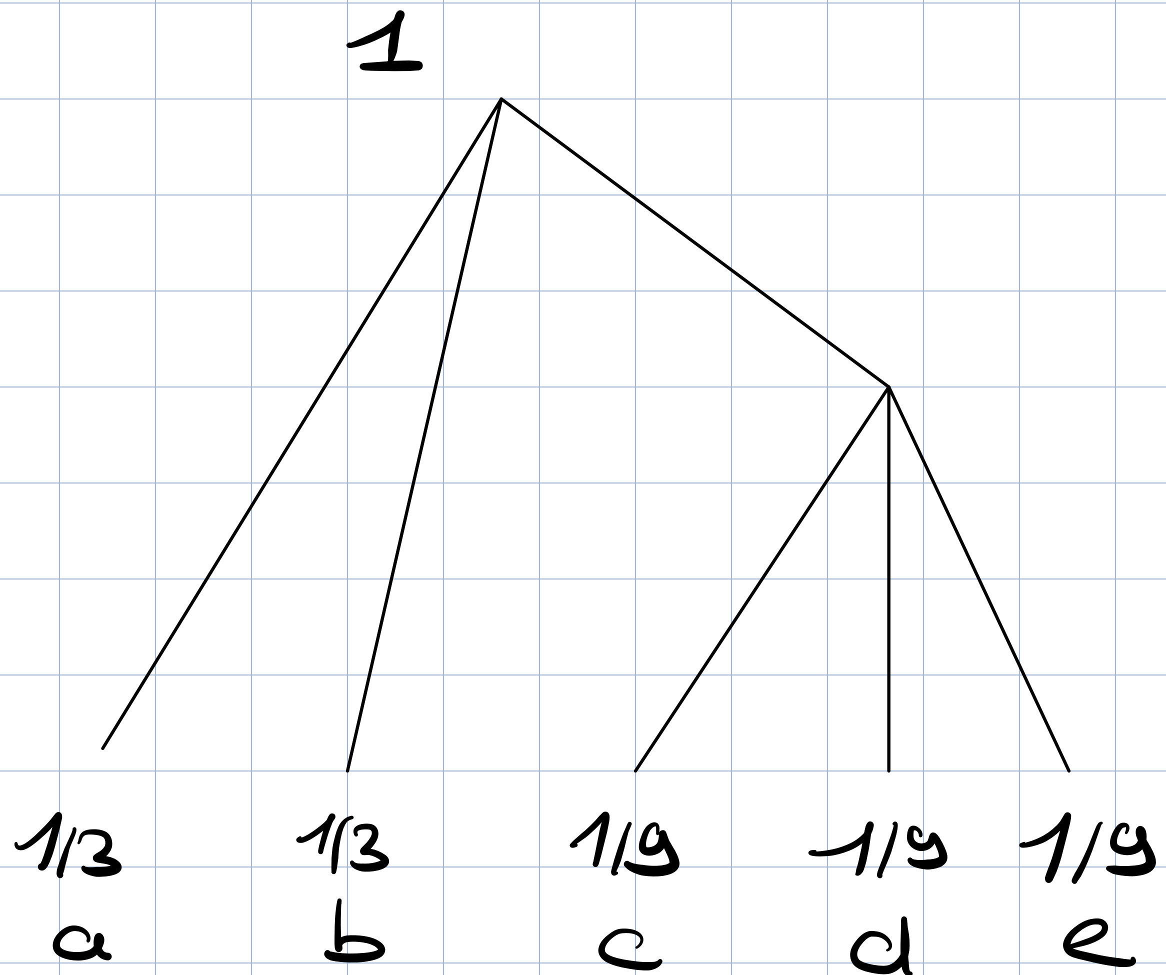
Question 1

$k(D-1)+D$



$$L(S, \Gamma_D) = \frac{1}{3} + \frac{1}{3} + \frac{1}{9} \cdot 2 \cdot 3$$

$$= \frac{2}{3} + \frac{2}{3} = \frac{12}{9}$$

$$H(S) = \frac{1}{3}\log(3)\cdot 2 + \frac{1}{9}\log(3^2)\cdot 3$$

$$= \frac{2}{3} + \frac{2}{3} = \frac{12}{9}.$$

(b) False, when $n \to \infty$.

