Name:_____

Lecture 35, class activity. LLN.

Ok, here is the setup. We are going to roll a large number n of six-sided dice independently and add the scores, and divide by n.

Specifically, we:

- let X_i have the uniform distribution on $\{1, 2, 3, 4, 5, 6\}$;
- define $S_n = \sum_{i=1}^{n} X_i$ and $A_n = S_n/n$;
- recall that we have the estimate

$$\mathbb{P}(|A_n - \mu| \geq \epsilon) \leq \frac{\mathrm{Var}(X_i)}{\epsilon^2 n}. \tag{1}$$

Then:

1. Verify that $\mu = \mathbb{E}[X_i] = 7/2 = 3.5$. Recall that we showed $\mathrm{Var}(X_i) = 35/12$, and for this problem let's just make it 3.

2. We want to find the n which guarantees with a 99% likelihood that

$$\mathbb{P}(A_n \in [3.4, 3.6]).$$

3. In this problem, identify what is ϵ, and then identify how large n should be so that the RHS of (1) is less than 1%.