Algorithm Design Assignment 3

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Solution #1
Refer to Table 1 and Figure 1:

Table 1

Node	Max Weight	Promising	Bound
1,1	20	✔	60
2,1	50	✔	60
3,1		✖	58
Backtrack to node (2,1)			
3,2	50	✔	
4,1		✖	
Backtrack to node (3,2)			
4,2	50	✔	53
5,1	53	✖	
Backtrack to node (4,2)			
5,2	50	✖	
Backtrack to node (1,1)			
2,2	20	✔	55
3,3	55	✖	
Backtrack to node (2,2)			
3,4		✖	
Backtrack to node (0,0)			
1,2		✖	

Solution: Node (4,2)
Profit: $50

Weight: 7
Bound: 53

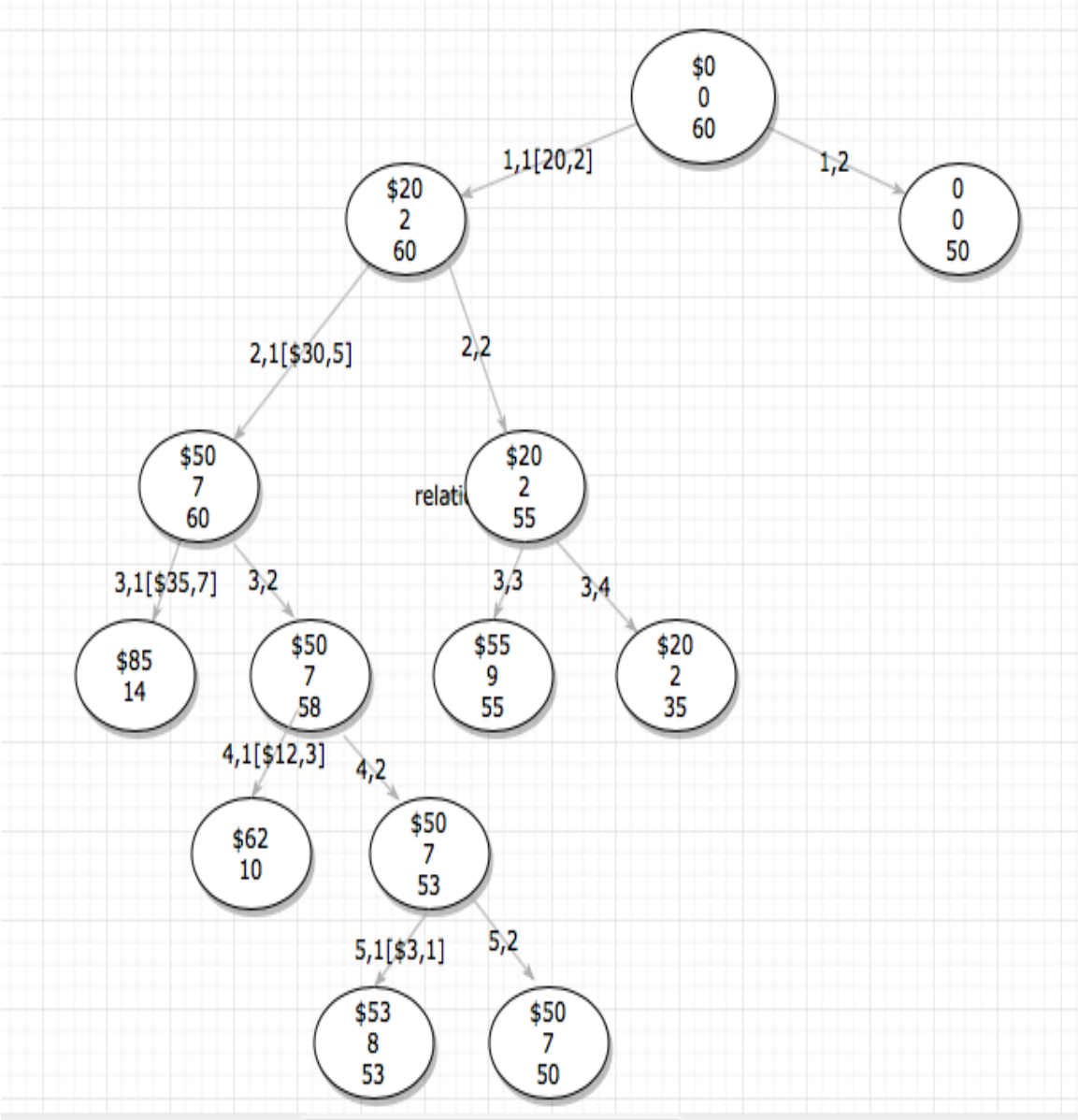

Figure 1

Solution #2
Refer to Table 2 and Figure 2
Here, we apply best-first search to the travelling salesperson problem.

