Problem Solving and Search in AI
Tutorial 1 (on May 9th - SS 2017)

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Exercise 1.1:
Consider the following *crossword puzzle*, where a given list of words can be used to fill the empty spaces.

1		2		3
#	#		#	
#	4		5	
6	#	7		
8				
	#	#		#

AFT
ALE
EEL
HEEL
HIKE
HOSES
KEEL
KNOT
LASER
LEE
LINE
SAILS
SHEET
STEER
TIE

a) Formalize the problem as a CSP and draw the *constraint graph*.

b) Reduce the domains of the variables by applying the constraint propagation method *arc consistency*.

c) Use a search algorithm with forward checking and the degree heuristic to obtain all solutions of the CSP.

Exercise 1.2:
Consider the *bridge crossing problem*, where 4 persons are on one side of a bridge and all of them need to end up on the other side. It is night and they have only one flashlight. Maximal 2 persons can cross the bridge at the same time and the flashlight needs to be brought back to the remaining persons. Each person walks with a different speed and when they go together they must walk at the rate of the slower man's pace.

The goal is to find the minimal time for crossing the bridge!

person	time
A	1 min
B	2 min
C	5 min
D	10 min

a) Design a dynamic programming algorithm to compute the solution!

b) Is there a general procedure which finds an optimal solution for an arbitrary number of people and crossing times?