

NCKU Programming Contest Training Course

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<http://myweb.ncku.edu.tw/~f74002060/Course5.rar>

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Backtracking

- What is backtracking?
 - A **searching** technique
- Goal
 - Find **solutions** under some constraints
 - Try to list out all kinds of possible ways
- Concept
 - Enumerate (枚舉) Pruning (剪枝)



Example

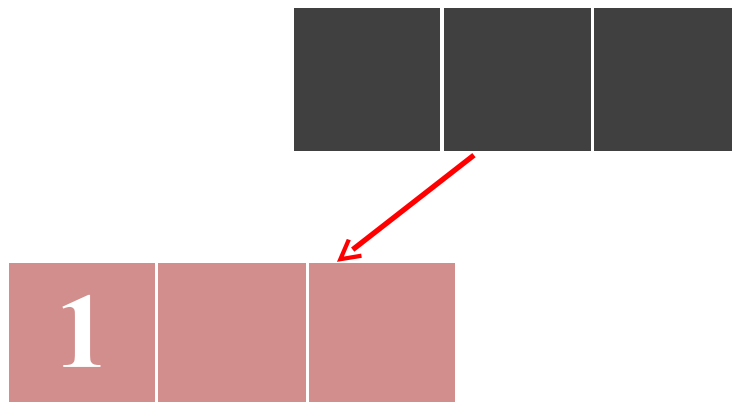
- Goal
 - give 5 numbers (1~5)
 - choose 3 numbers and list out by its order
- possible solution
 - 1 2 3 、 2 3 4 、 3 4 5 ...



