

# COMP4161

## Advanced Topics in Software Verification

### Exercises

Thomas Sewell and Predecessors

T3/2026



# More Practical Exercises

The main lecture series will build our understanding of Isabelle/HOL upwards.



In this exercise series we will try out some medium-sized problems directly.

# Reasons

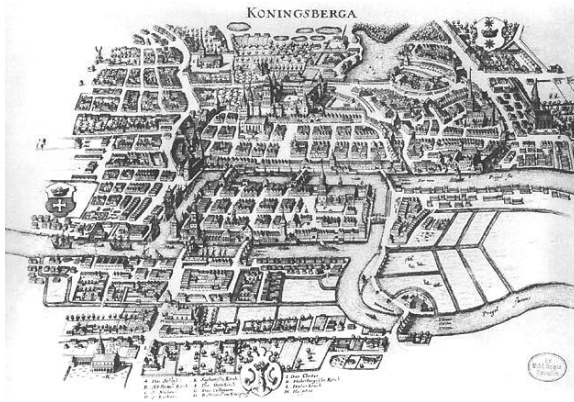
This exercise series is new and partly experimental.

It reflects two developments:

- The “sledgehammer” and other automation.
- Modern language hints.
  - (e.g. ask “what is isabelle syntax for applying the simplifier to reassociate append operations”)



# Königsberg



You may be able to count seven bridges.

- [https://en.wikipedia.org/wiki/Seven\\_Bridges\\_of\\_Koenigsberg](https://en.wikipedia.org/wiki/Seven_Bridges_of_Koenigsberg)

# Eulerian Circuits

Things we might try to prove:

- Eulerian paths visit each non-endpoint vertex an even number of times.
- There is no Eulerian path around Königsberg.
- There are Eulerian paths in even-degree graphs.
  - This might be too tricky for one demo.

# What did we learn?

Things we hoped to learn from this demo:

- We can phrase non-trivial problems in Isabelle/HOL.
  - Or maybe, the lecturers can phrase and solve non-trivial problems in Isabelle/HOL.
- There are a lot of built-in constants and types that are useful, and a library of facts about them.
- Some of the auto-tools (e.g. "try") can help us find relevant facts and solve problems even when we don't know exactly what is going on.

Also:

- The "demo curse" is real.
- It pays to sometimes persist, and sometimes change plan.
- We need to learn the system a bit better before experimentation starts to become valuable.

# Next Time

Things we might try to prove on other occasions:

- Sort functions sort, e.g. merge sort, bubble sort.
- Any group of six people contains a trio of friends or non-friends.
- Something about primes?
- Other requests?