Tutorial 02b

Problem 1

There are 100 men on a plane. Let X_i be the weight (in pounds) of the *i*th man on the plane. Suppose that the X_i's are i.i.d., and $EX_i = \mu = 170$ and $\sigma_{X_i} = \sigma = 30$. Find the probability that the total weight of the men on the plane exceeds 18,000 pounds.

Problem 2

Let X_1, X_2, $\cdots$, X_{25} be i.i.d. with the following PMF

$$P_X(k) = \begin{cases} 0.6 & k = 1 \\ 0.4 & k = -1 \\ 0 & \text{otherwise} \end{cases}$$

And let

$$Y = X_1 + X_2 + \cdots + X_n.$$

Using the CLT and continuity correction, estimate $P(4 \leq Y \leq 6)$.

Problem 3

You have invited 64 guests to a party. You need to make sandwiches for the guests. You believe that a guest might need 0, 1 or 2 sandwiches with probabilities $\frac{1}{4}$, $\frac{1}{2}$, and $\frac{1}{4}$ respectively. You assume that the number of sandwiches each guest needs is independent from other guests. How many sandwiches should you make so that you are 95% sure that there is no shortage?

Solution

Problem 4

Let X_1 , X_2, $\cdots$, X_n be i.i.d. $Exponential(\lambda)$ random variables with $\lambda = 1$. Let

$$\overline{X} = \frac{X_1 + X_2 + \cdots + X_n}{n}.$$

How large n should be such that

$$P\left(0.9 \leq \overline{X} \leq 1.1\right) \geq 0.95?$$

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