Generating Random Samples (Discrete RV)

- Let R = rand(1)
  - P[a < R <= b] = (b-a)
- Suppose we want to generate samples from a RV K with CDF $F_K(k)$ and PMF $P_K(k)$
- $P[F_K(k-1) < R <= F_K(k)] = F_K(k) - F_K(k-1) = P_K(k)$
- Algo:
  - r = rand(1)
  - Using the CDF of K, find the k for which the value r lies in between $F_K(k-1)$ and $F_K(k)$
  - The value r corresponds to K=k. So your drawn value from the discrete RV is k.

Example 2.47 Problem

Write a MATLAB function that generates m samples of a binomial (n, p) random variable.

IID Bernoulli Samples

- Repeat the following for n = 2, n= 10, n = 50, n=100, n=500
  - Simulate n Bernoulli trials for p = 0.1
  - Calculate the sum of the trials and the average (sample mean) of the trials
  - Generate 10000 such trials and the sum and average (sample mean) for each
  - Plot histogram of the obtained sums
  - Explain your observations in terms of the CLT
  - Plot empirical CDF of the obtained sums and overlay the CDF of the Gaussian approximation
  - Plot histograms of the obtained sample mean
- From the histograms of sums you just obtained, what value of n is large enough for us to use the CLT approximation?
- Comment on the histograms of the sample means.
- Deliverable: Code, 5 plots and explanations/comments