

m -Way Search Tree

An m -way search tree T may be an empty tree. If T is non-empty, it satisfies the following properties:

- (i) For some integer m known as the order of the tree, each node has at most m child nodes. A node may be represented as $A_0, (K_1, A_1), (K_2, A_2) \dots (K_{m-1}, A_{m-1})$

where $K_i, 1 \leq i \leq m-1$ are the keys and $A_i, 0 \leq i \leq m-1$ are the pointers to the subtree of T .

m -Way Search Tree

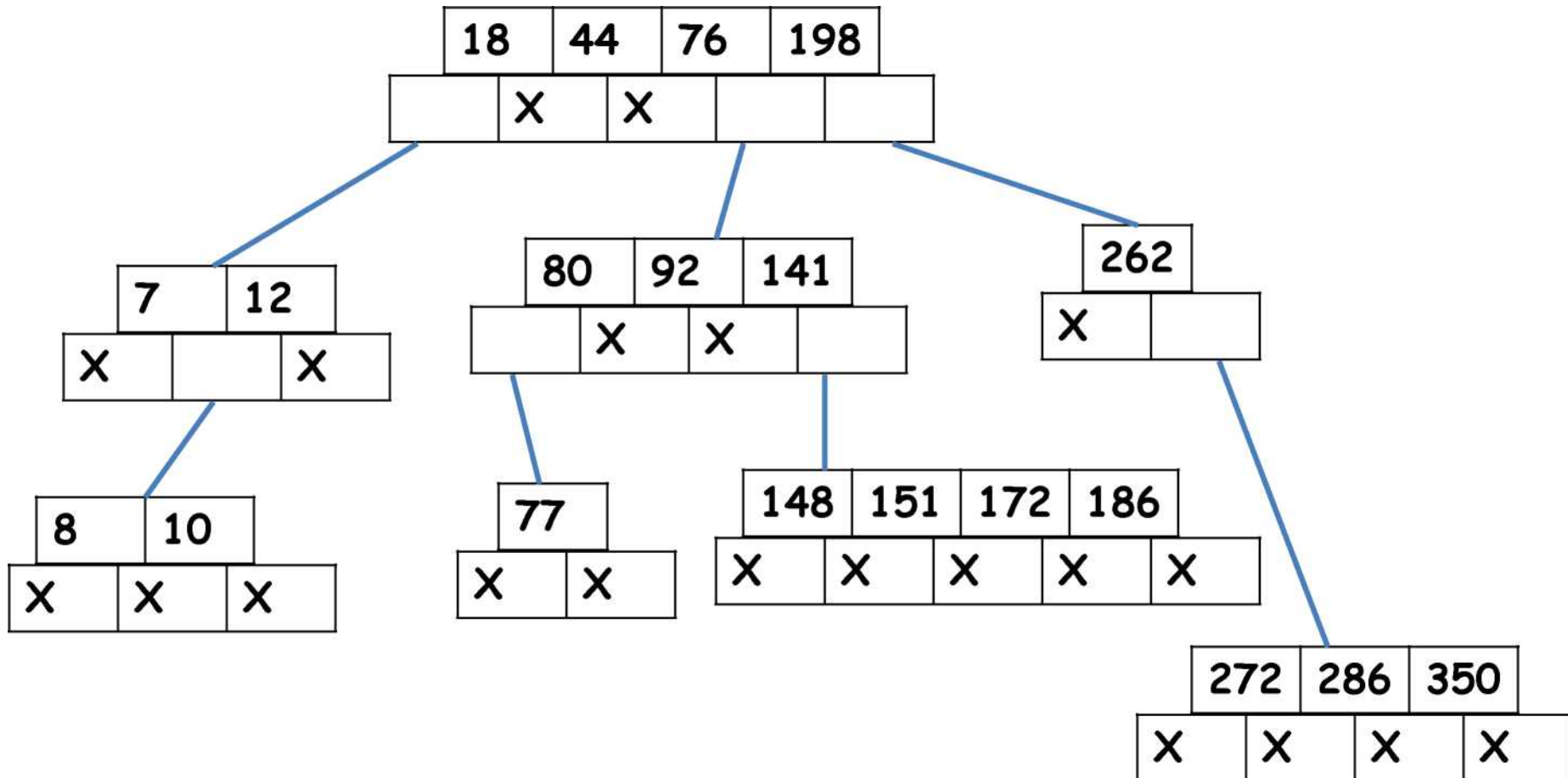
[2] If the node has k child nodes where $k \leq m$, then the node can have only $(k-1)$ keys, K_1, K_2, \dots, K_{k-1} contained in the node such that $K_i < K_{i+1}$ and each of the keys partitions all the keys in the subtrees into k subsets

