Exercise Sheet 5: More SPARQL and Wikidata

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Exercise 5.1. Use the Wikidata query service (WDQS)[1] to find all people that have returned from two spaceflights operated by organisations from different countries and the amount of time they have spent in space. You can expect Q255764 ("Yelena Kondakova") in the results.

Hint: For all the exercises using the WDQS, you can use the SQID browser[2] to explore the schema.

Exercise 5.2. Use WDQS to find all people that have received more than one Nobel Prize. Does your query find all four persons that have won two Nobel prizes? Why/Why not?

Exercise 5.3. An instance of 4×4-Sudoku is a partially-filled table as illustrated below. The goal is to fill the remaining cells with values 1, 2, 3, and 4 such that no value occurs twice in a row, in a column, or in one of the four 2×2 blocks.

1			
	2		
		4	
			3

Use SPARQL to solve this problem: find a query that returns all admissible ways of filling the grid as its answers.

1. First, define a suitable SPARQL query *and* underlying RDF graph to solve the problem.
2. Then show that your query can be modified to work using WDQS over the RDF data of this system.

Exercise 5.4. A *k-clique* in a simple graph $G = \langle V, E \rangle$ is a set $C = \{ v_1, v_2, \ldots, v_k \}$ of k vertices, where any two vertices $v, w \in C$ are adjacent, i.e., $\{ \{ v, w \} \mid v, w \in C \} \subseteq E$. Recall that a *simple path* from vertex s to vertex t is a sequence of vertices $p_0, p_1, \ldots, p_\ell$ with $\ell > 0$ and $s = p_0 \xrightarrow{e_1} p_1 \xrightarrow{e_2} \cdots \xrightarrow{e_\ell} p_\ell = t$ such that if $p_i = p_j$ for some $i \neq j$, then $\{ i, j \} = \{ 0, \ell \}$.

Compute the function $f : \mathbb{N} \to \mathbb{N}$ that maps a number k to the number of distinct simple paths $f(k)$ in a k-clique. What is $f(5)$?

Exercise 5.5. Use the WDQS to check for the existence of a 5-clique in the P3373 ("sibling") property.

[1] https://query.wikidata.org

[2] https://tools.wmflabs.org/sqid/#/