

Problems of 2021. Duration of the exam: **10 days!!**. Since this was held during the Corona times, it was a harder exam but it was a take-home and was due in 10 days.

1. (There was a very long story here which I won't translate, but I'll write the gist of the problem) Think of the edges of the cube graph (3-regular, 8 vertices) as roads connecting some nodes. Consider all edges (roads) to have equal length. There are four people A, B, C, D driving on these roads. A is trying to run away from B, C, D who are the chasers. We know that the speed of A is thrice the speed of B and C , while D is the slowest, his speed being very very small (his exact speed is not specified). Is it possible for the chasers to catch A ?
2. There's no one in the whole of Futrinka Street who knows more about bags than Monica. No wonder, since she devotes every spare moment to her vast collection: tending, cleaning, washing and ironing her bags. She also made a graph Z of them: the vertices are the pieces of her impressive collection, and there is an edge connecting two bags if one fits inside the other. (For every bag v , we have two positive values, $b(v)$ and $k(v)$: the former indicates the size of the volume of an object can be stuffed into bag v , and the latter is the volume of bag v in its crumpled state. So, there is an edge between bags u and v if $k(u) \leq b(v)$ or $k(v) \leq b(u)$.)
Being interested in math, Monica wonders if her bag graph is perfect: is it true that for every induced subgraph Z' , $\chi(Z') = \omega(Z')$? Can you help her decide?
3. Identify all connected graphs on 10 vertices for which the degree of every vertex in every BFS tree has degree 1 or 3.

There were 19 submissions for this contest. Correct solutions arrived for each problem. The level of the problems was not mentioned this year.