

Distributed Algorithms 2025

3

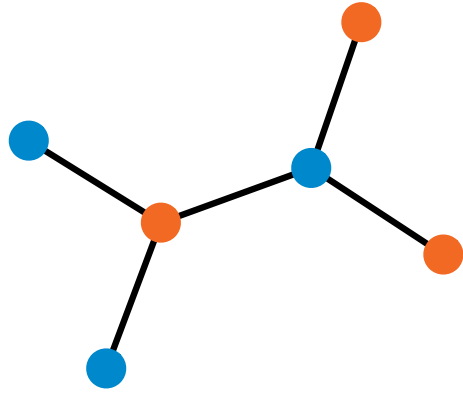
Port-numbering model

Port-numbered network
 $N = (V, P, p)$

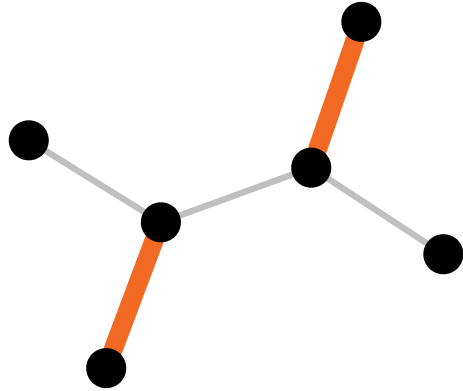
Distributed algorithm
 $A = (\text{init}, \text{send}, \text{receive})$

