AI1110
Assignment 9

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Outline

Papoullis Chapter 3 Exercise: 3.5

A shipment contains K good and N - K defective components.We pick at random n $\leq$ K components and test them. Show that the probability p that k of the tested components are good equals:

$$p = \binom{K}{k}\binom{N-K}{n-k}\Big/\binom{N}{n} \tag{1}$$

Solution

In this experiment, the total number of outcomes is the number of ways of picking n out of N objects, that is :

$$P_1 = \binom{N}{n} \tag{2}$$

The number of ways of picking k out of the K good components equals

$$P_2 = \binom{K}{k} \tag{3}$$

The number of ways of picking n-k out of the N-K defective components equals

$$P_3 = \binom{N-K}{n-k} \tag{4}$$

Hence, the number of ways of picking k good components and n-k defective components equals

$$P_4 = P_2 \times P_3 \tag{5}$$

$$= \binom{K}{k}\binom{N-K}{n-k} \tag{6}$$

Hence, from the above equations, we can finally state that:

$$P_f = P_4 / P_1 \tag{7}$$

$$= \binom{K}{k}\binom{N-K}{n-k} \Big/ \binom{N}{n} \tag{8}$$