Assignment3($Q_1$1.16.3.13)
NCERT EXAMPLER
Probability And Random Processes

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I. Q11.16.3.13

A bag contains 8 red and 5 white balls. Three balls are drawn at random. Find the Probability that
(a) All the three balls are white
(b) All the three balls are red
(c) One ball is red and two balls are white
Solution: Let,

$$Y = 0, 1$$

$$0 : red$$

$$1 : white$$

To find the probabilities using the Probability Mass Function (PMF), we'll use the hypergeometric distribution
The PMF for the hypergeometric distribution is given by:

P(X = x) = [C(k, x) * C(N - k, n - x)]/C(N, n)

Where:

N is the total number of balls in the bag
k is the number of successful outcomes
n is the number of draws
x is the number of successful outcomes in your specific scenario
C(a, b) represents the binomial coefficient, which is the number of ways to choose b items from a distinct items

(a) All the three balls are white:
P(X = 0 red) = [C(8, 0) * C(5, 3)] / C(13, 3)

= [(1) * (10)] / (286)

= 10 / 286 0.034965
(b) All the three balls are red:
P(X = 3 red) = [C(8, 3) * C(5, 0)] / C(13, 3)

P(X = 3 red) = [(56) * (1)] / (286)

P(X = 3 red) = 56 / 286 0.195804

(c)Now, let's calculate the total probability of getting one red and two white balls (which includes the cases where X = 1 red and 2 white and X = 2 red and 1 white):

Total probability of one red and two white = P(X = 1 red) + P(X = 2 red and 1 white)

Total probability = 0.279720 + [C(8, 2) * C(5, 1)] / C(13, 3)

= 0.279720 + [(28) * (5)] / (286)

= 0.279720 + 140 / 286

=0.279720 + 0.489510 = 0.769230