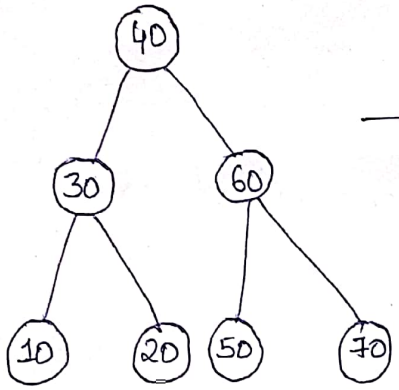
① Assume You are A Data Scientist and You are Wrangling In the preprocessing stage of your Data. And There are no Tools yet developed so your Task is To Convert a Binary Tree (BST) To a Sparse matrix for performing Analysis.



[This is the Tree Input as BST]

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① Input → root of a Tree.

② output → Is a Sparse matrix.

↓

[Base cases]

Test Case -1 :-

40

Only One node

↓

Output

↓

[40]

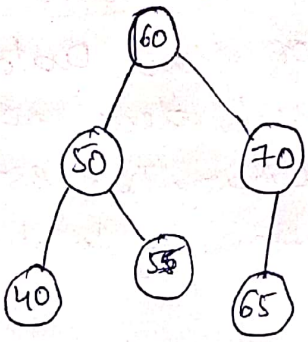
Test case -2 :-

→ [30, 40] ← 2 Nodes as Input

↓

$$\begin{bmatrix} 30 & 0 \\ 0 & 40 \end{bmatrix}$$

Testcase-3:-



[40, 50, 55, 60, 65, 70]

↓

Sparse matrix to be generated is

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$$\begin{bmatrix} 40 & 0 & 0 & 0 & 0 & 0 \\ 0 & 50 & 0 & 0 & 0 & 0 \\ 0 & 0 & 55 & 0 & 0 & 0 \\ 0 & 0 & 0 & 60 & 0 & 0 \\ 0 & 0 & 0 & 0 & 65 & 0 \\ 0 & 0 & 0 & 0 & 0 & 70 \end{bmatrix}$$

[Rare cases]

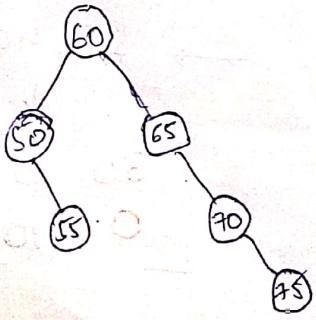
Testcase:-4

[ ] ← empty list

↓

[ ] ← empty Sparse Matrix

Testcase:5:-



[50, 55, 60, 65, 70, 75]

↓

50	0	0	0	0	0
0	55	0	0	0	0
0	0	60	0	0	0
0	0	0	65	0	0
0	0	0	0	70	0
0	0	0	0	0	75

* These are the Five Test cases of the problem

Input: ↓ Input

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Def Sparse (Self, root):
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root is Input

Matrix is output