[3] For a node $A_0, (K_1, A_1), (K_2, A_2), \dots, (K_{m-1}, A_{m-1})$ all key values in the subtree pointed to by A_i are less than the key K_{i+1} , $0 \leq i \leq m-2$ and all key values in the subtree pointed to by A_{m-1} are greater than K_{m-1}

m-Way Search Tree

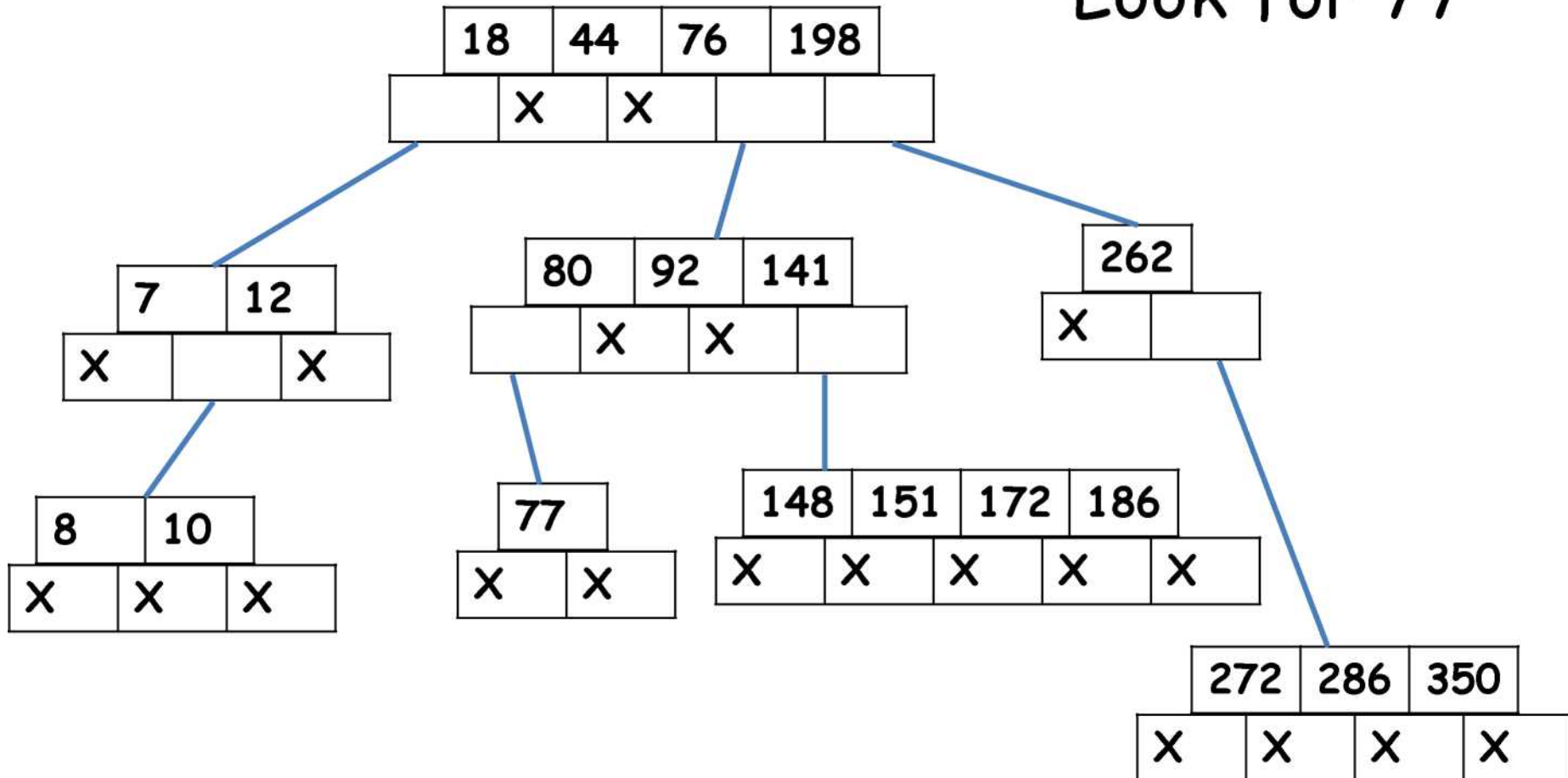
[4] Each of the subtree A_i , $0 \leq i \leq m-1$
are also m-way search tree

m-Way Search Tree [m=5]



