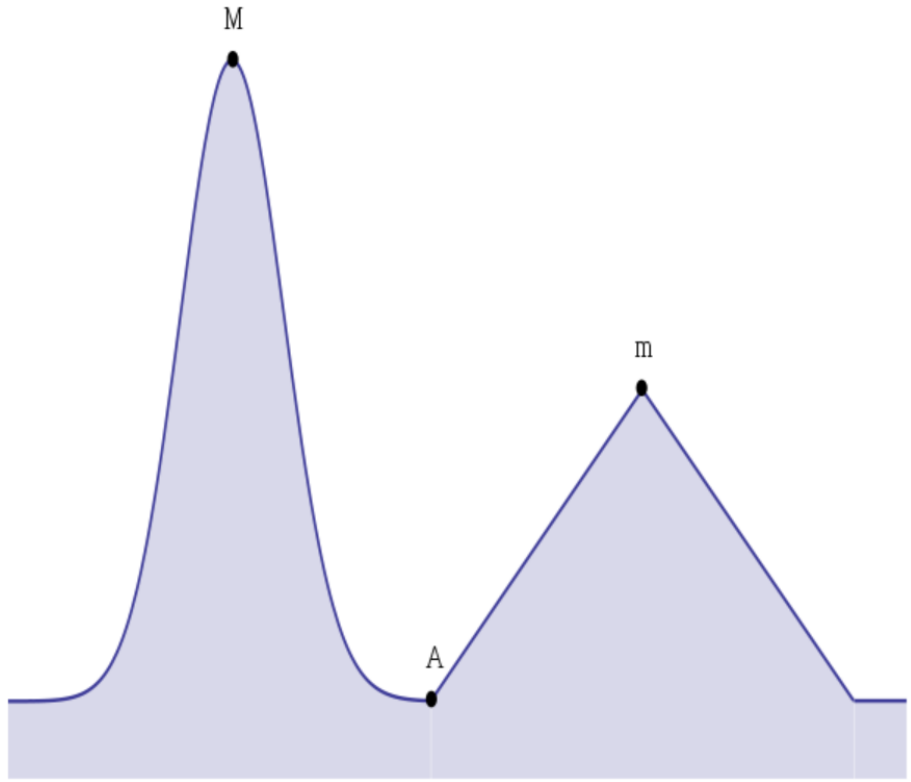
What is...a greedy algorithm 1?

