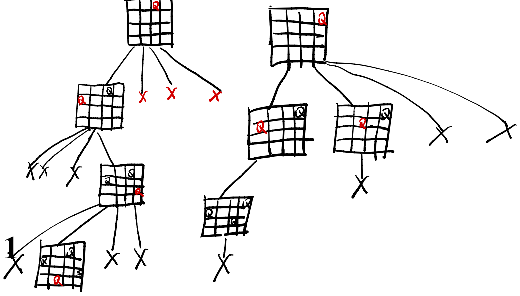
# Problem Session Week 11

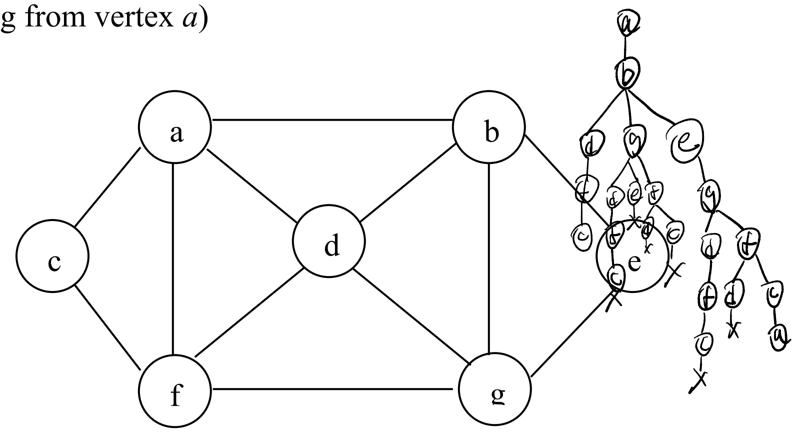


### Question 1

Continue the backtracking search for a solution to the four-queens problem, which was given in this week's lecture, to find the second solution to the problem. Explain how the board's symmetry can be used to find the second solution to the four-queens problem.

### Question 2

Apply backtracking to the problem of finding a Hamiltonian circuit in the following graph (starting from vertex *a*)



### Question 3

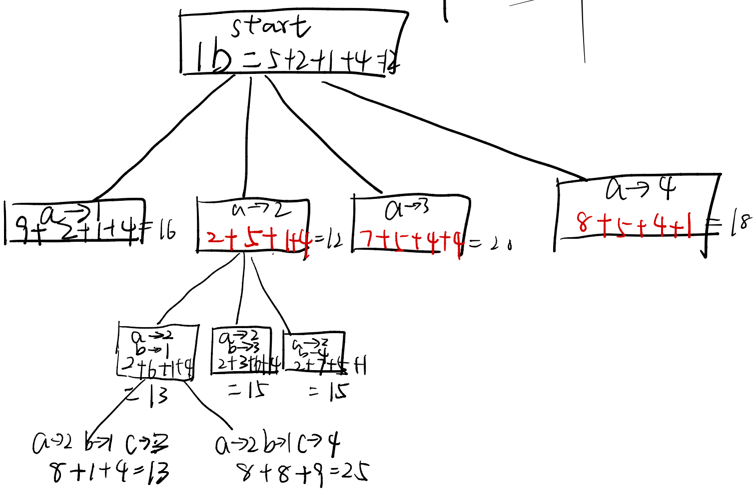
Solve the same instance of the assignment problem as the one solved in the section by the best-first branch-and-bound algorithm with the bounding function based on matrix columns rather than rows.

| | Job1 | Job1 | Job1 | Job1 |
|---|---|---|---|---|
| Person a | 9 | 2 | 7 | 8 |
| Person b | 6 | 4 | 3 | 7 |
| Person c | 5 | 8 | 1 | 8 |
| Person d | 7 | 6 | 9 | 4 |

按列
↓
每列选最小

low bound : 5 + 2 + 1 + 4 = 12

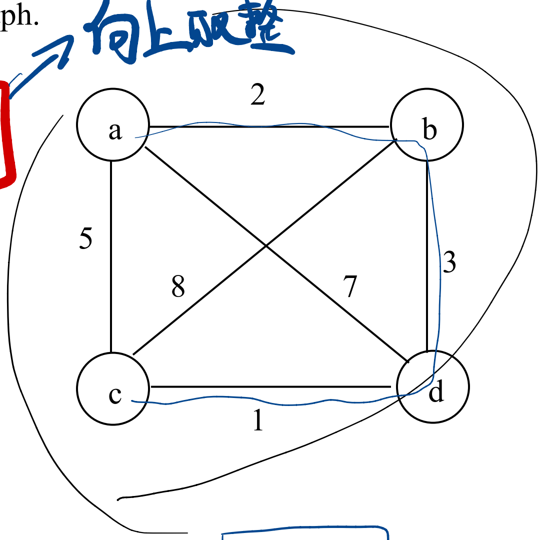
按行
↓
每行选最小



## Question 4

Apply the branch-and-bound algorithm to solve the travelling salesman problem for the following graph.

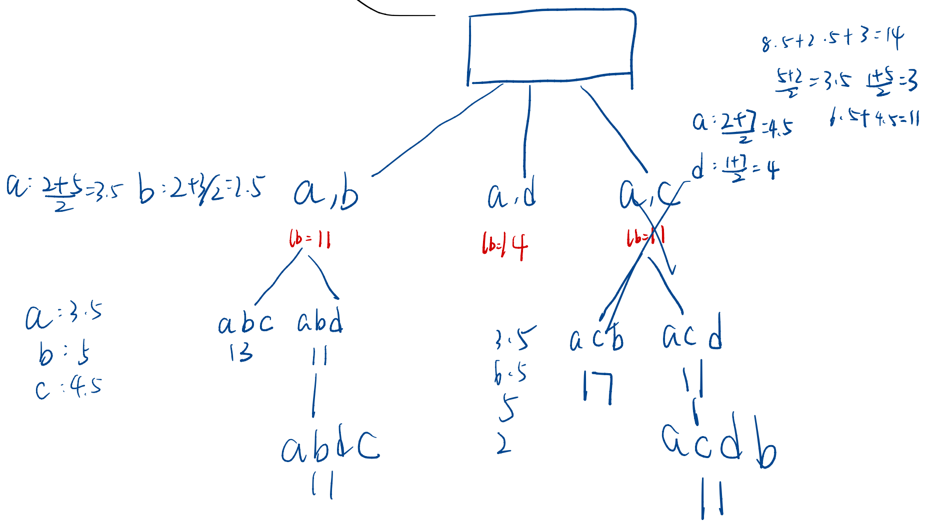
lb= ∑ [顶点 权最小的 两条 degree] / 2 → 向上取整



$$\begin{array}{c|cccc} & a & b & c & d \\ a & 0 & 2 & 5 & 7 \\ b & 2 & 0 & 8 & 3 \\ c & 5 & 8 & 0 & 1 \\ d & 7 & 3 & 1 & 0 \end{array}$$

a : 3.5
b : 2.5
c : 3
d : 2

lb = 3.5+2.5+3+2 = 11



$a: \frac{2+5}{2}=3.5$ $b: 2+3/2=2.5$

a : 3.5
b : 5
c : 4.5

3.5
6.5
5
2

8.5+2.5+3=14

$\frac{5+2}{2}=3.5$ $\frac{1+5}{2}=3$

6.5+4.5=11

$a: \frac{2+7}{2}=4.5$

$d: \frac{1+7}{2}=4$