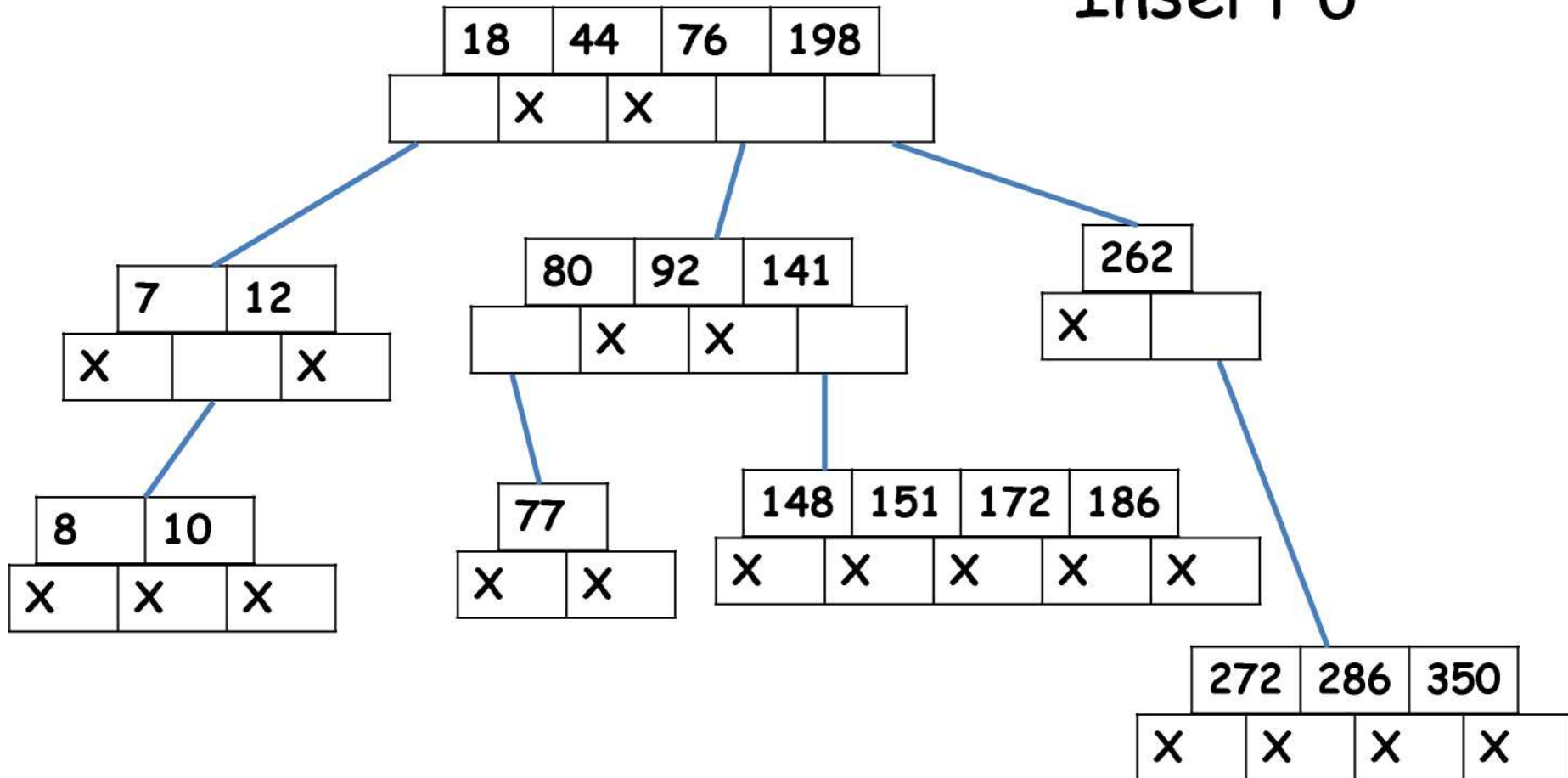
Searching in an **m**-Way Search Tree

Look for 77



Insertion in an **m**-Way Search Tree

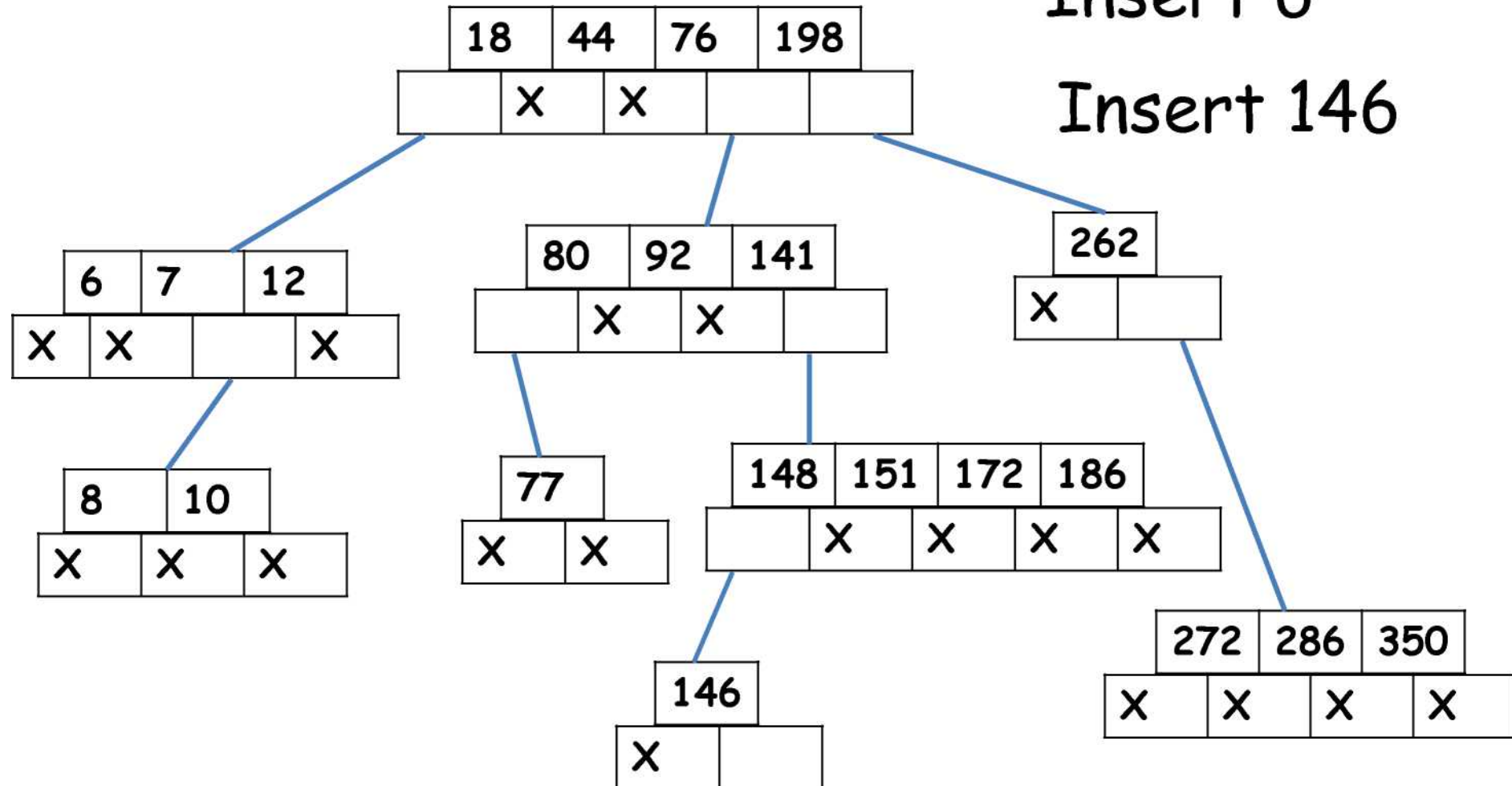
Insert 6



Insertion in an **m**-Way Search Tree

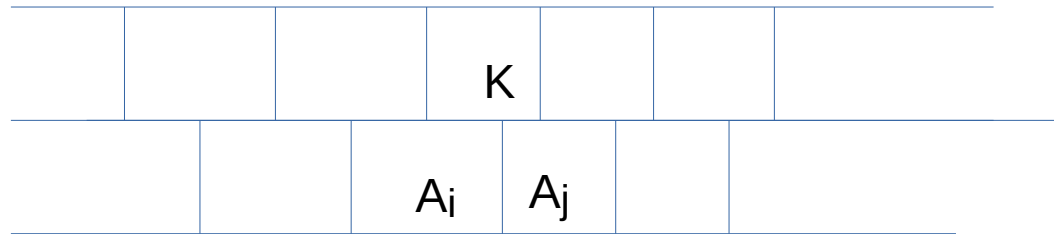
Insert 6

Insert 146



Deletion in an **m**-Way Search Tree

Let K be the key to be deleted from the m -way search tree.



