1) Population variance refers to the value of variance that is calculated from population data, and sample variance is the variance calculated from sample data. Due to this value of denominator in the formula for variance in case of sample data is 'n-1', and it is 'n' for population data. As a result, both variance and standard deviation derived from sample data are more than those found out from population data.

For example: Now, when the variance is to be calculated from population data, n is equal to the number of items. Thus, if variance in blood pressure of all the 1000 people is to be calculated from data on blood pressures of all the 1000 people, then n = 1000. However, when the variance is calculated from sample data 1 is to be deducted from n before dividing the sum of the squared deviations. Thus, in the above example if sample data have 100 items, the denominator would be 100 – 1 = 99.

2) a) MARKS

A class of students took a math test. Their teacher wants to know whether most students are performing at the same level, or if there is a high standard deviation.

1. The scores for the test were 85, 86, 100, 76, 81, 93, 84, 99, 71, 69, 93, 85, 81, 87, and 89. When the teacher adds them together, she gets 1279. She divides by the number of scores (15) to get the mean score.

1279 ÷ 15 =**85.2 (mean)**

2. 85.2 is a high score, but is everyone performing at that level? To find out, the teacher subtracts the mean from every test score.

85 - 85.2 = **-0.2**
86 - 85.2 = **0.8**
100 - 85.2 = **14.8**
76 - 85.2 = **-9.2**
81 - 85.2 = **-4.2**
93 - 85.2 = **7.8**
84 - 85.2 = **-1.2**
99 - 85.2 = **13.8**
71 - 85.2 = **-14.2**
69 - 85.2 = **-16.2**
93 - 85.2 = **7.8**

85 - 85.2 = -**0.2**
81 - 85.2 = **-4.2**
87 - 85.2 = **1.8**
89 - 85.2 = **3.8**

3. She squares each difference:

-0.2 x -0.2 = **0.04**
0.8 x 0.8 = **0.64**
14.8 14.8 = **219.04**
-9.2 x -9.2 = **84.64**
-4.2 x -4.2 = **17.64**
7.8 x 7.8 = **60.84**
-1.2 x -1.2 = **1.44**
13.8 x 13.8 = **190.44**
-14.2 x -14.2 = **201.64**
-16.2 x -16.2 = **262.44**
7.8 x 7.8 = **60.84**
-0.2 x -0.2 = **0.04**
-4.2 x -4.2 = **17.64**
1.8 x 1.8 = **3.24**
3.8 x 3.8 = **14.44**

4. The teacher finds the variance, which is the average of the squares:

0.04 + 0.64 + 219.04 + 84.64 + 17.64 + 60.84 +1.44 +190.44 +201.64 +262.44 + 60.84 + 0.04 + 17.64 + 3.24 + 14.44 = 1135

830.64 ÷ 15 = **75.6 (variance)**

5. Last, the teacher finds the square root of the variance:

Square root of 75.6 = **8.7 (standard deviation)**

The standard deviation of these tests is **8.7** points out of 100. Since the variance is somewhat low, the teacher knows that most students are performing around the same level.

PLAYER NAME	COUNTRY	HEIGHT
HARI	INDIA	168
STEPHEN	UK	155
WALTS	USA	150
RONY	AFRICA	170
SMITH	AMERICA	175
POLLARD	AUSTRALIA	180

Mean : 166.33

Variance = 112.22

Standard Deviation :10.593

Here standard deviation is 10.593 then men's would have much more variable heights,

c) Results of a Survey

A market researcher is analysing the results of a recent customer survey that ranks a product from 1 to 10. He wants to have some measure of the reliability of the answers received in the survey in order to predict how a larger group of people might answer the same questions.

Because this is a sample size, the researcher needs to subtract 1 from the total number of values in step 4.

1. The scores for the survey are 9, 7, 10, 8, 9, 7, 8, and 9. The mean is **8.4.**
2. The researcher subtracts the mean from every score (differences: 0.6, -1.4, 1.6, -0.4, 0.6, -1.4, -0.4, 0.6).
3. He squares each number (0.36, 1.96, 2.56, 0.16, 0.36, 1.96, 0.16, 0.36).
4. Because this is a sample of responses, the researcher subtracts one from the number of values (8 values -1 = 7) to average squares and find the variance: **7.88 (variance)**
5. Last, the researcher finds the square root of the variance: **2.8 (standard deviation)**

The standard deviation is **2.8**, which is somewhat low. The researcher now knows that the results of the sample

3) XMean = 34.2916

YMean = 1554.16

Covariance = 362.31

Correlation = 0.9488

When temperature increases ice-cream production also increases.