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: :

TABLE 0
TABLE-1

Parameters	values	Description
	1	if right-handed
X_i	0	if not right-handed
n	10	Total people
k	6	People right-handed
p	0.9	probability of being right-handed

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

Suppose $X_i, 1 \leq i \leq n$ 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

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

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

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

$$\Pr(Y \leq 6) = \sum_{k=0}^{6} p_Y(k) \tag{6}$$

$$= 0.01279 \tag{7}$$