K : Key

A_i , A_j : Pointers to subtree

Deletion in an m -Way Search Tree

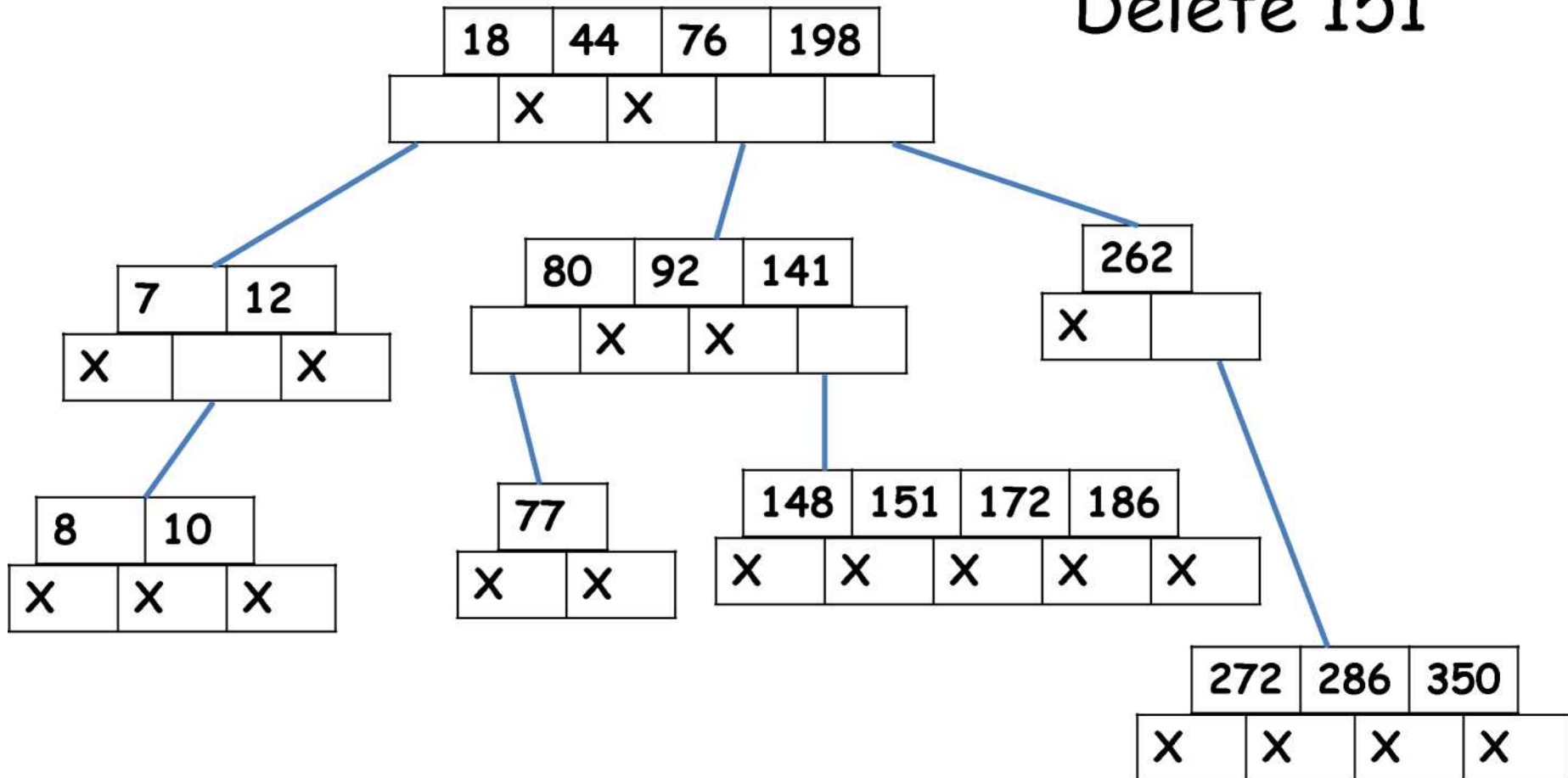
- [1] If $(A_i = A_j = \text{NULL})$ then delete K
- [2] If $(A_i \neq \text{NULL}, A_j = \text{NULL})$ then choose the largest of the key elements K' in the child node pointed to by A_i and replace K by K' .
- [3] If $(A_i = \text{NULL}, A_j \neq \text{NULL})$ then choose the smallest of the key element K'' from the subtree pointed to by A_j , delete K'' and replace K by K''

Deletion in an m -Way Search Tree

[4] If $(A_i \neq \text{NULL}, A_j \neq \text{NULL})$ then choose the largest of the key elements K' in the subtree pointed to by A_i or the smallest of the key element K'' from the subtree pointed to by A_j to replace K .

