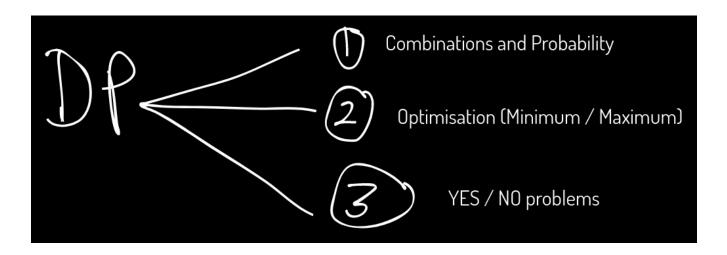
# Solving medium DP Problems

# Recap

For DP, we need:-

- 1. Recursive relation (with base case)
- 2. Overlapping subproblems



### **Basics of Combinatorics**

#### **Product Rule:**

If a job A can be done in **m ways** and after it is done, another job B can be done in **n ways**, then total number of ways to do both A **AND** B is m\*n ways.

(Independent jobs)

**Eg.** You need to form a team for ICPC of 1 mathematician, 1 programmer and 1 gamer. There are a total of 10 mathematicians, 15 programmers and 5 gamers in your college. In how many ways, can you form a team?

- 10 ways to select a mathematician
- 15 ways to select a programmer
- 5 ways to select a gamer Total ways =  $10 \times 15 \times 5$

#### **Sum Rule**

If a job A can be done in m ways and another job B can be done in n ways, then total number of ways to do both either A **OR** B is m+n ways.

**Eg.** You need to form a team for ICPC of 1 mathematician or 1 programmer or 1 gamer. There are a total of 10 mathematicians, 15 programmers and 5 gamers in your college. In how many ways, can you form a team ?

- 10 ways to select a mathematician
- 15 ways to select a programmer
- 5 ways to select a gamer Total ways = 10 + 15 + 5 = 30

### **Problem 1: Array Description**

Link: <a href="https://cses.fi/problemset/task/1746/">https://cses.fi/problemset/task/1746/</a>

Link to my code: <a href="https://cses.fi/paste/24fd50ca8e4cb856203207/">https://cses.fi/paste/24fd50ca8e4cb856203207/</a>

#### **Problem 2: Coin Combinations I**

Link: <a href="https://cses.fi/problemset/task/1635">https://cses.fi/problemset/task/1635</a>

Link to my code: <a href="https://cses.fi/paste/33c8a1398ac7c753203fba/">https://cses.fi/paste/33c8a1398ac7c753203fba/</a>

#### **Problem 3: Coin Combinations II**

Link: https://cses.fi/problemset/task/1636

Link to my code: <a href="https://cses.fi/paste/4a0ca5f0bd1fe8dc204113/">https://cses.fi/paste/4a0ca5f0bd1fe8dc204113/</a>

## **Problem 4: Exponential Subsets (Hackerearth)**

Link:

https://www.hackerearth.com/practice/algorithms/dynamic-programming/2-dimensional/practice-problems/algorithm/exponential-subset-f78d066f/

Link to my code:

https://www.hackerearth.com/submission/key/1899bbc5d4f744a49e3d 6970000c34d6/

# **HomeWork**

#### Problem 5: Two Sets II

Link: <a href="https://cses.fi/problemset/task/1093">https://cses.fi/problemset/task/1093</a>

Link to my code: <a href="https://cses.fi/paste/9b9f6fc873b99b19140b72/">https://cses.fi/paste/9b9f6fc873b99b19140b72/</a>