {X_i}^2$.

Class Limit		Class Frequency (fi)	Class Mark (xi)	FIXI	xi*xi	fi*xi*xi
Lower	Upper					
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
TOTAL		50=n		1345		37940.5

To compute for the variance, we have

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

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

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

$$s_g{}^2 = \frac{88000}{2450}$$

$$s_g{}^2 = 35.91836735 \approx 35.92$$

Class Limit		Class Frequency (fi)	Class Mark (xi)	FIXI	xi*xi	fi*xi*xi
Lower	Upper					
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
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35	38	7	36.5	255.5	1332.25	9325.75
TOTAL		50=n		1345		37940.5

To compute for the standard deviation, we have

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

$$s_g = \sqrt{35.91836735}$$

$$s_g = 5.99319318$$

$$s_g \approx 5.99$$

Class Limit		Class Frequency (fi)	Class Mark (xi)	FIXI	xi*xi	fi*xi*xi
Lower	Upper					
15	18	4	16.5	66	272.25	1089
19	22	8	20.5	164	420.25	3362
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TOTAL		50=n		1345		37940.5