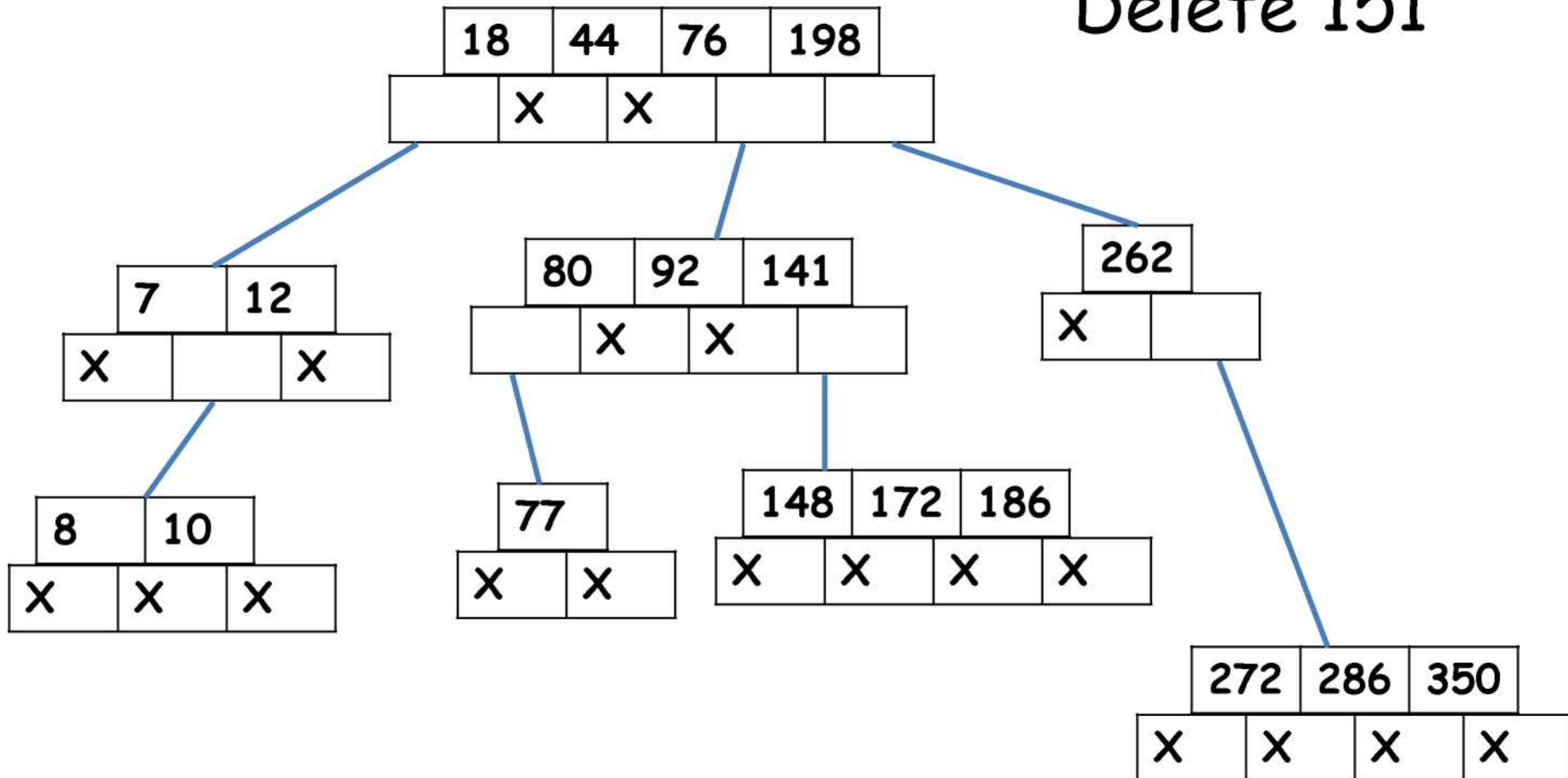
5-Way Search Tree

Delete 151



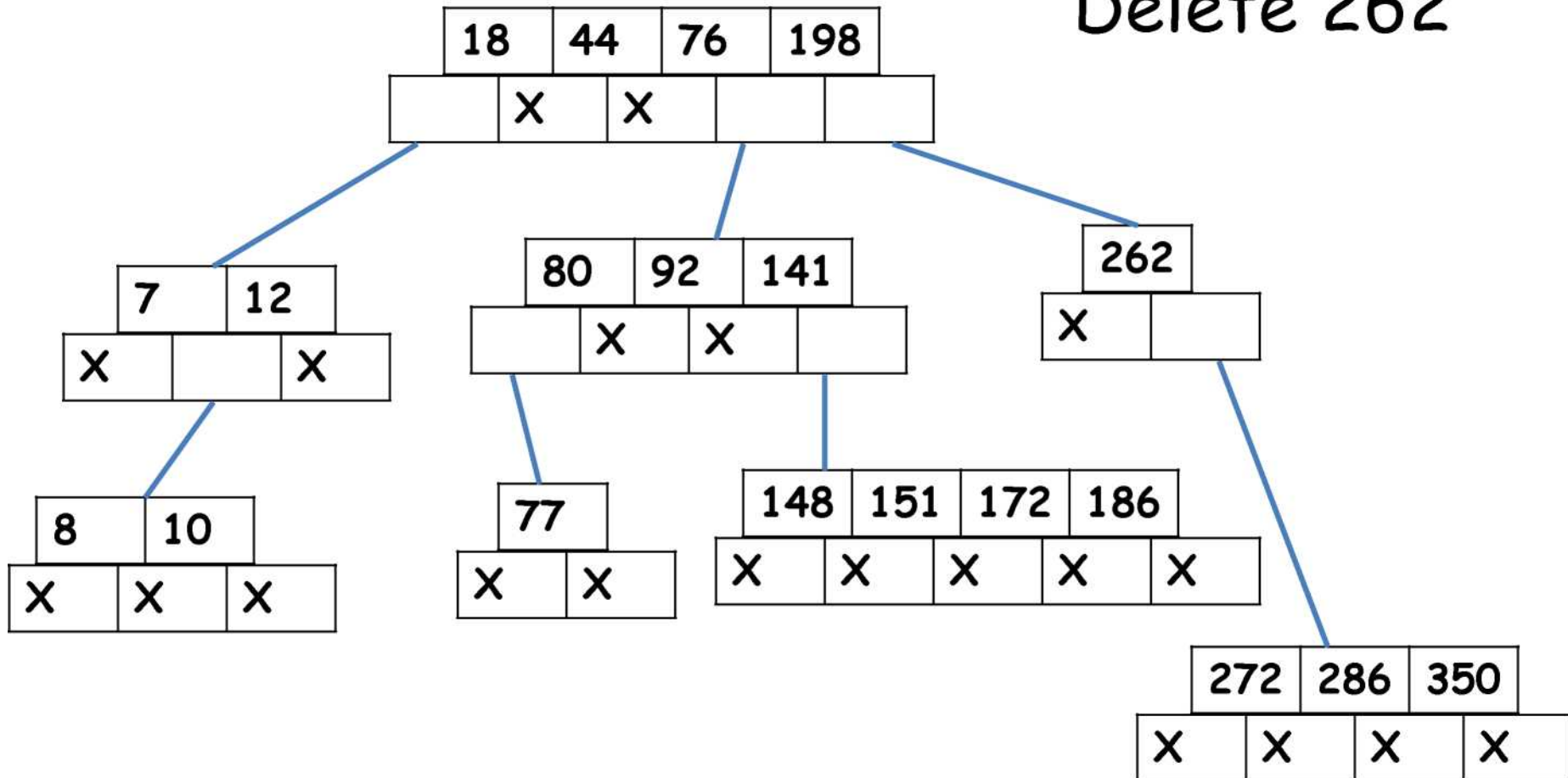
