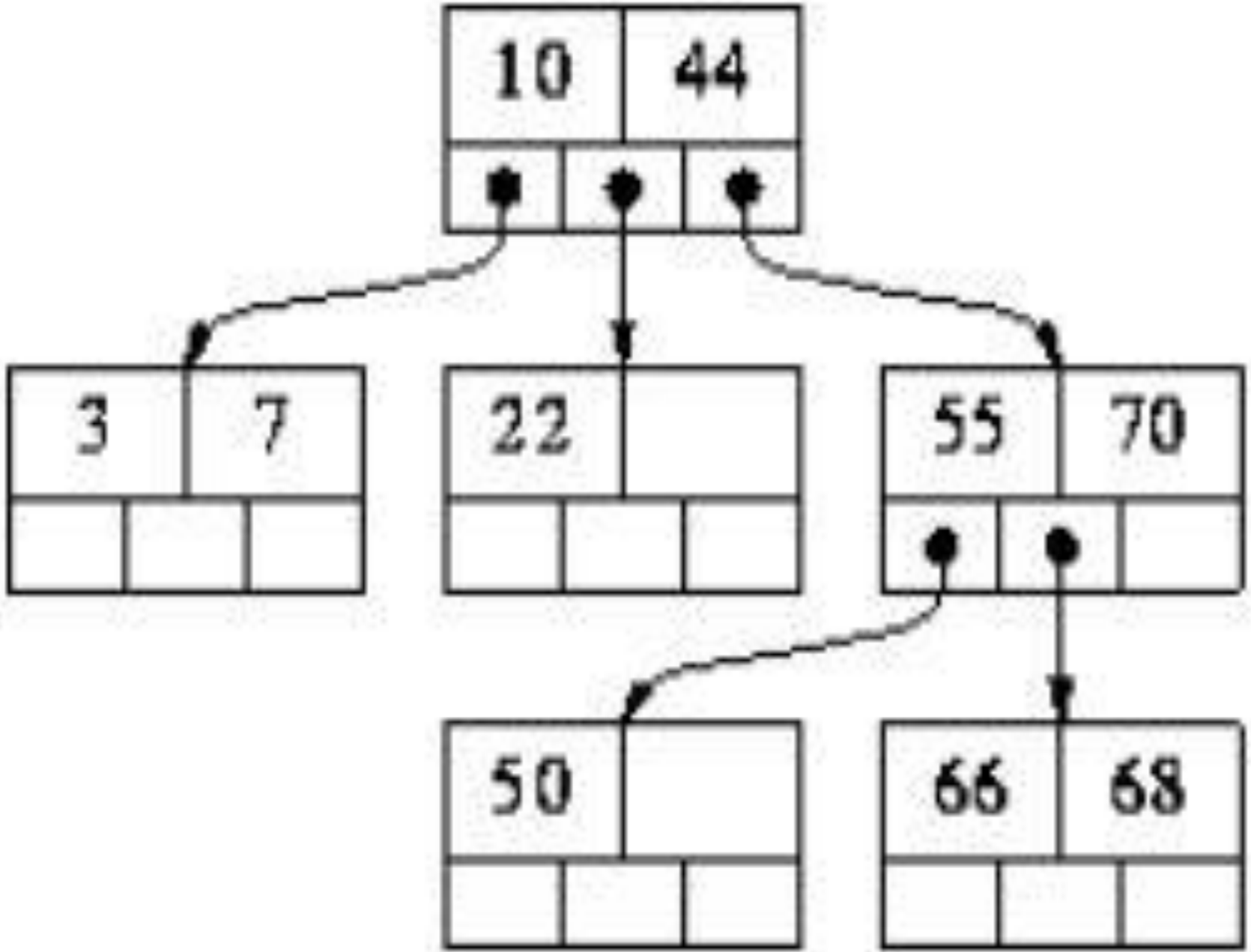
M- WAY TREES

ADITYA TIWARI

ASSISTANT PROFESSOR

CSVTU, BHILAI

- A **multi-way tree** is a tree that can have more than two children
- A **multi-way tree of order m (number or a **m-way tree**) is one in which a tree can have m children.
- An m-way search tree is a m-way tree in which:
  - a) Each node has m children and m-1 key fields
  - b) The keys in each node are in ascending order.
  - c) The keys in the first i children are smaller than the i^{th} key
  - d) The keys in the last m-i children are larger than the i^{th} key


