Inductive Datatypes

1. [**Exercise 8.12, page 215**]

   Give an inductive definition of the function *sum*(L) which computes the sum of a list L of numbers. For example, *sum* $[6, 2, 5] = 13$.

   Use your definition to step-by-step compute *sum* $[6, 2, 5]$.

A dictionary data structure is a binary tree with values stored at the (internal) nodes with all values stored in the left subtree of a node being smaller than the value stored at the node, and all values stored in the right subtree of a node being larger than the value stored at the node. For example, valid dictionaries for storing the set of names

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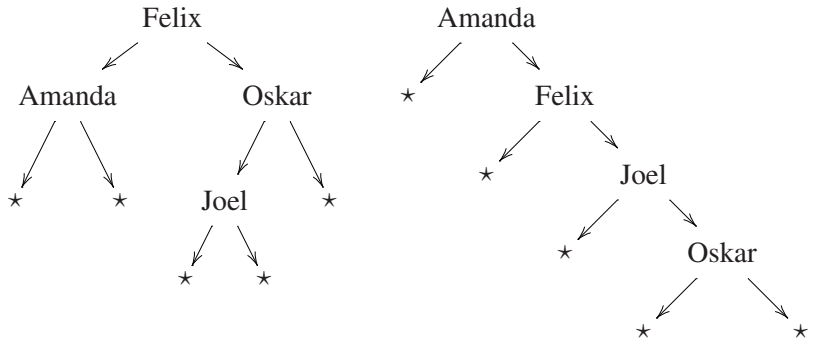
(where order is determined lexicographically) may be given by either of the following trees:



2. [**Exercise 8.7, page 212**]

   Give an inductive definition for the dictionary data structure. Note that the data structure would only define the syntactic structure; the fact that the values are stored in proper order is a semantic issue which will not be reflected in the definition.

   Use your definition to express the above two dictionaries.

3. Given an inductive definition of the function *listout*(t) which converts a dictionary into a (sorted) list.

   Apply your definition to the first of the above two dictionaries.