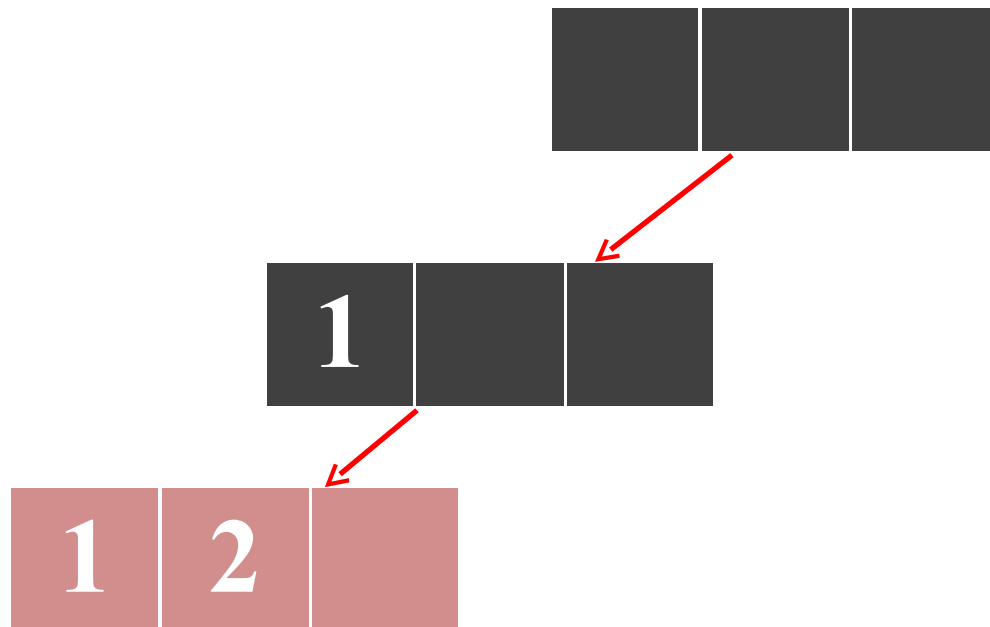
Example



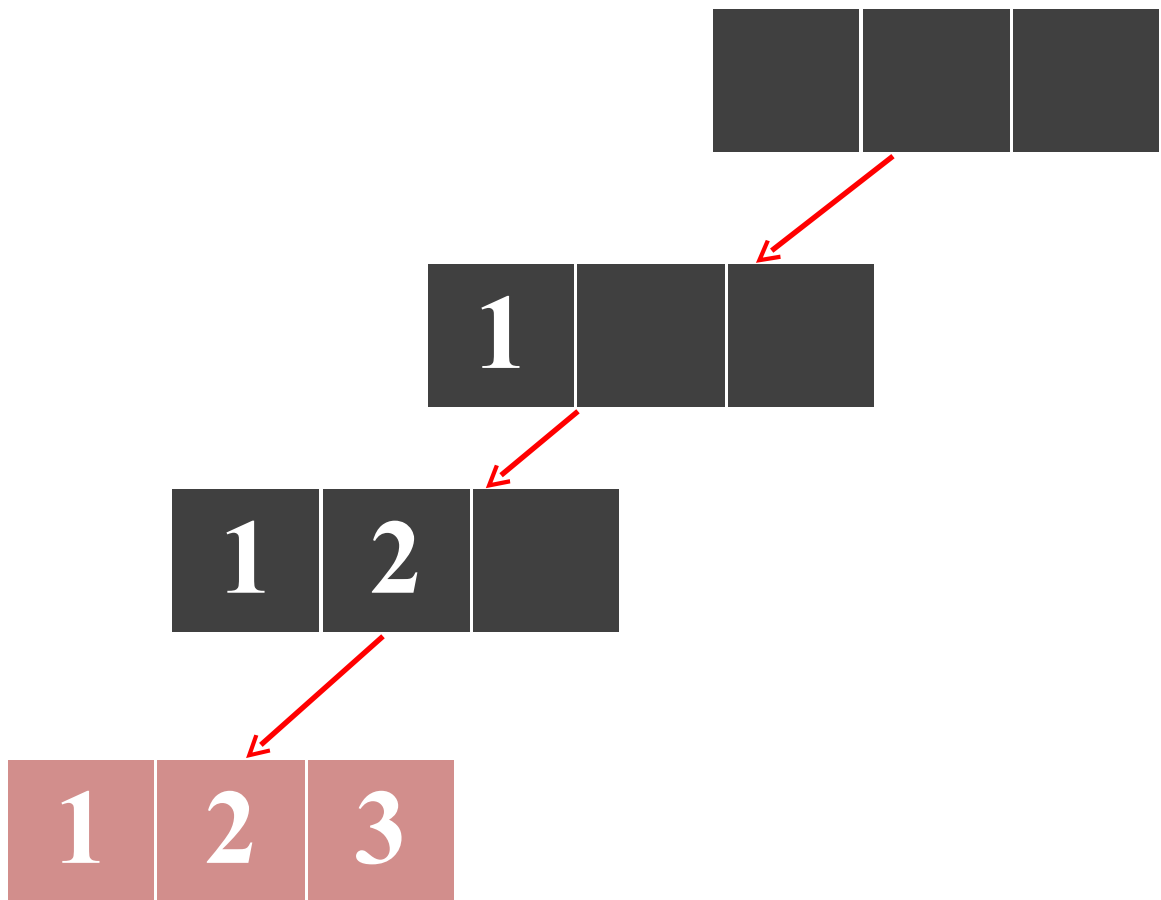
Example



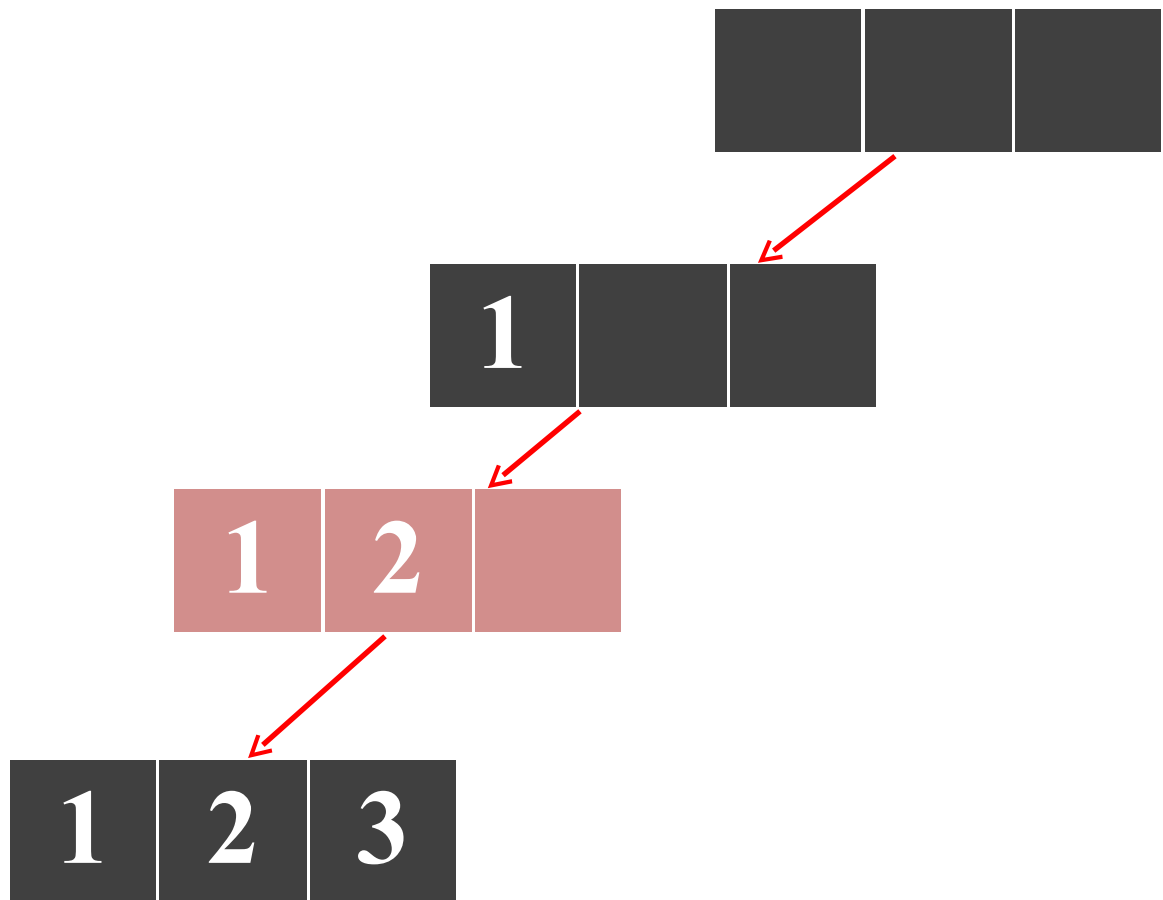
Example



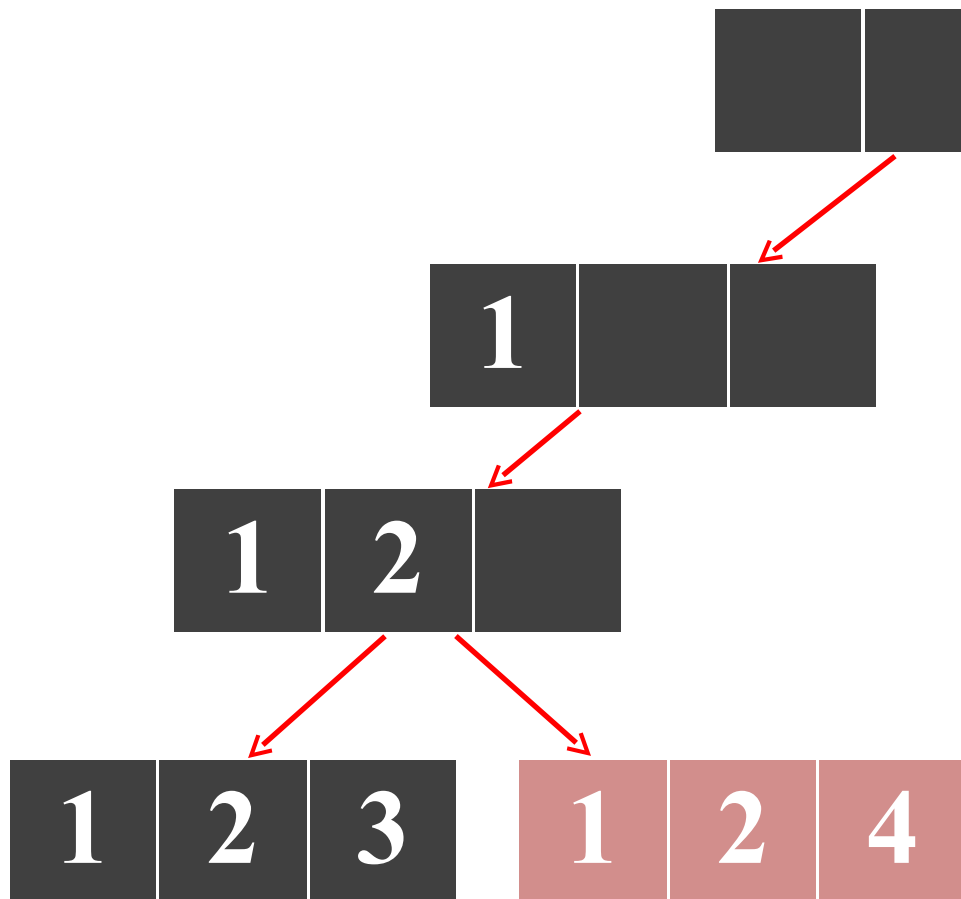
