Week 9 Assignment

Question 1: Estimating π with Random Sampling

You are designing a simulation to estimate the value of π using 100,000 random points uniformly sampled inside a unit square.
How accurate is your estimate compared to the true value of π?
Use random sampling and compare the estimate over 10 different runs.

Question 2: Estimating the Mean of a Normal Distribution

Suppose you repeatedly draw 1,000 samples of size 50 from a normal distribution with mean $\mu = 10$ and standard deviation $\sigma = 2$.
What does the distribution of the sample means look like?
Plot a histogram of the sample means and compute the overall average and standard deviation.

Question 3: Estimating Dice Probability

Two fair six-sided dice are rolled.
Using 100,000 simulations, estimate the probability that the sum of the two dice is greater than 9.
How close is this to the theoretical probability?