# Solving medium DP Problems
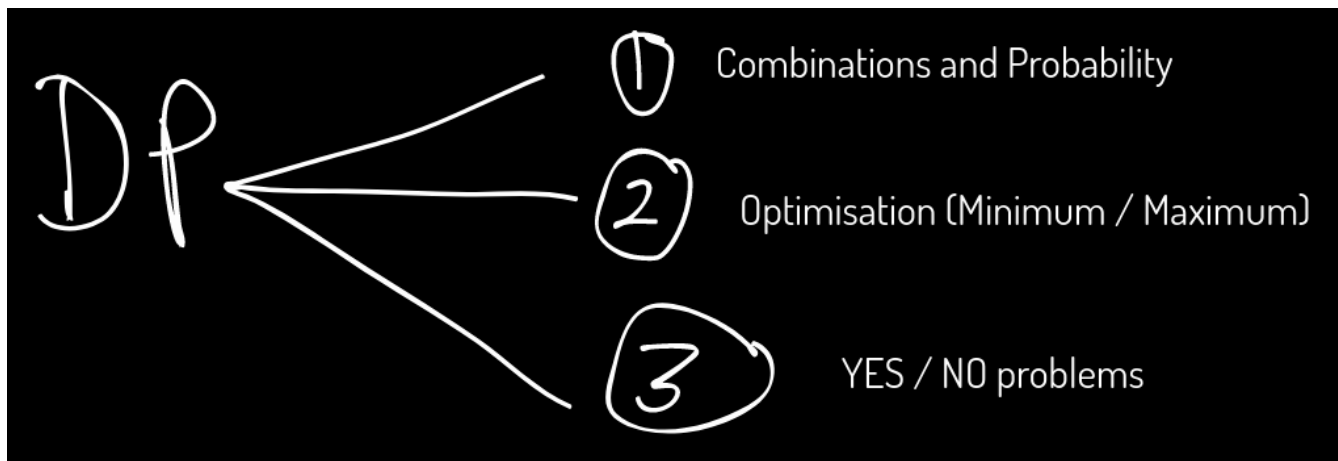
## Recap

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 x 15 x 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: https://cses.fi/problemset/task/1746/
(Code is explained in the video, link to the code will be updated on sunday at 3:00 PM)

## Problem 2: Coin Combinations I

Link: https://cses.fi/problemset/task/1635

(Code is explained in the video, link to the code will be updated on sunday at 3:00 PM)

## Problem 3: Coin Combinations II

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

(Code is explained in the video, link to the code will be updated on sunday at 3:00 PM)

## Problem 4: Exponential Subsets (Hackerearth)

Link:

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

(Code is explained in the video, link to the code will be updated on sunday at 3:00 PM)

# HomeWork

## Problem 5: Two Sets II

Link: https://cses.fi/problemset/task/1093