

DP Concepts

video
36

&

Questions



हाथ
(Motivation)

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



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withMIK

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

we'll do:-

(i) RECURSION
+
MEMOIZATION
(Top Down)

(ii) Bottom UP .

(iii) Time & Space

Knapsack Series



Why it is a big deal in DP???

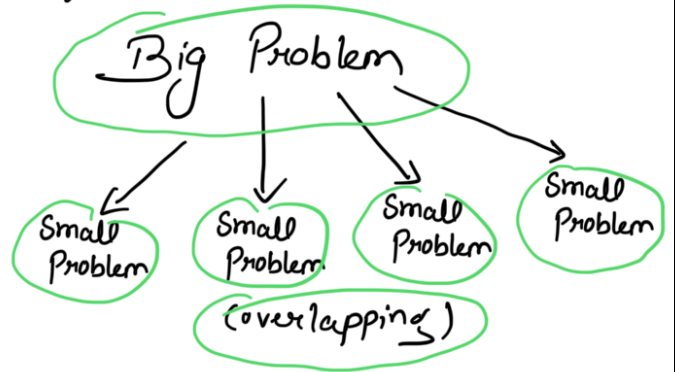
Pick / skip

- 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 \rightarrow Tons of problems reduce to a knapsack problem.

How Knapsack

Usually looks like?



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

\Rightarrow We want to count no. of ways
or

to optimize something (cost, weight, etc.)

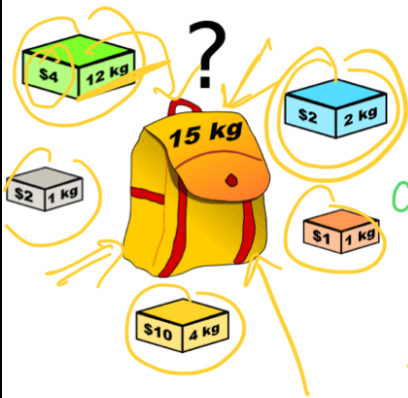
We want to optimize something (cost, weight etc.)

⇒ 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.
...

the 1990s, the number of people in the world who are undernourished has increased from 600 million to 800 million (FAO 1996).

There are a number of reasons why the world's population is becoming more undernourished. First, the world's population is growing rapidly. The world population is projected to increase from 5.5 billion in 1990 to 7.5 billion in 2020 (United Nations 1994). Second, the world's population is becoming more urbanized. The world's population is projected to increase from 25% urban in 1990 to 55% urban in 2020 (United Nations 1994). Third, the world's population is becoming more dependent on food imports. The world's population is projected to increase from 10% dependent on food imports in 1990 to 25% dependent on food imports in 2020 (United Nations 1994).

There are a number of reasons why the world's population is becoming more dependent on food imports. First, the world's population is becoming more dependent on food imports because of the increasing demand for food. The world's population is projected to increase from 5.5 billion in 1990 to 7.5 billion in 2020 (United Nations 1994).

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