Chapter 4: measures of dispersions for frequency table

1) Variance (S^2)

$$S^2 = \frac{\sum(X_i - \bar{X})^2 \times F_i}{N - 1}$$

2) Standard deviation (S)

$$S = \sqrt{\frac{\sum(X_i - \bar{X})^2 \times F_i}{N - 1}}$$

3) Example,

education	frequency	Cumulative frequency
1	32	
3	10	
9	58	
12	2	
15	67	
21	19	
25	34	
N		

$$\bar{X} = \frac{\sum X_i \times F_i}{N}$$

$$= \frac{1 \times 32 + 3 \times 10 + 9 \times 58 + 12 \times 2 + 15 \times 67 + 21 \times 19 + 25 \times 34}{222}$$

$$\bar{X} = \frac{\sum X_i \times F_i}{N} = 12.9$$

$$S^2 = \frac{(1 - 12.9)^2 \times 32 + (3 - 12.9)^2 \times 10 + (9 - 12.9)^2 \times 58 + (12 - 12.9)^2 \times 2 + (15 - 12.9)^2 \times 67 + (21 - 12.9)^2 \times 19 + (25 - 12.9)^2 \times 34}{221}$$

$$S^2 = \frac{\sum (X_i - \bar{X})^2 \times F_i}{N - 1} = 58.4$$

$$S = \sqrt{\frac{\sum (X_i - \bar{X})^2 \times F_i}{N - 1}} = 7.7$$

4) When to use what

Types of variables	IQV	variance	St.d.
Nominal	Yes	No	No
Ordinal	Yes	No	No
Interval/ratio	Yes	Yes	Yes

5) Exercise

For the following frequency table, compute variance and st.d.

age	frequency	Cumulative frequency
2	101	
34	26	
57	5	
61	36	
72	97	
N		

$$\bar{X} = \frac{\sum X_i \times F_i}{N} = 39.8$$

$$S^2 = \frac{\sum (X_i - \bar{X})^2 \times F_i}{N - 1} = 997.8$$

$$S = \sqrt{\frac{\sum (X_i - \bar{X})^2 \times F_i}{N - 1}} = 31.6$$