

$$\ell = \left\lceil \log_2 \frac{1}{\prod_{i=1}^n p(x_i)} \right\rceil = \left\lceil \sum_{i=1}^n \log_2 \frac{1}{p(x_i)} \right\rceil < \sum_{i=1}^n \log_2 \frac{1}{p(x_i)} + 1$$