1. Branch and Bound - Assignment Problem

	Job 1	Job 2	Job 3	Job 4
Person 1	9	2	7	8
Person 2	6	4	3	7
Person 3	5	8	1	8
Person 4	7	6	9	4

1) Construct Root with least lower bound value.

Find minimum value in each row

$lb = 2 + 3 + 1 + 4 = 10$

Find minimum value in each column.

$lb = 5 + 2 + 1 + 4 = 12$

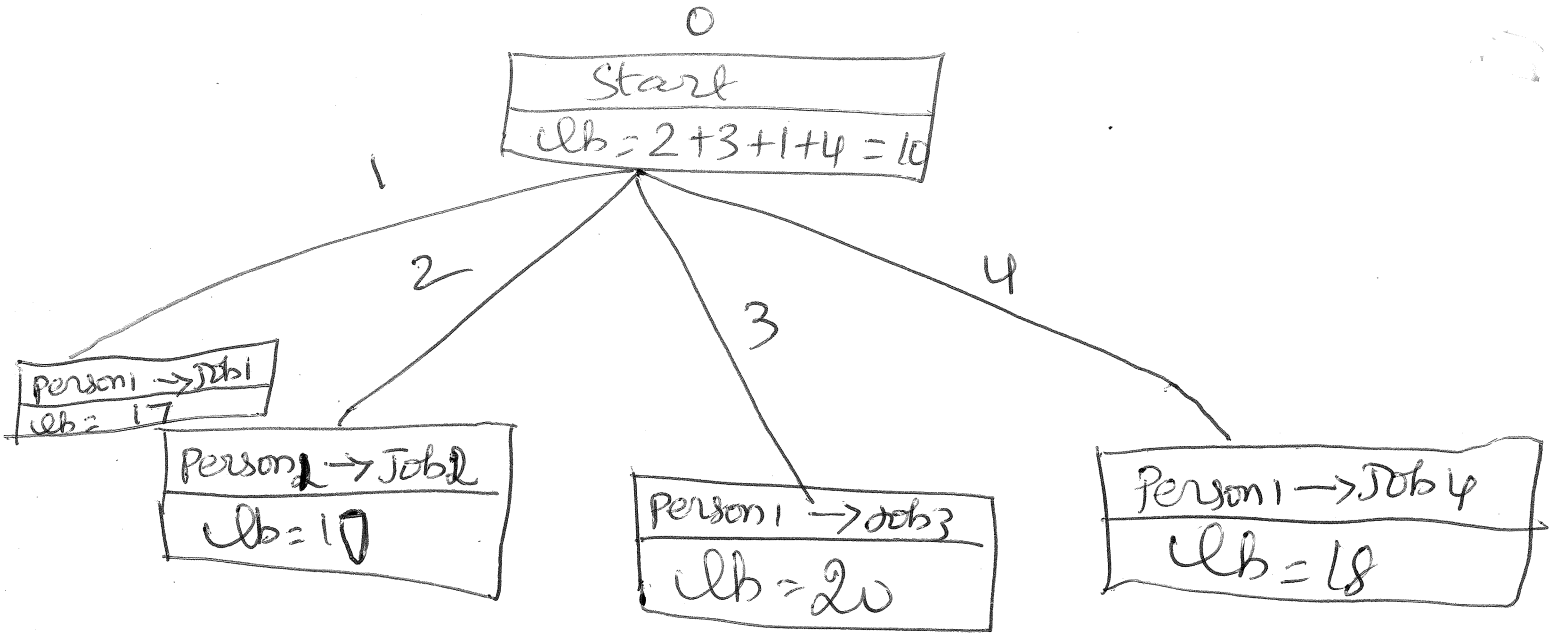
Out of these two values minimum is 10.

So root node is constructed with $lb = 10$

0

Start
$lb = 2+3+1+4 = 10$

2) Using Best first search Branch root node.



Person 1 → Job 1

lb = 9 + (Since Person 1 is assigned Job 1 Value)
3+1+4 { other persons are assigned minimum Value }

= 9+3+1+4

lb = 17

Person 1 → Job 2

lb = 2 + (Since Person 1 is assigned Job 2 Value
3+1+4 { other persons are assigned minimum Value }

lb = 10

Person 1 → Job 3

lb = 7 + (Since Person 1 is assigned Job 3 Value)
(3)+(1)+4 (Person 2 is not assigned Job 3. Since it is assigned person 1. So choose next minimum Value)
(Person 3 is not assigned Job 3. Since it is assigned person 1. So choose next minimum value)