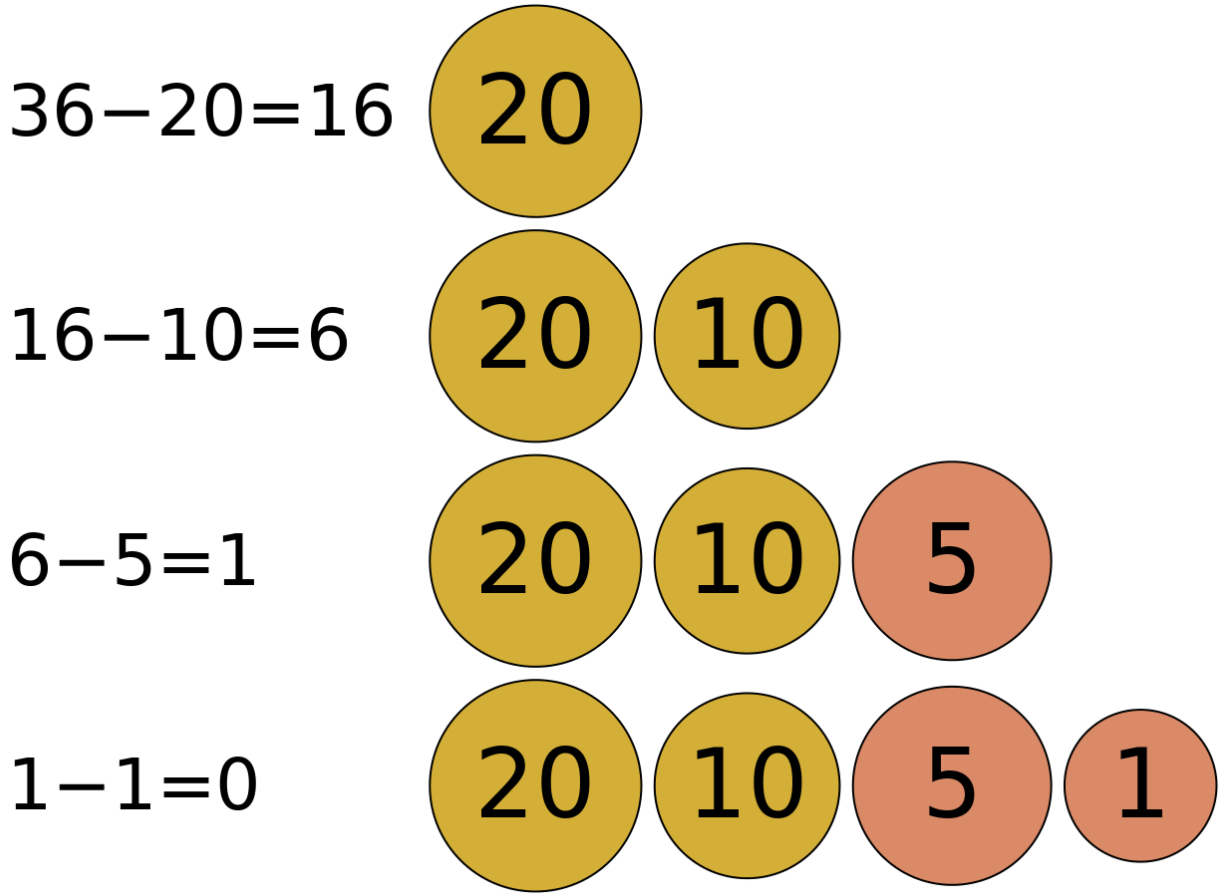
Or: Greedy in general

Do not be greedy!



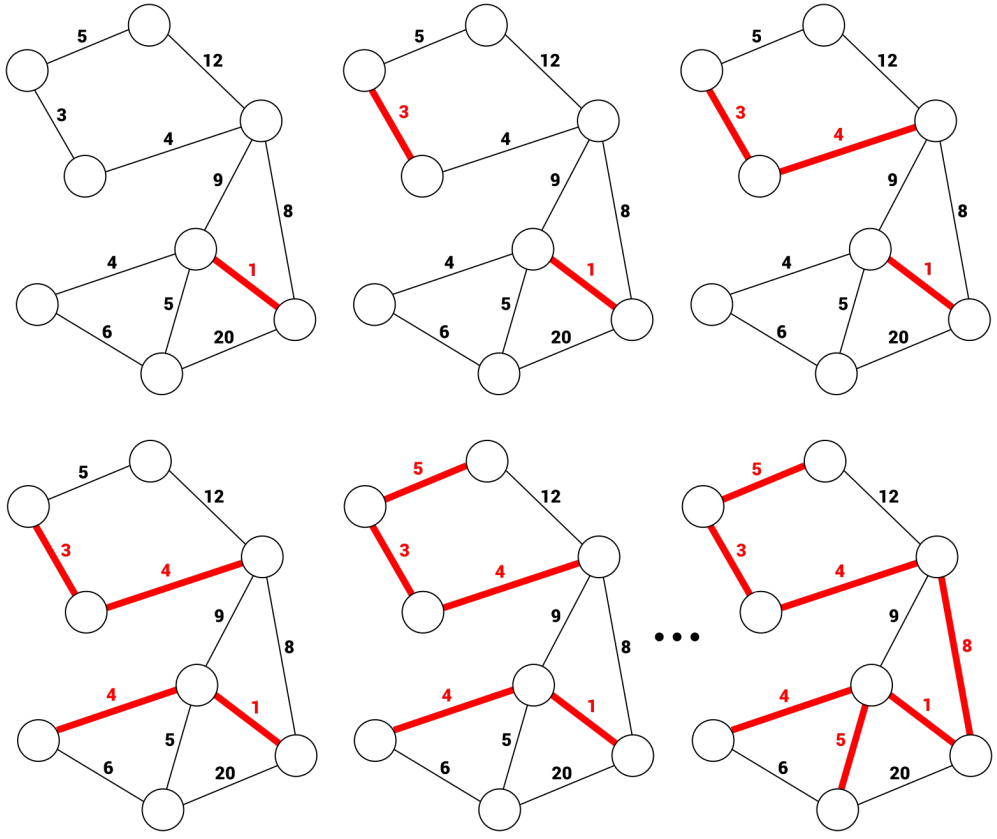
- Greedy (in this video) = doing locally the optimal and hope for globally optimal results
- One should not expect this to work!
- Example Collecting coins on the street will not get you rich
- Example Above finding the maximum will fail with a greedy strategy

Well...



- Sometimes a greedy strategy actually works
- If it works, then we get a remarkably simple algorithm
- Example A greedy strategy gives the minimum number of coins to give for change

Even more well...



