



**Definition**

Consider two distributions on the same finite set. The *cross entropy* of the first distribution *relative* to the second distribution is the expectation of the negative logarithm of the first distribution under the second distribution.

**Notation**

Suppose  $p : A \rightarrow \mathbf{R}$  and  $q : A \rightarrow \mathbf{R}$  are distributions on the finite set  $A$ . We denote the cross entropy of  $p$  relative to  $q$  by  $H(q, p)$ ; in symbols,

$$H(q, p) := - \sum_{a \in A} q(a) \log p(a)$$



