

Q5

Sicheng Wang

March 1, 2019

1 a)

$$\begin{aligned}P(A|B, C) &= \frac{P(A, B, C)}{P(B, C)} \\&= \frac{\frac{P(A, B, C)}{P(C)}}{\frac{P(B, C)}{P(C)}} \\&= \frac{\frac{P(A, B, C)}{P(A, C)} \frac{P(A, C)}{P(C)}}{\frac{P(B, C)}{P(C)}} \\&= \frac{P(B|A, C)P(A|C)}{P(B|C)}\end{aligned}$$

2 b)

$$\begin{aligned}P(fair, k) &= \frac{F}{F+1} * \left(\frac{1}{2}\right)^k \\P(double, k) &= \frac{1}{F+1} * 1^k = \frac{1}{F+1}\end{aligned}$$

To believe it is a double-headed coin better than even change, $P(double, k) > P(fair, k)$.

$$\begin{aligned}P(fair, k) &> P(double, k) \\ \frac{1}{F+1} &> \frac{F}{F+1} * \left(\frac{1}{2}\right)^k \\ 1 &> \frac{F}{2^k} \\ k &> \log_2 k\end{aligned}$$