Well there you are! A new arrival at the TU Delft, studying Computer Science & Engineering. And wow, isn't it amazing? A large group of like-minded ~~puzzle-lovers~~ students, a nice looking campus, and to top it all off a lovely city!

Like any student though, you quickly realise you could do with a bit more spending money. So you and some of your friends decide to open up a small agency that does odd-jobs around the city. Having rescued a litter of lost kittens and having helped with planning some local events, you quickly establish a reputation for yourself as a team of all-round problem solvers. Little did you realise though, that your biggest adventure yet was about to begin. At the start of it you had no idea that this ever-twisting case would last two years, or 4 courses. Welcome to part one of the Quadruple Quest!

Note: The Quadruple Quest is still fairly new, and we would love to hear your feedback. If there are things you believe are incorrect, or you just want to tell us something about it, feel free to reach out to qq-cs-ewi@tudelft.nl. Enjoy your puzzling, and remember that any puzzle is more fun when shared with friends! Especiallly for the later puzzles, we strongly recommend teaming up!

It starts, as many of these stories do, with a new client walking in to your agency. You quickly learn that this handsome young man goes by the name of Dennis and he seems very distressed. His suit, which clearly is meant to impress, is all wrinkled and is stained green around the knees. You offer him something to drink, and once he is settled with a nice cappuccino, ask him what you can do for him. Dennis takes a sip, and starts his story.

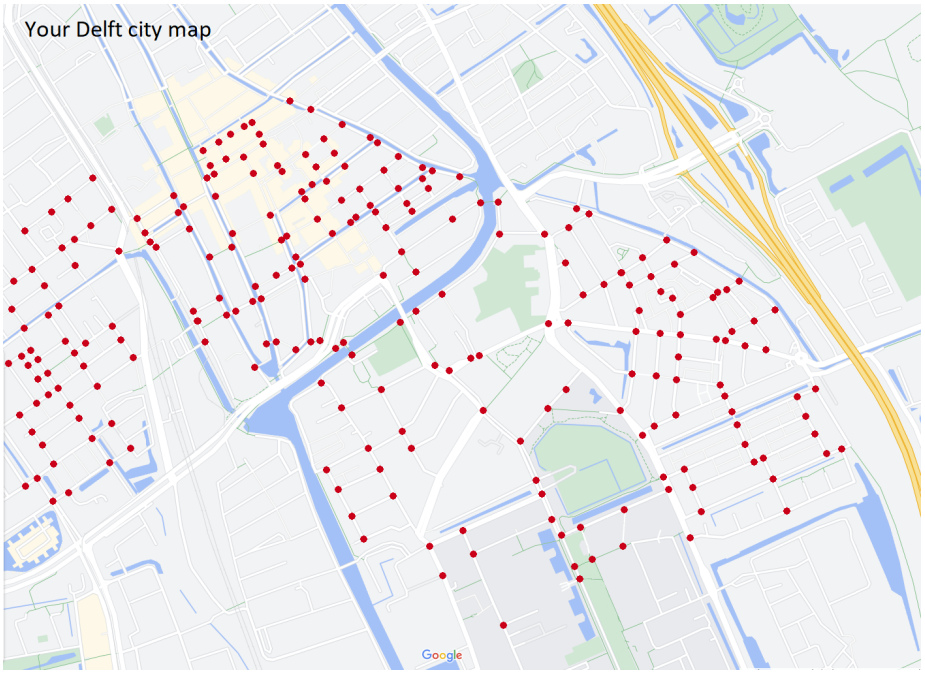
> This all happened just an hour ago! Seeing how today is a lovely day, me and some of my friends were out picknicking. We were just done eating and decided to play a quick game of Red7 together, when suddenly someone ran up to us, took my backpack and ran of with it! We tried to follow them, but to no avail. I'm really hoping you can help us out, that backpack meant the world to me!

You notice Dennis is still a bit rattled and wonder whether his knees don't hurt. He must have given chasen and fallen on them, that would explain the green patches. You give him a moment to collect his thoughts before you quiz him more. You ask him if he has a description of the thieves, but unfortunately he gets no further than "they had a scooter without a readable license plate". His backpack though, is easily described. A red and yellow backpack, filled with:

- Wireless earbuds
- The game "the Crew"
- Some water bottles
- A large cross-stitching project Dennis had been working on for the better part of two years. (See image below)

Leaving a still very distressed Dennis in the hands of your colleagues, you race out of the door in the hopes that there are still clues to be found! As you leave, you realise that you never asked Dennis for the location of the crime. Mentally berating yourself never to make such a mistake again, you catch a lucky break. On the police radar, you hear them describe a theft of a backpack from some address on the Mekelweg. Unfortunately they are speaking in code, so you'll need to do a bit of work to figure out what they're saying.

On the bright side you do have a map of the city available to you! You know for sure that only the crossing marked with a red dot were open. As such when you get route instructions, you should focus on the marked crossings only and ignore any other streets that may be available. (Full image available at: `https://courses.ewi.tudelft.nl/rl/qq/map.png`)



Puzzle 1: You realise that the police has a different way to communicate the house number along the Mekelweg. The code they use is optimised for signaling with only 2 hands, rather than with 10 fingers. The information you get is this:

1. A tautology can be said to be sufficient for a contingency.
2. A tautology can be said to be necessary for a contradiction.
3. A conjunction of a contingency and a contradiction is true.
4. The XOR of two tautologies is true.

1	2	3	4

$\Rrightarrow \square$

Puzzle 2:

Having found the house number, you now want to track them down. The police seems to have partially managed, but lost them at some point. You overhear the following on the police scanner:

- Agent 1: I'm in pursuit! Exiting the building taking a Left, followed by SRSL.
- Agent 2: Hang on Ema, what are you doing!
- Agent 1: What do you mean?
- Agent 2: Why are you not using our Abbreviated Schema for Coppers Intellectual & Interesting[1] to encode the route? You know this channel isn't secure.
- Agent 1: Phew, as if that really makes a difference. If people can figure out that we've abbreviated Right, Left and Straight, they can sure figure out what the numbers 1, 2 and 3 mean as well.
- Agent 2: I know I know, but just use it okay! We don't want the boss to find out we've been breaking the rules!
- Agent 1: Okay okay, speaking of rules... I'm not sure this path is allowed for scooters.
- Agent 2: Hmm, you may be right. But this is where they went?
- Agent 1: Jup! And then they continue with, lemme look here... 3122131, they then seem to have entered a parking lot there.
- Agent 2: Seem to?

[1] Isn't it amazing how some people can so brilliantly misremember the full text of an acronym?

- Agent 1: Yeah, I'll look for clues. Now where did I leave my fingerprinting dust, I'm really a big fan of that Universally Terrific Fingerprinting (version) 8^2 brand...

Now you don't know much about this encoding of theirs, but over your past adventures and the dark corners of the detective web, you learned some valuable information. It seems that each number represents a single letter/direction, and that you can find them by filling in a specific kind of table according to the following rules...

1. If p is true, then this is equivalent to $\neg q$. Otherwise it's $\neg(r \to q)$.
2. If p is truthful, then we follow q, otherwise we follow r.
3. It's the same as 1 in 50% of the cases, and the same as 2 in 87.5% of the cases. The only difference with 2 is where the parity of the number of 1s in p, q and r is odd and q is true.

p	q	r	1	2	3
0	0	0	...	...	...
...	...	...	...	...	...

[2] Oh come one, really? These people and their acronyms