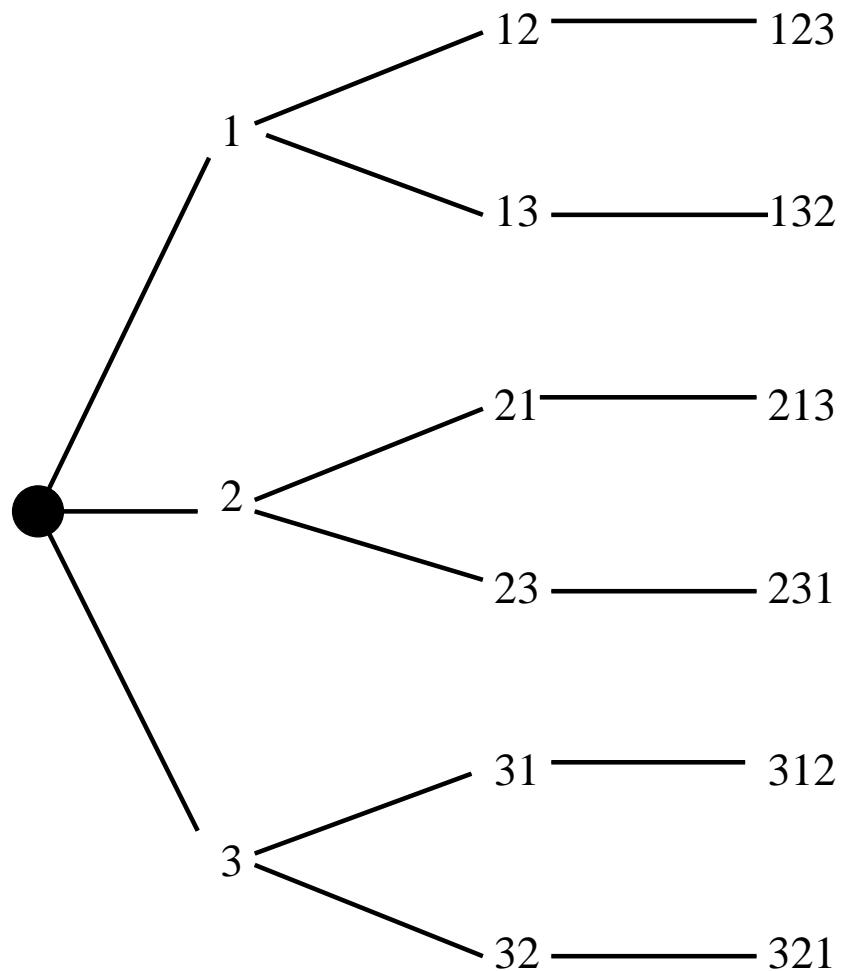


Generating permutations (lexicographic order)



Generating permutations

Input: n .

Output: all permutations of $1, 2, \dots, n$, listed in lexicographic order.