Example



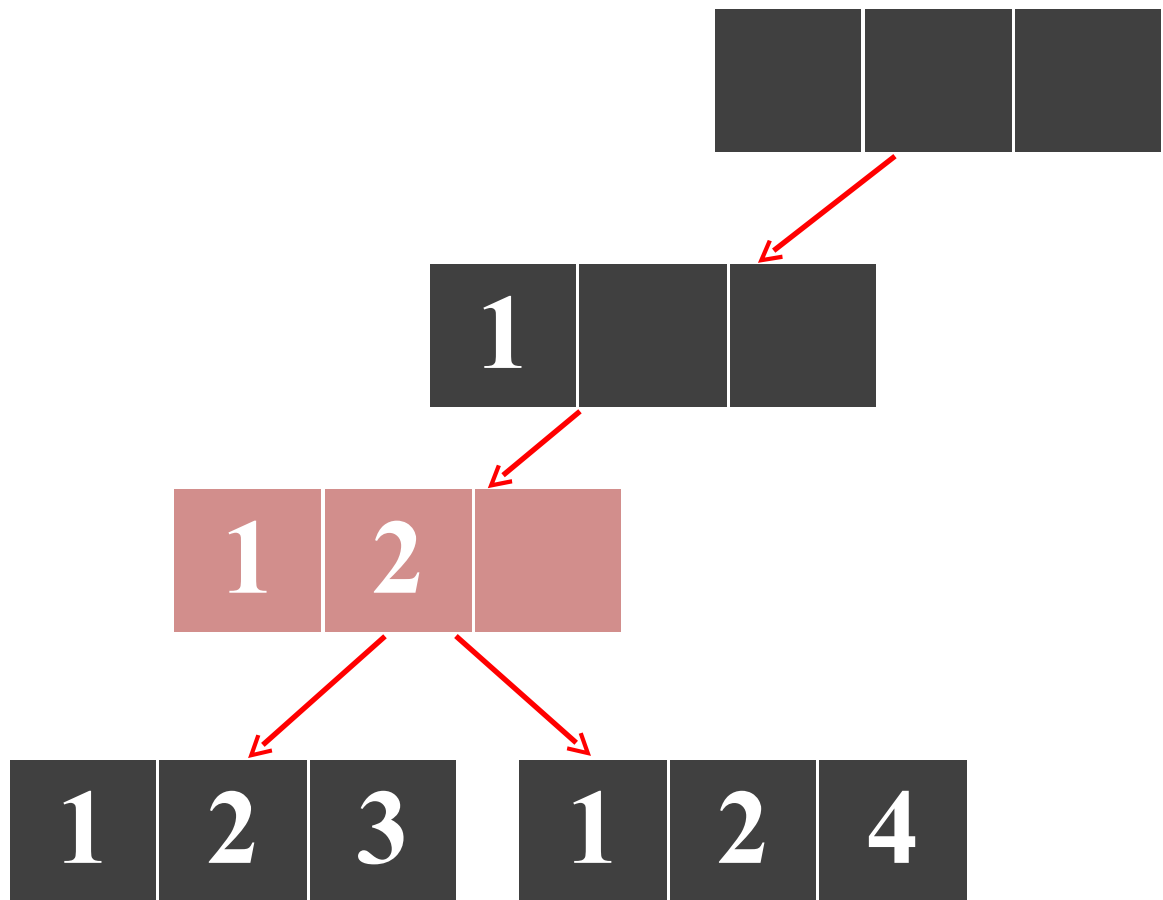
Example



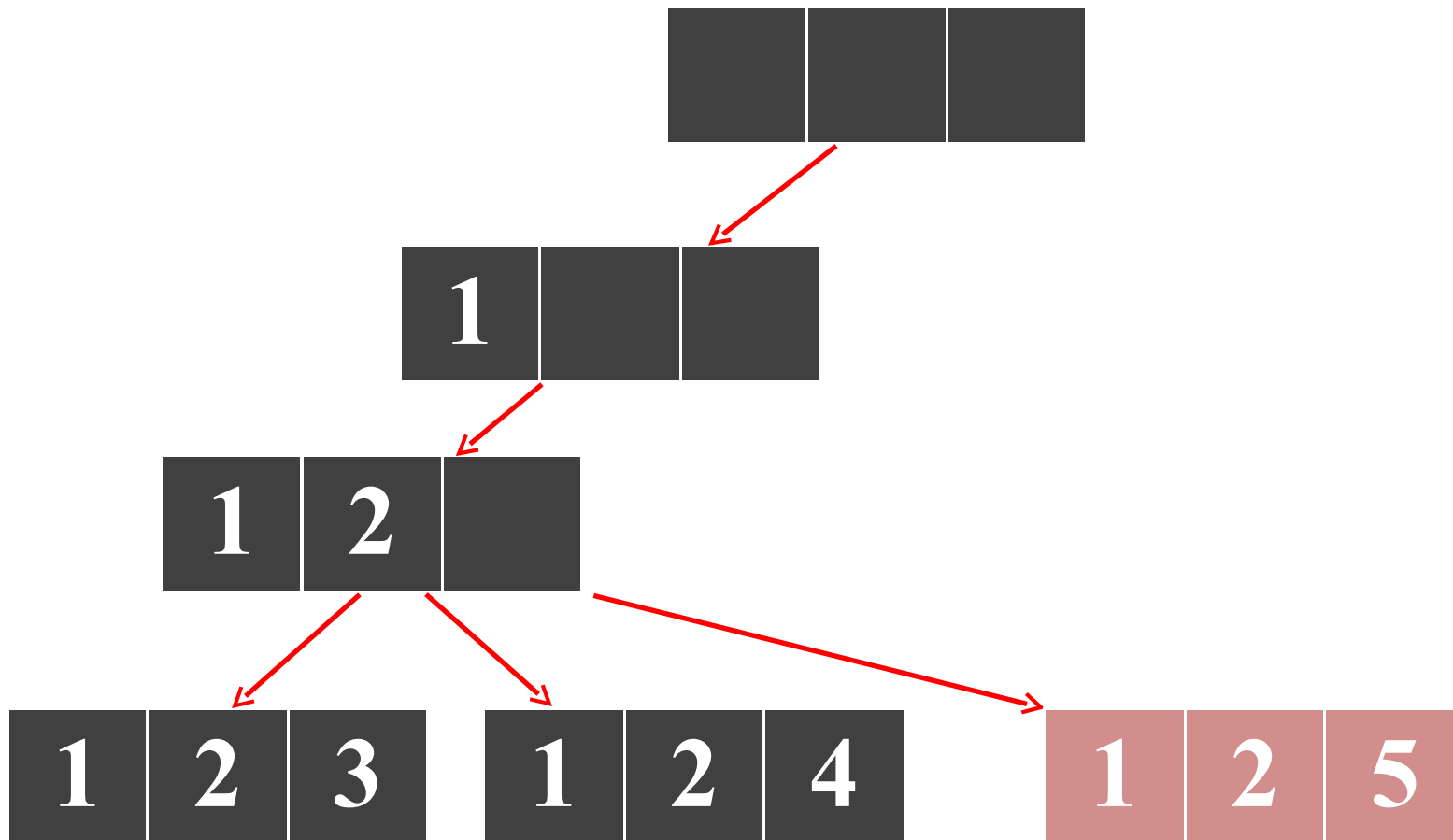
Example



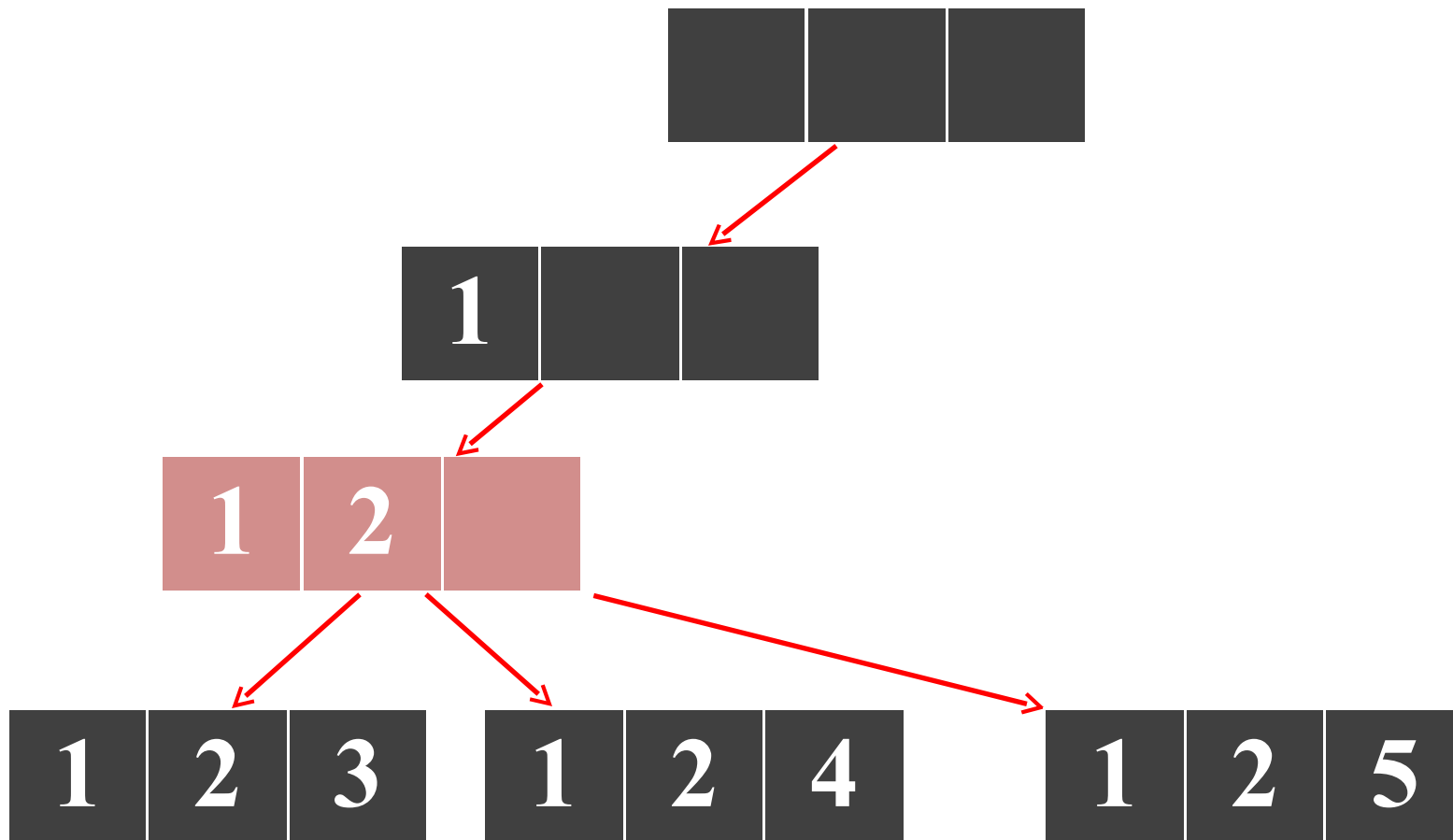
Example



