1. # Consider the following instance of a skip list data structure.
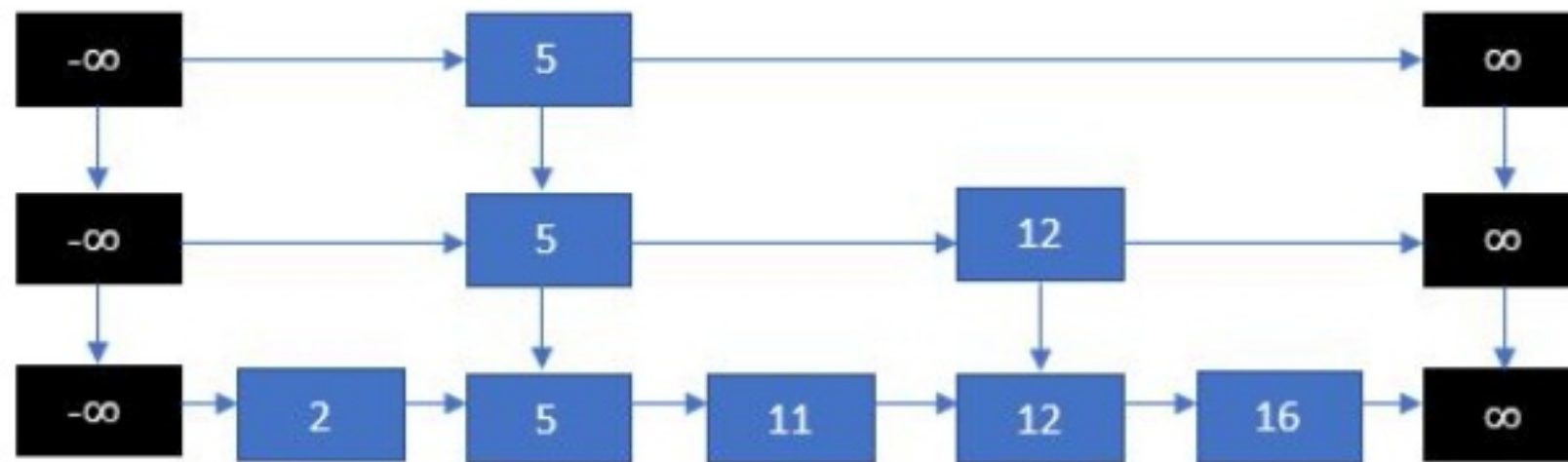

Select all the true facts about skip lists.

☑ Suppose we wish to search for the node 12 in this skip list, our search will reach this node through the path $(-\infty) \to 5 \to 5 \to 12 \to 12$.

✓ **Correct**
Correct.

☑ In this skip list, suppose we wish to insert a new node and flip coins with probability $1/2$ to recreate nodes in the levels above, the probability that at least one new level is created is $1/8$.

✓ **Correct**
Correct.

☐ In this skip list, we can reach any node from the sentinel $(-\infty)$ with a path of length 5 or smaller.

Note: length of a path is number of nodes *including* the sentinel itself.

☐ The bottom row of the skip lists contains all the elements we have inserted so far but not in a sorted order.

2. Consider part of the path taken through the skip list during the process of finding an element X.
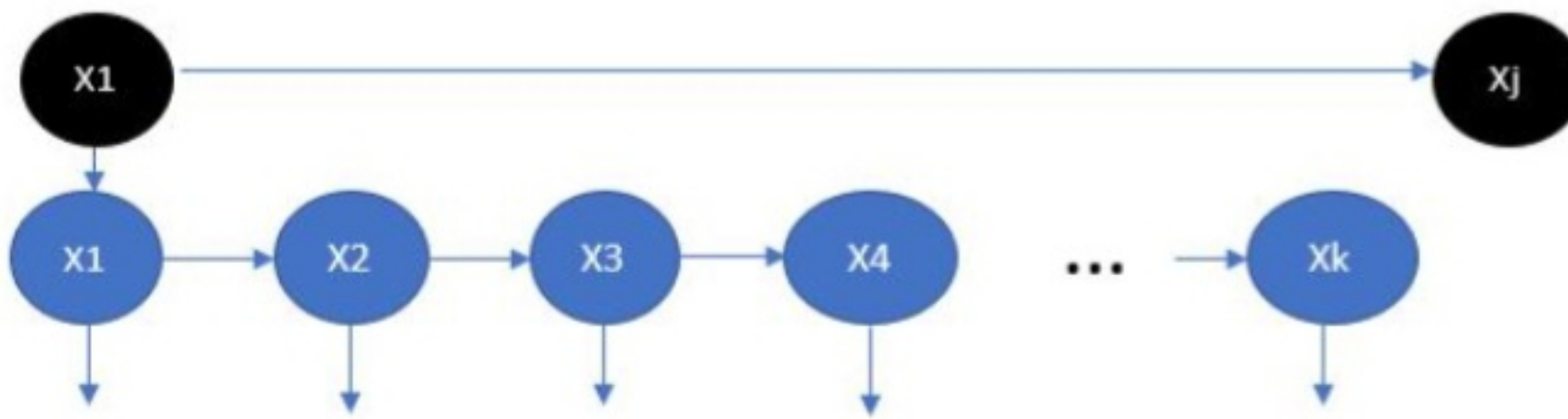
We reach the level from above at node x_1 and continue at this level until we reach x_k. The nodes one level above are shown in black. They include x_1 and the node to its right in the level above x_j.

Select all the true facts about the values/nodes $[x_1, \ldots, x_k]$ and x_j in relation to the key x that we wish to find.

☑ It holds that all keys $[X1, \ldots, Xk]$ are less than or equal to X.

> ✓ **Correct**
> True. Otherwise, we will need to move down before Xk.

☑ $Xj > X$

> ✓ **Correct**
> True. Otherwise, we would move from X1 to Xj in the level above and not bother traversing X1,..., Xk in the level below.

☑ The nodes $[Xk, \ldots, X2]$ cannot have a pointer from the level above down.

> ✓ **Correct**
> True. Or else, we would have traversed to that node in the level above before moving down a level.

☑ If the probability that upon insert each node is replicated one level up is $1/2$, then the probability that $[X2, \ldots, Xk]$ do not have a pointer from the upper level and X1 does is $1/(2^k)$.

> ✓ **Correct**
> True. This is just k independent coin tosses where we have k-1 tails but 1 heads.

☑ The expected length of the path taken by find at any level is given by that of a geometric distribution with probability ½ of success.

> ✓ **Correct**
> True.