

Branch & bound algorithm

"Enumeration plus curtailment"

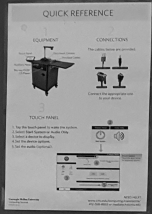
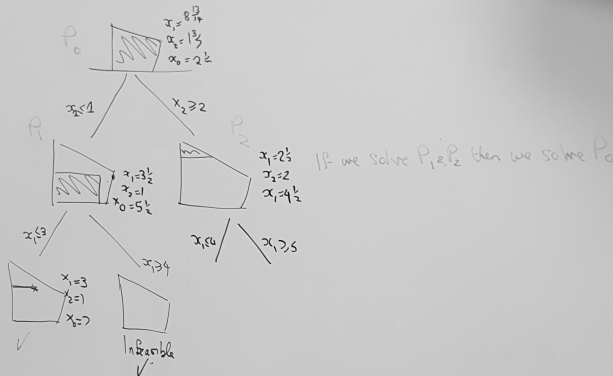
Minimize $20 - 3x_1 - 4x_2$

st

$\frac{2}{5}x_1 + x_2 \leq 3$

$\frac{3}{5}x_1 - \frac{2}{5}x_2 \leq 1$

$x_1, x_2 \geq 0$ & indep.



Suppose I already know a solution of value v^* [not necessarily optimal]

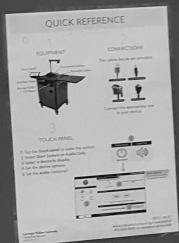
① Solve LP relaxation — minimising.

(a) Answer is integral — also solves IP. [If its value v satisfies $v < v^*$ then $v^* \leftarrow v$.]

(b) LP is infeasible — IP is infeasible. — Problem Solved.

(c) LP value $v \geq v^*$ — no integer solution of value $< v^*$. — Problem not interesting. BOUND

(d) $v < v^*$: Choose a non-integral variable $x_j = \alpha$, say.
Split into 2 problems by adding $x_j \leq \lfloor \alpha \rfloor$
or $x_j \geq \lfloor \alpha \rfloor + 1$

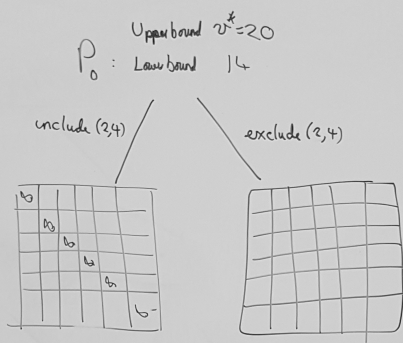


Trouvelling Salesperson

6 cities

0	4	7	3	4	5
6	0	2	1	3	7
8	2	0	3	4	5
6	3	2	0	5	8
2	4	10	3	0	2
4	6	8	8	5	0

Lower bound =
Sum row mins.



v^* : 1-2-3-4-5-6-1
 $v^* = 26$

0	1	4	0	1	2	3
5	0	1	0	2	6	1
6	0	0	1	2	3	2
4	1	0	0	3	6	2
0	2	8	1	0	0	2
1	3	5	0	2	0	3

				0	
				1	
				3	
				8	
				1	

For every tree T , $l(T) = l_1(T) + 13$
 $= l_2(T) + 14 \geq 14$

