Experiment1-董皓彧

环境：

```
g++.exe (x86_64-win32-seh-rev1, Built by MinGW-Builds project) 13.2.0
Visual Stdio Code 1.86.2
```

作业仓库地址：
https://github.com/FHYQ-Dong/Tsinghua-Program-Design-Assignments-2/tree/main/Experiment1

必做题

Experiment1-1

题目：

```
用 C++ 打印杨辉三角，直至第十行
```

输入格式：

```
略
```

输出格式：

```
杨辉三角
```

代码：

```cpp
#include <iostream>
using std::cout, std::endl;

int main() {
    // init
    int a[11][11] = {0};
    for (int i = 0; i < 11; ++i) {
        a[i][0] = 1;
        a[i][i] = 1;
    }
    // calculate
    for (int i = 1; i < 11; ++i) {
        for (int j = 1; j < i; ++j) {
            a[i][j] = a[i-1][j-1] + a[i-1][j];
        }
    }
    // print
    for (int i = 1; i < 11; ++i) {
        for (int j = 0; j <= i; ++j)
            cout << a[i][j] << " ";
        cout << endl;
```

```
    }
    return 0;
}
```

输入1：

```

```

输出1：

```
1 1
1 2 1
1 3 3 1
1 4 6 4 1
1 5 10 10 5 1
1 6 15 20 15 6 1
1 7 21 35 35 21 7 1
1 8 28 56 70 56 28 8 1
1 9 36 84 126 126 84 36 9 1
1 10 45 120 210 252 210 120 45 10 1
```

Experiment1-2

题目：

```
用 C++ 编程实现如下三维动态数组 x：动态数组大小为 n×n×n，x[i][j][k] = i*j/(k+1)，输出该三维数组各个元素之和，取 n=5，10，15
```

输入格式：

```
一个数字 n，表示三维数组的大小
```

输出格式：

```
一行，一个数字，表示该三维数组各个元素之和
```

代码：

```
#include <iostream>
using std::cin, std::cout, std::endl;

inline double func(int n) {
    double ***a = new double** [n];
    for (int i = 0; i < n; ++i) {
        a[i] = new double* [n];
        for (int j = 0; j < n; ++j) {
            a[i][j] = new double [n];
            for (int k = 0; k < n; ++k)
                a[i][j][k] = i*j/(k+1);
        }
    }
    // calculate
```

```
    double sum = 0;
    for (int i = 0; i < n; ++i)
        for (int j = 0; j < n; ++j)
            for (int k = 0; k < n; ++k)
                sum += a[i][j][k];
    // free
    for (int i = 0; i < n; ++i) {
        for (int j = 0; j < n; ++j)
            delete [] a[i][j];
        delete [] a[i];
    }
    return sum;
}

int main() {
    int n; cin >> n;
    cout << func(n) << endl;
    return 0;
}
```

输入1：

```
5
```

输出1：

```
210
```

输入2：

```
10
```

输出2：

```
5694
```

输入3：

```
15
```

输出3：

```
35611
```

选做题

Optional-Experiment1-1

题目：

> 利用‘*’符号，使用格式控制符，在控制台组成一个“龙”字图样

输入格式：

> 略

输出格式：

> “龙”字

代码：

```
#include <iostream>
#include <iomanip>
#include <vector>
using std::cin, std::cout, std::endl, std::setw;

int main() {
    // pixel data
    std::vector<int> v[15] = {
        {6}, \
        {6, 3}, \
        {6, 4}, \
        {6}, \
        {1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1}, \
        {6, 2}, \
        {6, 2, 4}, \
        {5, 3, 4}, \
        {5, 3, 3}, \
        {5, 3, 2}, \
        {4, 4, 1}, \
        {4, 4, 6}, \
        {3, 4, 1, 6}, \
        {2, 3, 1, 2, 6}, \
        {1, 8, 1, 1, 1, 1}
    };
    // print
    for (int i = 0; i < 15; ++i) {
        for (int j = 0; j < v[i].size(); ++j) {
            cout << setw(v[i][j]) << "*";
        }
        cout << endl;
    }
    return 0;
}

/*====================

     *
```

```
      *  *
      *   *
      *
***************
      * *
      * *   *
     *  *   *
     *  *  *
     *  * *
    *   **
    *   *      *
   *    **     *
  *   ** *     *
*        *****

====================*/
```

输入1：

```

```

输出1：

```
      *
      *  *
      *   *
      *
***************
      * *
      * *   *
     *  *   *
     *  *  *
     *  * *
    *   **
    *   *      *
   *    **     *
  *   ** *     *
*        *****
```