

D1 Matchings – Maximum Matching Algorithm (MMA) – www.m4ths.com

(1) A bipartite graph is_____

(2) Albert, Bert, Chung, Dave and Emily all attend a party where there are only 5 desserts are on offer. The desserts are (1) Cheesecake, (2) Ice Cream, (3) Jelly, (4) Apple Pie and (5) Mousse. There is one of each dessert at the party. Albert is happy to eat Cheesecake, Mousse or Jelly. Bert will only eat Apple Pie. Chung is happy with either Mousse, Jelly or Apple Pie. Dave will eat anything but Mousse and Emily will eat either Cheesecake or Ice Cream.

(a) Show the possible allocations on the bipartite graph in fig (i).

(b) An initial matching is given. Albert eats the Mousse, Chung eats the Jelly, Dave eats The Apple Pie and Emily eats the Ice Cream. Show this initial match on figure (ii)

(c) Use the MMA to find an alternating path and an improved matching showing your full workings. Use figures (iii) and (iv) if required. State your new matching.

(d) State whether your new matching is a complete matching.

(3) Paula, Quentin, Raja, Steve and Toni all work for Company X. The jobs 1,2,3,4 and 5 need to be carried out on a project. Paula can do jobs 1-4. Quentin can do jobs 2 and 3. Raja can only do job 2. Steve can do all of the jobs. Toni can also only do job 2.

(a) Show these allocations on figure (i)

(b) Explain why a complete matching is not possible.

(c) Initially, Paula is allocated job 1, Raja job 2 and Steve job 3. Show this initial matching on fig (ii).

(d) Use the MMA to find an improved matching showing all of your workings and stating the improved matching.

(e) After a staff training session Quentin can now do job 4 and Toni can do job 3 also. Starting with your improved matching in part (d) use the MMA to find a complete matching. Show full workings and state your final matching. Use figures (iii) and (iv) if required.

(Use the table above if you wish!)

(i)	•	(ii)	•
•	•	•	•
•	•	•	•
•	•	•	•
•	•	•	•
(iii)	•	(iv)	•
•	•	•	•
•	•	•	•
•	•	•	•
•	•	•	•

(Use the table above if you wish!)

(i)	•	(ii)	•
•	•	•	•
•	•	•	•
•	•	•	•
•	•	•	•
(iii)	•	(iv)	•
•	•	•	•
•	•	•	•
•	•	•	•
•	•	•	•