1. Start with the permutation

$$s_1 = 1, s_2 = 2, \dots, s_n = n.$$

2. Find the rightmost element s_i so that

$$s_i < s_{i+1}.$$

3. Find the smallest element s_j so that

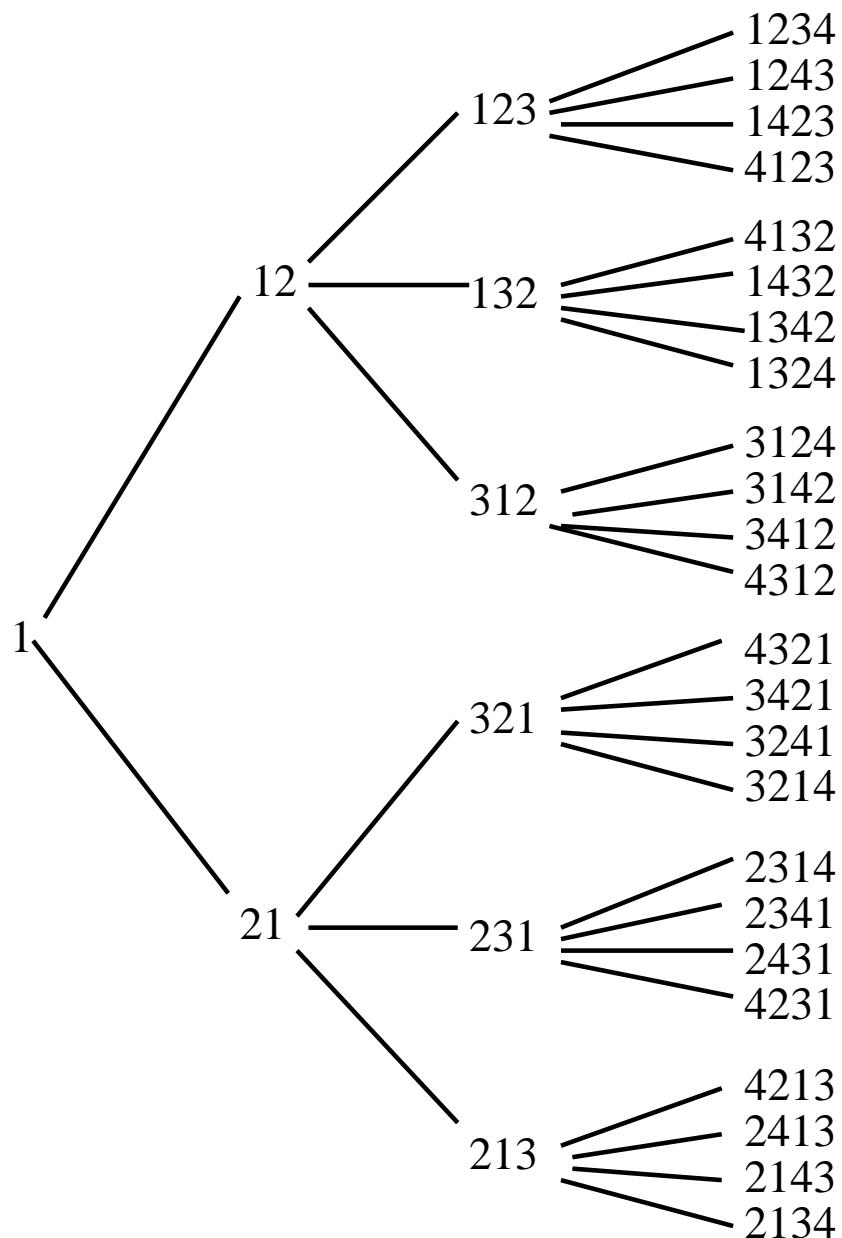
$$s_j > s_i \text{ and } j > i.$$

4. Swap s_i and s_j .

5. Rearrange the elements $s_{i+1} \dots s_n$ in increasing order.

6. Repeat steps 2–5 until no element s_i can be found in step 2 (so all s_i 's are in decreasing order).

Generating permutations (minimal difference)



Inclusion/Exclusion Principle:

For all sets A, B, C, D :

$$|A \cup B| = |A| + |B| - |A \cap B|$$

$$|A \cup B \cup C| = |A| + |B| + |C| - |A \cap B| - |A \cap C| - |B \cap C| + |A \cap B \cap C|$$

$$\begin{aligned} |A \cup B \cup C \cup D| &= |A| + |B| + |C| + |D| \\ &\quad - |A \cap B| - |A \cap C| - |A \cap D| \\ &\quad - |B \cap C| - |B \cap D| - |C \cap D| \\ &\quad + |A \cap B \cap C| + |A \cap B \cap D| \\ &\quad + |A \cap C \cap D| + |B \cap C \cap D| \\ &\quad - |A \cap B \cap C \cap D| \end{aligned}$$

Etc.....