

Exercise Sheet 5: Yet More SPARQL and Wikidata
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 Knowledge Graphs, 2023-12-03, Winter Term 2024/2025

Exercise 5.1. Use the Wikidata query service² to find all characters that appear in two distinct works that are instances of a subclass of Q7725634 (“literary work”).

Hint: You can use the SQID browser³ to explore how literary works are modelled on Wikidata. Start from a simpler query and gradually refine it. For simple queries, it is good to use LIMIT to avoid overly large results while testing.

Exercise 5.2. 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 5.3. A k -clique in a simple graph $G = \langle V, E \rangle$ is a set $C = \{v_1, v_2, \dots, v_k\}$ 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, \dots, p_ℓ with $\ell > 0$ and $s = p_0 \xrightarrow{e_1} p_1 \xrightarrow{e_2} \dots \xrightarrow{e_\ell} p_\ell = t$ such that if $p_i = p_j$ for some $i \neq j$, then $\{i, j\} = \{0, \ell\}$.

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

Exercise 5.4. Use the WDQS to check for the existence of a 5-clique in the P3373 (“sibling”) property.

Exercise 5.5. Consider a simple bipartite graph $G = \langle V, E \rangle$ with $V \neq \emptyset$. Show that the following are equivalent:

1. G has exactly two distinct 2-colourings
2. G is connected

²<https://query.wikidata.org>

³<https://tools.wmflabs.org/sqid/>