Question1: Provide your specific solution for the Berlin tram routes. You need to specify the number of colours used and which colours are used for which routes.

Solution: By going through heuristic method we get the minimum number of colours are 7 which follow the following method to allot the routes:

Routes	Color no.
'M1','M2','M16','M18','M18','M37','M61'	1
M4','M17','M50','M62'	2
M5','M12','M21','M63'	3
M6','M60'	4
M8','M61'	5
M10','M27','M68'	6
M13'	7

Question2: Explain your procedure in your own words (you may be asked about this in a short oral exam!), written in the form of a flow chart which can be implemented for larger problems.

Solution: We will go through heuristic to get minimum number of colours. We get by the following method:

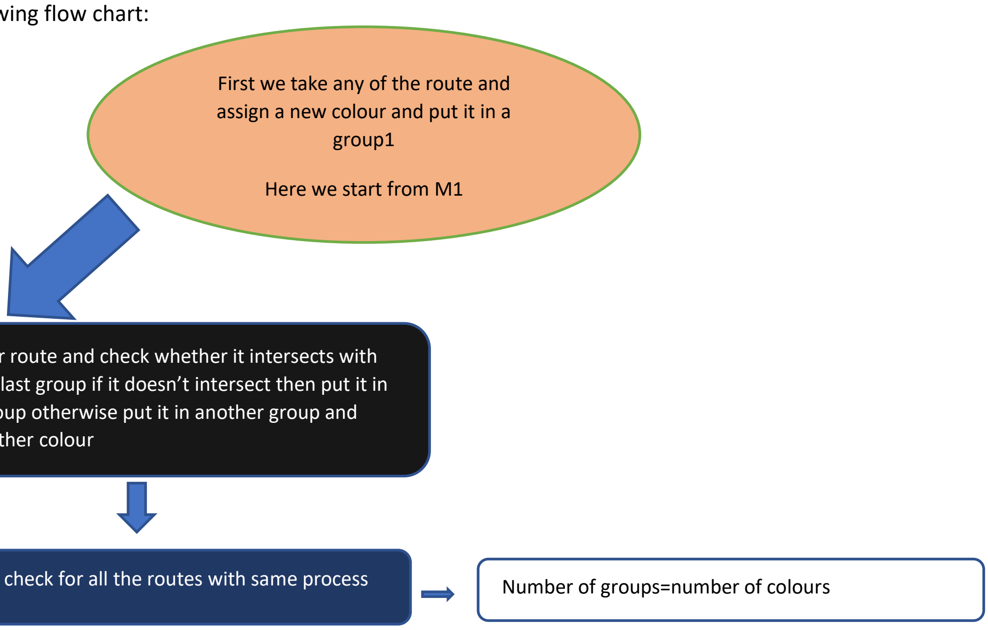
1. First we take route M1 and assign a colour 1 to it.
2. Now we will take route M2 and check whether it intersects or not. If it intersects then assign a new colour it and if it is not then we give it the same colour same as M1. Same we do it with next routes.
3. As we get a new colour we start making new groups of these routes who has distinct colour.
4. Now our next step to take new route and check with one of the last groups and if it does not intersect with any member of the group then assign the same colour to that route what is assigned to that group otherwise we go to next group and check further same as last group made till that.If we don't get any group then we assign it a new colour and put in a new group.

Similarly we go through all the routes and get:

Number of groups =Number of colours =7

Hence we are needed 7 colours to show routes on map so that each route can be easily picked up.

We can easily understand by following flow chart:

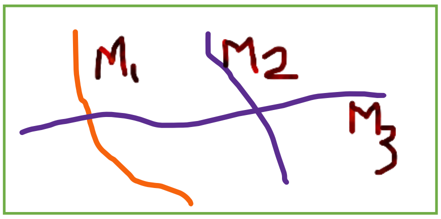


Question3: If we have n routes and there is a route that intersects the other n − 1 routes, then we need n colours to represent the map. True or false? If true, provide a proof, if false, provide a counterexample.

Solution: Given statement is true if n=2 then we need 2 routes to show them up.so number of routes is equal to number of colours.

The statement is false n>2. Since it is possible that that route which intersects with other (n-1) routes is the only one route which intersects any other route and all other never intersect each other then only two colour are enough We can verify this by following example:

dfLet we have 3 routes M1,M2,M3 as follows:



Hence in the given example number of routes is not equal to number of colours.