5-Way Search Tree

Delete 151



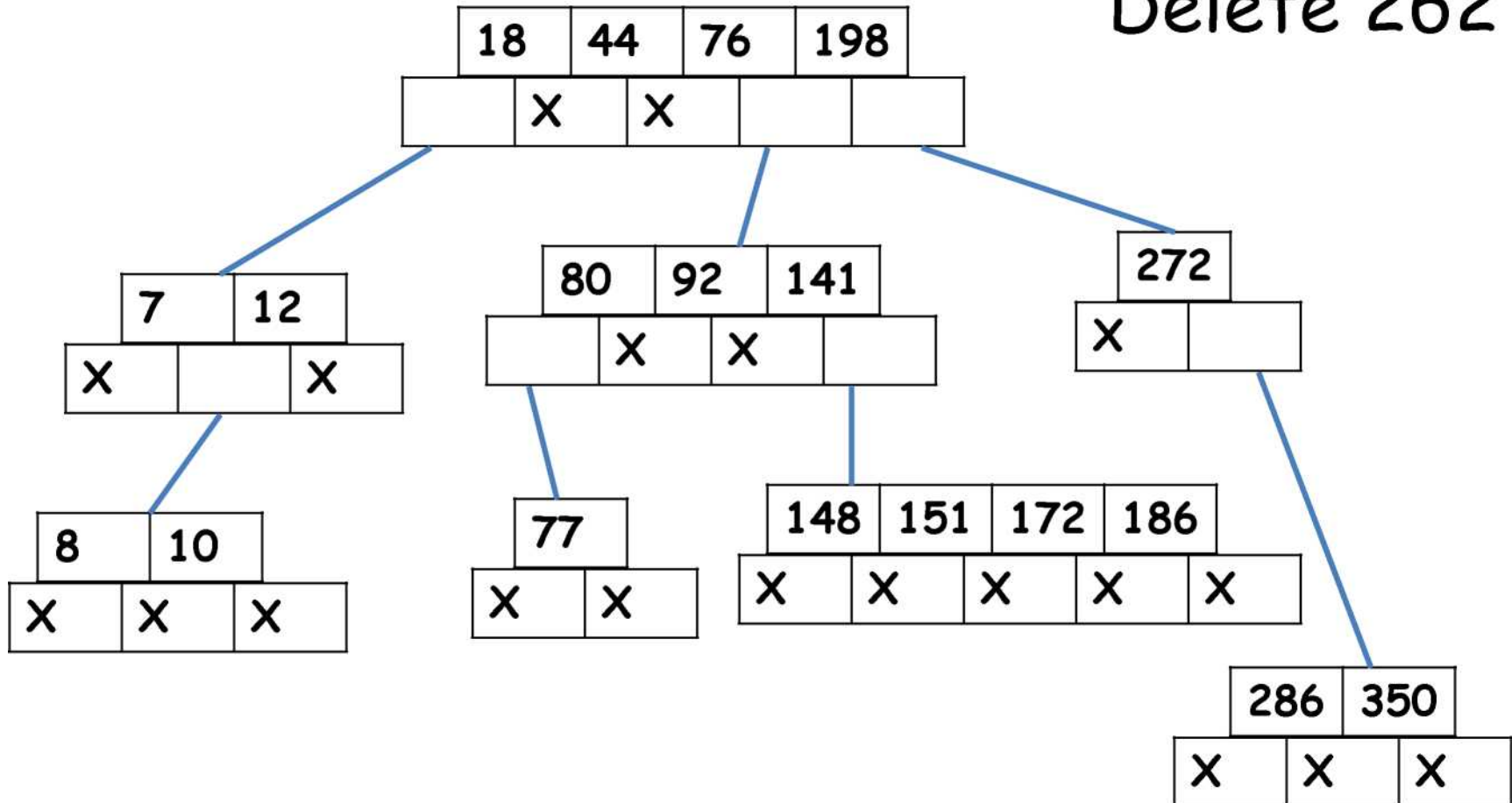
5-Way Search Tree

Delete 262



