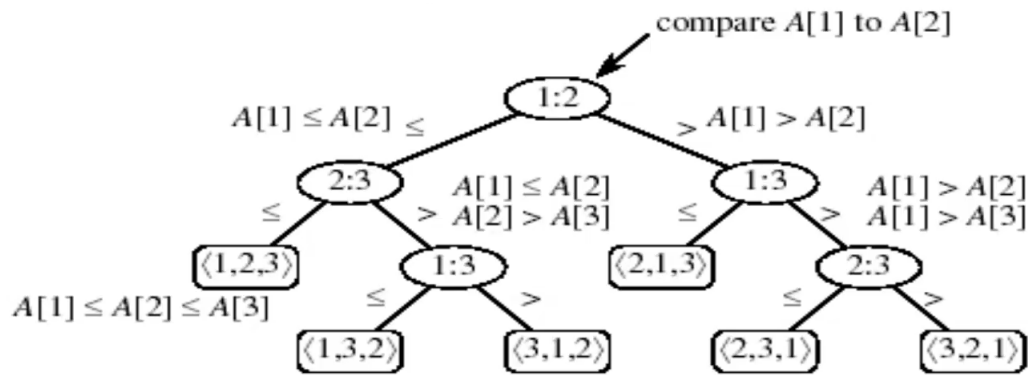


# Lower Bound on Sorting

Claim: when using **comparison sorts** (i.e. insertion sort, merge sort, heapsort, quicksort, etc...) we must make *at least*  $n \lg n$  comparisons in the general case.

## The Decision Tree Model

- an abstraction of any comparison sort
- represents comparisons made by a specific algorithm on inputs of a given size



- each internal node is labeled by indices of array elements from their original position
- each leaf is labeled by the permutation of orders that the algorithm determines

## Lower bound of the tree

The lower bound of the height of the tree is  $n \lg n$ .