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Chapter-3

Problem 41:

Workers 1,....,n are currently idle. Suppose that each worker, indepedently, has probability p of being eligible for a job, that a job is equally likely to be assigned to any of the workers that are eligible for it (if none are eligible, the job is re-jected). Find the probability that the next job is assigned to worker 1.

Solution:

~~Worker~~ 1 ~~gets the~~ job if,

S.

The probabity is

$$p \sum_{k=0}^{n-1} \binom{n-1}{k} p^k (1-p)^{n-1-k} \frac{1}{k+1}$$

$$= p \sum_{k=0}^{n-1} \frac{(n-1)!}{(k+1)!(n-k-1)!} p^k (1-p)^{n-1-k}$$

$$= 1/n \sum_{k=0}^{n-1} \binom{n}{k+1} p^{k+1} (1-p)^{n-(k+1)}$$

$$= 1/n \sum_{k=1}^{n} \binom{n}{k} p^k (1-p)^{n-k}$$

$$= 1/n \left(1 - \binom{n}{0} p^0 (1-p)^{n-0}\right) = \frac{1-(1-p)^n}{n}$$