# DP Concepts & Questions

Video 36


Failure is the world's most honest teacher. It strips away illusions and shows us where growth truly begins.

MIK...

## भाषा (Motivation)

cswithMIK → Twitter

Facebook, Instagram → codestorywithMIK

whatsapp → codes1 withMIK

- 1-D based DP
- Grid based DP
- String based DP
- Knapsack Series
- Digit DP
- Game Strategy

We'll do :-

(·) RECURSION + MEMOIZATION (Top Down)

(·) Bottom UP

(·) Time & Space


# Knapsack Series

Why it is a big deal in DP ???

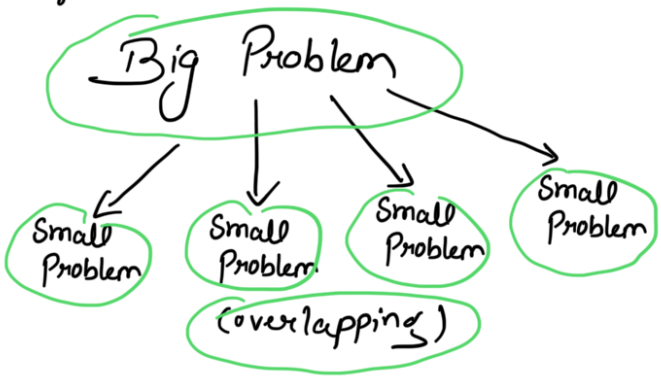
Pick / Skip

→ It is more than just "pick or skip" item.

→ It will teach you the core mechanics behind a huge range of optimization problems.


→ It teaches us

- How to think in terms of decisions: take / skip
- Foundation of DP –




- Most DP problems have constraints
  - ↳ time
  - ↳ weight
  - ↳ budget etc


- Covers a wide range of problems.
- Variants
  - → Fractional Knapsack → Greedy
  - ↳ 0/1 Knapsack

↳ Unbounded Knapsack

- Interview goldmine → Tons of problems reduce to a Knapsack problem.

# How Knapsack usually looks like?

⇒ Everything will revolve around filling a limited sized container with a subset of items.

⇒ We want to count no of ways

or

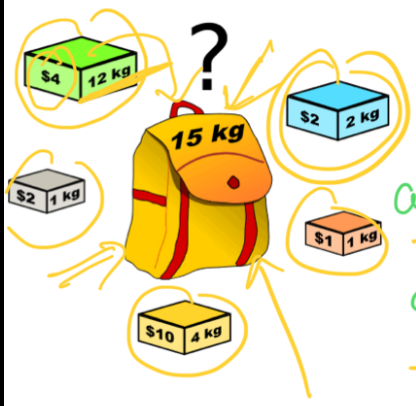
we want to optimize something (cost, weight etc.)

⇒ Items will have some weight & value.

⇒ The container capacity will be limited.

Example :-

⇒ 0/1 Knapsack Problem :- Choosing a subset of items such that we maximize the total value and weight does not exceed the container capacity.




weight
Cost

⇒ Counting total possible ways of doing

etc. etc. etc.

Warning :-

A simple Knapsack Problem can be

found hidden inside a complex problem.
with twists etc.
The more you practice, more familiar you become.

## Real world Applications :-

→ Finding the least wasteful way to cut raw materials.

→ Choosing which luggage to load into a truck/airline/ship to maximize profit while staying within weight/capacity limits.

→ Assigning computing tasks to servers where each task consumes resources (CPU, memory) and give some benefit.




etc. etc. etc.

Let's crack Knapsack

and Conquer it like

we did for other topics.

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