Programming Methodology - Lab

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Lab task 4. Backtracking algorithms

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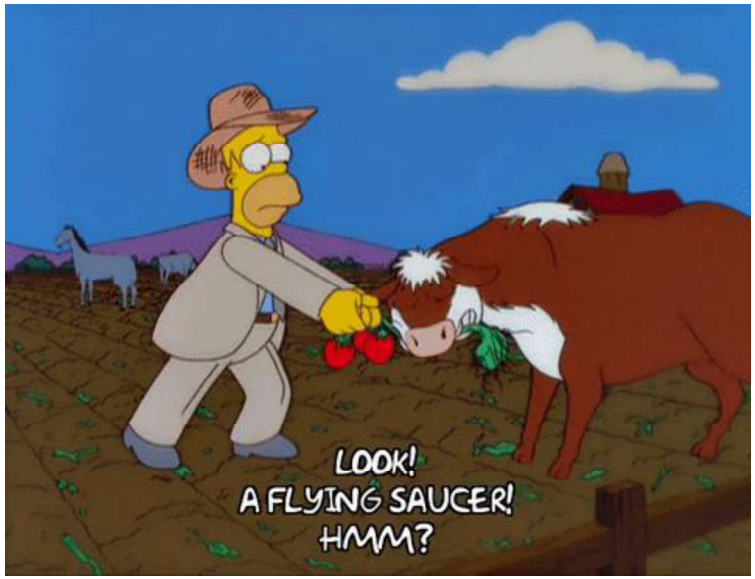
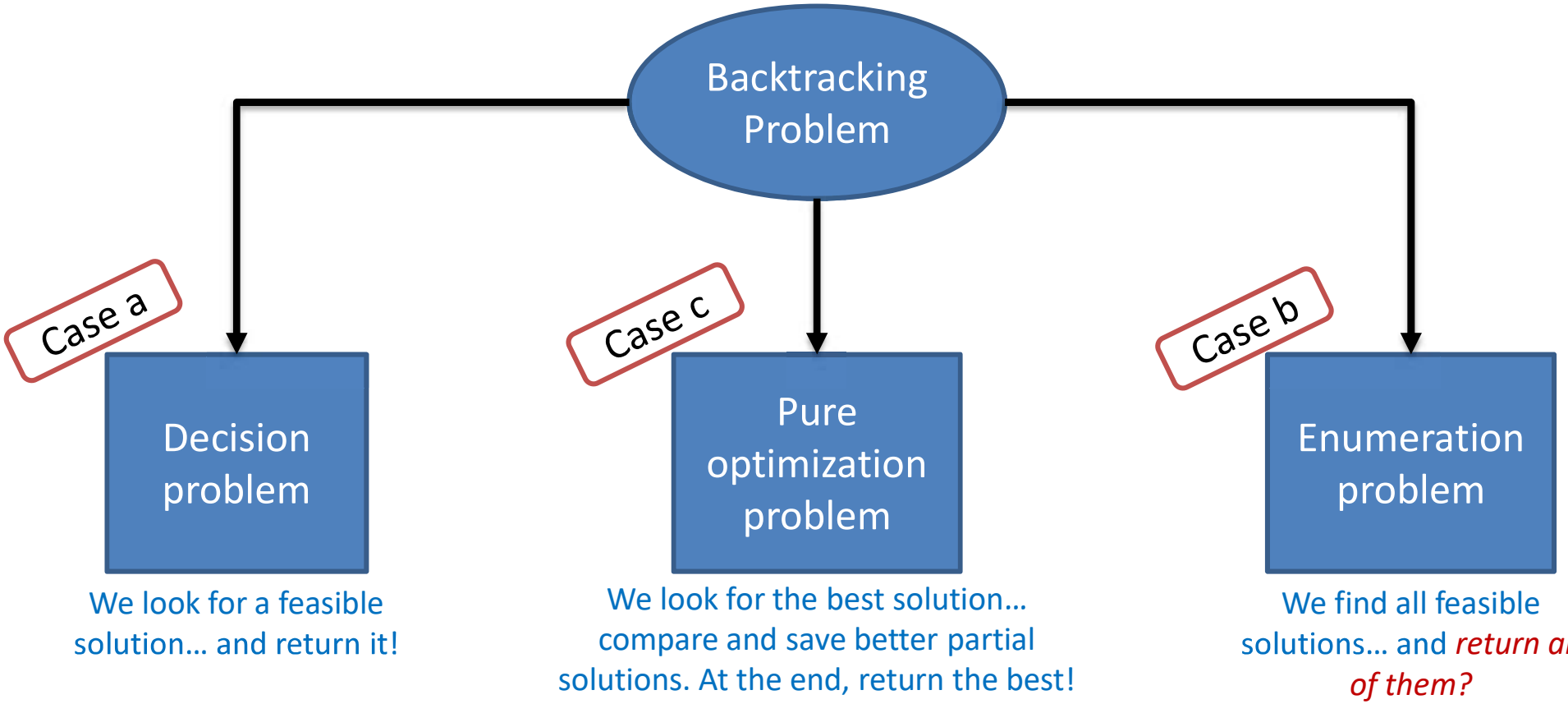
Cows' Livestock (I)

- **Assumptions:**
  - N cows for sale (e.g. N=30)
  - Each cow:
    - Necessary space
    - Necessary food
    - Milk produced
  - Plot meters (new farm): M



- **Objectives:**
  - Case a: List of cows to achieve a minimum production of L milk litres
    - *Additional constraint*: new farm with only M square meters
  - Case b: Total number of batches of cows to produce a minimum of L milk litres
    - *Additional constraint*: new farm with only M square meters
  - Case c: Best posible batch of cows to obtain the highest value of milk production.
    - *Additional constraint*: new farm with only M square meters

Cows' Livestock (II)



Key question:

What if I try to buy a cow, what if I don't buy it (as part of the solution)?

- *How would it affect the different cases?*

Cows' Livestock (III)

- **Think about the backtracking elements**
  - Stage (level)
  - Feasibility test
  - Completion test
  - Recursive call(s)
- **State-space tree** ***food for thought!***
  - In the tree…
    - What does a stage (level) represent?
      - What about the last stage (related to the completion test?)
    - What does a state (node) represent?
    - What whould be the descendants of a node?
    - What whould be the goal nodes (leaves)?
    - Will there be any pruning?
      - If exists, when (related to the feasibility test)?

Think for the three cases

Cows' Livestock (IV)

- **Important parameters to consider…**
  - Initial set of cows
  - Initial value of M meters (new farm)
  - Minimum of L litres (case a & b)
  - Free space in the new farm (in meters)
  - Milk litres produced (case a, b & c)
    - The highest in case c
- **Complexity analysis**
  - Calculate the complexity of the developed algorithms
  - Try several simulations and determine from which number of cows makes the problem untreatable