nth Catalan Number

卡塔兰数可以用来解决如下问题：

1. 对于指定的n，计算n对正确匹配的括号的表达式的数量

2. 计算具有n+1个叶子节点的完全二叉树的数量

$$T(n) = \sum_{i=0}^{n-1} T(i) * T(n-i-1) \text{ for } n \geq 1$$

```cpp
#include <stdio.h>
#include <vector>
#include <bits/stdc++.h>
#include <boost/multiprecision/cpp_int.hpp>

// helpful for handling large numbers having range beyond the long long, long double data type (264) in C++.
std::vector<boost::multiprecision::cpp_int> catalan;

void getCatalan(int n) {
    catalan.resize(n + 1);
    catalan[0] = catalan[1] = 1;
    for (int i = 2; i < n; ++i) {
        for (int j = 0; j < i; ++j) {
            catalan[i] += catalan[j] * catalan[i - j - 1];
        }
    }
}


int main() {
    getCatalan(101);
    int T;
    scanf("%d", &T);
    while (T--) {
        int n;
        scanf("%d", &n);
        std::cout << catalan[n] << std::endl;
    }
    return 0;
}
```

Advanced C++ with boost library - GeeksforGeeks
https://www.geeksforgeeks.org/advanced-c-boost-library/