① Lower bound for comp-based sorting.

- Any comp-based algorithm is a decision tree
- Root is input and leaves are output
- Leaves represent permutations of input
- If alg. is to be correct, all $n!$ permutations should be at the leaves
- An alg has to take time at least equal to depth of tree $= \Omega(\log n!)$
- Height of tree is $\log n!$

② Deterministic linear-time selection

- Divide into $\frac{n}{5}$ groups of 5 elements each
- Find median of each group
- Recursively find median of the medians
- Use this median to partition array
- Recurse on the appropriate side

$\frac{n}{5}$ $\quad 3\frac{n}{10}$ $\quad$ for $\frac{7n}{10}$

$$T(n) \leq O(n) + T(n/5) + O(n) + T\left(\frac{7n}{10}\right)$$

$$\leq T(n/5) + T\left(\frac{3n}{10}\right) + cn$$

$$= O(n).$$