**Output of algorithm A
in network N**

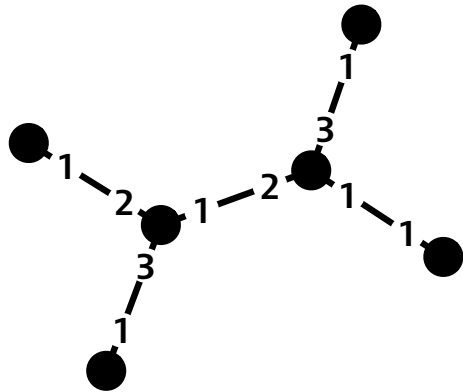
Bipartite maximal matching



Input:
proper 2-coloring



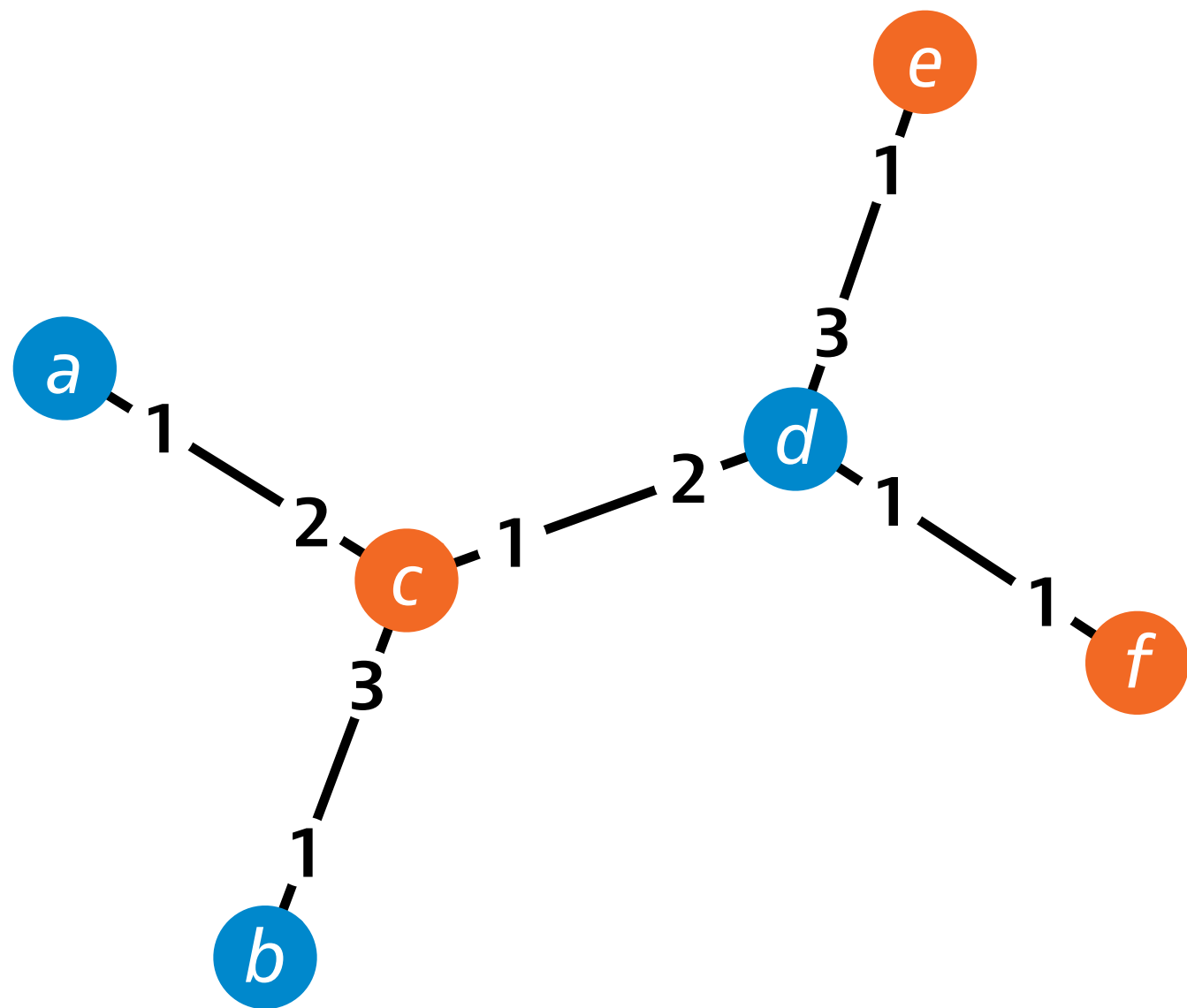
Output:
maximal matching

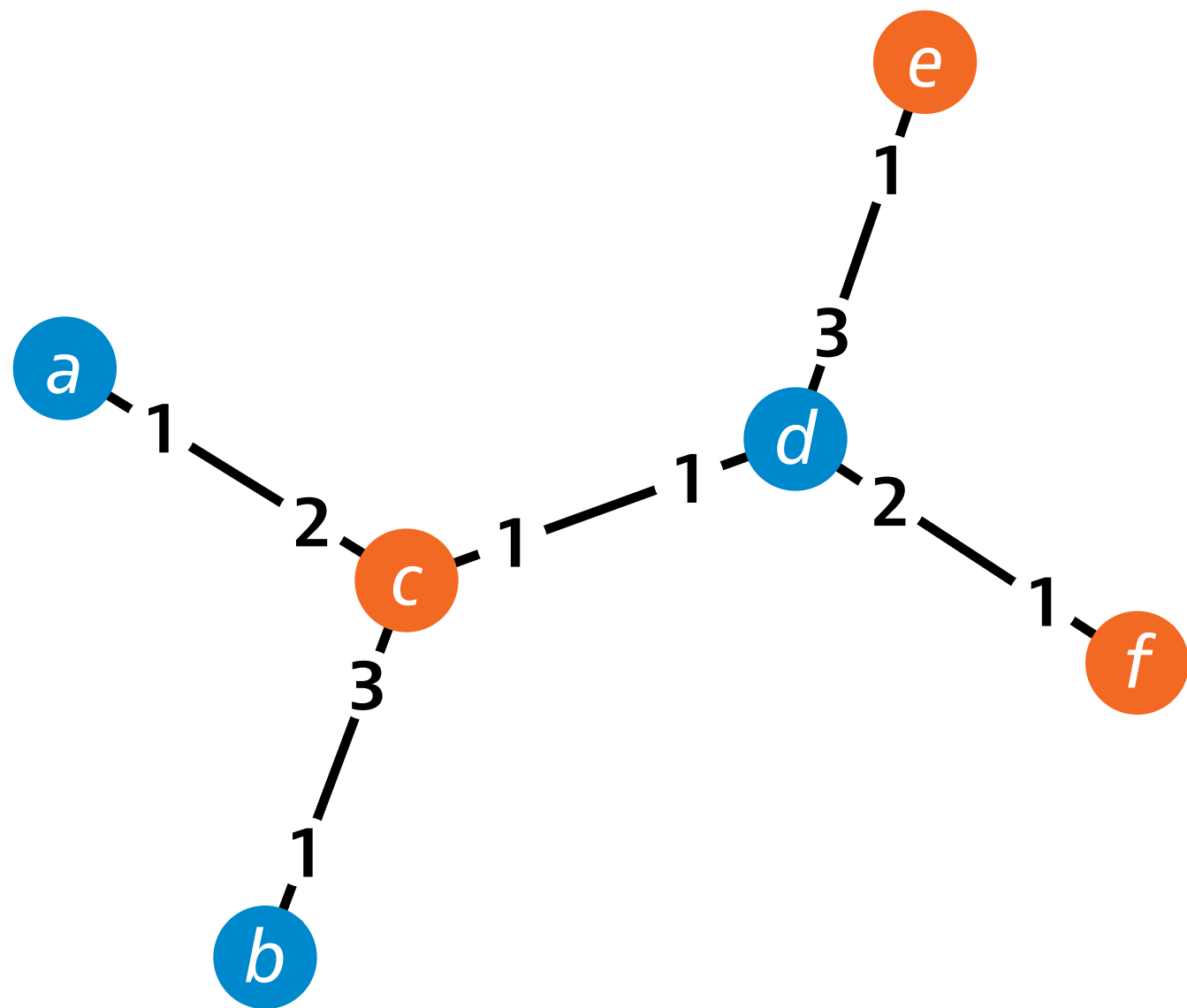


Model of computing:
PN model

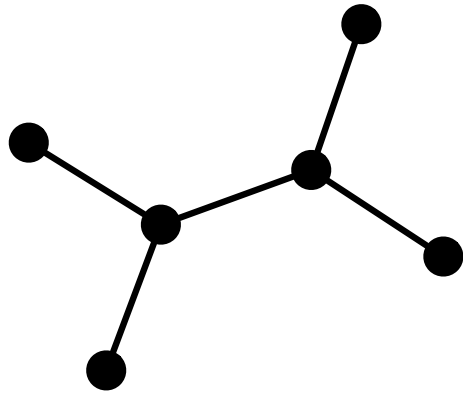
Algorithm

- **Orange** nodes send ***proposals*** to their neighbors, one by one
 - order by port numbers
- **Blue** nodes ***accept*** the first proposal they get, reject everything else
 - break ties by port numbers

