Given the following data:

Key size = 15 bytes
Pointer size = 4 bytes
Block size = 512 bytes
Number of records = 150k

Let assume there are no duplicate keys.

OK - so how many entries can there be in an index node? Remember there is 1 more pointer in the index nodes than keys so the formula is (sizeof(k)*n + sizeof(p)*(n+1) < sizeof(node).

So if our key is 15 bytes, our pointer is 4 bytes, and our node is 512 we have the following:

\[15n + 4(n+1) < 512\]
\[19n <= 508\]
\[n <= 26\]

So we have max 26 keys and 27 pointers in an index.

That says we have \(\log_{27}N + 1\) levels, where \(N\) = the number of leaf nodes. How many leaf nodes are there?

If you have 150,000 data entries, each one has 15 bytes of key and 4 bytes of pointer. Each leaf node can hold 512 bytes, and contains 2 pointers for the doubly linked list:

\[(15+4*(N) + 8 <= 512\]
\[19N <= 504\]
\[N <= 26\]

\[150000 / 26 = 5770\] leaf pages

\[27^1 = 27\]
\[27^2 = 729\]
\[27^3 = 19683\]

so \(\log_{27}5770 + 1 = 4\) levels