Entropy: Properties
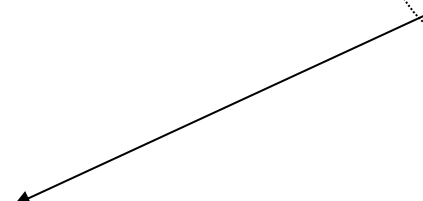
- **Minimum value of H(X): 0**
  - **What kind of X has the minimum entropy?**

- **Maximum value of H(X): log M, where M is the number of possible values for X**
  - **What kind of X has the maximum entropy?**

- **Related to coding**

$$H(X) = -\sum_{x \in \Omega} p(x) \log_2 p(x)$$

$$= \sum_{x \in \Omega} p(x) \log_2 \frac{1}{p(x)}$$

$$= E\left(\log_2 \frac{1}{p(x)} \right)$$

$$\textit{"Information of } x\textit{"} = \textit{"\# bits to code } x\textit{"} = -\log p(x) \quad H(X) = E_p[-\log p(x)]$$