

Counting

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Counting

The art of counting is known as enumerative combinatorics. One tries to count the number of elements in a set (or, typically, simultaneously count the number of elements in a series of sets).

For example, let S_1, S_2, S_3, \dots be sets with $1, 2, 3, \dots$ elements, respectively. Then the number of subsets of S_i is given by $f(i) = |P(S_i)| = 2^i$.

The basic principles are extremely simple, but counting is a nontrivial task.

The Product Rule

Suppose that a task can be broken down into a sequence of two subtasks. If there are n_1 ways to solve subtask 1 and n_2 ways to solve subtask 2, then there must be $n_1 n_2$ ways to solve the task.

Let S_1 and S_2 be sets describing the ways of the first and second subtasks, so $n_1 = |S_1|$ and $n_2 = |S_2|$.

Then $|S_1 \times S_2| = n_1 n_2$.