

ECE 302 Homework 7
COMER

Topic: Expectation

1. Suppose that the random variable X is equal to the number of hits by a certain baseball player in his next 3 at bats. If $P(X = 1) = 0.3$, $P(X = 2) = 0.2$, and $P(X = 0) = 3P(X = 3)$, find $E[X]$.
2. A coin that when flipped comes up heads with probability p is flipped until either heads or tails has occurred twice. Find the expected value of the number of flips.
3. Compute $E[X]$ if X has a density function given by

(a)

$$f_X(x) = \begin{cases} \frac{1}{4}xe^{-x/2}, & \text{if } x > 0 \\ 0, & \text{if } x \leq 0 \end{cases}$$

(b)

$$f_X(x) = \begin{cases} \frac{5}{x^2}, & \text{if } x > 5 \\ 0, & \text{if } x \leq 5 \end{cases}$$

4. Find the mean and variance of the binomial random variable.
5. Show that $E[X]$ for the random variable with cdf $F_X(x) = 1 - 1/x$, for $x > 1$, does not exist.
6. Let $g(X) = ba^X$, where a and b are positive constants and X is a Poisson random variable. Find $E[g(X)]$.
7. Suppose a fair coin is tossed n times and that each coin toss costs d dollars.
 - (a) If the reward for obtaining X heads is $aX^2 + bX$, find the expected value of the net reward.
 - (b) If the reward for obtaining X heads is a^X , where $a > 0$, find the expected value of the net reward.
8. A product, sold seasonably, yields a net profit of b dollars for each unit sold and a net loss of l dollars for each unit left unsold when the season ends. The number of units of the product that are ordered at a specific department store during any season is a random variable having probability mass function $p(i), i \geq 0$. If s is the total number of units stocked, find the expected profit for this product as a function of b, l, s , and $p(\cdot)$.