

Chapter 4: measures of dispersion (variance and st.d in frequency table)

1) Variance (S^2)

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

2) St.d.: Standard deviation (S)

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

3) Example

For the following frequency table, please compute S^2 and S

age	frequency	Cumulative frequency
15	106	
21	4	
36	29	
47	31	
55	21	
68	110	
N	301	

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

$$\bar{X} = \frac{\sum X_i \times F_i}{N} = \frac{15 \times 106 + 21 \times 4 + 36 \times 29 + 47 \times 31 + 55 \times 21 + 68 \times 110}{301} = 42.6$$

$$S^2 = \frac{(15 - 42.6)^2 \times 106 + (21 - 42.6)^2 \times 4 + (36 - 42.6)^2 \times 29 + (47 - 42.6)^2 \times 31 + (55 - 42.6)^2 \times 21 + (68 - 42.6)^2 \times 110}{300}$$

$$S^2 = 528.9$$

$$S = \sqrt{\frac{\sum(X_i - \bar{X})^2 \times F_i}{N - 1}} \Rightarrow S = \sqrt{528.9} = 23.0$$

4) Exercise

For the follow frequency table, please compute S^2 and S

Temperature	frequency	Cumulative frequency
32	10	
44	41	
50	290	
68	31	
75	21	
88	110	
N		

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

$$\bar{X} = \frac{\sum X_i \times F_i}{N} = 59.7$$

$$S^2 = 279.3;$$

$$S = 16.7$$