

PMF of geometric RV  $X$ :

$$P(X=k) = (1-p)^{k-1} p, \quad k=1, 2, 3, \dots$$

$$E(X) = \frac{1}{p}$$

Transformation Method:

- ① Generate a uniform random variable  $[0,1]$
- ② Transform  $U$  into the geometric variable  $X$ :

$$\text{CDF of } X \text{ is } P(X \leq k) = 1 - (1-p)^k$$

$$\text{Let } U = 1 - (1-p)^k$$

$$k = \frac{\log(1-U)}{\log(1-p)} = X$$

The average number of comparisons  $\Rightarrow E(X)$   
 $= \frac{1}{p}$