

# B-Tree Search Complexity Proof

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## 1 Theorem: B-Tree Search Complexity

**Statement:** Searching in a B-Tree with  $n$  keys takes  $O(\log n)$  time.

## 2 Proof

1. Search traverses from root to leaf:  $O(\log_t n)$  levels
2. At each level, perform binary search on at most  $(2t - 1)$  keys:  $O(t) = O(1)$  if  $t$  is constant
3. Number of levels:  $O(\log_t n) = O(\log n)$
4. Total time:  $O(\log n) \times O(1) = O(\log n)$

**Conclusion:** B-Tree search has  $O(\log n)$  time complexity.