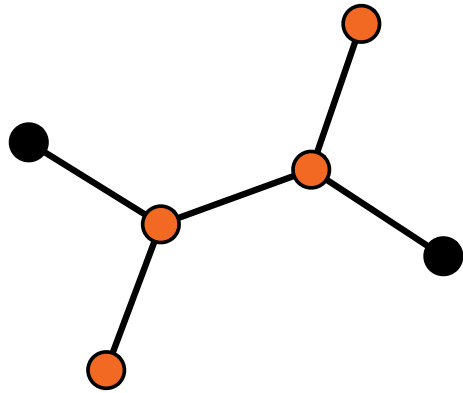




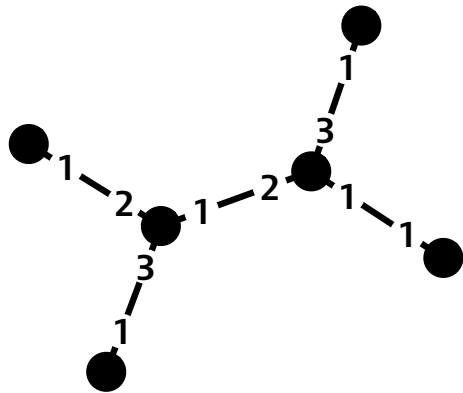
**Vertex
cover**



Input:
nothing



Output: 3-approximation
of minimum vertex cover

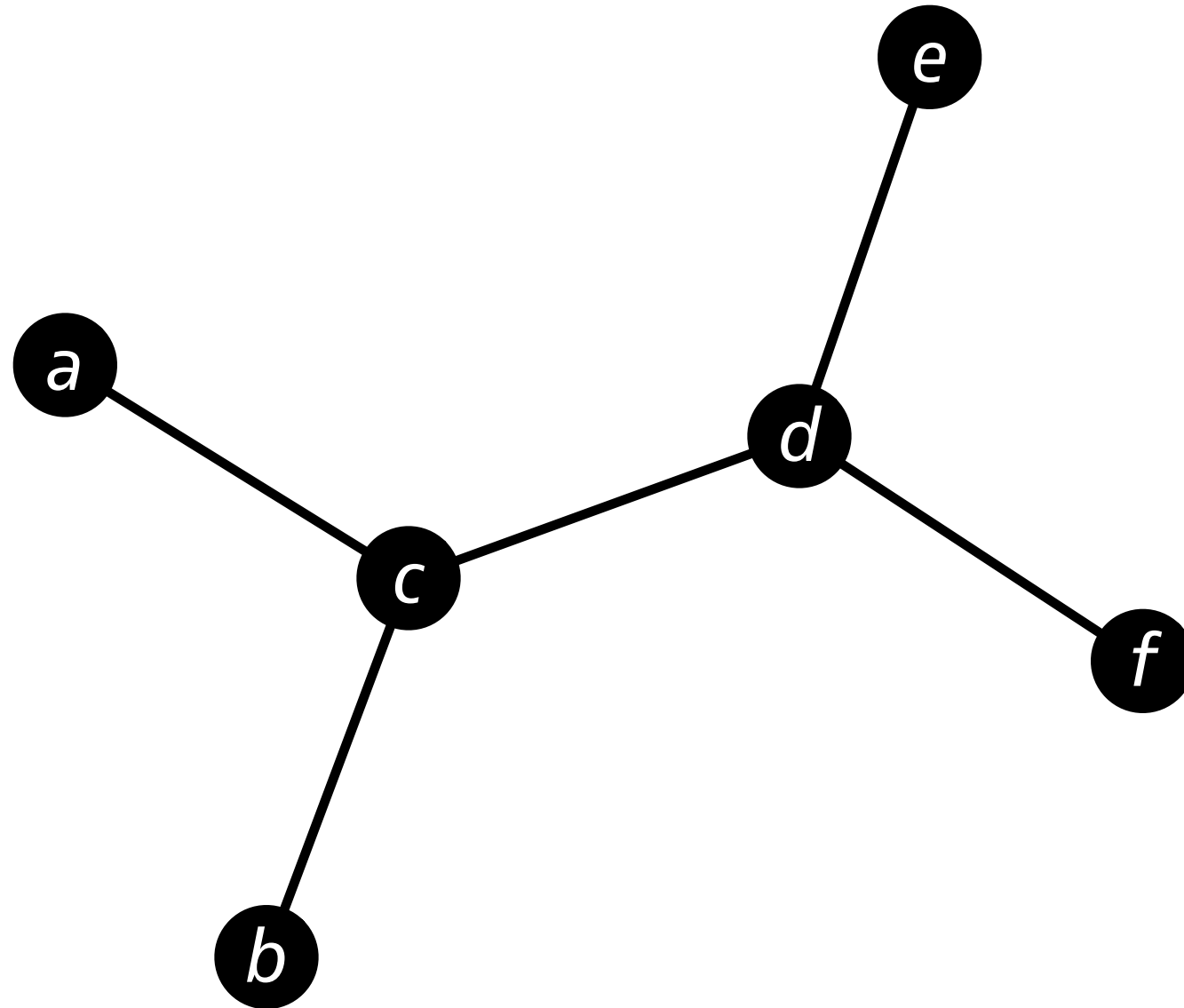


