The idea of dynamic programming is to compute all the sub-solutions in order to produce a final solution.

**Binomial numbers.** $\binom{n}{k} = \frac{n!}{k!(n-k)!}$ requires $2k$ multiplications and 1 division.

To use dynamic programming, we'll use the obvious recursion for binomials:

$$\binom{n}{k} = \binom{n-1}{k-1} + \binom{n-1}{k}$$
$$\binom{n}{0} = \binom{n}{n} = 1$$

**Partition numbers.** $\mathcal{P}_{n,k}$ represents the number of ways we can partition an $n$-set into $k$ non-empty subsets.

$\mathcal{P}_{n,0} = 1$ and $\mathcal{P}_{n,n} = 1$. $\mathcal{P}_{n,k} = \mathcal{P}_{\setminus} - \infty, \| - \infty + \mathcal{P}_{n-1,k} \times k$.

**Travelling salesman problem (TSP).** Given sites $1, \cdots, n$ and a function $d(i, j)$ giving the distance between sites $i$ and $j$.