$\boxed{Q2}$

(1) $\frac{1}{2^x} + \frac{1}{2^2} + \frac{1}{2^3} + \frac{1}{2^3} < 1$

$\Rightarrow \frac{1}{4} + \frac{1}{4} + \frac{1}{2^*} < 1$

$\Rightarrow \frac{1}{2} +$

$\boxed{Q3}$

(1) True they are independent ?

$$p(E/F) = p(E) \Leftrightarrow$$

$$\Leftrightarrow \quad \frac{p(E \cap F)}{p(F)} = p(E)$$

Q4

$$p(x/y) = p(x) \cdot p(y) \,?$$

$$p(x=0) = \frac{2}{3}$$

$$p(x=1) = \frac{2}{6} = \frac{1}{3}$$

$$p(Y=A) = \frac{3}{12}$$

$$p(0/A) = \frac{1}{6} = \frac{2}{3} \cdot \frac{3}{12} = \frac{6}{36} = \frac{1}{6}$$

$$p(Y=B) = \frac{3}{6} = \frac{1}{2}$$

$$p(Y=C) =$$

(b) $p(E/F) = \frac{1/3}{}$

<u>False</u> (if F occurred, E can not)

(c) <u>True</u>

Q5

a) $\cancel{H(X_1, X_2, X_3) = H(X_1) + H(X_2, X_3 / X_1)}$

$$= \left[\frac{1}{3}\left[1 \cdot \log_2(1)\right]\right.$$

$$\left. + \frac{2}{3}\left[\frac{1}{2}\log(2)\right]\right) \cdot 3$$

$\frac{1}{3}\log(3) \cdot 3 = \log(3)$ par le choix de la boite initiale

et ensuite 2 bits à stocker

$\log(3) + 2$

iff X and Y indep then:

$$H(Y) + H(X) = H(X,Y)$$

$$\Rightarrow H(Y) = \frac{3}{12}\log(2^2)\cdot 2$$

$$+ \frac{1}{2}\log(2) = \frac{3}{2} = \frac{2}{2} + \frac{1}{2}$$

$$H(X) = \frac{2}{3}\log\left(\frac{3}{2}\right) + \frac{1}{3}\log(3) = \log(3) - \frac{2}{3}$$

$H(X,Y)$

$$= \frac{1}{6}\log(6)\cdot 3 + \frac{1}{12}\log(12)\cdot 2 + \frac{1}{3}\log(3)$$

$$= \frac{1}{2}\left[\log(3) + \log(2)\right] + \frac{1}{6}\left[\log(3) + \log(4)\right]$$

$$+ \frac{1}{3}\log(3)$$

$$= \log(3)\left[\overset{\frac{3}{6}}{\cancel{\frac{1}{2}}} + \overset{\frac{2}{6}}{\frac{1}{3}} + \overset{\frac{1}{6}}{\frac{1}{6}}\right]$$

$$+ \overset{\frac{3}{6}}{\cancel{\frac{1}{2}}} + \overset{\frac{2}{6}}{\frac{1}{3}}$$

$$= \log(3) + \frac{5}{6}$$

$$\log(3) - \frac{2}{3} + \frac{3}{2}$$

$$= \log(3) - \frac{4}{6} + \frac{9}{6} = \log(3) + \frac{5}{6}$$

001 $\frac{1}{3} \cdot \frac{1}{2} \cdot \frac{1}{2} \cdot \log(12)$ 1

100 2

010 3

110 4

111 5

$2^3 - 1 = 7$ $\frac{1}{12}$

$$\frac{7}{12} \log\left(\frac{12}{7}\right)$$

$$= \frac{7}{12}\left[\log(3) + 2\right] - \frac{7}{12}\log(7)$$

~~000~~

001 100

010

001

0/8

1/7

$$\boxed{\frac{1}{3}\cdot\frac{1}{2}\cdot\frac{1}{2}}$$

$$\frac{1}{3}\cdot\frac{1}{2}\cdot\frac{1}{2}\cdot 3=\frac{1}{4}$$

$$\left[\frac{1}{3}\cdot\frac{1}{2}\cdot\frac{1}{2}=\frac{1}{12}\right]\cdot 3=\frac{1}{4}$$

$$\left[\frac{1}{3}\cdot\frac{1}{2}\cdot\frac{1}{2}\cdot 2\right]\cdot 3=\frac{1}{6}+\frac{1}{6}+\frac{1}{6}=\frac{1}{2}$$

111

001

010

100

110

101

011

$$\frac{1}{4}\log(4) + 3\cdot\frac{1}{12}\log(12)$$
$$+ 3\cdot\frac{1}{6}\log(6)$$

$$= \frac{1}{2} + \frac{1}{4}\left[\log(6) + \log(2)\right]$$
$$+ \frac{1}{2}\left[\log(3) + \log(2)\right]$$

$$= \frac{1}{2} + \frac{1}{4} + \frac{1}{4}\left[\log(3) + \log(2)\right]$$
$$+ \frac{1}{2}\log(3) + \frac{1}{2}$$

$$= \frac{3}{2} + \frac{3}{4}\log(4)$$