# Universität Zürich UZH

# Introduction to Artificial Intelligence
# Exercise Sheet 3

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# Exercise 3.1

a) The wolf and goat can never be alone on a river bank, as well as the cabbage and goat can never be alone on a river bank.

Initial state: $\langle L, L, L, L \rangle$

Goal state: $\langle R, R, R, R \rangle$

Abstract state, satisfies the goal state: $On\langle Wolf, L \rangle \wedge On\langle Goat, L \rangle \wedge On\langle Cabbage, L \rangle \wedge On\langle Farmer, L \rangle \wedge Cabbage, R \rangle \wedge \langle Wolf, R \rangle \wedge On\langle Farmer, R \rangle \wedge On\langle Goat, R \rangle$

The goal state is reached in at least three steps. We ignored states which will lead to a sink state. The result is informative in the way that we know that reaching the goal state can be achieved in at least three steps.

b) It is admissible as it doesn't overestimate the cost of reaching the goal state as the lowest possible cost from the initial state is at least three steps.

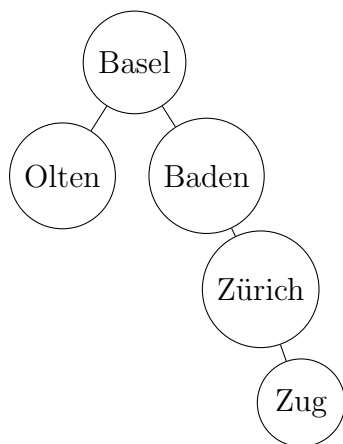Side note: If the heuristic is admissible, then it is safe and goal-aware.

c) It is consistent as the estimated cost of reaching the goal from the initial state is no greater than the step cost of getting to the successor action (crossing the river) plus the estimated cost (at least three steps) of reaching the goal state from the initial state.

Side note: If the heuristic is goal-aware and consistent, then it is admissible.


# Exercise 3.2

a) Initial state = head node: Basel

Following states with least cost, if we think ahead and don't look at it step by step (ordered): Baden, Zürich, Zug; total cost = 126



b)

c)

# Exercise 3.3

Programming