Assignment 1-probability and Random Variable

Aravind-BM19MTECH11007

January 14, 2021

Problem Statement: Suppose that 90% of people are right handed.What is the probability that at most 6 of a random sample of 10 are right-handed?

Solution: Let X be the number of right-handed people
n=10(number of sample)
p=9/10(probability of right handed people)
q=1/10(probability of left handed people)

From bernoulli's distribution we know that,

$$P(X = r) =^n C_r p^r q^{n-r} \qquad (1)$$

$$
\begin{aligned}
P(X \le 6) &= 1 - P(X > 6) \\
&= 1 - [P(X = 7) + P(X = 8) + P(X = 9) + P(X = 10)] \\
&= 1 - [^{10}C_7 \left(\frac{9}{10}\right)^7 \left(\frac{1}{10}\right)^3 +^{10}C_8 \left(\frac{9}{10}\right)^8 \left(\frac{1}{10}\right)^2 \\
&\quad +^{10}C_9 \left(\frac{9}{10}\right)^9 \left(\frac{1}{10}\right) +^{10}C_{10} \left(\frac{9}{10}\right)^{10}] \\
&= 1 - 9^7/10^{10}[^{10}C_7 +^{10} C_8 \times 9 +^{10} C_9 \times 9^2 +^{10} C_{10} \times 9^3] \\
&= 1 - 9^7/10^{10} \left[\frac{10 \times 9 \times 8}{3 \times 2 \times 1} + \frac{10 \times 9 \times 9}{2} + 10 \times 81 + 729 \right] \\
&= 1 - 9^7/10^{10}[120 + 405 + 810 + 729] \\
&= 1 - \left(\frac{9^7 * 2064}{10^{10}} \right) \\
&= .0128
\end{aligned}
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$$(2)$$