The given adjacency matrix:

	1	2	3	4	5
1	0	6	6	10	8
2	3	0	12	7	6
3	8	7	0	14	20
4	5	13	9	0	8
5	9	8	10	6	0

We first compute the minimum bound:
Min_bound=sum of minimum of each row
: 6+3+7+5+6=27

Table :2

Node	Distance	Total Bound
[1,2]	6+3+8+5+6	28
[1,3]	6 3 7 5 6	27
[1,4]	10 3 7 5 8	33
[1,5]	8 3 7 5 6	29
Node containing [1,3] has min bound, so we go to its children		
[1,3,2]	6 7 6 8 6	33
[1,3,4]	6 14 6 8 8	42
[1,3,5]	6 20 7 13 6	52
Node containing [1,3,2] has min bound, so we go to its children		
[1,3,2,4]	6 7 7 8 9	37
Tour Length [1,3,2,4,5,1]= 37		
[1,3,2,5]	6 7 6 6 5	30
Tour Length [1,3,2,5,4,1]= 30		
The nodes containing [1,4],[1,3,4] and [1,3,5] become non promising because their bounds 33,42 and 52 are greater than		

30,the new value of minlength		
Next we find promising, unexpanded node with the smallest bound →node[1,2]: bound=28(<30)		
[1,2,3]	6 12 14 8 6	46
[1,2,4]	6 14 8 20 10	58
[1,2,5]	6 20 14 8 6	54
All these are non-promising because their bounds are greater than minimum tour length i.e. 30		
Next we find promising, unexpanded node with the smallest bound →node[1,5]: bound=29(<30)		
[1,5,2]	8 8 7 7 9	39
[1,5,3]	8 10 7 7 9	41
[1,5,4]	8 6 7 7 9	37
All these are non-promising because their bounds are greater than minimum tour length i.e. 30		

The minimum total length found is 30.
The nodes are →[1,3,2,5]
The optimal tour is provided by→[1,3,2,5,4,1]

Figure 2 on next page

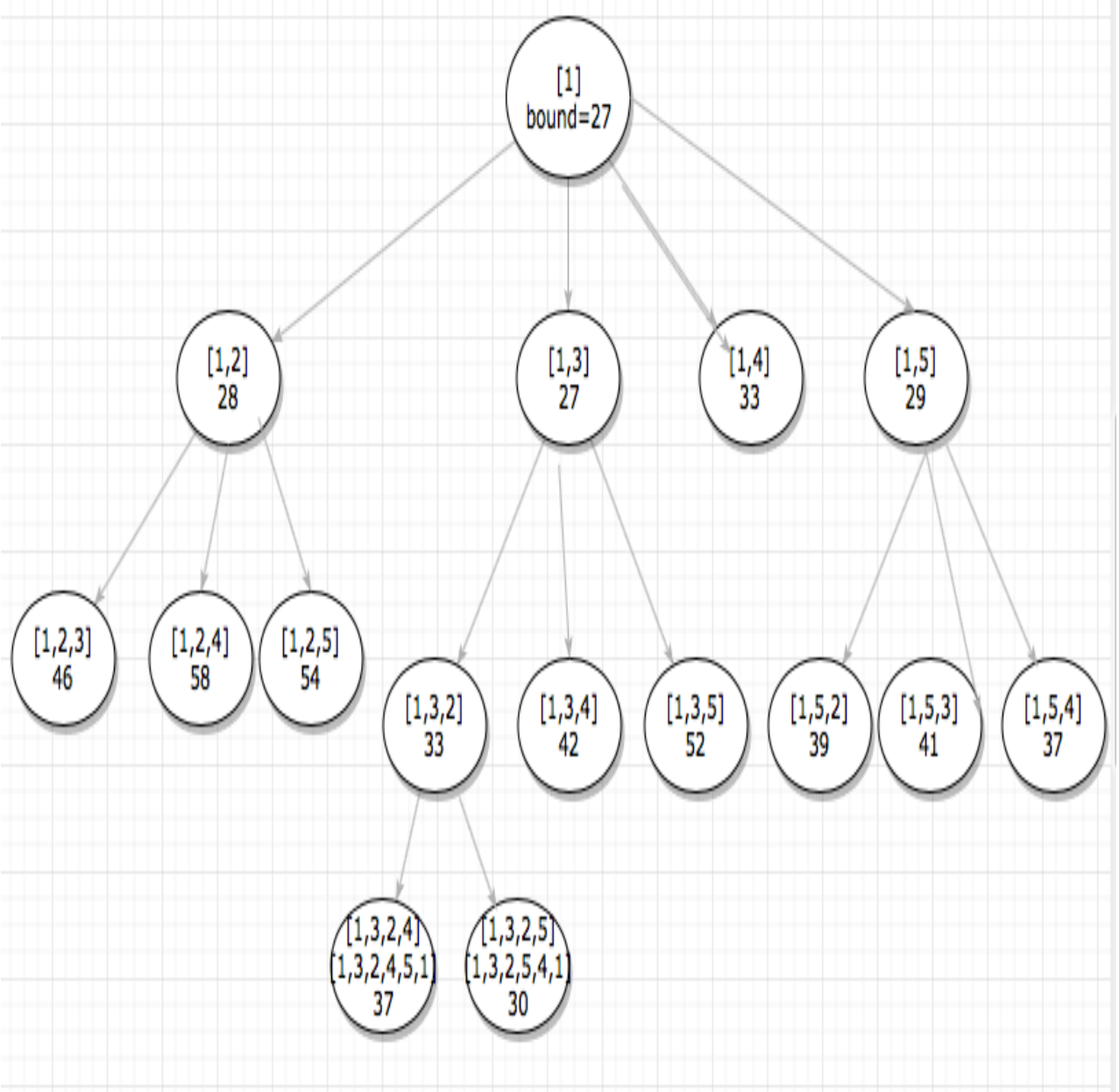
[1]
bound=27
[1,2]
28
[1,3]
27
[1,4]
33
[1,5]
29
[1,2,3]
46
[1,2,4]
58
[1,2,5]
54
[1,3,2]
33
[1,3,4]
42
[1,3,5]
52
[1,5,2]
39
[1,5,3]
41
[1,5,4]
37
[1,3,2,4]
[1,3,2,4,5,1]
37
[1,3,2,5]
[1,3,2,5,4,1]
30

Figure 2

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