Week 2 Monday Worksheet

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Welcome to the session! Moving forward I will try to incorporate more of the homework and R coding into the worksheets. For the first session, I decided we would go over the basics.

Concepts / Definitions

Probability Density Function (pdf)

The probability density function (pdf) is a function f_X associated with a random variable X that describes the likelihood of that random variable X taking a specific value $X = x$, usually written as $f_X(x)$ or simply $f(x)$. As a special case, if X is discrete, the pdf indicates the probability of each possible value occurring $f(x) = Pr(X = x)$.

Cumulative Distribution Function (CDF)

The cumulative distribution function (CDF) indicates the probability that X is less than or equal to a specific value x: $F(x) = Pr(X \leq x)$

Central Limit Theory

The central limit theorem states that if you take sufficiently large samples from a population, the samples' means will be normally distributed, even if the population isn't normally distributed.

Our Definition:

Law of Large Numbers

The law states that as you take larger and larger samples from a population and calculate the average of those samples, the sample mean will converge to the true population mean.

Our Definition:

Exercises

Question 1

Suppose $X \sim N(3, 4)$. Find $Pr(X > 3)$.

Answer:

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1 - pnorm(3, mean = 3, sd = 2)
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## [1] 0.5
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Can you explain the code? Why are we subtracting from 1? Why is sd $= 2$?

Question 2

Suppose $X \sim N(2, 25)$. How can we normalize this?

Hint: Use the normalizing formula $Z = \frac{X - \mu}{\sigma} = N(0, 1)$ or this formula $Var(aX + bY + c) = a^2 Var(X) + b^2 Var(Y) + 2abCov(X, Y)$.