Elementary Statistics: Math 080

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Summary

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Unit 2 and 3

1. Central Limit Theorem: 7.1
2. Confidence Intervals and Hypothesis Testing
    - Confidence intervals and data interpretation: 8.1 - 8.4
    - Rejecting the null hypothesis, types of error, underlying distributions: 9.1 - 9.3, 9.6

The Central Limit Theorem

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Central Limit Theorem: Let X be a continuous random variable, with mean μ_x and standard deviation σ_x. The average $\bar{x}$ of n values of X is normally distributed like $N(\mu_x, \sigma_x/\sqrt{n})$.

The Central Limit Theorem

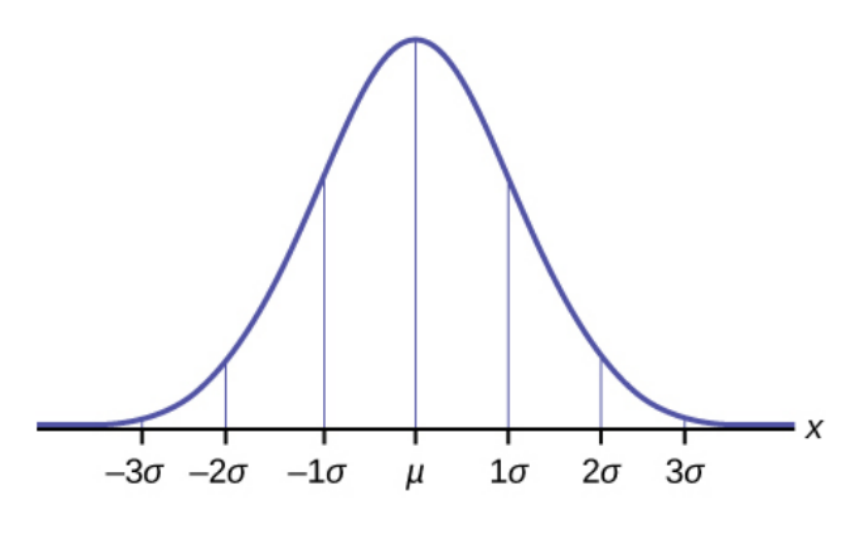

Figure 1: The normal distribution about a mean μ with the units of standard deviations shown.

Example: An unknown distribution has a mean of $\mu = 90$ and a standard deviation of $\sigma = 15$. Samples of size $n = 25$ are drawn randomly from the population. Find the probability that the *sample mean* is between 87 and 93.

Interactive Questions

Interactive Questions: Central Limit Theorem

Suppose we take samples of size $n = 16$ from a large data set and compute the averages and standard deviations of the samples. Suppose we repeat the whole process, but change $n = 100$. Which of the following is true?

- A: The means of our samples will shift upwards by a factor of $100/16$.
- B: The means of our samples will shift downwards by a factor of $100/16$.
- C: The standard deviations of our samples will shift downwards by a factor of $\sqrt{100/16}$.
- D: The standard deviations of our samples will shift upwards by a factor of $\sqrt{100/16}$.

Interactive Questions: Central Limit Theorem

Suppose we take samples of size $n = 100$ from a large data set that has mean μ and standard deviation σ, and compute the averages and standard deviations of the *samples*. Which of the following is true?

- A: Each standard deviation of each sample we collect will be $\sigma/10$.
- B: The standard deviation of the means of our samples will be $\sigma/10$.
- C: Each mean of each sample we collect will be $\mu/10$.
- D: The mean of the means of our samples will be μ.