B+ Tree Insertion (Order n=4) - Step-by-Step

Step 1: Insert 85

[85]

Step 2: Insert 62

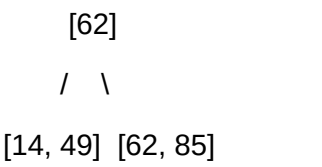
[62, 85]

Step 3: Insert 14

[14, 62, 85]

Step 4: Insert 49 -> Split leaf [14, 49, 62, 85]

- Left: [14, 49]
- Right: [62, 85]
- Promote 62



Step 5: Insert 73

[62]

[14, 49] [62, 73, 85]

Step 6: Insert 58

[62]

[14, 49, 58] [62, 73, 85]

Step 7: Insert 25 -> Split [14, 25, 49, 58]

- Left: [14, 25]
- Right: [49, 58]
- Promote 49 -> Root becomes [49, 62]

[49, 62]

/ | \

[14,25][49,58][62,73,85]

Step 8: Insert 91 -> Split [62, 73, 85, 91]

- Left: [62, 73]
- Right: [85, 91]
- Promote 85 -> Root becomes [49, 62, 85]

[49, 62, 85]

/ | | \

[14,25][49,58][62,73][85,91]

Step 9: Insert 67

[49, 62, 85]

[14,25][49,58][62,67,73][85,91]

Step 10: Insert 34

[14,25,34][49,58][62,67,73][85,91]

Step 11: Insert 80 -> Split [62,67,73,80]

- Left: [62,67]
- Right: [73,80]
- Promote 73 -> Root becomes [49, 62, 73, 85] -> Overflow

Split root [49, 62, 73, 85]

- Left: [49, 62]
- Right: [85]
- Promote 73 -> New root = [73]

[73]

/ \

[49,62] [85]

/ | \ / \

[14,25,34][49,58][62,67][73,80][85,91]

Step 12: Insert 56

[49,58] -> [49,56,58]

Step 13: Insert 23 -> Split [14,23,25,34]

- Left: [14,23]
- Right: [25,34]
- Promote 25 -> [49,62] becomes [25,49,62]

[73]

/ \

[25,49,62] [85]

/ | | \ / \

[14,23][25,34][49,56,58][62,67][73,80][85,91]

Step 14: Insert 74

[73,74,80]

Step 15: Insert 48 -> Split [49,56,58,48]

- [48,49,56,58] -> Split:
  - Left: [48,49]
  - Right: [56,58]
  - Promote 56 -> [25,49,62] becomes [25,49,56,62] -> Overflow

Split [25,49,56,62]

- Left: [25,49]
- Right: [62]
- Promote 56 -> Root [73] becomes [56, 73]

[56, 73]

Final B+ Tree:

Root: [56, 73]

Level 1: [25,49], [62], [85]

Leaves: [14,23] -> [25,34] -> [48,49] -> [56,58] -> [62,67] -> [73,74,80] -> [85,91]