

CSE 312: Foundations of Computing II

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Lecture Topics: 3.2 More on Expectation, 3.3 Variance

[**Tags:** Linearity of Expectation, Indicator Random Variables]

1. There is a team of 14 DJs at Rainy Dawg Radio that are getting ready for a show and each need to choose an unordered playlist of 3 **different** songs from 50 total songs. Each DJ chooses a playlist of 3; any subset of 3 songs out of 50 is equally likely. DJ's choose songs independently of each other. That is, it is possible to reuse the same song across different DJs, but a DJ cannot use a song more than once.
 - a. The manager of the station needs to buy the rights to the songs the DJs choose for any show. How many songs should she expect to buy the rights to for the show?
 - b. The rights to each song cost \$100, and there is an overall processing fee of \$40 to complete all the transactions. What is the expected cost to the manager of the station?

[**Tags:** Expectation, Variance, LOTUS]

2. Suppose we have two coins. Coin C_1 comes up heads with probability 0.3 and coin C_2 comes up heads with probability 0.9. We repeat this process 3 times:
 - Choose a coin with equal probability.
 - Flip that coin once.

Suppose X is the number of heads after 3 flips.

- a. What is $E[X]$?
- b. What is $Var(X)$?
- c. Based on the number of heads we get, we earn $Y = \frac{1}{X+1}$ dollars. What is $E[Y]$?