= 7+4+5+4

lb = 20

Person1 → Job4

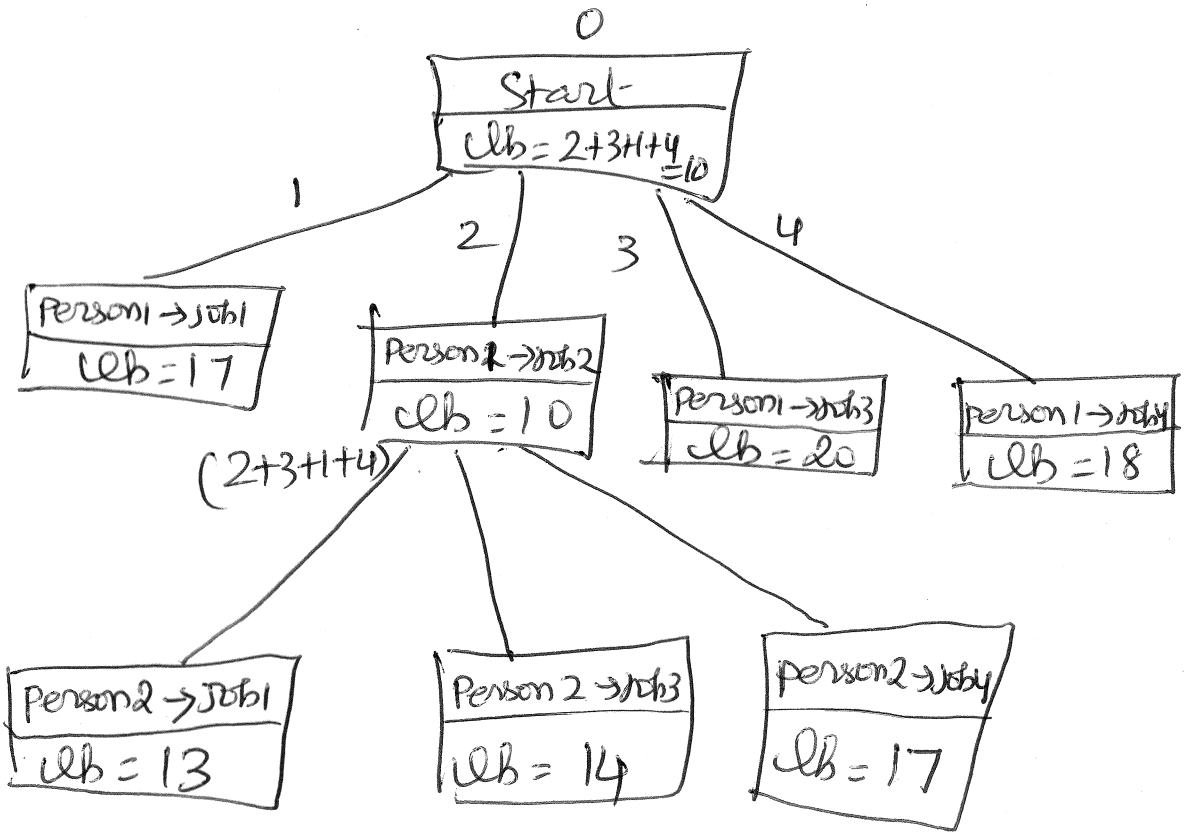
lb = 8 + (Since Person1 is assigned with Job 4)

3 + 1 + 6 (Person4 is not assigned with Job4. Since it is assigned with Person1. So Choose next minimum value)

= 8 + 3 + 1 + 6

lb = 18

out of these four lb values, Choose minimum value. So lb = 10 value is choosen. So Branch node 2.



Person2 → Job1

lb = 2 (Since Person1 is assigned Job2 because lb is minimum)

+ 6 (Person2 is assigned to Job1)

+ 1 + 4 (other Persons are assigned minimum value)

= 2 + 6 + 1 + 4

lb = 13

Person2 → Job3

lb = 2 (since Person1 is assigned Job2 because lb is minimum
+3 (Person2 is assigned Job3)
+1+4 (other persons are assigned minimum value. person3 is not assigned Job3 since it is already assigned person2 Choose next minimum value)

= 2+3+5+4

lb = 14

Person2 → Job4

lb = 2 (since it is assigned person1 job2)
+7 (person2 is assigned Job4)
+1+9 (since Job4 is assigned Person2 so choose next minimum value: next minimum is 6. it is already assigned for Person1 So choose next minimum value

= 2+7+1+7

lb = 17

out of these three lb values minimum value will be taken for further Branching.

