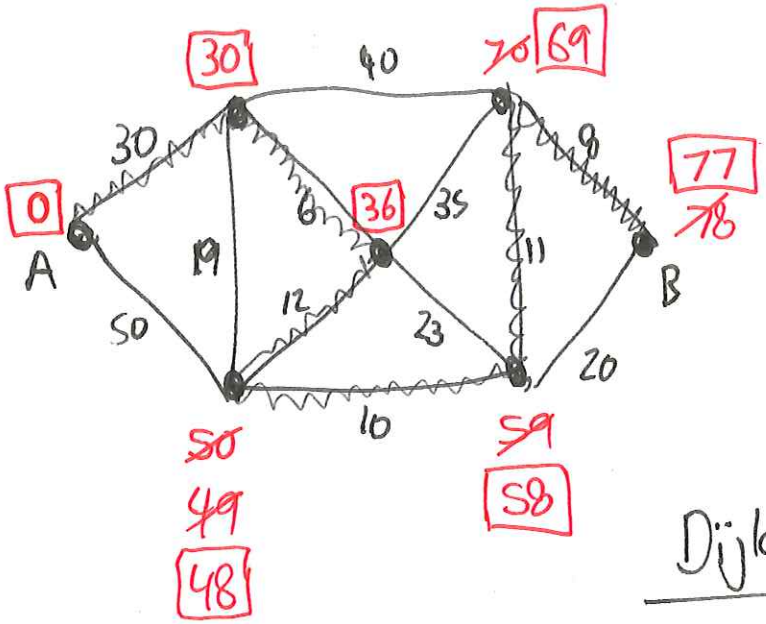
Shortest path

(all weights must be > 0!)

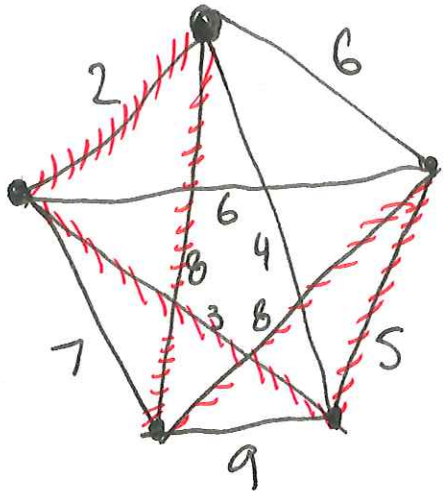


from A to B in 77 steps.

Dijkstra's algorithm.

Records

26



Travelling Salesman Problem:

→ find a loop visiting every vertex in shortest amount of time.

- astronomy
- DNA sequencing

One algorithm:

"Greedy algorithm"

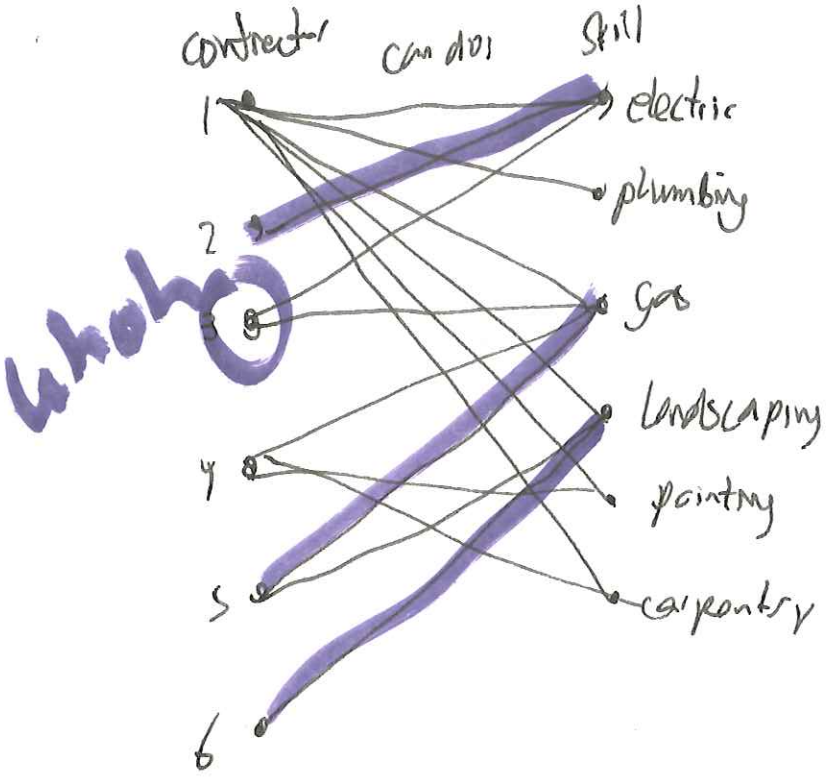
- At each step, choose add to your route the shortest remaining edge that wouldn't create a loop if you add it (other than completing whole loop) (or 3 at a vertex)

- "Nearest neighbor algorithm"

  Start at A. Always choose cheapest edge from current node that doesn't create a loop.

[did some examples on board]

The marriage problem



is there a way to assign jobs?

no!

If there's a set of k people with only less than k skills collectively, there's no possible solution!

Another problem: 1 person with 0 skills, no sol

There is a set of 4 people $\{2, 3, 5, 6\}$ with only three skills between them.

Theorem ("Hall's Marriage Theorem")

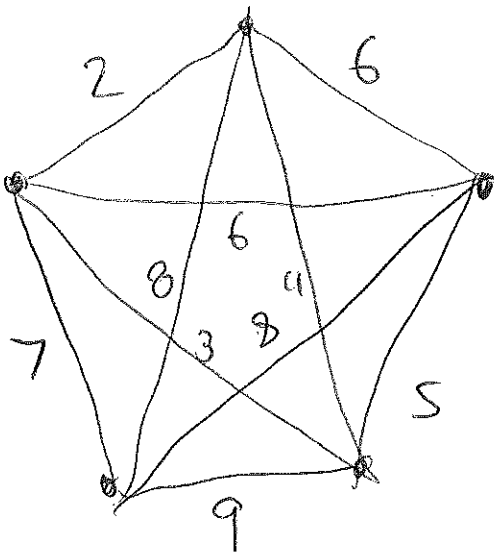
It is possible to assign ~~to~~ spouses / contractors as long as for every set of k contractors, they have at least k skills between them. (And vice versa)

→ Every person knows one skill

→ Every two people have at least two

→ ...

The minimum connector problem



Greedy algorithm:

Keep adding shortest edge that won't create cycle.

It always gives best result!