CSE 21 Homework 6 Solutions

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Exercises from Bender

Most solutions can be found in the book itself. But here we solve the review questions from chapter 4.

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Let X be binomial n, a and Y be binomial n, b and suppose X, Y are independent. Let $Z = X + 2Y, \epsilon > 0$. Then Chebychev's inequality says that

$$\begin{aligned} Pr(|Z - na - 2nb| \geq \epsilon) &= Pr(|Z - E(Z)| \geq \epsilon) \\ &\leq \frac{\mathrm{Var}(Z)}{\epsilon^2} \\ &= \frac{\mathrm{Var}(X) + 4\mathrm{Var}(Y)}{\epsilon^2} \\ &= \frac{na(1-a) + 4nb(1-b)}{\epsilon^2}, \end{aligned}$$

which is answer (c).

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If X_i is 10 with probability $\frac{1}{10}$ and 0 with probability $\frac{9}{10}$ for $i = 1, \ldots, 1600$, then $E(\sum_{i=1}^{1600} X_i) = \sum E(X_i) = 1600 \cdot 1$ (even if the X_i are dependent), and so the answer is (d).

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Suppose a coin is flipped 3 times. Let X be 1 if 2 tails come up in a row and 0 otherwise. Let Y be the number of tails. Then the joint distribution of X, Y evaluated at $(1, 2)$ is $Pr(X = 1, Y = 2) = \frac{2}{8}$ since only TTH and HTT cause $X = 1, Y = 2$, so the answer is (d).