Assignment #19

Due on Friday, May 1, 2020

Read Section 8.3 on *The Central Limit Theorem* in the class lecture notes at
`http://pages.pomona.edu/~ajr04747/`

Read Section 6.3 on *The Central Limit Theorem* in DeGroot and Schervish.

Do the following problems

1. An experiment consists of rolling a die 81 times and computing the average of the numbers on the top face of the die. Estimate the probability that the sample mean will be less than 3.

2. A random sample of size 49 is taken form a distribution with mean μ and variance σ^2. Estimate the probability that sample mean will be within 0.7 standard deviations from the mean of the distribution.

3. A large freight elevator can transport a maximum of 9800 pounds. Suppose a load of cargo containing 49 boxes must be transported via the elevator. Experience has shown that the weight of boxes of this type of cargo follows a distribution with mean $\mu = 205$ pounds and standard deviation $\sigma = 15$ pounds. Based on this information, what is the probability that all 49 boxes can be safely loaded onto the freight elevator and transported?

4. Forty–nine measurements are recorded to several decimal places. Each of these 49 numbers is rounded off to the nearest integer. The sum of the original 49 numbers is approximated by the sum of those integers. Assume that the errors made in rounding off are independent, identically distributed random variables with a uniform distribution over the interval $(-0.5, 0.5)$. Compute approximately the probability that the sum of the integers is within two units of the true sum.

5. Let X denote a random variable with pdf

$$f_X(x) = \begin{cases} \dfrac{1}{x^2} & \text{if } 1 < x < \infty, \\ 0 & \text{otherwise.} \end{cases}$$

Consider a random sample of size 72 from this distribution. Compute approximately the probability that 50 or more observations of the random sample are less than 3.