



## Why

We want to indicate membership in a set by a function.<sup>1</sup>

## Definition

The *characteristic function* (or *indicator function*) of a set  $X$  is a function from  $X$  to  $\{0, 1\}$  which is 1 if the argument is in  $A$  and 0 otherwise.

The function which assigns to each subset  $A$  of  $X$  to characteristic function of  $A$  is a one-to-one function from  $\mathcal{P}(X)$  onto  $2^X$ .

## Notation

Let  $A$  be a non-empty set and  $B \subset A$ . We denote the characteristic function of  $B$  in  $A$  by  $\chi_B : A \rightarrow R$ . The Greek letter  $\chi$  is a mnemonic for “characteristic”.

The subscript indicates the set on which the function is one. In other words, for all  $B \subset A$ ,  $\chi_B^{-1}(\{1\}) = B$ .<sup>2</sup>

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<sup>1</sup>Future editions will elaborate, perhaps with forward-looking connections to Rectangular Functions.

<sup>2</sup>Another notation used is  $1_B : A \rightarrow \{0, 1\}$  or  $\mathbf{1}_B$ . In the second notation here, the 1 is bold.