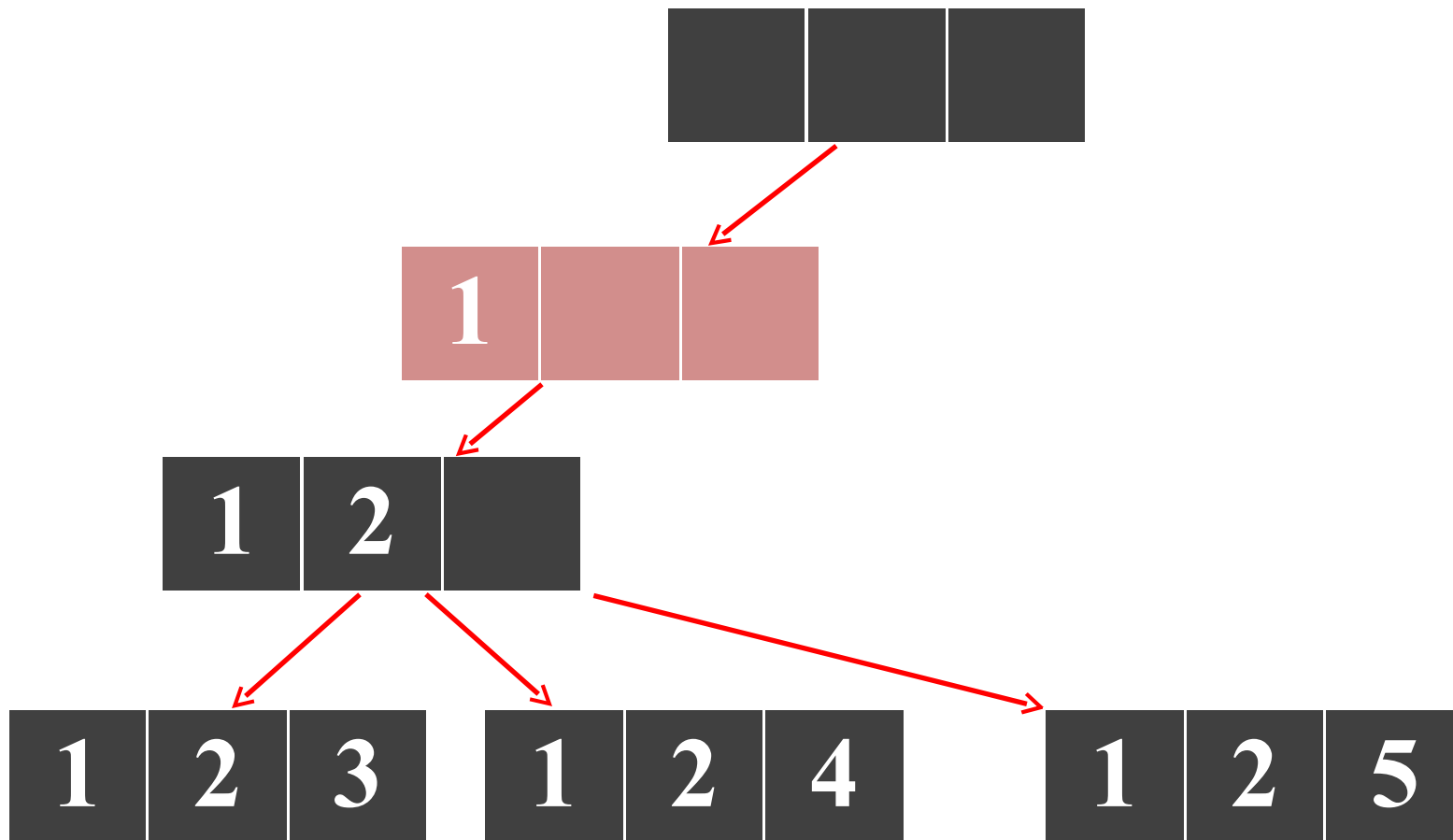
Example



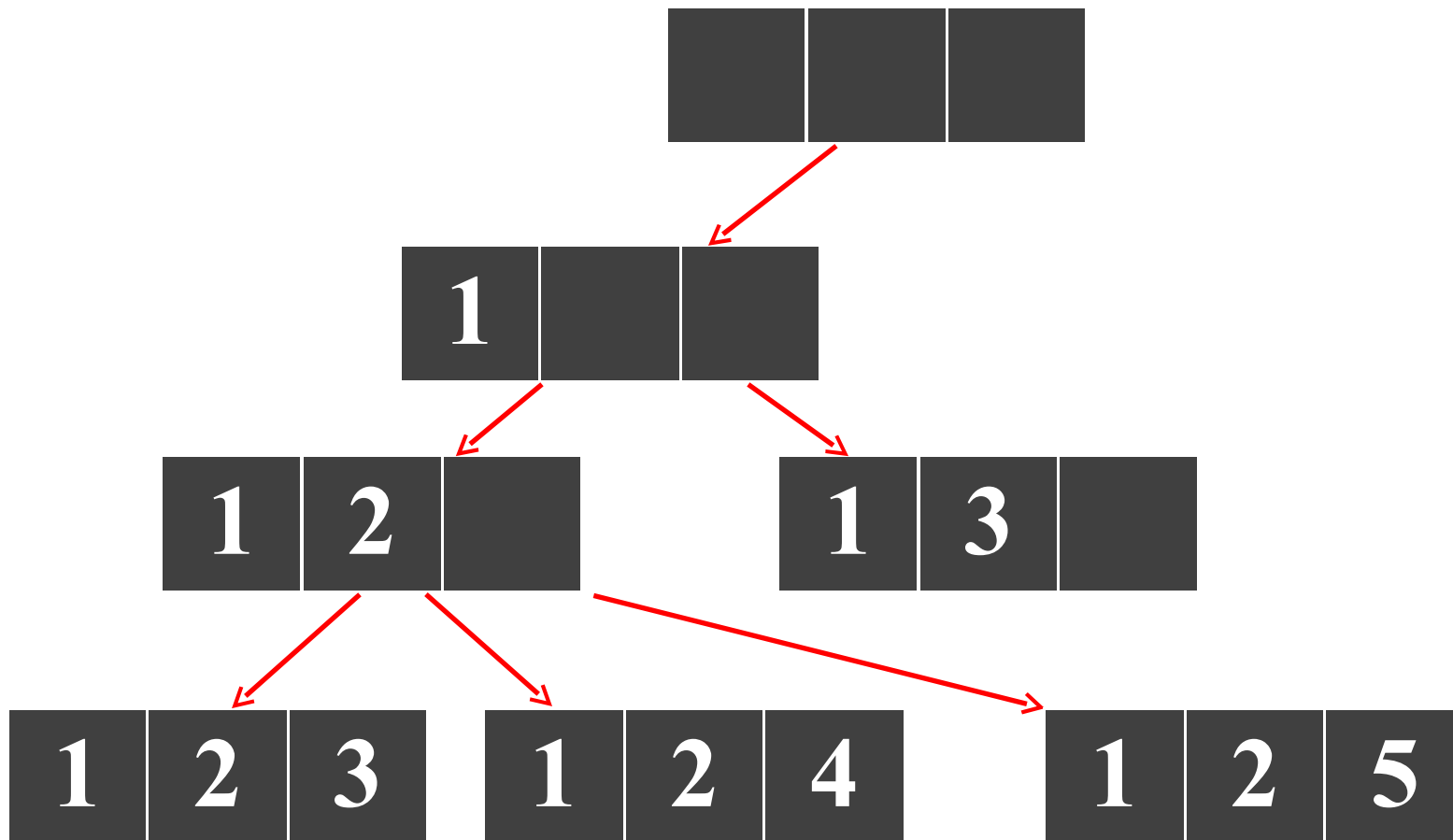
Example



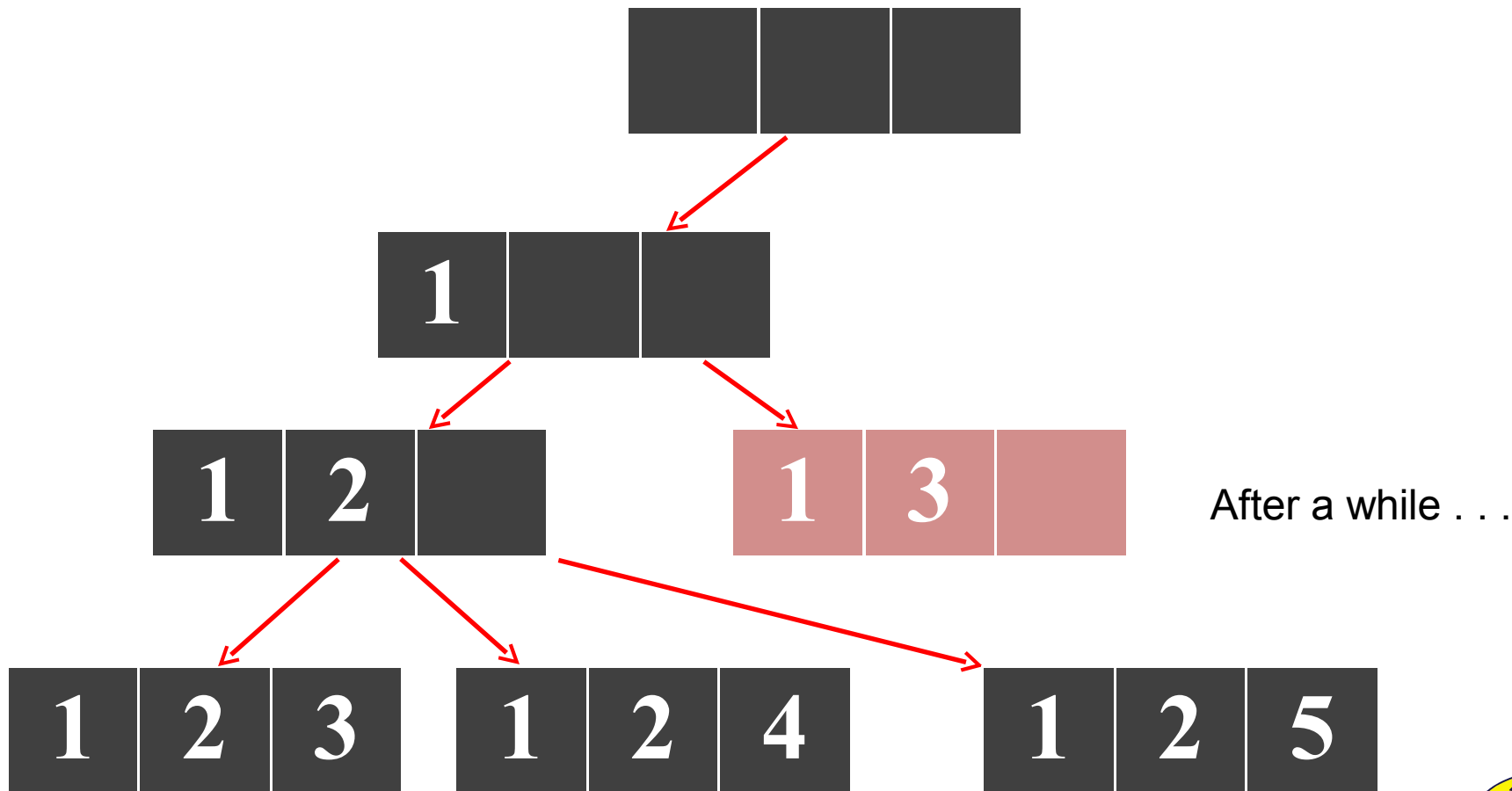
Example



Example



Example



Example

You find all the solution

123 234 345

124 235

125 245

134

135

145



Strategy

- Enumerate possible solution
 - by DFS order
- Set the end point
 - return when find out a solution
- Answer Array
 - maintain **possible solution** during searching
- Prune
 - **Skip unnecessary search**



Pseudo Code

```
int solution[MAX_DIMENSION];  
void backtracking(int dimension)  
{  
    if( solution is well-generated )  
    {  
        process solution  
        return;  
    }  
    for( x = each value of current dimension )  
    {  
        if( condition )  
        {  
            solution[dimension] = x;  
            backtrack( dimension + 1 );  
        }  
    }  
}  
call backtracking( 0 );
```



Practice

Uva 441

Uva 167



Thank for Your Attention

