problem 1.1

Q 证明 Mean of $X = E(X) = \frac{1}{p}$

Solution $p(X=k) = (1-p)^{k-1}p$ (1)

$$E(X) = \sum_{k=1}^{\infty} k\, p(X=k) \quad (2)$$

(2)代入(1) $= \sum_{k=1}^{\infty} k\,(1-p)^{k-1}p$

let $q = 1-p$ $= \sum_{k=1}^{\infty} k q^{k-1} p$

p常数 $= p\sum_{k=1}^{\infty} k q^{k-1}$

$= \frac{p}{q}\sum_{k=1}^{\infty} k q^{k}$ $\quad 1q^1 + 2q^2 + 3q^3 + \cdots + kq^k = \frac{a}{(1-q)^2}$

$= \frac{p}{q}\,\frac{q}{(1-q)^2}$

$= \frac{p}{(1-q)^2}$

$= \frac{p}{[1-(1-p)]^2}$

$= \frac{p}{p^2} = \frac{1}{p}$