∴ lb = 13 is choosen for Branching

Person 3 → Job 3

lb = 2 + (Person 1 is assigned Job 2
6 + (Person 2 is assigned Job 1
1 + (Person 3 is assigned Job 3
4 + other Persons choose minimum value)

= 2 + 6 + 1 + 4

lb = 13

Person 3 → Job 4

lb = 2 + (Person 1 is assisned Job 2)
6 + (Person 2 is assigned Job 1
8 + (Person 3 is assigned Job 4
5 + (others choose minimum value. since this minimum value is assisned to ones jobs i.e Job 4 is assigned Person 3 so choose next minimum value) (5)
that value is also assigned to Person 1. Choose next minimum value (7). this value is also assigned to Person 2. So choose next minimum value

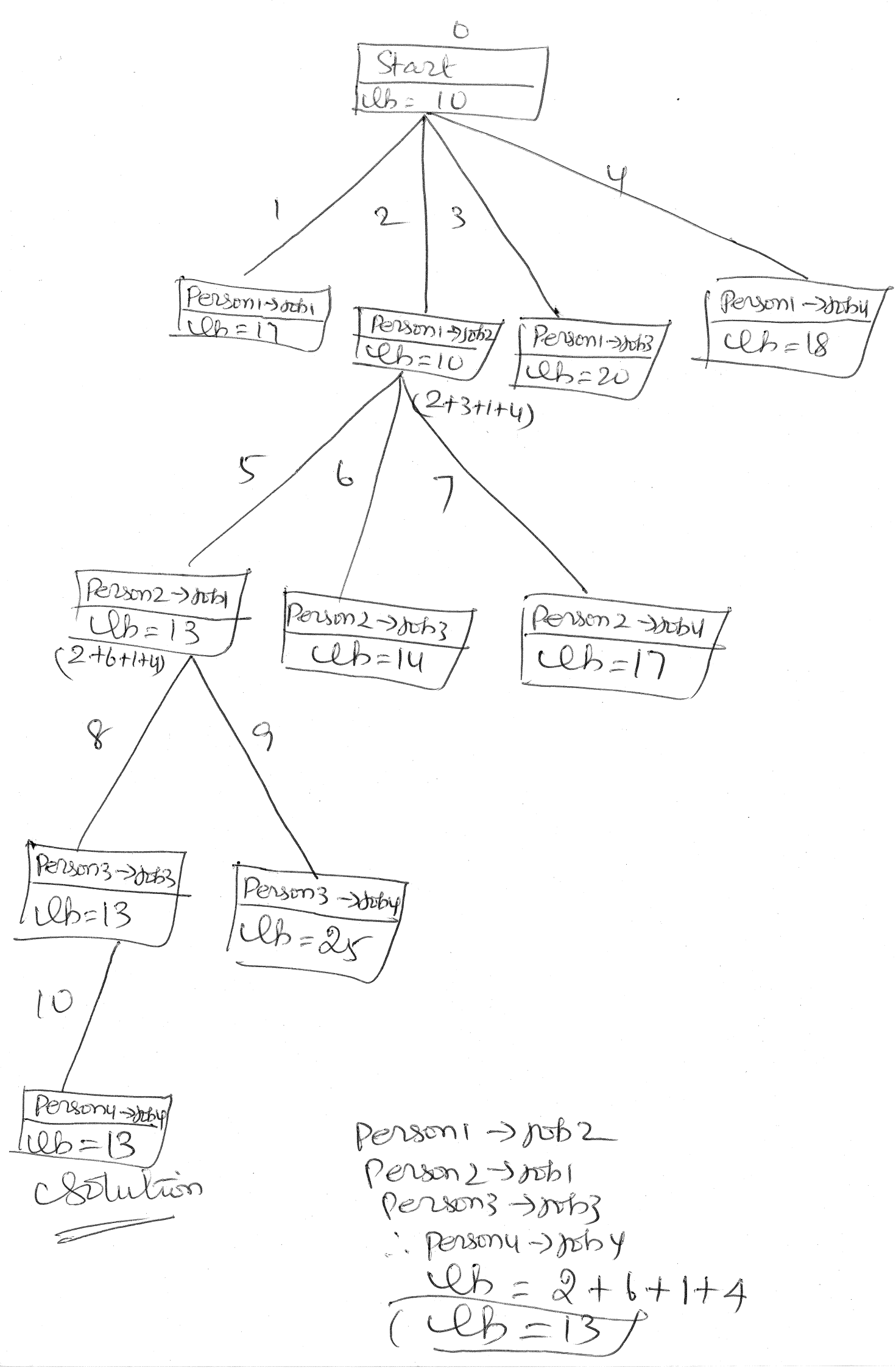
= 2 + 6 + 8 + 5

lb = 21

out of these lb values Choose minimum lb value.

∴ lb = 13 is for branching.

∴ Person 1 is assigned Job 2
Person 2 is assigned Job 1
Person 3 is assigned Job 3
Person 4 is assigned Job 4



Person1 → job2
Person2 → job1
Person3 → job3
∴ Person4 → job4

$lb = 2 + 6 + 1 + 4$

$(lb = 13$