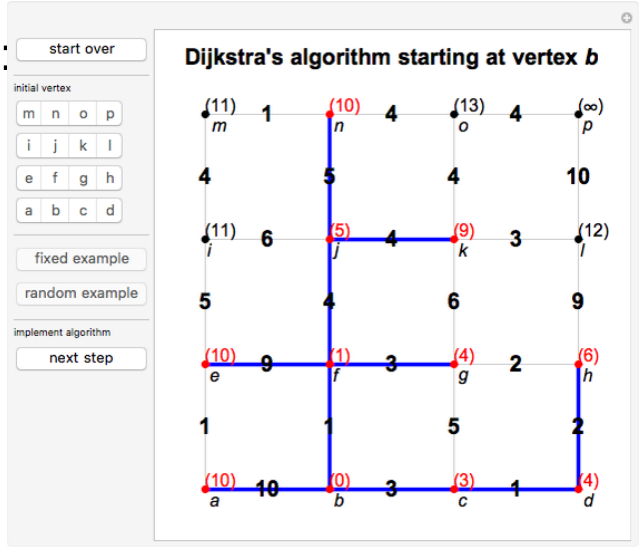
- Greedy spanning forests In step k take any edge that does not give a cycle with the $k-1$ previously chosen edges
- This works!
- This even works weighted

For completeness: A formal statement

Greedy algorithms apply to problems coming from matroids

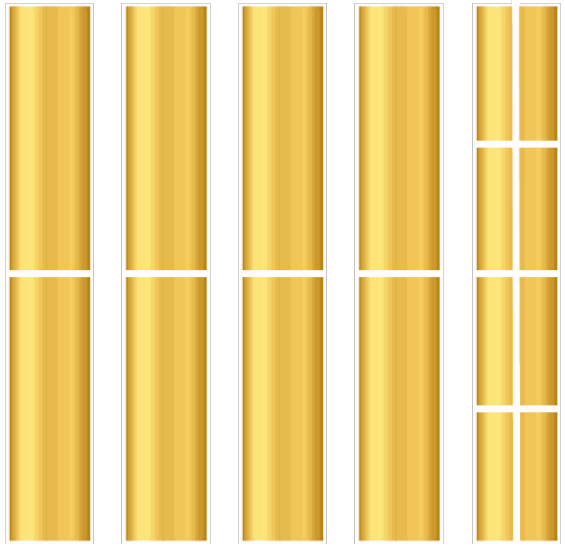
Details next time – below are a few more examples of greedy algorithms

- Finding shortest paths:

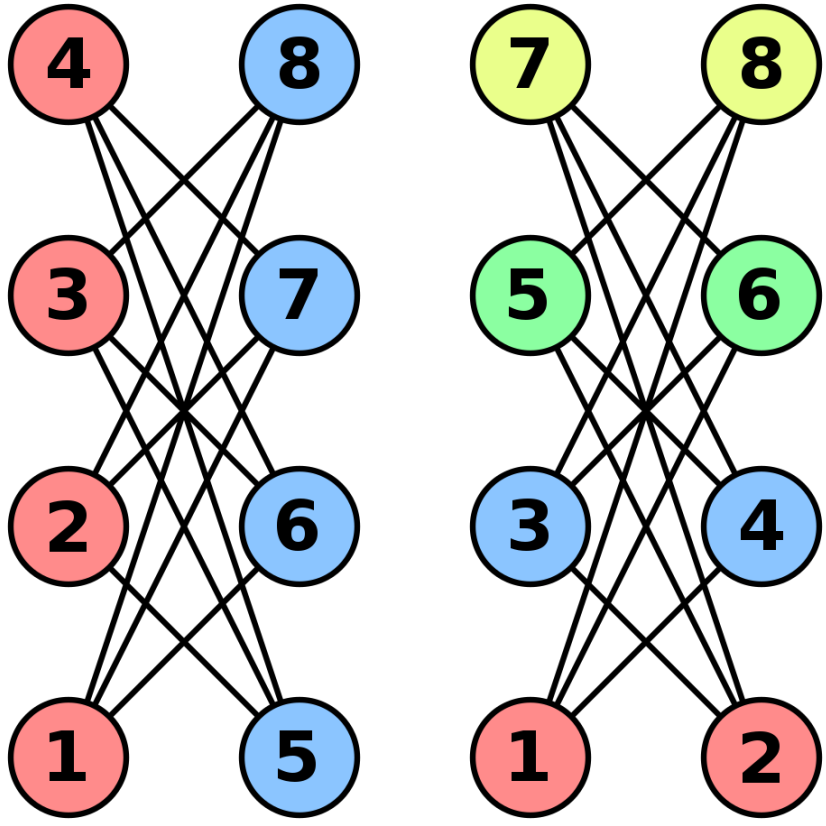


- Egyptian fractions:

$$\frac{5}{8} = \frac{1}{2} + \frac{1}{8}:$$



Almost greedy



- Greedy strategies often give very good approximations for difficult problems
- Example Greedy coloring = inductively assign each vertex its first available color
- Graph coloring is NP complete but the above works really well

Thank you for your attention!

I hope that was of some help.