10
44
3
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22
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70
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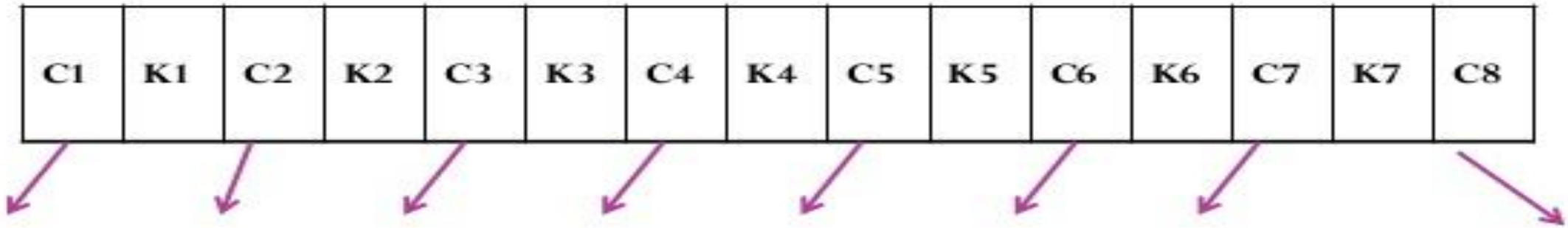
66
68

- In a binary search tree, m=2. So it has one value and two sub trees.
- The figure above is a m-way search tree of order 3.
- M-way search trees give the same advantages to m-way trees that binary search trees gave to binary trees - they provide fast information retrieval and update.
- However, they also have the same problems that binary search trees had - they can become unbalanced, which means that the construction of the tree becomes of vital importance.

- In m-way search tree, each sub-tree is also a m-way search tree and follows the same rules.
- An extension of a multi-way search tree of order m is a **B-tree of order m**.
- This type of tree will be used when the data to be accessed / stored is located on secondary storage devices because they allow for large amounts of data to be stored in a node.

Example

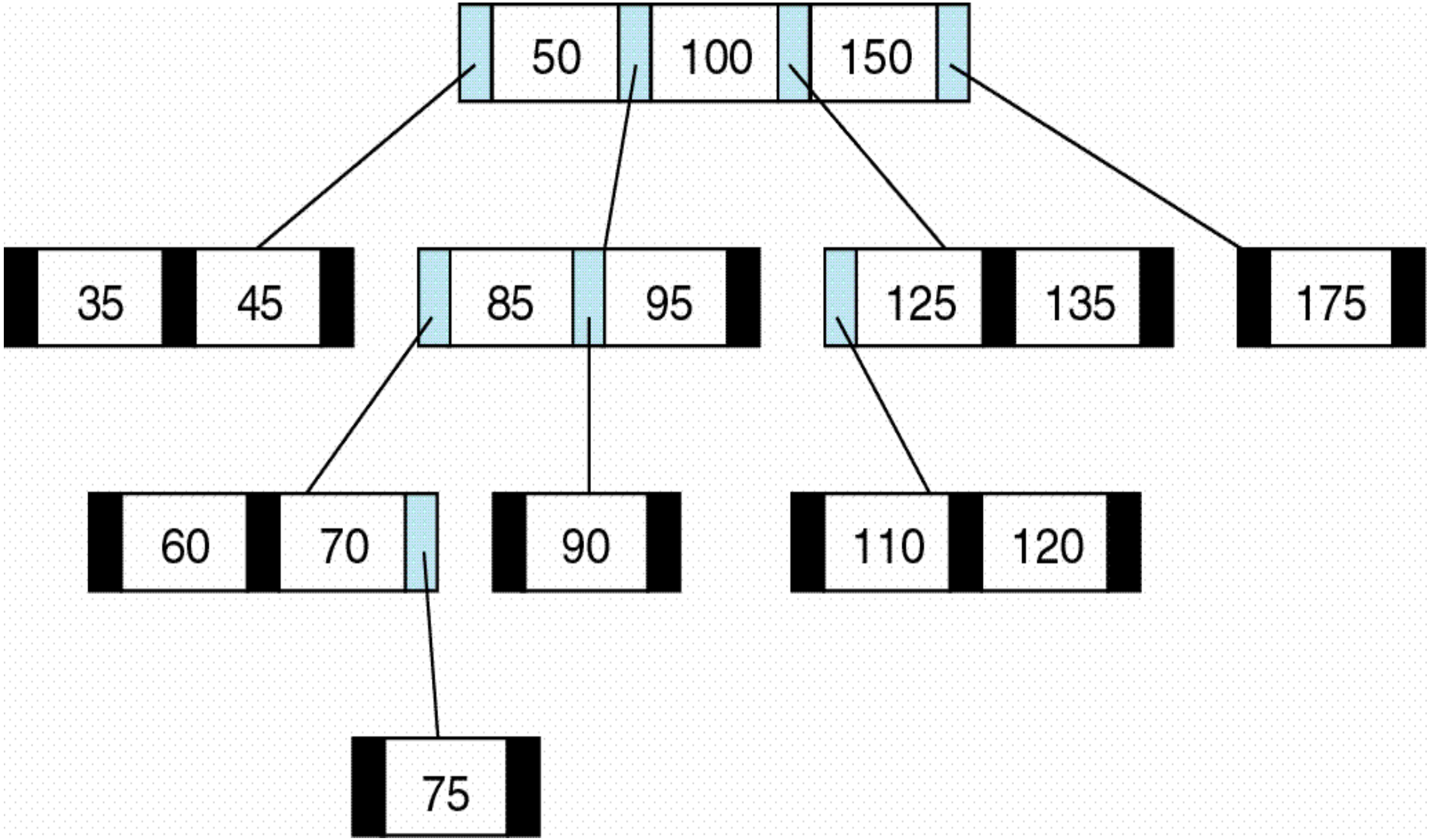
Consider a node of m-way search tree of order 8



