**Interpretation:**

1.6

The red line overlay represents the theoretical density of the exponential distribution with a rate parameter of 4. This line is a smooth curve that shows the expected distribution according to the specified exponential distribute on. A close alignment suggests that the observed data follows the anticipated exponential distribution. Deviations may suggest discrepancies between the observed data and the expected distribution.

1.7

If the heights of the bars in the graph closely match the red points, it indicates a good fit between the sample data and the Poisson distribution with λ= 2.Deviations may suggest discrepancies between the observed data and the Poisson distribution.

2.1

Coin Tosses: The probability distribution for coin tosses is symmetric and follows a binomial distribution. The probability of getting each sum is highest at the midpoint (n/2). As n increases, the distribution becomes more concentrated around the expected mean.

Die Rolls: The probability distribution for die rolls is uniform, as each sum has an equal probability of 1/6. The bars in the plot indicate the uniform distribution of the possible sums.

2.3

the observation is expected to reveal the convergence of the sample mean towards the expected value and the increasing accuracy of probability estimates as the sample size N grows.

2.4

the observed convergence of the empirical cumulative distribution function towards the standard normal distribution with increasing sample size aligns with key concepts in probability theory, demonstrating the consistency of the empirical distribution in capturing the underlying distribution as the sample size becomes larger.

3.1

The phenomenon illustrated by this code is the convergence of the sample mean towards the expected mean, as predicted by the Law of Large Numbers, and the convergence of the distribution of sample means towards a normal distribution, as predicted by the Central Limit Theorem.

3.3

The observed phenomenon is that, for small sample sizes, the boxplots exhibit wide variability and the presence of outliers, reflecting the heavy-tailed nature of the Cauchy distribution. As the sample size increases, the spread of values diminishes, but there is no convergence toward a normal distribution, highlighting the influence of heavy tails on the behavior of sample means from the Cauchy distribution.