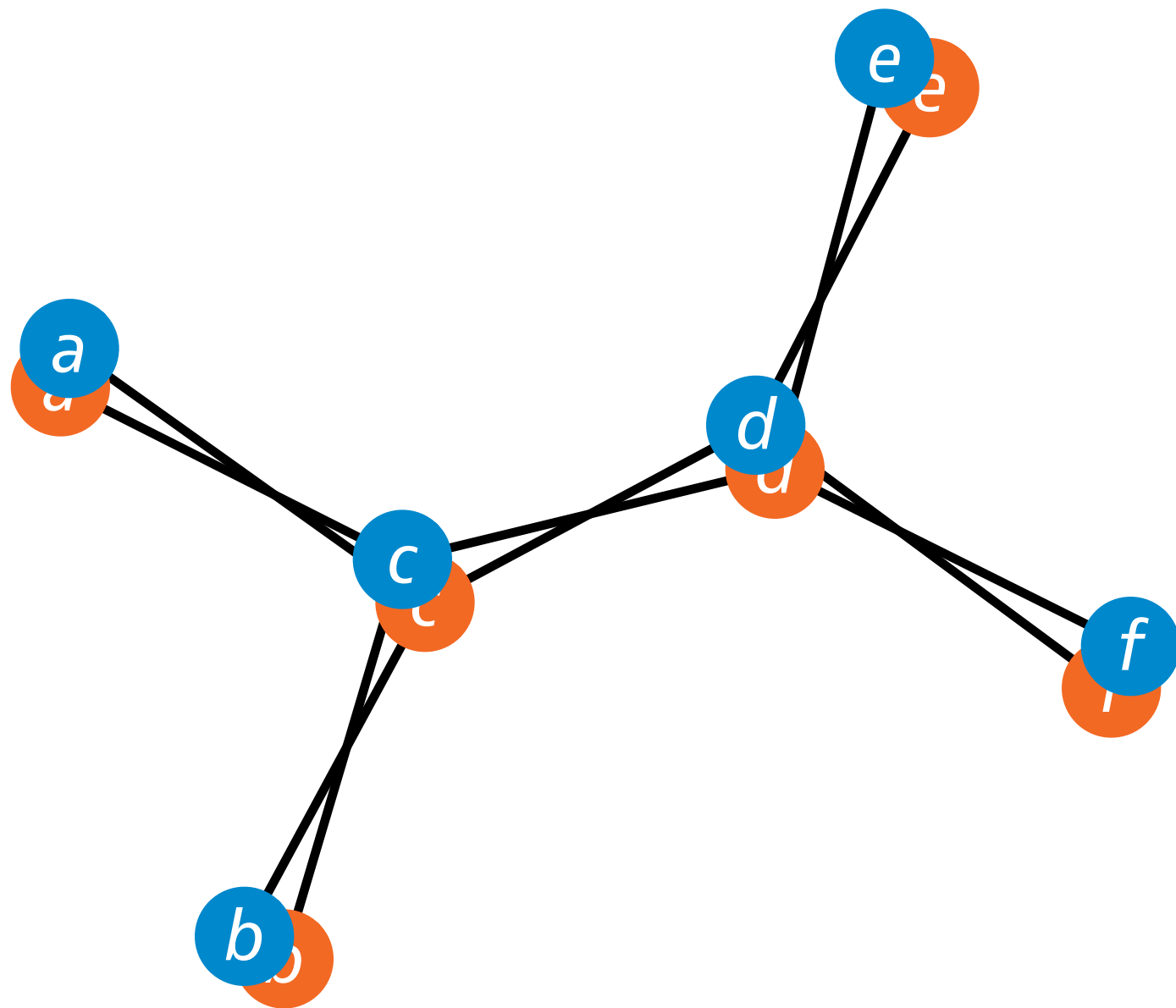
Model of computing:
PN model

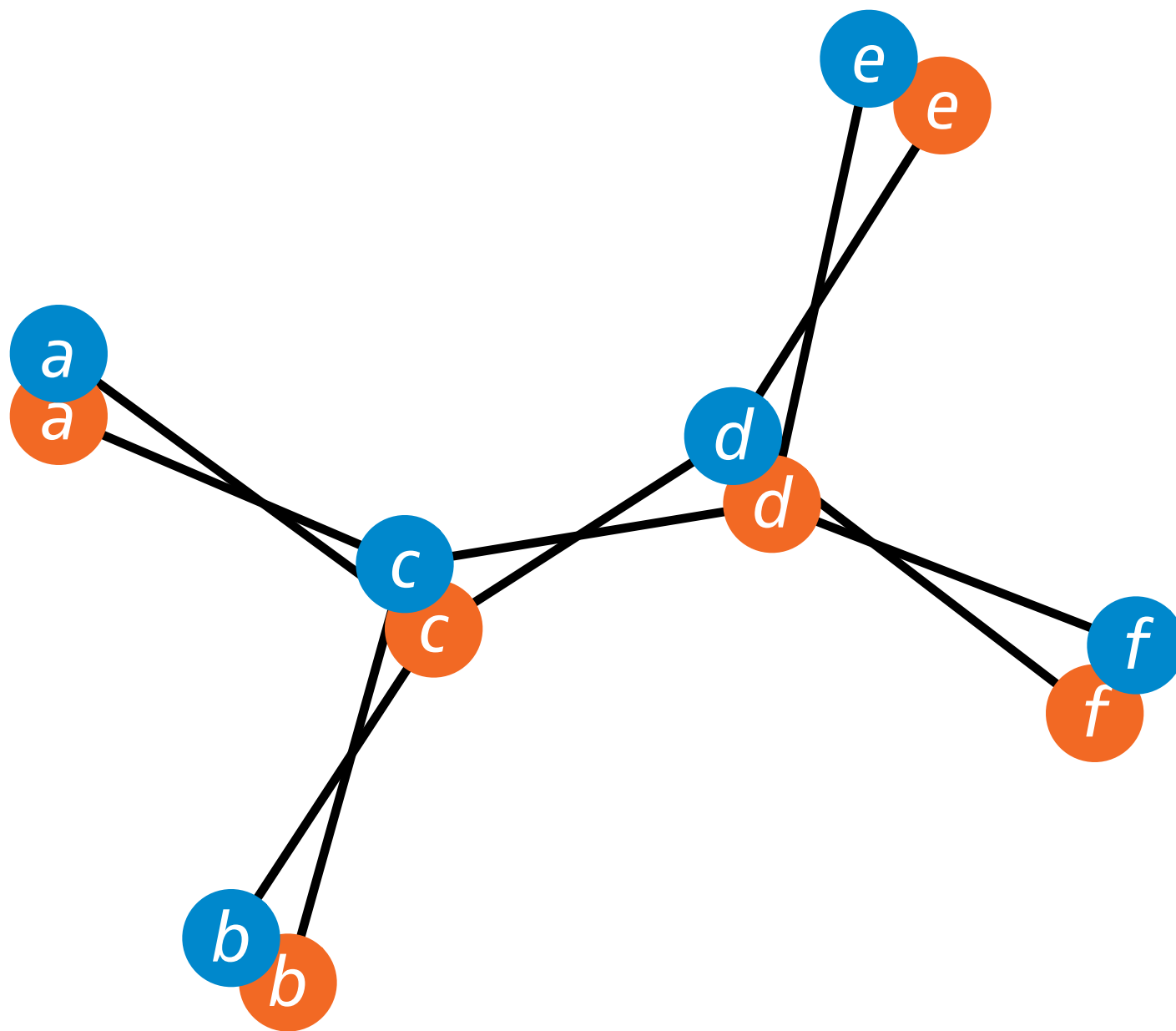
Algorithm

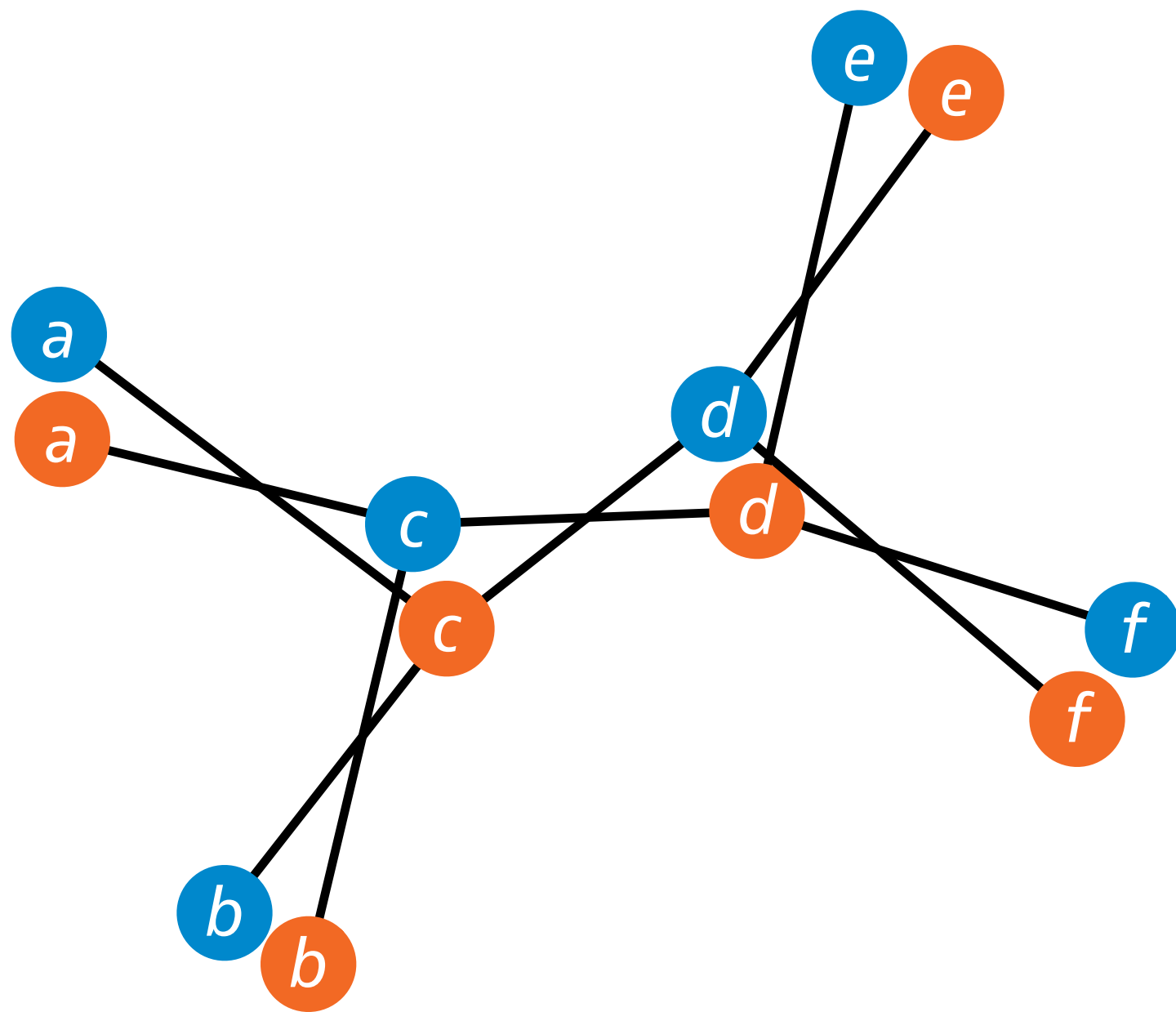
- Construct bipartite double cover G'
 - one node in G : two virtual copies in G'
 - one edge in G : two virtual copies in G'
- Find a maximal matching M' in G'
- Take all original nodes of G whose virtual copies are matched in M'