1. This node has the capacity to hold 7 keys and 8 children.
2. K1 < K2 < K3 < K4 < K5 < K6 < K7
3. The key K1 is greater then all the keys in subtree pointed to by C1 and less than all the keys in subtree pointed to by pointer C2. Similarly this relation holds true for other keys also.
4. Keys(C1) < K1< Keys(C2) < K2 < Keys(C3) < K3 < Keys(C4)< K4 ....

Note:

From the definition of m-way search trees, we can say that m-way search trees are generalized form of Binary Search Trees and a Binary search tree can be considered as an m-way search tree of order 2.


50
100
150
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90
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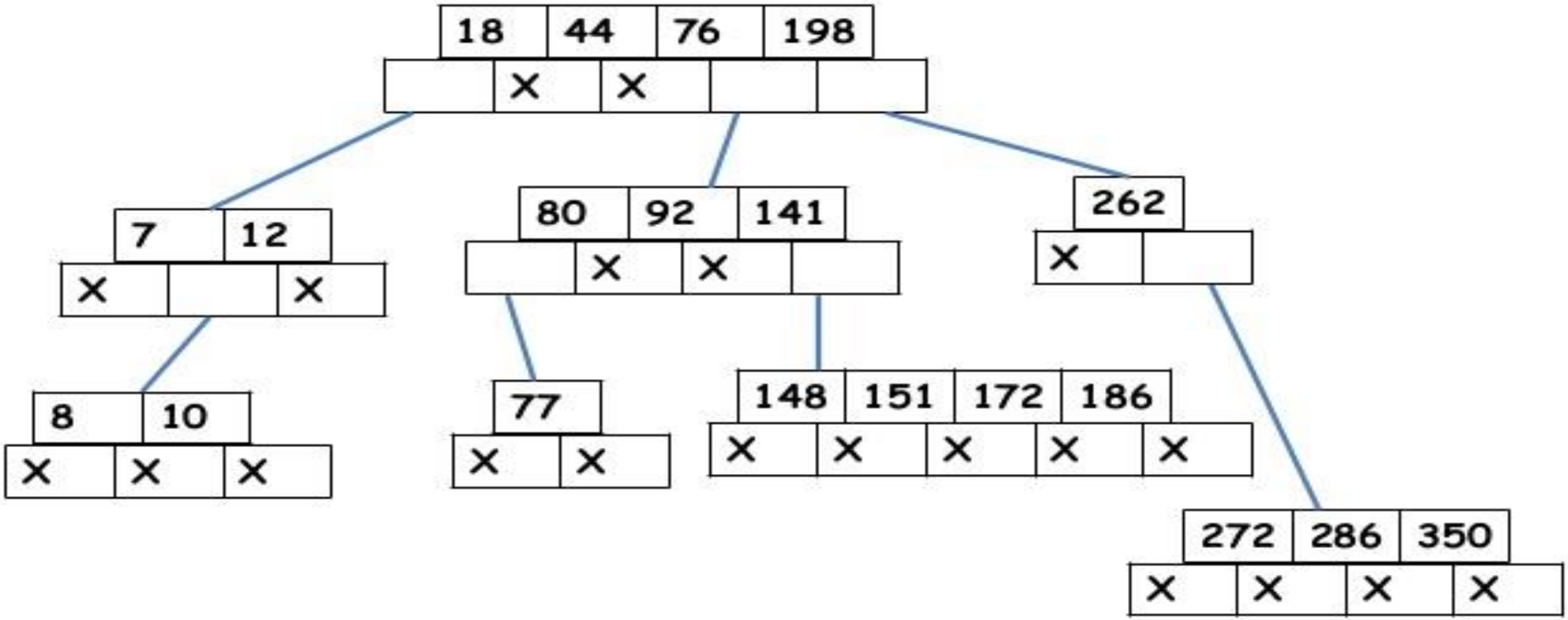
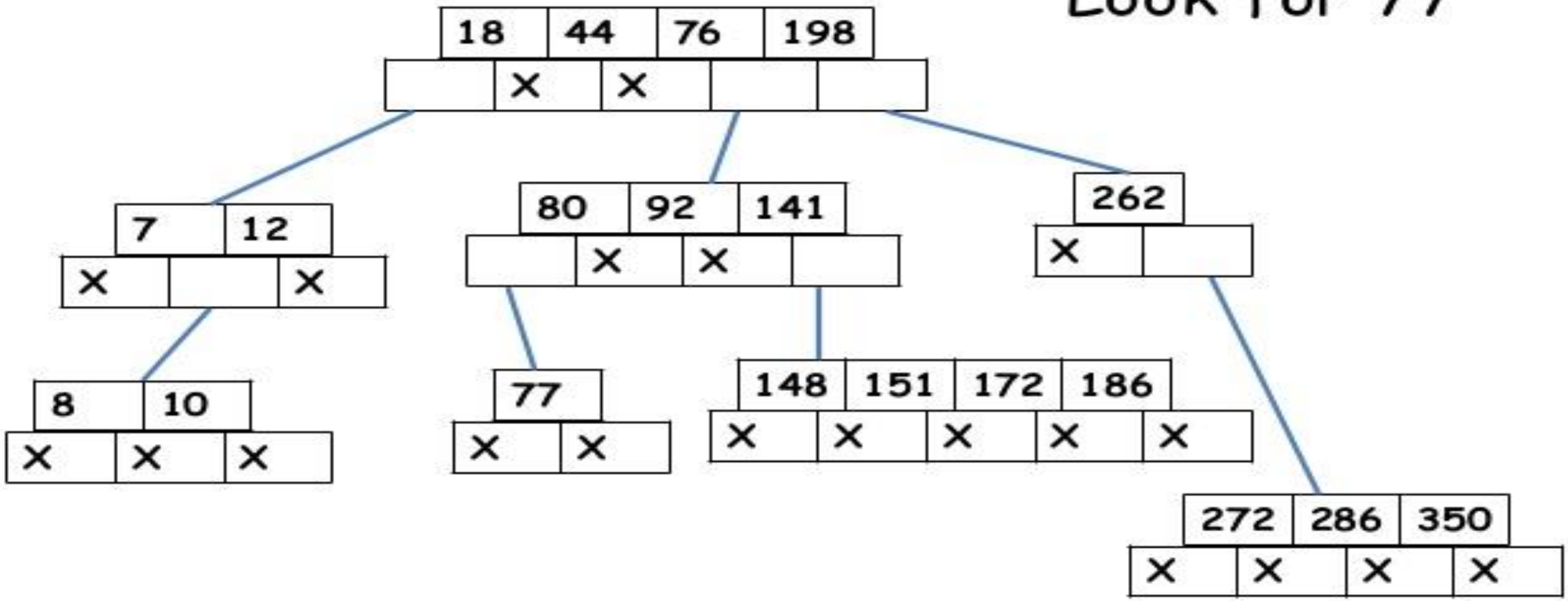
120
75

m-Way Search Tree [m=5]



Searching in an m-Way Search Tree

Look for 77



- Thank You