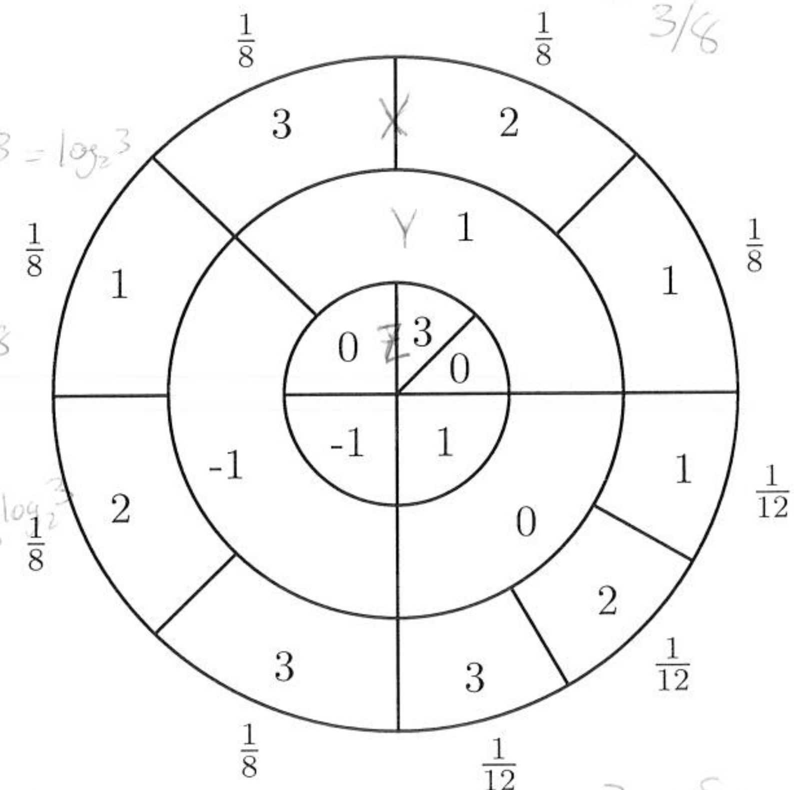
$$P[X=1 \mid Z=0] = \frac{P[X=1 \,\&\, Z=0]}{P[Z=0]} = \frac{2/8}{3/8} = 2/3$$

$$H(X) = \sum_a P(X=a) \cdot \log_2 1/P(X=a)$$



(a) Calculate $H[X]$. $= \frac{1}{3}\log_2 3 + \frac{1}{3}\log_2 3 + \frac{1}{3}\log_2 3 = \log_2 3$

(b) Calculate the expected number of binary registers needed to store Z.

$H(Z) = \frac{3}{8}\log_2 8/3 + \frac{1}{4}\log_2 4 + \frac{1}{4}\log_2 4 + \frac{1}{8}\log_2 8$

(c) Calculate the uncertainty of Z given that $X = 0$. $H(Z|X=0) = 0$ $\quad H(X|Z=0) = \frac{2}{3}\log_2(3/2) + \frac{1}{3}\log_2 3$

(d) Calculate $H[\cancel{X}|Y, Z]$.

$H[Z|Y,X]$

(e) Calculate $\cancel{H[Z|Y]}$.

$H[X|Y]$

$$\frac{3}{8}(\log_2 8 - \log_2 3) + \frac{1}{4}\cdot 2 + \frac{1}{4}\cdot 2 + \frac{1}{8}\cdot 3$$

$$= \frac{9}{8} + \frac{1}{2} + \frac{1}{2} + \frac{3}{8} - \frac{3}{8}\log_2 3$$

$$= 5/2 - \frac{3}{8}\log_2 3$$

$$H[Z|Y] = P[Y=1]H[Z|Y=1] + P[Y=-1]H[Z|Y=-1] + P[Y=0]H[Z|Y=0]$$

$$= \frac{3}{8}\left(\frac{2}{3}\log_2 3/2 + \frac{1}{3}\log_2 3\right) + \frac{3}{8}\left(\frac{2}{3}\log_2 3/2 + \frac{1}{3}\log_2 3\right) + \frac{1}{4}\cdot 0$$

$Y=1 \ \& \ X=1$

$$H[Z|Y,X] = P[Y=1 \& X=1]\,H[\cancel{Z}|Y=1 \& X=1] + \dots$$

$$P[Y=1 \& X=1]\left(P[Z=0|X=1 \& Y=1] \log_2 \frac{1}{P[Z=0|X=1 \& Y=1]} \right) + \dots$$

$$= 0$$

because Z is dependent on X & Y

so $P[Z=a|X=b \& Y=c] = 1$

$$H[X|Y] = \frac{3}{8} H[X|Y=1] + \frac{3}{8} H[X|Y=-1] + \frac{1}{4} H[X|Y=0]$$

$$= \frac{3}{8}\left(\frac{1}{3}\log_2 3 + \frac{1}{3}\log_2 3 + \frac{1}{3}\log_2 3\right) + \frac{3}{8}\log_2 3 + \frac{1}{4}\log_2 3$$

$$= \log_2 3$$

5 double XX / 139 $\cong$ 0.0359

3 double XX / 134 $\cong$ .0223

$$P \cong \frac{.027\,N}{(N-1)I_c + 1 - (0.038)N}$$

$$P_{first} = \frac{.027(140)}{139(0.054) + 1 - (0.038)140} = \frac{3.78}{} \cong 0.18644$$

$$P_{second} = \frac{.027(135)}{134(0.037) + 1 - (0.038)135} \cong 4.4021$$