

Dynamic Programming

- Optimization Problems
- Dynamic Programming Paradigm
- Example: Matrix multiplication
- Principle of Optimality
- Exercise: Trading post problem

Optimization Problems

- In an optimization problem, there are typically many *feasible* solutions for any input instance I
- For each solution S , we have a *cost* or *value* function $f(S)$
- Typically, we wish to find a feasible solution S such that $f(S)$ is either *minimized* or *maximized*
- Thus, when designing an algorithm to solve an optimization problem, we must prove the algorithm produces a best possible solution.

Example Problem

You have six hours to complete as many tasks as possible, all of which are equally important.

Task A - 2 hours Task D - 3.5 hours

Task B - 4 hours Task E - 2 hours

Task C - 1/2 hour Task F - 1 hour

How many can you get done?

- Is this a minimization or a maximization problem?
- Give one example of a feasible but not optimal solution along with its associated value.
- Give an optimal solution and its associated value.