Graph G

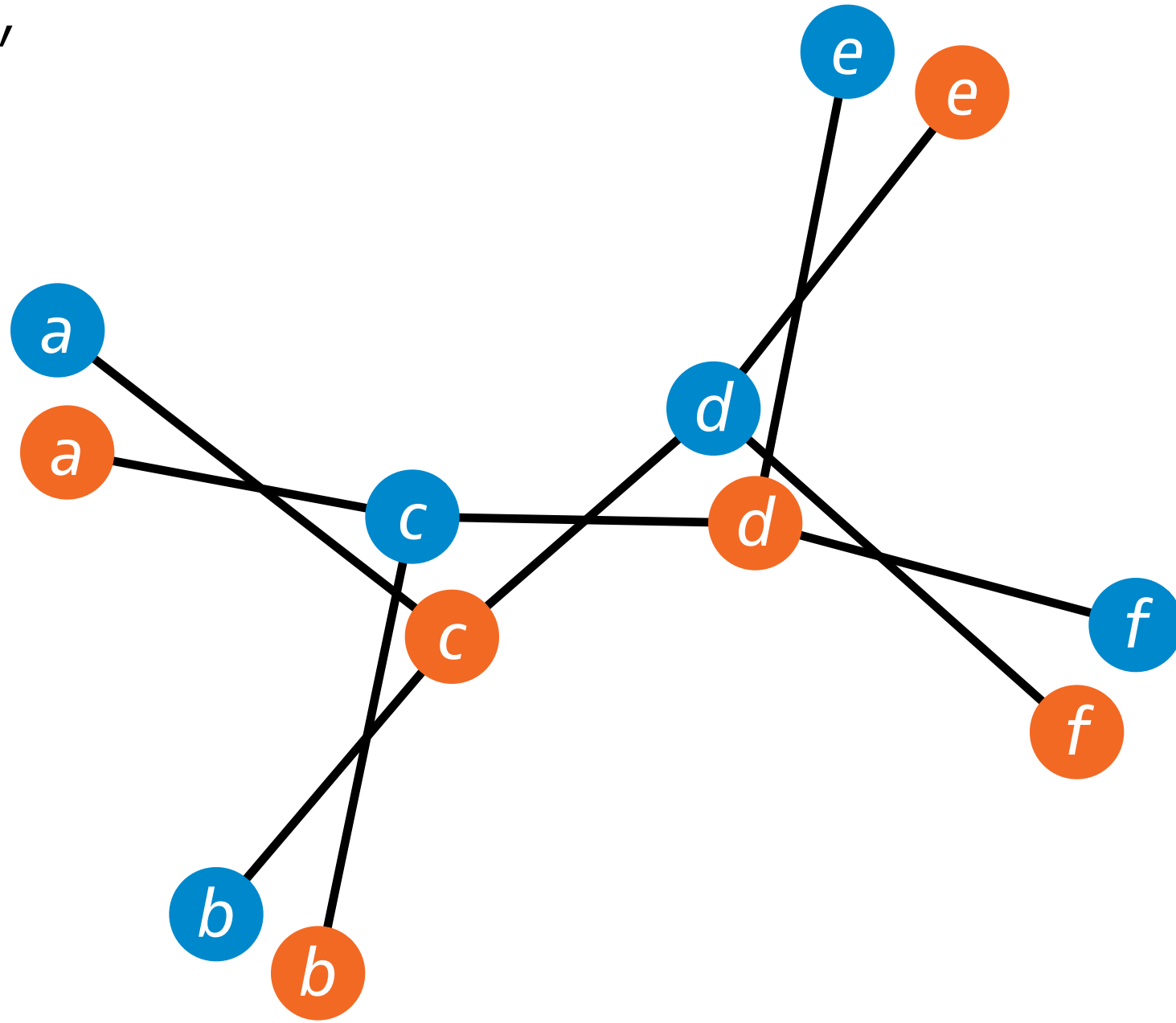




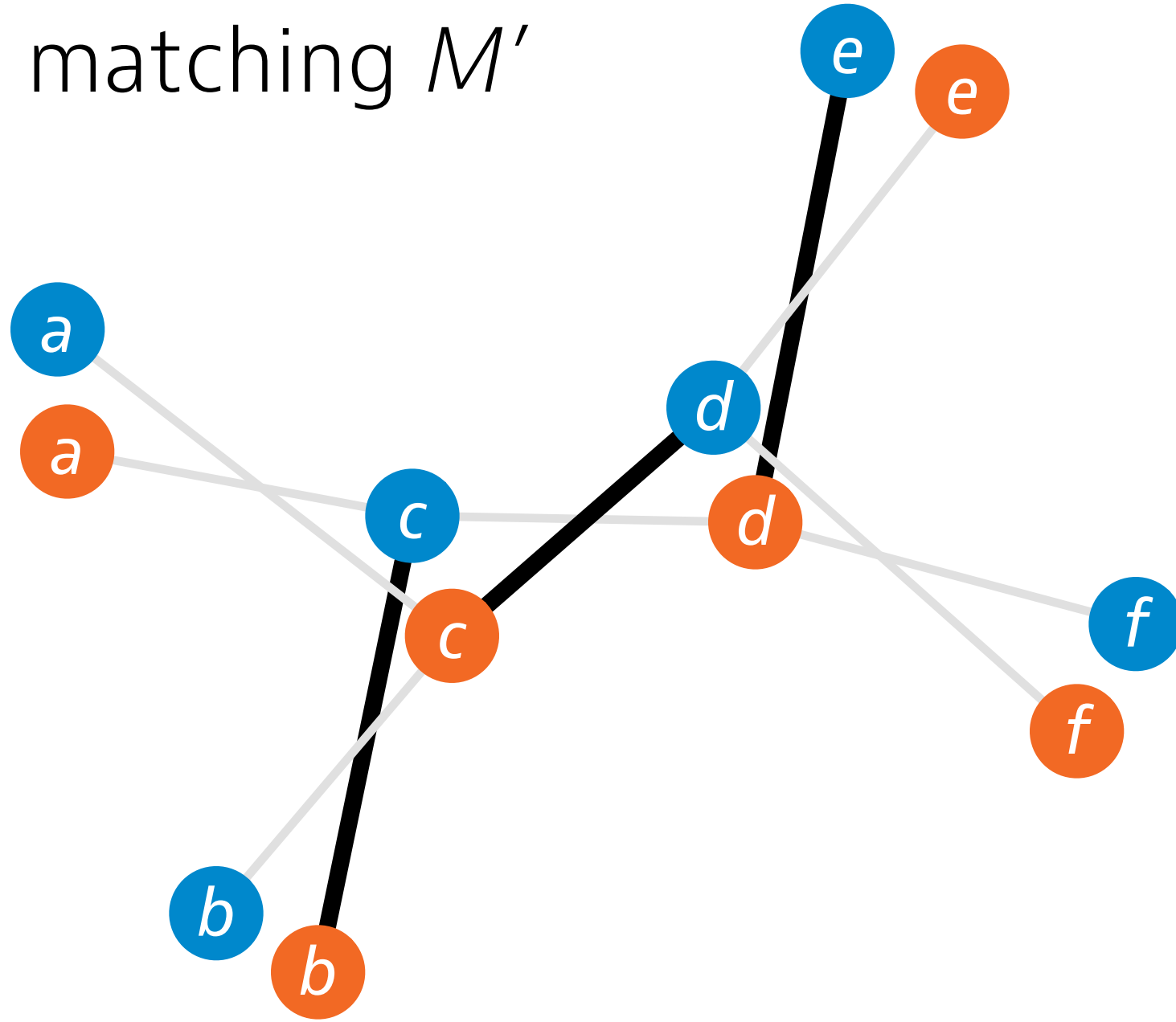


