Synopsis

A parallel vote tabulation is a statistical method for estimating (within a margin of error) the outcome of an election using a carefully selected sample. In an election involving five candidates Alice, Bob, Carol, Dave and Eli, the share of votes (as a percentage) of a particular candidate is obtained by dividing the vote share for the candidate by the total number of votes for all the candidates multiplied by 100. In order to obtain the margin of error, the following formula is used:

$$\sqrt{\frac{(1-f)(\sum_{i=1}^{k} a_i^2 - 2p\sum_{i=1}^{k} a_i m_i + (p^2 \sum_{i=1}^{k} m_i^2))}{k\bar{m}^2(k-1)}} \times 1.96 \times 100$$

Where:

a_i is the vote share of a particular candidate at **a** polling point i

m_i is the sum of all vote shares in **a** polling point i

p is the point estimate $\frac{\sum_{i=1}^{k} a_i}{\sum_{i=1}^{k} m_i}$

$\bar{m}$ is the mean of the sum of all vote shares in **all** the polling points

k is the number of polling points

f is the fraction of voters in the sample to the number of voters in the original population (let's assume this to be 0)

Problem Statement

In a given election involving five candidates: Alice, Bob, Carol, Dave and Eli, a sample of votes were tabulated from ten different polling points as follows:

Alice	10	92	23	17	2	44	33	41	19	54
Bob	21	91	10	9	12	21	52	18	34	78
Carol	10	81	8	28	53	53	10	11	40	36
Dave	48	12	40	30	33	37	81	29	28	32
Eli	12	9	21	44	13	17	21	34	33	62

Given the formula for computing margin of error above, write a program to obtain the vote shares for each of the candidates (as a percentage of all votes cast) and compute the margin of error for each of those estimates correct to two decimal places.