Greedy Algorithms

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Objectives

Your Objectives:

- Explain the properties of a greedy algorithm
- Know when to use it in a contest.

Properties of Greedy Algorithms

1. They have *optimal substructure* — subproblems have optimal solutions that can be combined to get the main solution.
2. They have the *Greedy Property* — We will never regret making a greedy choice locally.

Classic Example: Coin Change

- Given coins of values 25, 10, 5, 1: make 57 with as few coins as possible.
- Greedy for this version! $57 = 25 \times 2 + 5 + 1 \times 2$.
- A 20 cent coin will break the greedy property!
- 40 cents $= 20 \times 2$ is optimal, not $25 + 10 + 5$.

In contests

- Use it if you can, but *be sure*. Otherwise, use Complete Search or DP.
- Learn a few classic algorithms: coin change, load balancing, interval covering
- Preprocessing input can help... e.g., sorting your input first.