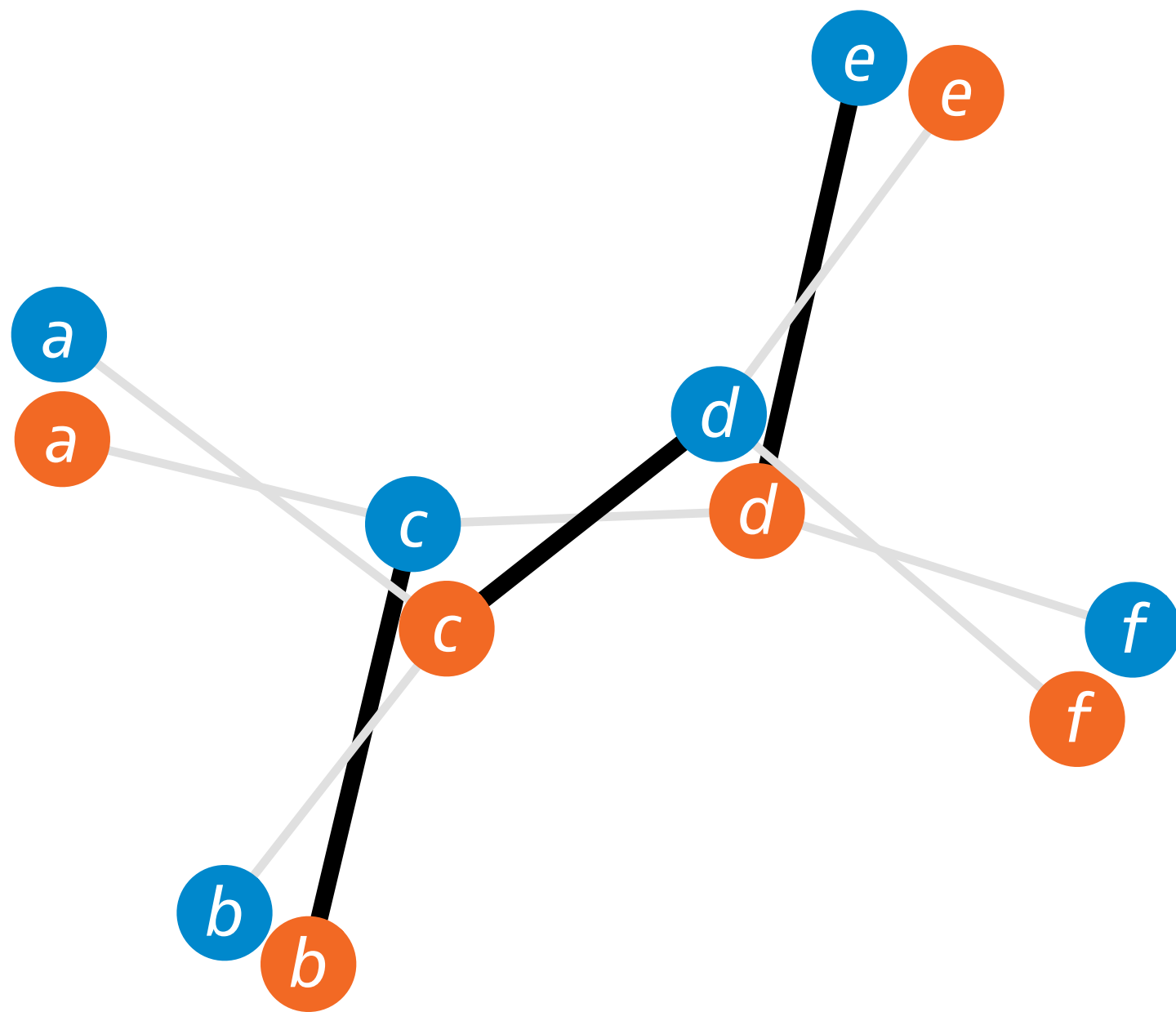


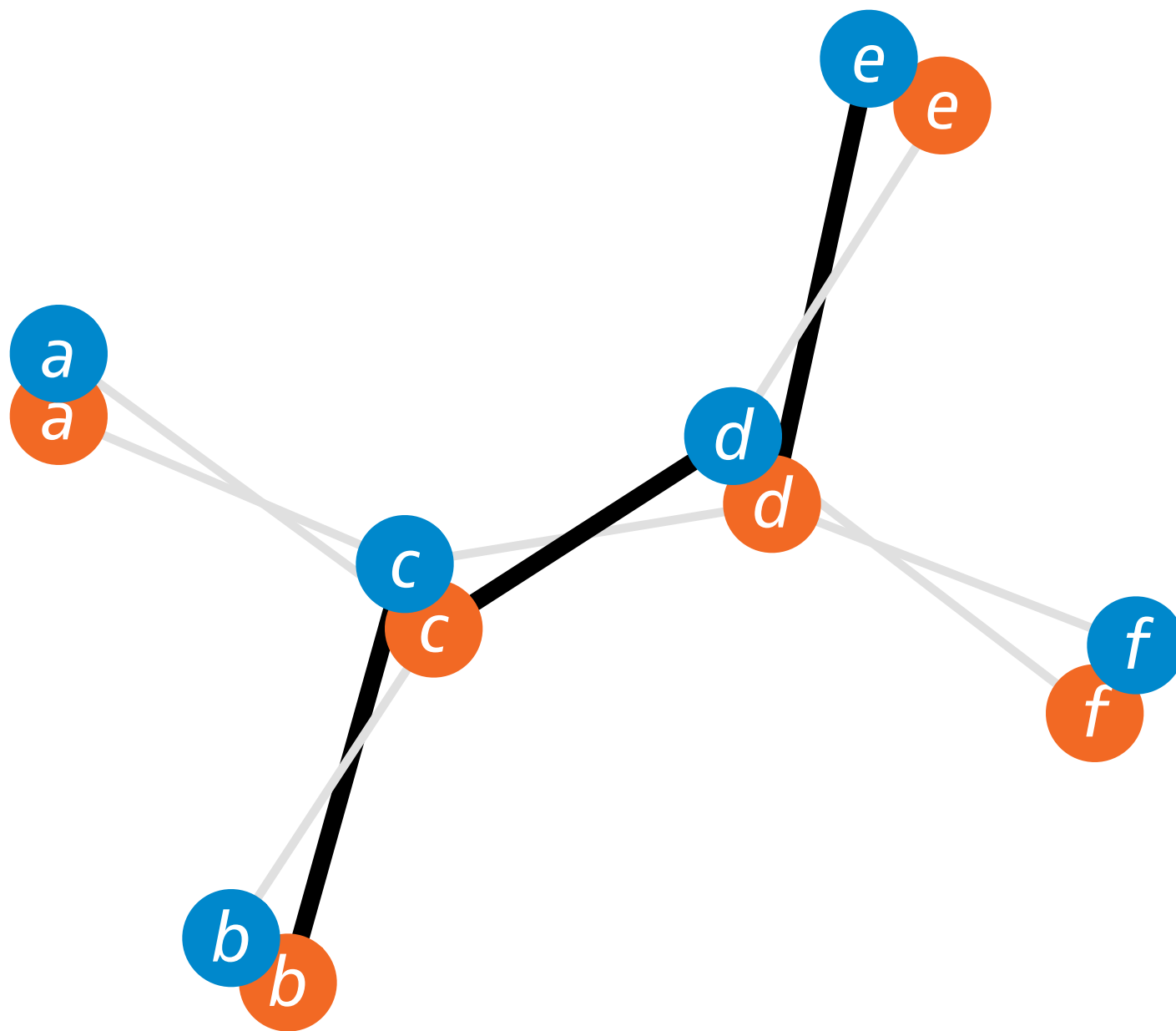
Graph G'

