AI1110
PROBABILITY AND RANDOM VARIABLES
Assignment 1

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Question(12.13.6.4): Suppose that 90% of people are right-handed. What is the probability that at most 6 of a random sample of 10 people are right-handed?
Answer-1-$\sum_{r=7}^{10}\binom{10}{r}(0.9)^r(0.1)^{10-r}$**.**
Solution:

Let us consider a random variable X,

X=number of right-handed people among a random sample of 10 people.
X={0,1,2,3,4,5,6,7,8,9,10}

X is a Binomial random variable.
Given that 90% of the people are right-handed.
Let **p** be the probability that the picked person is right-handed and **q** be the probability that the picked person is left-handed.

p=0.9
q=0.1

As X is a Binomial random variable its probability distribution function can be given as following

$$\Pr(X=x)=\binom{10}{x}p^x q^{10-x}$$

$$\Pr(X=x)=\binom{10}{x}(0.9)^x(0.1)^{10-x}$$

Now our aim is to find the probability that atmost 6 are right-handed among 10. That is

$$\Pr(X\leqslant 6)=1-\Pr(X\geqslant 7)$$

As we know from axioms of probability that probability of entire sample space is 1.

$$\Pr(X\leqslant 6)=1-(\Pr(X=7)+\Pr(X=8)+\Pr(X=9)+\Pr(X=10))$$

$$=1-(\binom{10}{7}(0.9)^7(0.1)^3+\binom{10}{8}(0.9)^8(0.1)^2+\binom{10}{9}(0.9)^9(0.1)^1+\binom{10}{10}(0.9)^10(0.1)^0)$$

Hence our required probability can be expressed as

$$\Pr(X\leqslant 6)=1-\sum_{r=7}^{10}\binom{10}{r}(0.9)^r(0.1)^{10-r}.$$