



Graph Coloring

Lesson Plan: Class 08 / DM / 01



Overall goal of the lesson	This lesson take Graph coloring to an application level so that the student can associate a problem in real life with the theory
Prior knowledge required	Lesson Part A is must that teaches the concepts of Maps and Graphs

MODULE 1: **Module time:** 35 minutes

Goal:	Apply graph coloring to problems in life like time table, meeting scheduling or an air traffic controller's work.
Description:	This lesson is an application of graph theory where the teacher can walk the students through the time table problem in a step by step manner. Later this lesson applies the theory to two other problems.
Material required:	Physical: A worksheet is available with three problems to work out in a step by step manner. Electronic: Power point
Procedure Details:	<ol style="list-style-type: none">1. The teacher walks through a recap of Map coloring and Graph coloring (lesson A). The emphasis is on stating that maps can be converted to graphs with vertices and relations can be defined as edges. The coloring is done in a manner such that two vertices connected by an edge have different colors.2. The school time table is discussed. A few subjects are mentioned. Here the figure shows these subjects as circles and they are connected by lines. Why are they connected? What could be a relation - as relation connect vertices?3. The 4 lines below define a relation with the subjects Suman has taken Maths, Economics and Computers Ravi has taken Biology, Computers and Economics Lucy madam teaches Sanskrit and Hindi Economics and Hindi are taught in the same class room Emphasize that Suman cannot have all three subjects together. Similarly Ravi too has a problem. The relation need not be students or teachers. A room could also lead to a relation. Perhaps subjects require a projector and there is only one room that has this.4. Bring in the concept of a conflict here. Suman cannot take three subjects is a conflict that needs to be resolved.5. Walk through the slides step by step and ask the students to mark the lines on their worksheet. Connect subjects with lines if there is a relation. Here Suman is a relation for Maths, Economics and Computers and they are all connected together by lines6. Ask the students to draw lines for the four relations. Once done emphasize that each vertex that is joined to another vertex cannot be in the same period. In other words cannot have the same color.7. Ask the students to assign different colors to the vertices. One color corresponds to one period.8. Start with Economics and assign it to red color or period 1. Only Sanskrit is not connected to it so it can also be in the first period.

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| | <ol style="list-style-type: none"> 9. Assign green to Biology Maths and Hindi which are not connected to each other but to Economics. Indicate that this is the second period 10. The last one left is the third period. 11. Indicate that Suman can attend Maths, Economics and Computers now. Ravi can attend Biology, Computers and Economics. Lucy madam can teach Hindi and Sanskrit. Economics and Hindi can be in the same class as they are at different times. 12. Indicate how a seemingly complex problem can be easily solved using Graph Theory. Mention that today software do this for the whole school automatically. 13. Take another problem on the same lines. Indicate that Amar the secretary has a problem to solve and it can be done using graph coloring 14. Let the students study the worksheets second problem and see for themselves how same ministers are put on different portfolios. 15. Indicate the vertices that have been defined. Ask the students to start connecting vertices with the same ministers. The relation between the vertices is the minister who is common to the portfolio vertices. 16. The connections are pretty straightforward. Check that all students have got the connectivity correct. 17. Let them now color them in the same manner as the time table problem. Each vertex not connected can have same color. Start with the red. Food Education and Foreign affairs are not connected to each other so they can be red. Indicate that sports cannot be red as it is already connected to a red vertex. 18. Next color blue and then green and yellow. We have solved Amar's problem by assigning different meeting slots to the portfolios. 19. A Map coloring problem has been converted to a graph coloring problem. This has been used to solve problems in life. |
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