Set 8

29. Allen starts with the number 0, and wants to get to the number 2014. If on each step, he can either multiply by 3 or add 1, what is the minimum number of steps needed to get to 2014?

30. Let $S_0, S_1, \cdots, S_8$ be subsets of $\{1, 2, 3, 4, 5, 6, 7, 8\}$ such that $S_0 = \varnothing$, and S_i is a proper subset of S_{i+1} (i.e. $S_i \neq S_{i+1}$) for integer i with $0 \leq i \leq 7$. How many possible chains of subsets (ways to choose the subsets) are there?

31. How many distinct (non-degenerate) kinds of tetrahedrons created from 4 distinct vertices of a cube are there? Two tetrahedrons are not considered distinct if one can be turned into the other by reflection and/or rotation.

32. The *rhombicuboctahedron* is a polyhedron with 8 triangular faces and 12 square faces. Each of its 24 vertices has 3 square faces and 1 triangular face meeting at that vertex. Find the volume of a rhombicuboctahedron of side length 1.