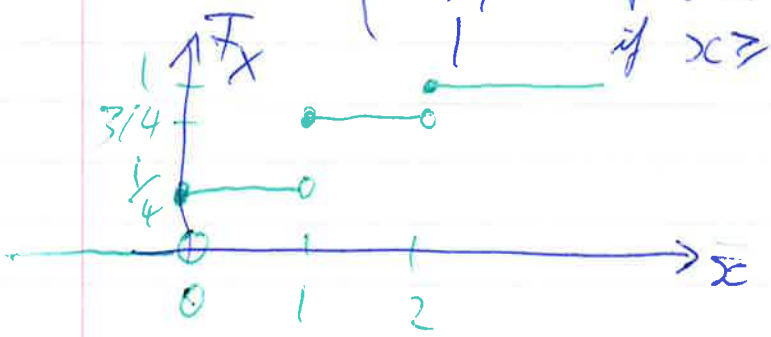
Example 1.5 X = number of heads.

k	0	1	2
$P(X=k)$	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{1}{4}$

pmf

$$F_X(x) = \begin{cases} 0 & \text{if } x<0 \\ 1/4 & \text{if } 0 \le x < 1 \\ 3/4 & \text{if } 1 \le x < 2 \\ 1 & \text{if } x \ge 2. \end{cases}$$



$$p_X(k) = (1-p)^{k-1} p, \quad k \in \mathbb{N}.$$

$$F_X(\ell) = \sum_{k=1}^{\ell} (1-p)^{k-1} p = p \sum_{k=0}^{\ell-1} a^k = p \frac{a^\ell - 1}{a-1}$$

$a := 1-p$

$$= p \frac{(1-p)^\ell - 1}{(1-p) - 1} = 1 - (1-p)^\ell \quad \text{for } \ell \in \mathbb{N}.$$