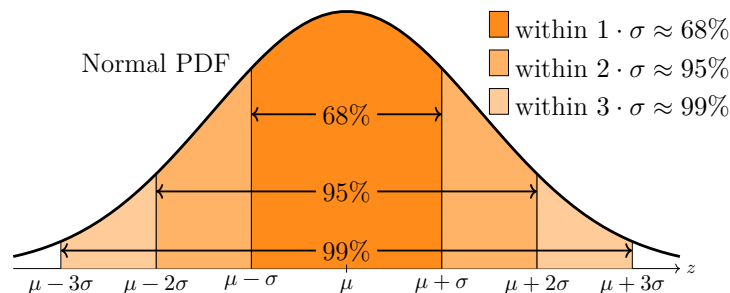


Class 6b in-class problems, 18.05, Spring 2022

Concept questions

Concept question 1. Normal distributions

X has normal distribution, standard deviation σ .



(a) $P(-\sigma < X - \mu < \sigma)$ is approximately

- (i) 0.025 (ii) 0.16 (iii) 0.68 (iv) 0.84 (v) 0.95

(b) $P(X > \mu + 2\sigma)$ is approximately

- (i) 0.025 (ii) 0.16 (iii) 0.68 (iv) 0.84 (v) 0.95

Board questions

Problem 1. Standardization

Suppose X is a random variable with mean μ and standard deviation σ . Let Z be the standardization of X .

(a) Give the formula for Z in terms of X , μ and σ .

(b) Use the algebraic properties of mean and variance to show Z has mean 0 and standard deviation 1.

Problem 2. CLT

(a) Carefully write the statement of the central limit theorem.

(b) To head the newly formed US Dept. of Statistics, suppose that 50% of the population supports the team of Alexandre, Gabriel, Sarah and So Hee, 25% support Jen and 25% support Jerry.

A poll asks 400 random people who they support. What is the probability that at least 55% of those polled prefer the team?

(c) What is the probability that less than 20% of those polled prefer Jen?

Problem 3. Sampling from the standard normal distribution

How would you approximate a single random sample from a standard normal distribution using 9 rolls of a ten-sided die?

Note: $\mu = 5.5$ and $\sigma^2 = 8.25$ for a single roll of a 10-sided die.

Hint: CLT is about averages.

Extra problems

Bonus problem

An accountant rounds to the nearest dollar. We'll assume the error in rounding is uniform on $[-0.5, 0.5]$. Estimate the probability that the total error in 300 entries is more than \$5.

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18.05 Introduction to Probability and Statistics

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