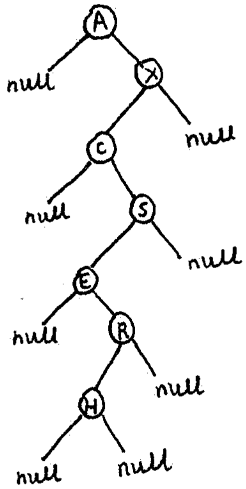
Randy Truong

2a.) A X C S E R H (in its current order)

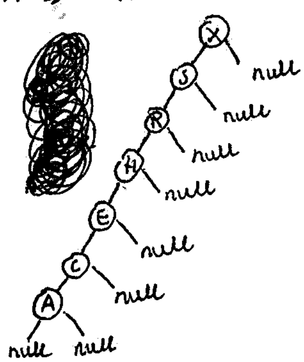
If we are only considering the given elements, then there is only one worst case, such that each node has one null link, except for the last node, which has two null links.



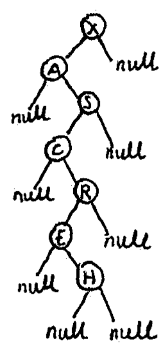
However, if we can change the order of the elements, then we can produce multiple worst cases where each node has one null link, except the last node, which has two ~~node~~ null links.

Other examples include:

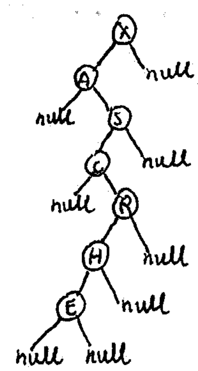
X S R H E C A



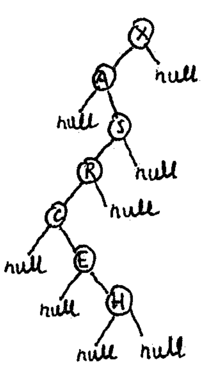
X A S C R E H



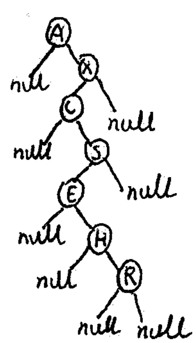
X A S C R H E



X A S R C E H



A X C S E H R

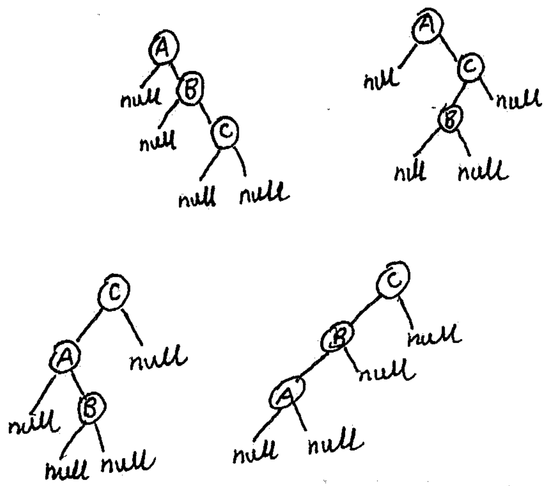


2b.) For a binary tree of height n with n nodes, the tree ~~with~~ would consist of each node being linked to another node and a null link, except the last node, which has two null links. So there are 2^{n-1} binary tree shapes of n nodes (by (*))

(*) Suppose we had the distinct keys A, B, C.

Then $n = 3$

We see that we can construct binary trees of n height as follows.



So the total number of binary tree shapes of n nodes is 2^{n-1}.

$n=3$, $2^{3-1} = 2^2 = 4$ shapes