B+Tree

- Most widely used database index
- B stands for balanced (not binary)
  - All leaves are the same distance from the root
  - Trees grow and shrink at the root

B+tree Order

- If the tree has order M then
  - The maximum number of children a node can have is M
  - The maximum number of keys in a node is M-1
  - The minimum number of children a non-leaf node (except the root) can have is ceiling(M/2)
  - The minimum number of keys in a node (except the root) is ceiling(M/2)-1
  - The root can have between 1 and M-1 keys
  - A node with x children contains x-1 keys
B+Tree

- Good for equality and range searches
- Cost of the search depends on height of the tree
- B+Trees are very short and wide
- Keys in the leaves of an order M, height n B+tree?
  - Maximum number of keys in leaves: \((M)^n(M-1)\)
  - Minimum number of keys in leaves: \(2^{(\lceil M/2 \rceil) + 1} * (\lceil M/2 \rceil - 1)\)
- For example a height 3, order 201 B+tree has between 2,040,200 and 1,624,120,200 keys in the leaves