

ENTROPIE

DESORDRE

LETTER	E	N	T	R	O	P	I
Appearance	2	1	1	1	1	1	1
Probability	$\frac{1}{4}$	$\frac{2}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$

D	E	R	S	O
2	2	2	1	1
$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{8}$	$\frac{1}{8}$

$$1 \cdot \frac{1}{4} \cdot \log\left(\frac{4}{1}\right) + \frac{3}{6} \cdot \frac{1}{8} \cdot \log(8)$$

$$3 \cdot \frac{1}{4} \cdot \log\left(\frac{4}{1}\right) + \frac{2}{8} \cdot \frac{1}{8} \cdot \log(8)$$

$$\frac{1}{4} \cdot \underbrace{\log(4)}_2 + \frac{3}{4} \cdot \underbrace{\log(8)}_3$$

$$> \frac{3}{4} \cdot \underbrace{\log(4)}_2 + \frac{1}{4} \cdot \underbrace{\log(8)}_3$$

$$\log(4) < \log(8)$$

$$\frac{2}{4} + \frac{3 \cdot 3}{4} = \frac{11}{4}$$

$$> \frac{3 \cdot 2}{4} + \frac{3}{4} = \frac{9}{4}$$

$$B = \left[\begin{array}{ll} \text{AVENCHES} & E:2 \quad A,V,N,C,H,S:1 \\ \text{COSSONAY} & O,S:2 \quad C,N,A,Y:1 \\ \text{ECUBLENS} & E:2 \quad C,U,B,L,N,S:1 \\ \text{GRANDSON} & N:2 \quad G,R,A,D,S,O:1 \\ \text{LAUSANNE} & A,N:2 \quad L,U,S,E:1 \end{array} \right] = A$$

$C = \text{MONTREUX}$ all letters are different $\rightarrow \text{max. Entropy}$

$$H(C) > H(B) \quad H(C) > H(A)$$

$$\boxed{H(A) > H(B) ?}$$

$$\begin{aligned} H(A) &= \frac{2^1}{8_4} \cdot \log_2\left(\frac{8_4}{2}\right) + 6 \cdot \frac{1}{8} \cdot \log_2\left(\frac{8}{1}\right) \\ &= \boxed{\frac{1}{4} \cdot \log_2(4) + \frac{3}{4} \cdot \log_2(8)} > \end{aligned}$$

$$\begin{aligned} H(B) &= 2 \cdot \frac{2}{8} \cdot \log(4) + 4 \cdot \frac{1}{8} \cdot \log(8) \\ &= \boxed{\frac{1}{2} \cdot \log(4) + \frac{1}{2} \cdot \log(8)} \end{aligned}$$

Note that $\log(4) < \log(8)$

$$H(A) = \frac{2}{4} + \frac{3 \cdot 3}{4} = \frac{11}{4} = 2.75$$

$$H(B) = \frac{2}{2} + \frac{3}{2} = \frac{5}{2} = 2.5$$