

Excel variance functions

For a population, we have the following formula:

$$VAR = \sigma^2 = \frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n} \quad (1)$$

For example, our population is our class. We could find the height of each student and use the above equation to estimate the variance.

For a sample, we have the following formula:

$$VAR = \sigma^2 = \frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n-1} \quad (2)$$

If we use our class to represent all students at Loyola, then it is a sample. We use Equation (2) to estimate the variance of the heights of all students at Loyola.

Excel function	Population or sample	Type of data	Formula applied
VAR(), VAR.S()	Sample	Numeric	$\sigma^2 = \frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n - 1}$
VARP(), VAR.P()	Population	Numeric	$\sigma^2 = \frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n}$
VARPA()	Population	Numeric and/or logic	$\sigma^2 = \frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n}$

Example: we have three values of 1, 2 and 3. What is their variance?

For population, we apply Equation (1), mean= (1+2+3)/3 =2

Population, apply equation (1)	$\sigma^2 = \frac{(1-2)^2 + (2-2)^2 + (3-2)^2}{3} = \frac{1+0+1}{3} = \frac{2}{3} = 0.6667$
	=VARP(1,2,3)
Sample, apply Equation (2)	$\sigma^2 = \frac{(1-2)^2 + (2-2)^2 + (3-2)^2}{3-1} = \frac{1+0+1}{2} = \frac{2}{2} = 1$
	=VAR(1,2,3) or =VAR.S(1,2,3)
Logic value TRUE=1, FALSE=0	=VARP(1,2,3,TRUE) <==> =VARP(1,2,3,1) =VARPA(1,2,3,TRUE) <==> =VARP(1,2,3,1)