Solution (#294) If we list the elements $\{1, 2, \ldots, n\}$ in some order then there is a free choice from the n elements of what the first term is. Given that choice, though, there are now $n-1$ choices for the second term as the first term may not appear again. So there are $n\,(n-1)$ ways to choose the first two terms.
Given those two choices there are $n-2$ choices for the third term and so $n\,(n-1)\,(n-2)$ ways to choose the first three terms.
In all, then, there are

$$n \times (n-1) \times (n-2) \times \cdots \times 1 = n!$$

ways of listing n elements where order counts.