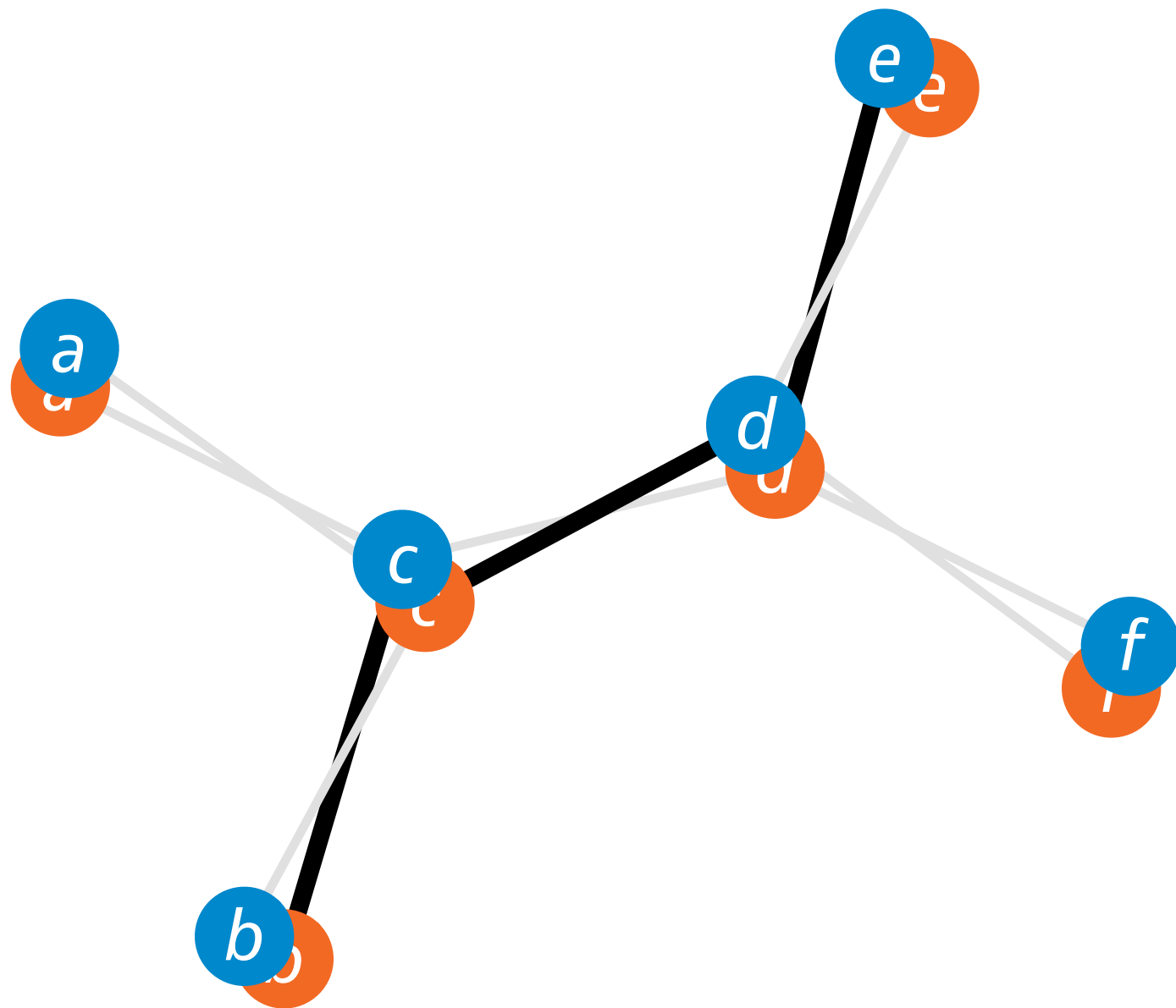


Maximal matching M'

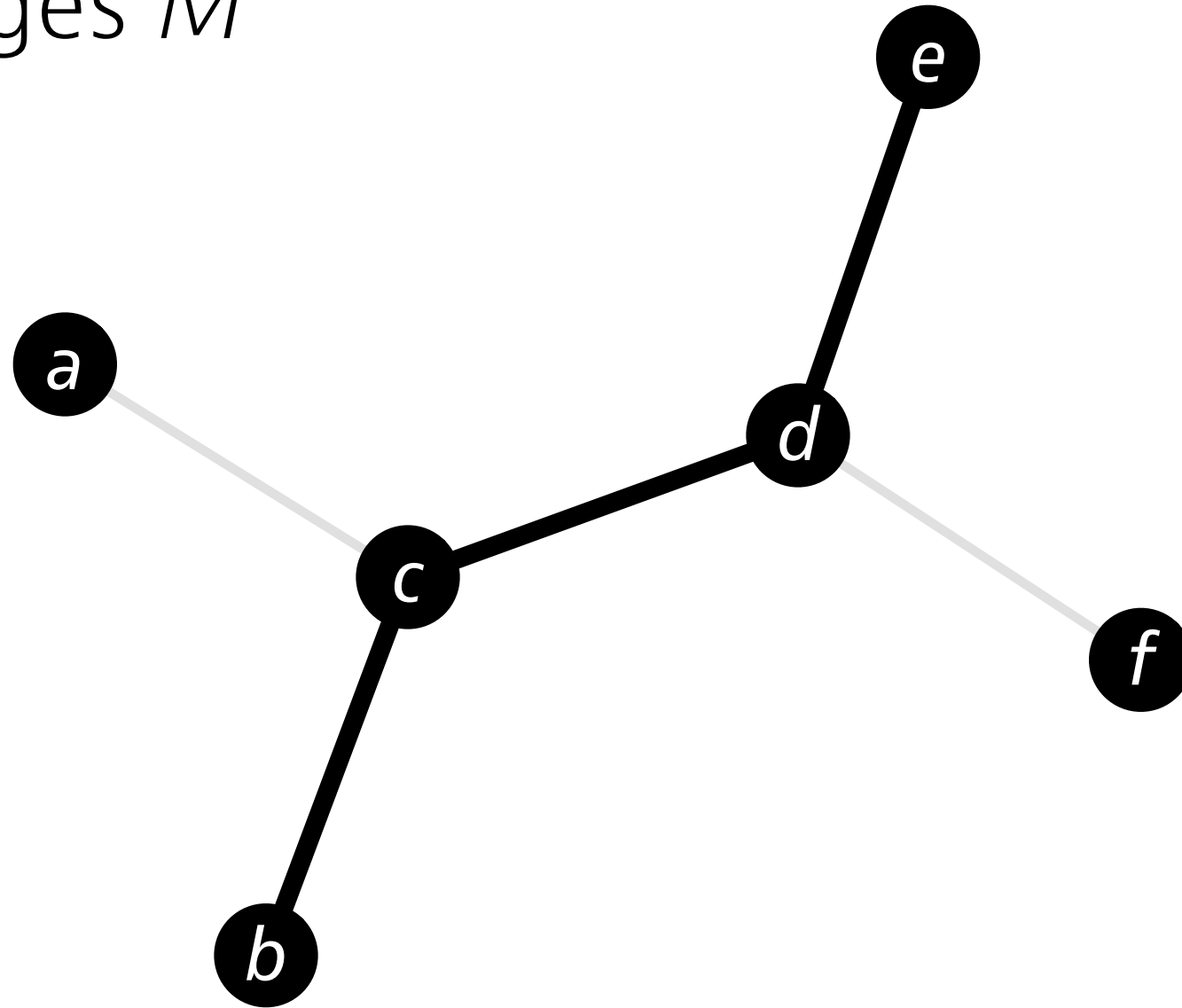








Set of edges M



Set of nodes C

