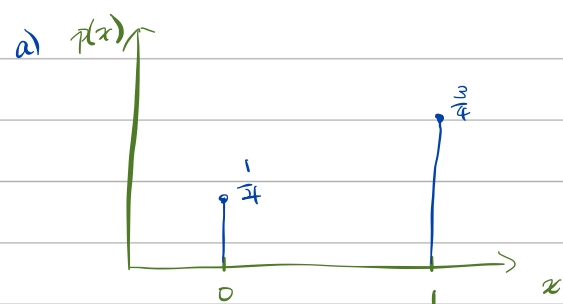


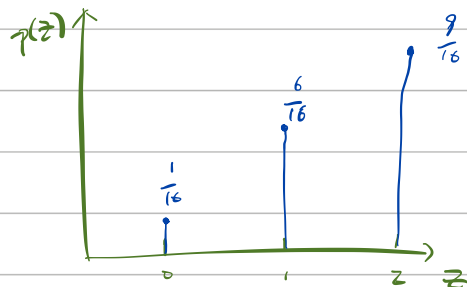
0



b) when  $p = \frac{3}{4}$   $H(x) = -\left[\frac{1}{4} \cdot \log_2\left(\frac{1}{4}\right) + \frac{3}{4} \cdot \log_2\left(\frac{3}{4}\right)\right] \approx 0.811$

when  $p = \frac{1}{2}$   $H(x) = -2 \cdot \frac{1}{2} \cdot \log_2\left(\frac{1}{2}\right) = 1$

② a) pmf of  $Z$ :  $p(z) = \begin{cases} \binom{2}{0} p^0 (1-p)^2 = \frac{1}{16}, & z=0 \\ \binom{2}{1} p^1 (1-p)^1 = 2 \cdot \frac{3}{4} \cdot \frac{1}{4} = \frac{3}{8}, & z=1 \\ \binom{2}{2} p^2 (1-p)^0 = \frac{9}{16}, & z=2 \end{cases}$



③ a)  $X \sim \text{Geom}\left(\frac{1}{2}\right)$

$p(x) = \frac{1}{2} \cdot \left(\frac{1}{2}\right)^{x-1}$  for  $x = 1, 2, 3, \dots$

see attached pdf for script.