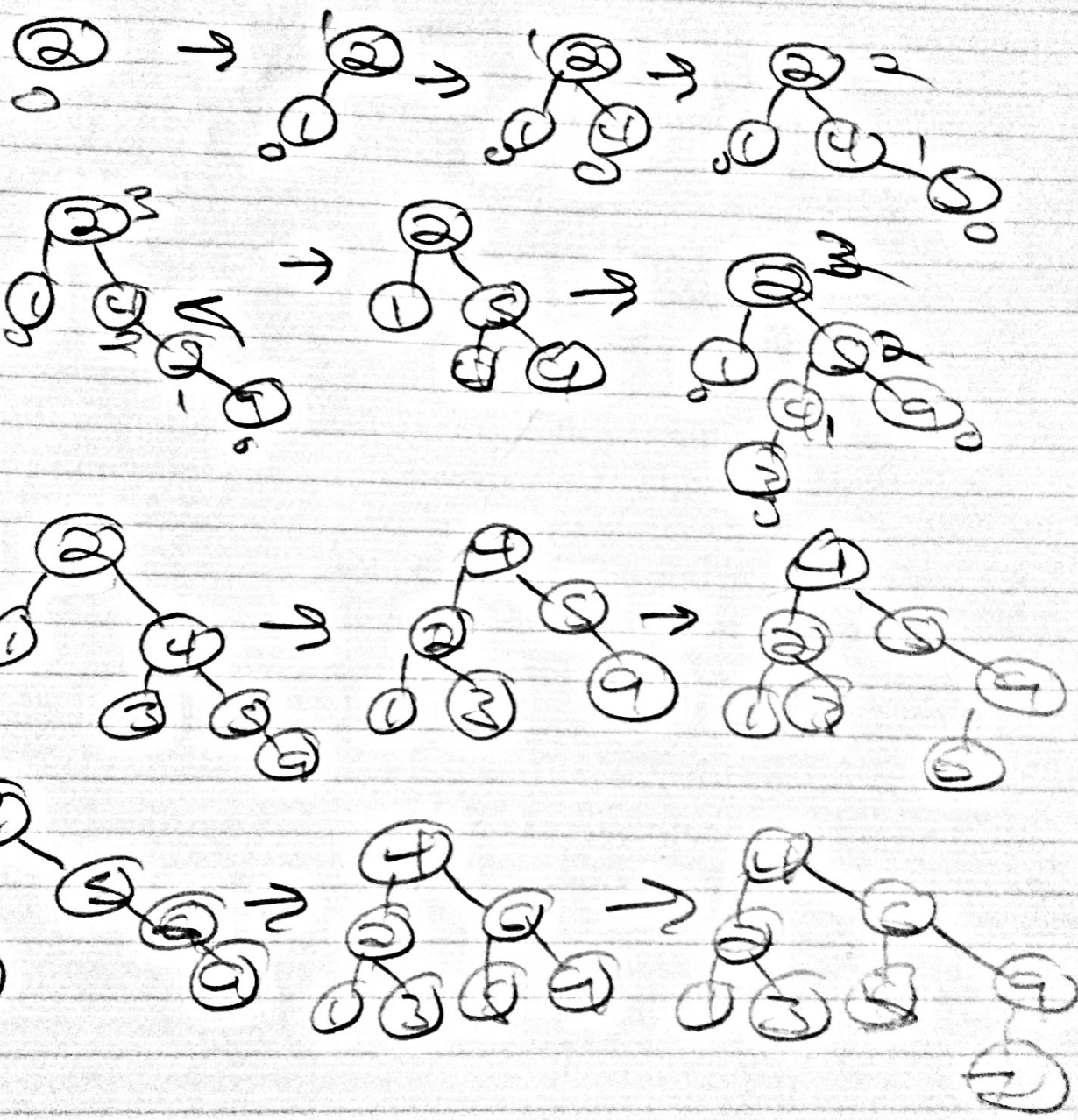
1. What is the minimum number of nodes that a balanced tree of height 15 can have?

The calculation can be solved with the recurrence $\mathcal{N}(h) = \mathcal{N}(h-1)+\mathcal{N}(h-2)+1$. Which when solved for (15) gives the value 2583.

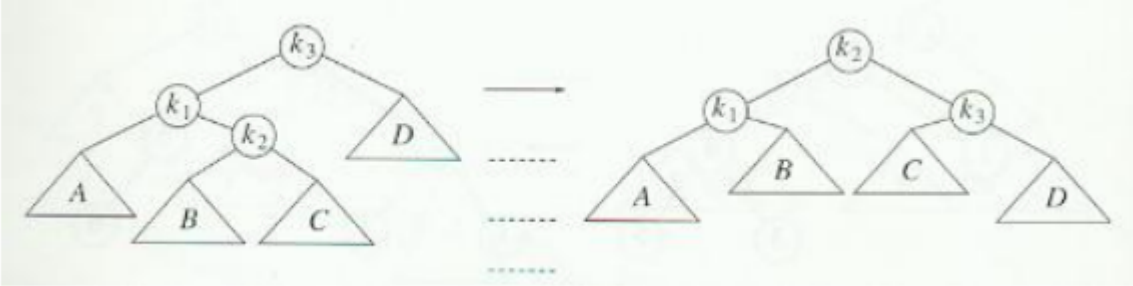
2. Prove that if keys $1, 2, \ldots, 2^{k-1}$ are inserted into an initially empty AVL tree, then the resulting tree is perfect.

3. Insert 2,1,4,5,9,3,6,7 into an initially empty AVL tree. Redraw the tree each time a rotation is required.

2, 1, 4, 5, 9, 3, 6, 7



4. Consider the diagram on below that shows double rotation. List all of the pointers that need to be updated after the rotation. Provide the new value for each pointer.



$$
\begin{aligned}
k3.left &= k2.right \\
k2.right.parent &= k3 \\
k2.parent &= k3.parent \\
k3.parent &= k2 \\
k1.right &= k2.left \\
k2.left.parent &= k1 \\
k1.parent &= k2 \\
k2.left &= k1
\end{aligned}
$$