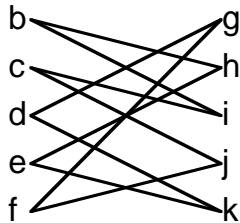


1. Give the cycle structure representation for a 108 degree rotation of the corners of a 10-gon.

2. Consider the problem of matching people b,c,d,e,f with jobs g,h,i,j,k given the possible pairings below.

a) Construct the matching network and make a flow corresponding to the partial matching b-i, c-j, d-g, e-k.

b) Apply the Augmenting Flow Algorithm (show ALL labels) and from it obtain a complete matching.



3. Consider the game of Nim on the right.

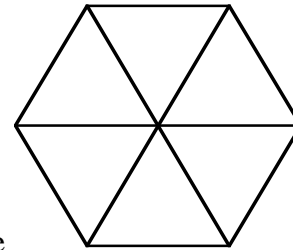
a) Make a move to get into a kernel position.



b) Make a move to get into a position with Grundy number equal to 2.



c) Suppose you can remove 1 or 3 or 4 sticks from each pile. In this new game, find a move into the kernel.



4. Give an expression for the pattern inventory of 2-colorings of the 12 edges of this unoriented figure (rotations and flips allowed).

5. Do one of the following two problems

I. Prove that for any vertex x in a progressively finite graph, there is a path starting from x of length k if $g(x)=k$.

II. In the following table of remaining games, it is possible for the Bears to be champions (NOT co-champions) if they win all remaining games? Build the appropriate network model and show the required flow, if possible.

Team	Wins to date	Games to play	with Bears	with Lions	with Tigers	with Vampires
Bears	21	7	—	1	2	4
Lions	26	6	1	—	3	2
Tigers	26	7	2	3	—	2
Vampires	22	8	4	2	2	—