(P1) Suppose that X is a nonegative random variable with $E[X] = 10$.

(a) Give an upper bound on the probability that X is larger than 15.

(b) Suppose that we also know that $\text{Var}(X) = 3$. Give a better upper bound on $P(X > 15)$ than in part (a).

(c) Suppose that $Y_1, Y_2, \ldots, Y_{300}$ are independent and identically distributed (i.i.d.) random variables with the same distribution as X so that, in particular, $E[Y_i] = 10$ and $\text{Var}(Y_i) = 3$. Estimate the probability that $\sum_{i=1}^{300} Y_i$ is larger than 3030.

(P2) Nate is a competitive eater specializing in eating hot dogs. The probability distribution for the time it takes Nate to eat a hotdog is unknown, but we know that it is not normally distributed. What we can say from past experience is that it takes him on average 15 seconds to consume one hot dog, with a standard deviation of 4 seconds. In this year's hot dog eating contest he hopes to consume 64 hot dogs in just 15 minutes. Use the CLT to approximate the probability that he achieves this feat of skill.