Definition  
A data type can be considered abstract when it is defined in terms of operations on it, and its implementation is hidden (so that we can always replace one implementation with another for, e.g. efficiency reasons, and this will not interfere with anything in the program). Thus, speaking about such a type, we leave its implementation aside considering it irrelevant to the topic, unless we directly discuss the implementation.  
  
An intuitive explanation:  
Define an interface (in mathematical terms a signature)  
Define known constants  
Define functions in terms of the constants and composition with other functions.

You don't know how the ADT computes, but you know what it computes.

The term function is used in the mathematical sense here: as a mapping from one set of values (the domain) to another (the range).

This differs from the usual programmatic notion due to the fact that it just associates input and output values and has no means of causing programmatic side effects (such as assignment to global variables.)