Basic Statistics-2

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Data

A total of 15 print-heads were randomly selected and tested until failure. The durability of each print-head (in millions of characters) was recorded as follows:
1.13, 1.55, 1.43, 0.92, 1.25, 1.36, 1.32, 0.85, 1.07, 1.48, 1.20, 1.33, 1.18, 1.22, 1.29

Solution

Sample mean ($\bar{X}$) = 1.2386666666666666

a. Build 99% Confidence Interval Using Sample Standard Deviation

Sample standard deviation (s) = 0.18661427836285438
Degree of Freedom (df) = 14
t-critical for 99 confidence level with df of 14 = 2.976842734370834
Margin of error (mor) = t-critical * (s/$\sqrt{n}$) = 0.14343499804054372

99% CI for above sample is ($\bar{X}$ - mor, $\bar{X}$ +mor) = (1.095231668626123, 1.3821016647072102)

b. Build 99% Confidence Interval Using Known Population Standard Deviation

Population standard deviation (σ) = 0.2
z-critical for 99 confidence level = 2.5758293035489004
Margin of error (mor) = z-critical * ($\sigma/\sqrt{n}$) = 0.13301525327090588

99% CI for above Data is ($\bar{X}$ - mor, $\bar{X}$ +mor) = (1.1056514133957607, 1.3716819199375725)

Conclusion

The CI of known standard deviation is narrower compared to CI of sample standard deviation, because in known standard deviation, we are dealing with more certain parameter (σ) compared to sample standard deviation (s).