HAND-IN 2

Problem 1.

You will need SFML for this task.

You are given source code for a "game" missing one function (see link on fronter): update(). The update function should search for $3x3$-patterns on the board and remove all of these. Your job is to implement the update() function.

Some requirements:

1. The patterns should be kept in a file. Changing the pattern-file should change the behaviour of the game without recompiling. The format of the patternfile is up to you.
2. You need to take into account superposition of patterns. For instance $xx0xx$ replaced with $xxxxx$ should result in all the five x removed.
3. Removing of a pattern should result in removing the entries, scrolling down those above, and new random values put in the empty spaces.

If you want to start from scratch and ignore the source file, then that is fine. Someone asked if they could implement a UI for input of patterns instead of using a file - that is also fine.

Problem 2.

Write prolog programs which

a) duplicates each entry in a list. e.g. [a,b,c,d,d] should become [a,a,b,b,c,c,d,d,d,d].
b) removes consecutive entries from a list e.g. [a,a,a,b,c,b,b,e] should become [a,b,c,b,e].
c) removes consonants from a list e.g.[a,a,b,d,c,e] should become [a,a,e].

Problem 3.

Create

a) a knights and knave puzzle.

b) a knights, knave and spy puzzle.

Give a clear and precise description of the solution.

Problem 4.

Solve at least one of the following puzzles. I lift the restriction on the number of people working together, in fact the whole class can work together if you wish. But when it comes to writing down the solution, you should do that individually. Of course you should try to solve all of them without help, as developing puzzle solving skills will help you on the exam.

If you are looking for an easy one, consider 5) with the hints given.

Ensure that you give a precise solution with explanation, and not just an answer.

1)

Four people come to a river in the middle of night. There is a narrow bridge which can only be crossed by at most two people at a time. It is dark, so they have to use a torch when walking across the bridge. Unfortunately they only have one torch, so the torch needs to be brought back and forth. When two people cross together, they cannot move faster than the slowest of the two.

Person A can cross the bridge in one minute, B in two minutes, C in five minutes, and D in eight minutes.

Find the least amount of time needed for the four people to cross the bridge and write down a convincing explanation as to why there are no solutions which require less time.

2)

The 100 inhabitants of an island are all logicians. They have all either blue or green eyes, and there is at least one of each. One day it is decided that all blue-eyed logicians are going to move to another island. Every day a ferry arrives and waits for anyone with blue eyes to get on. The logicians are introverted and so they do not speak to

each other or communicate in any other way. They are however able to look into other logicians eyes to determine other logicians' eye colour. There are no mirrors (or anything except logical reasoning) to help them discover their eye-colour.

No one gets on the ferry the first day, and the ferry continues to leave without passengers. Then suddenly one day one of the logicians thinks "Ah, my eyes must be blue" and gets on the ferry.

How did the blue eyed logician manage to figure out that his eyes were blue?

3)

A and B are trying to figure out C's birthday. C gives them a list of 10 possible dates.

May 15, May 16, May 19
June 17, June 18
July 14, July 16,
August 14, August 15, August 17

C tells A the month, and B the day of the month, but A doesn't know the day and B doesn't know the month. The following conversation takes place:

A: I don't know when C's birthday is, but I do know that B doesn't know.
B: At first I didn't know, but I do know now.
A: Then I also know.

When is C's birthday?

4)

You are a ruthless emperor of a medieval empire and it is 24 hours before you are hosting a large banquet. You have acquired 1000 bottles of wine for the occasion, but you have also found out that one of them is poisoned.

The poison cannot be detected except by drinking the wine and it takes at least 20 hours for the poison to start working. Being ruthless,

you decide to test out the wine on 10 prisoners.

Find a way to organise the tasting so that you are guaranteed to discover which bottle is poisoned.

5)

A bowl contains 75 blue marbles and 150 red marbles, and next to the bowl there is a bag of 1000 red marbles.

You balls from the bowl, one at a time, as follows:

You choose two random marbles from the bowl. If at least one of them is red, you put a red marble in the bag, and the other back in the bowl. If both marbles are blue, they are thrown away, and a red marble is moved from the bag to the bowl.

What is the colour of the last marble in the bowl?

Hints for 5)

Try the following strategy:

Reduce the number of marbles of each type and solve the problem.

What happens if you have only one marble in the bowl?

What happens if you have one marble of each type? Two arbitrary marbles?

Three marbles?

and so on.....

Seeing what happens will reveal a pattern and allow you generalise to any number of marbles.

All you need to do now is to find out why the pattern emerges and write down the solution.