Question:Suppose than 90% of people are right-handed. What is the probability that atmost 6 of a random sample of 10 people are right-handed?
Solution: :Calculating Probability Using Bernoulli Distribution
Given that 90% of people are right-handed, let $p = \frac{9}{10}$ be the probability of success (right-handed), and $(1-p) = \frac{1}{10}$ be the probability of failure (left-handed).

$$X \sim \text{Ber}(p) \tag{1}$$

Suppose $X_i, 1 \le i \le n$ represent each of the n draws. Define Y as

$$Y = \sum_{i=1}^{n} X_i \tag{2}$$

Then, since the X_i are iid, the pmf of Y is given by

$$Y \sim \text{Bin}(n, p) \tag{3}$$

The cdf of Y is given by

$$F_Y(k) = \Pr(Y \le k) \tag{4}$$

$$= \begin{cases} 0 & k < 0 \\ \sum_{i=1}^{k} \binom{n}{i} p^i (1-p)^{n-i} & 1 \le k \le n \\ 1 & k \ge n \end{cases} \tag{5}$$

In this case,

$$p = \frac{9}{10}, \ n = 10 \tag{6}$$

1) We require $\Pr(Y \le 6)$. Since $n = 10$,

$$\Pr(Y \le 6) = 1 - \Pr(Y > 6) \tag{7}$$

$$= F_Y(6) \tag{8}$$

$$= \sum_{k=0}^{6} p_Y(k) \tag{9}$$

$$= \sum_{k=0}^{6} \binom{n}{k} p^k (1-p)^{n-k} \tag{10}$$

$$= 0.0128 \tag{11}$$