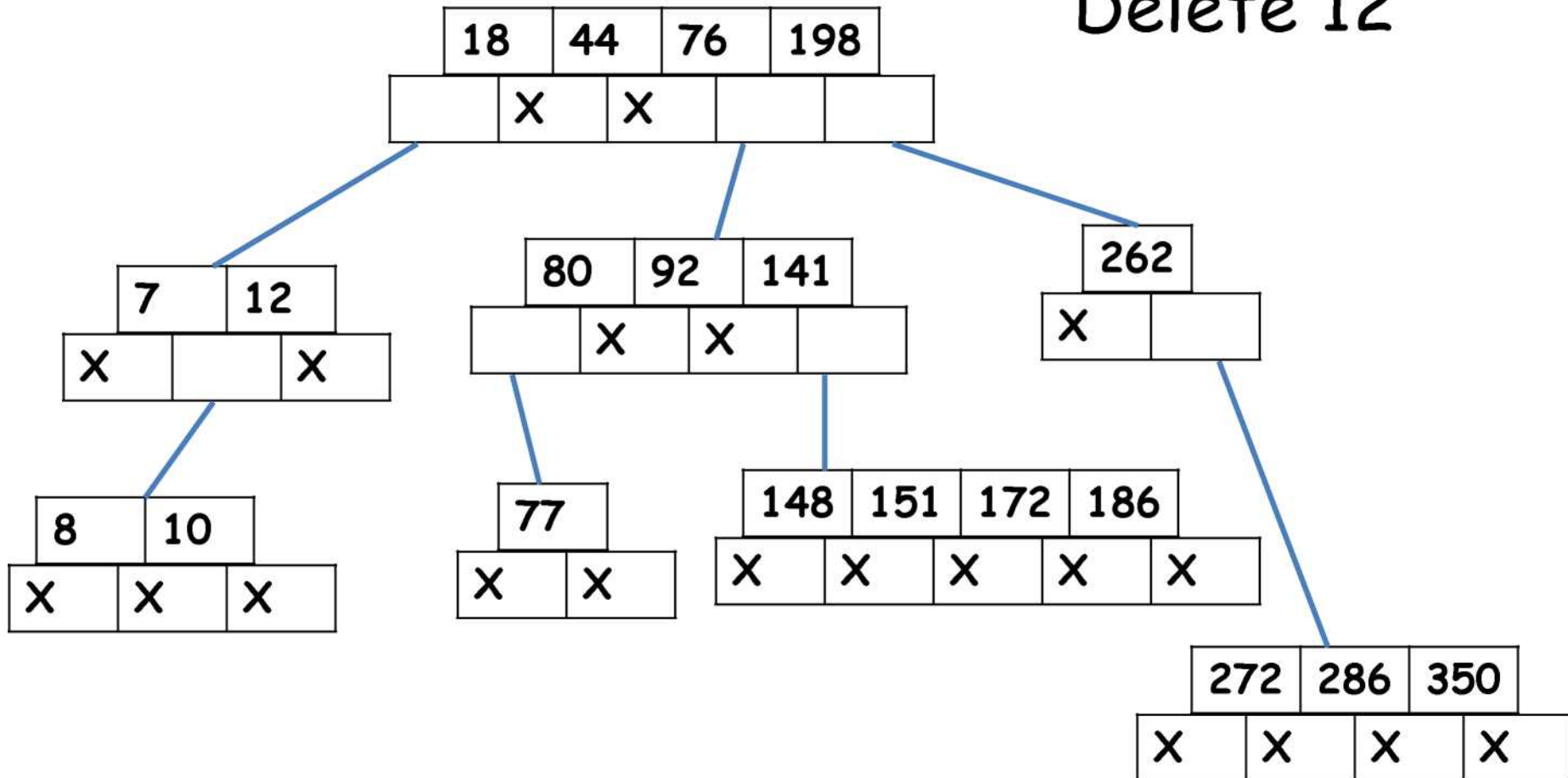
5-Way Search Tree

Delete 262



5-Way Search Tree

Delete 12



5-Way Search Tree

Delete 12

